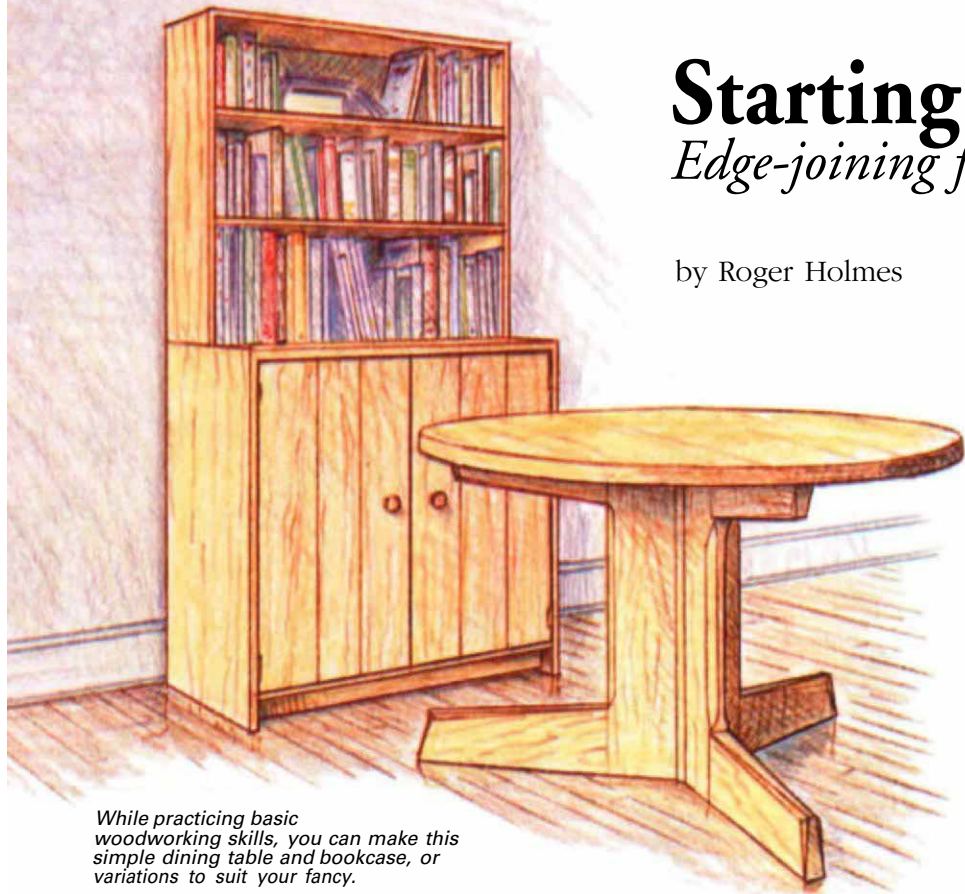


Starting Out

Edge-joining for the beginner

by Roger Holmes



While practicing basic woodworking skills, you can make this simple dining table and bookcase, or variations to suit your fancy.

A friend of mine took a beginners' woodworking course not too long ago. She was surprised, and a little disappointed, to discover that the first two sessions were devoted not to the construction of a coffee table or a dovetailed box but to the making of a simple, ordinary board—two flat, parallel faces, and square to them, two straight edges.

Board-making is not exactly the stuff of woodworking romance. But without boards it's tough to make tables and cabinets. In this article I'll tackle board-making; in subsequent articles, I'll cover other basics—cutting bridle joints, rabbets, and so on. My methods aren't definitive, but I hope they'll get you going.

Making sample joints isn't much fun, so if you don't have your own projects to practice on, you can cobble up the table and bookcase shown above as you go along. (Make the 48-in. dia. tabletop now, the table base with the next article, the bookcase with the third and fourth.) I built these pieces after my wife and I moved our meager possessions into a seven-room apartment and needed to fill up the empty spaces. The results are hardly masterpieces of design or construction, but you can generate a lot of simple furniture from them. Chests of drawers, after all, are just little boxes housed in a big box; tables, merely slabs of wood perched at various heights above the floor.

Wood—I decided to build the table and bookcase of solid wood, even though using plywood would have eliminated gluing up wide boards. I enjoy working solid wood. Curling a long shaving out of my plane gives me a great deal of satisfaction—planing plywood produces grit and dust.

There is solid wood and solid wood, however. Some woods, such as rosewood and walnut, seem to demand elegant designs. But what I wanted was utility, economy, and something easy and pleasing to work. Pine filled the bill on all counts, and I discovered a small lumberyard up the road selling it for \$.30 to \$1.00 a board foot.

I strongly recommend that beginners work with pine or a similarly soft, evenly grained wood such as basswood or certain varieties of fir. Mistakes are inevitable and instructive, so you might as well make them cheaply. In lumberman's lingo, you'll need 4/4 (1-in.) boards for the boxes and 8/4 (2-in.) boards for the table.

If you can, buy roughsawn (unplaned) boards. If not, buy the planed, or surfaced, boards sold at most lumberyards. The most common variety of surfaced board is designated S4S, which stands for "surfaced four sides," meaning that the boards have been surfaced on both faces and both edges. No. 2 Common pine boards are fine. They're relatively cheap,

and the knots in them will add character to your furniture (that's as good a rationalization as any for penny-pinching.) Because the boards have been surfaced, they will not be the full nominal thickness. For example, if you want boards between 3/4 in. and 1 in. thick after you've flattened them, start with 5/4 S4S stock.

Flattening boards—The tabletop and the box that forms the bookcase base require large, flat expanses of wood. Roughsawn boards from the sawmill or surfaced boards from the lumberyard are seldom flat enough or wide enough. Their faces usually will be cupped across the grain, bowed, or twisted diagonally along the grain, or a combination of all these. Making wide boards by edge-joining requires flat boards, so your first task is to make them that way.

Cabinetmaking, like mathematics, proceeds logically from start to finish. Each step builds on the last, and if you miss something at the beginning, you'll likely suffer for it at the end—or sooner. If the first face isn't reasonably flat, everything that follows will be affected. The sequence is simple: After flattening one face, flatten the other while removing enough wood to bring the board to the right thickness. Then plane the edges square to the faces, and you're ready to glue up.

I think that the hand plane is the most effective tool for flattening. Its mechanical cousin, the jointer, is quicker, but the width of the jointer bed limits the width of board that can be flattened. A thickness planer can make a board uniformly thick, but it can flatten only the thickest boards. Whenever possible, I use a combination of hand and machine techniques. But even if you're blessed with a wide jointer and a planer, it helps to know how to flatten, thickness and joint the edges of boards by hand. In the process, you'll also

For a close shave

Planing with a dull tool is a thankless task. I spent much of my first wood-working year struggling with a dull plane blade, and when I finally managed a keen edge, it was a revelation. It's inevitable that, for a while, you'll be keener than your tools.

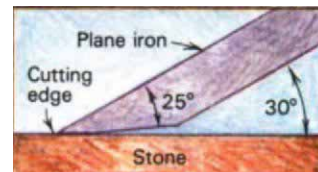
In sharpening, the end totally justifies the means, and there are dozens of equally effective routes to a sharp edge. The cutting edge of a plane blade is at the intersection of the bevel and the back of the blade. The ideal edge, like the ideal line in geometry, would have length but no thickness. All sharpening methods try to refine the bevel/back intersection to the ideal by removing steel with finer and finer abrasives.

My sharpening tools are simple: a bench grinder with a medium-grit, 6-in. carborundum wheel; an 8-in. long combination India benchstone, one side coarse, one side fine; a 6-in. long soft Arkansas benchstone; and a leather strop, a piece of belt leather impregnated with a fine abrasive such as rottenstone. (The leather alone, or even the palm of your hand, will do for a strop).

The bevel of a new plane iron is ground to about 25° and I maintain this angle, trying not to facet the bevel when grinding. Most grinders have tool rests that can be fixed, or adapted, to support the blade at the bevel angle. You can grind the cutting edge slightly convex in its length or dub off the corners to prevent making ridges in the wood when you're rough-planing. I use one plane for everything, so I grind straight across, and plane the ridges out with a few strokes of a sharp, finely set blade.

After grinding, rub a little light machine oil on the fine face of the India stone and rest the bevel on

it. I hold the blade with one hand, tilt it slightly forward (about 5°) and draw it toward me. The motion can be slow or fast, but hold the blade steady—don't rock it from front to back or side to side. Tilting the blade forms a second bevel, which makes the cutting edge a little more durable.



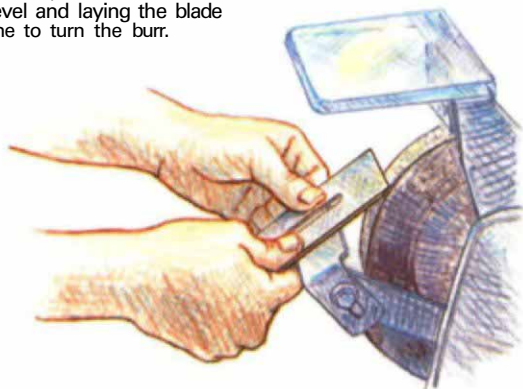
Take six to eight strokes, then feel for a burr of steel rolling over the back of the cutting edge. When the burr appears, move to the soft Arkansas stone and make about as many strokes at the same angle. Then turn the blade over, lay it *flat* on the stone, and rub it back and forth to turn the burr. Alternate on the Arkansas between the bevel and the back until the burr disappears. Then stroke the bevel and back on the leather strop, just as on the stones.

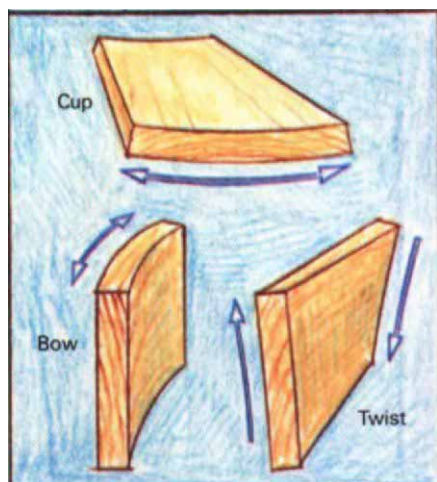
At the end of this little ritual, try to shave the hair off the back of your hand—a clean shave equals a sharp edge. If you tire of being asked about your bald hand, rest the flat side of the blade on your thumbnail, raise it slightly and push the cutting edge toward the cuticle. The lower the angle at which the edge catches on the nail, the sharper it is. If the edge isn't sharp enough, strop again; if that doesn't work, go back to the stones.

That's how I do it. Others hold the blade with both hands, move it in a circle or a figure eight on the stone, strop the edge on their pant leg, and so on. No matter how long it takes, don't get discouraged. Once you get used to it, you can sharpen a plane iron in less time than takes to read about how to do it. —R.H.

Sharpening on stone

Sharpening involves a series of simple operations, but success requires patience and persistence. Grind a 25° bevel on the blade (below), then refine the edge with increasingly fine benchstones and a leather strop. Try not to rock the blade as you push or pull it across the stones (above). When you move to the soft Arkansas stone, alternate between stroking the bevel and laying the blade *flat* on the stone to turn the burr.





Planing technique

Most boards are afflicted with at least one of the problems shown at left, but can be cured with a hand plane. Hold the plane comfortably; make your whole body work for you. Extend your right index finger along the edge of the blade for added control. Begin with pressure on the plane's toe, and end with pressure on the heel.



acquire dexterity with the plane, which is handy for all sorts of work.

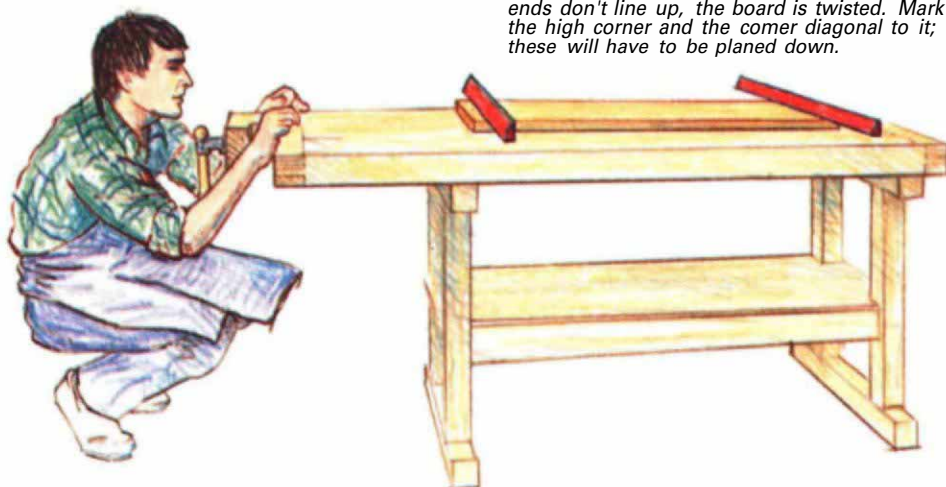
Selecting a plane—Locked up in a London warehouse is my collection of bench planes—eight or nine different sizes, all in working order. When I acquired them, I was teaching myself to woodwork from books and it didn't seem possible to get by with fewer than a half-dozen bench planes. I did my best with them, but the results were mixed. When I went to England to work with master craftsman Alan Peters, I packed them all, eagerly expecting Alan to reveal their secrets. The secret, he told me, was to leave them in the box and use a jointer plane.

I use a 22-in. long, 7½-lb. Stanley-Bailey #07 jointer for everything, from flattening rough lumber to slicing a few thousandths of an inch off the end grain of a 2-in. wide drawer side. The plane is at least 30 years old and cost me \$35 used.

I like the jointer's size, weight and balance. Its length and width make it ideal for flattening boards and jointing long edges. It rides over low spots while slicing

Using winding sticks

You can check for twist by sighting across two identical pieces of wood called winding sticks. Get the edges at one end of each stick in your line of sight, then move your eye down the length of the edges. If the edges at the other ends don't line up, the board is twisted. Mark the high corner and the corner diagonal to it; these will have to be planed down.



off the high until everything is flat. And it's heavy enough to maintain solid contact with the wood so most of the pushing can be in the direction of the stroke.

Most important for me is the jointer's balance. Held only by its handle, a jointer remains nearly horizontal—there's about as much weight behind the handle as in front. Balance makes the plane easier to control and less tiring to use.

Every woodworker has a favorite plane. The right bench plane for a job is the one you're most comfortable with—don't be afraid to go against the book and try a plane outside its prescribed territory.

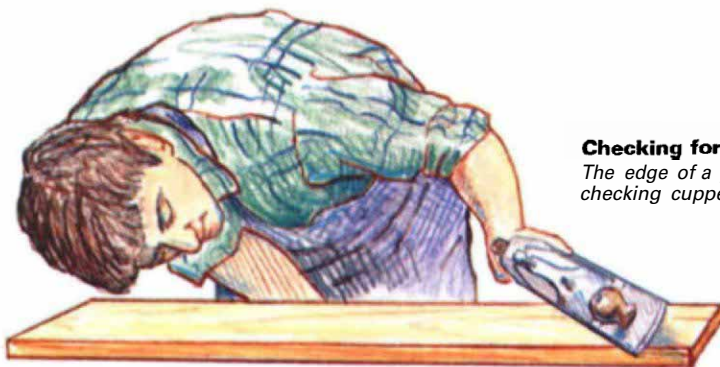
Planing—First determine where the board isn't flat. This can be done by eye, alone or aided by a straightedge, or by feel on a large, flat surface, such as a benchtop, the top of a tablesaw, or the kitchen floor (unless your kitchen floor is like mine and

requires sea legs to navigate). Sight across the width of the board to check for cupping and along its length to check for bowing. If you've got a flat surface, check for twist by placing the face of the board on it, then tap each corner in turn. A twisted board will rock, supported on diagonal corners. If you haven't got a flat surface, you can use winding sticks to determine twist, as shown on the facing page.

When you've found and marked the high spots, plane them off. The first problem here is holding the board while you plane. A bench with a tail vise and benchdogs is ideal: pinched between the vise and a stop, most if not all of the board is supported by the benchtop. Lacking a built-in, wooden tail vise, you can mount a regular bench vise on the end of a bench, and bore holes in the benchtop for homemade wooden dogs— $\frac{3}{4}$ -in. dia. dowels with scrapwood heads work fine. An easier solution is to drive three or four nails into the benchtop in an L-shaped configuration and shove the board against them. As long as you plane toward the nails, the board won't move.

I set the plane blade to remove as much wood as possible, while still allowing for a comfortable stroke. Position the chip breaker about $\frac{1}{16}$ in. back from the cutting edge and make sure that the edge is parallel to the sole of the plane. (Keep the sole and cutting edge parallel for all planing.) I lower the cutting edge as I make the first few strokes. The amount varies with the character of the board, how keen the cutting edge is, and how keen I am to shove away. If you're a hearty soul and the wood is cooperative, you can peel off a goodly shaving (maybe $\frac{1}{32}$ in. thick) with each pass. Less blade, less brawn and more strokes will get the job done just as well. If you keep lowering the blade and still slice off only a wisp of wood, or none at all, chances are the blade is dull—take the time to sharpen it.

I hold and push the plane as shown on the facing page. Planing is repetitive work and is most accurately and efficiently done rhythmically, each stroke the same, or nearly the same, as the last. I like to power the stroke with my back and shoulders as well as my arms, shifting weight from front to rear



Checking for cup

The edge of a plane works fine for checking cupped boards.

foot as the stroke progresses. Using your whole body allows you to control the plane with your hands and wrists.

I plane the concave side of a cupped or bowed board first. The plane can too easily follow the contour of the convex side, and you'd just keep planing the same curve rather than flattening it. Regardless of whether the board is cupped, bowed or twisted, it's best to plane diagonally across the board's width, because the plane is less likely to follow and maintain the contour of a long curve or to tear the grain severely. Concentrate on removing the high spots. Check your progress every now and then with a straightedge, flat surface or winding sticks. If the plane is long enough, you can use it as a straightedge, as shown above. A torn and rough surface indicates that you're planing against the grain—try planing the other way. After the face is planed, draw an arrow on it to mark the best direction for planing—the arrow will help you lay out the boards when you're ready to joint the edges.

If the planed board is wide enough to use without gluing up (a bookcase side, for example), smooth any torn grain with

a sharp plane, stroking parallel to the grain direction. Often I make these last strokes after assembling the piece. I don't sand the surfaces, because I like the look and feel of a planed surface—and sanding is no fun at all.

Flattening boards is a good way to get a feel for planing. In the old days, apprentices spent months at it, paying their dues, building up their skill and their biceps. You make lots of strokes, but there isn't a lot of risk involved. About the worst you can do is end up with thinner boards than you wanted. And if you really screw one up, try another—after all, it's just pine.

Thicknessing—When you're satisfied with the first face, you can gauge from it to flatten the second face and thickness the board. Set a marking gauge to the thickness you want (or the thickness you can get—the thinnest spot on the edges or ends), then run it around the edges and ends of the board. Now plane down to the scribe, just as for flattening.

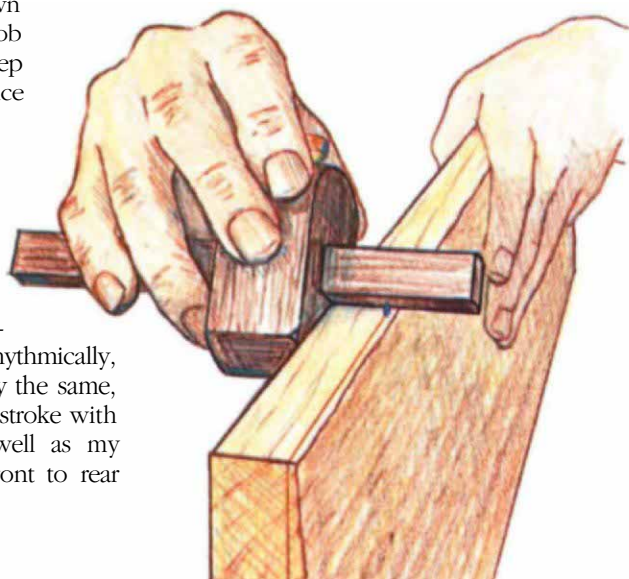
If you don't want to thickness boards by hand, a local millwork shop might do it for you by machine. If you haven't flattened one side, make sure they do, otherwise you'll just end up with uniformly thick boards that are still cupped, bowed or twisted. Also let them know beforehand if the boards are pine—some shops won't machine resinous woods.

Edge-Jointing—When you've got a stack of flat boards, a pile of fragrant shavings and a pair of sore arms, you're ready to plane the edges for gluing up. This is less strenuous than flattening or thicknessing, but more exacting. I've come to appreciate bookcases that can be made without edge-joined boards. Tabletops and deeper boxes, unfortunately, can seldom be made without gluing up boards. Once I'm resigned to necessity, I usually enjoy the technical challenge of making good edge joints.

The ideal edge joint consists of two edges, planed straight, flat and square to their adjacent faces, cemented together with a microscopic layer of glue. In practice, the edges needn't be square or flat as

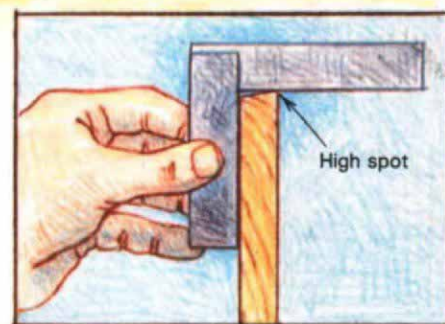
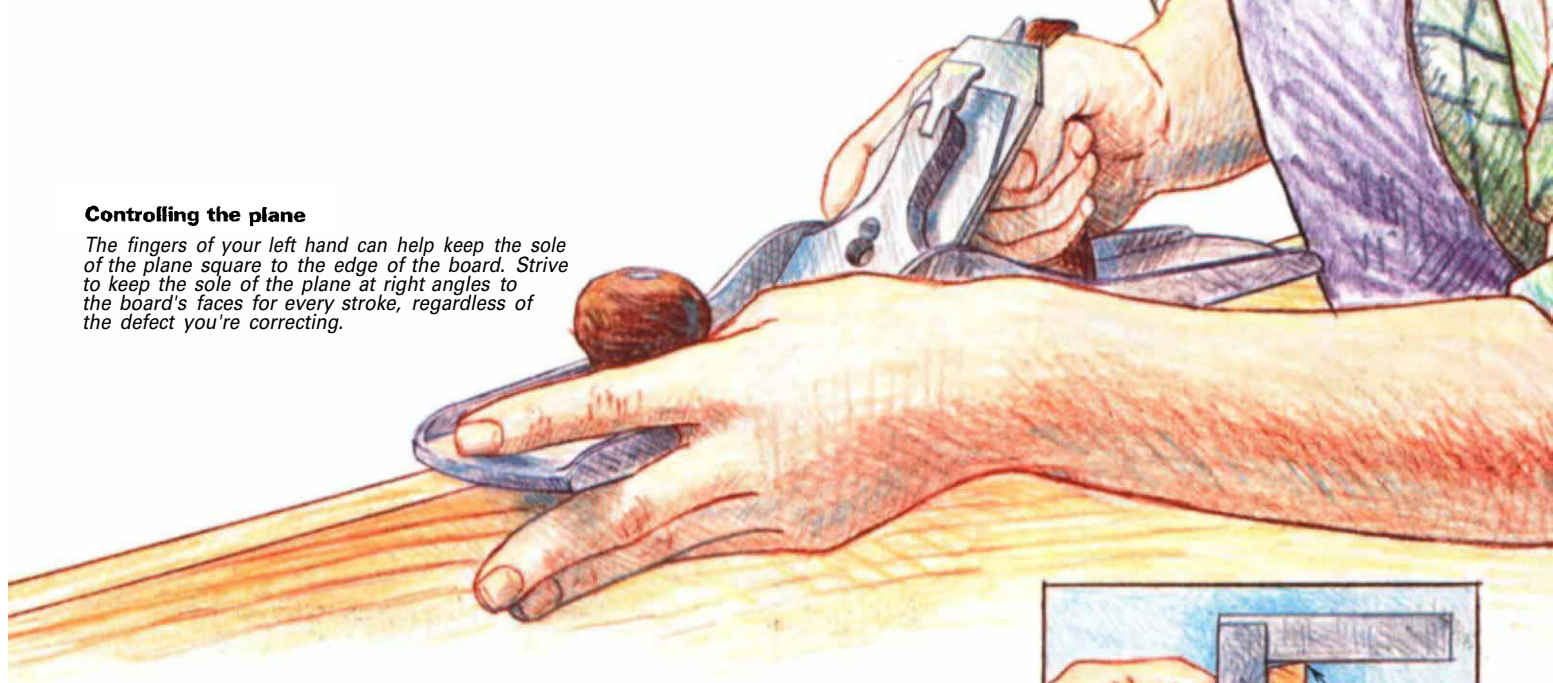
Scribing the thickness

After flattening one face, scribe a line indicating the board's thickness around the edges and ends with a marking gauge. Push the gauges fence flush to the flat face and its scribe point into the wood. Push or pull the gauge, whichever suits you.



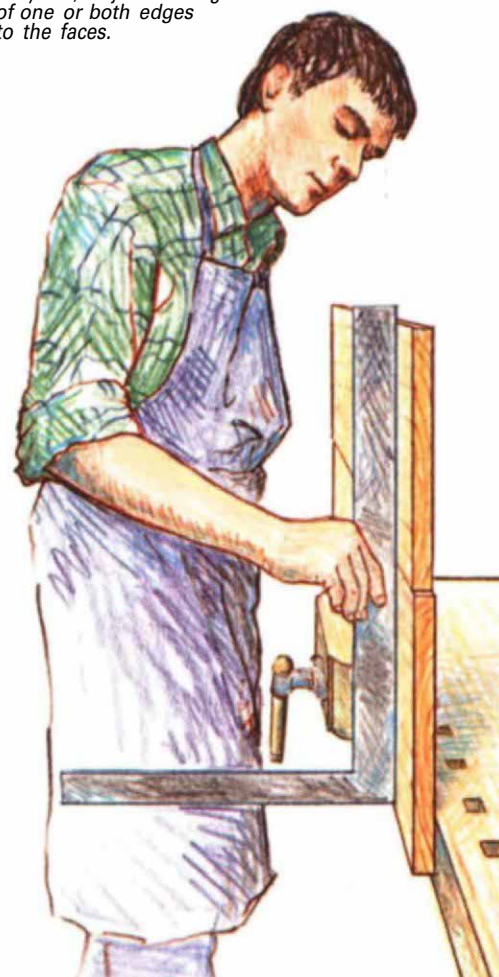
Controlling the plane

The fingers of your left hand can help keep the sole of the plane square to the edge of the board. Strive to keep the sole of the plane at right angles to the board's faces for every stroke, regardless of the defect you're correcting.



Checking the edges

Check the squareness of an edge with a try square. Sight into a light source as you slide the square along the edge. Light between the edge and the blade indicates a high spot. If high spots at each end are on diagonally opposed corners, the edge is twisted. Check mating edges with a straightedge, as shown below. If the surface isn't fairly flat, adjust the angle of one or both edges to the faces.



long as they are complementary, and if the edges axe slightly concave in their length, the joints will be less prone to open at the ends. That said, I still *try* to plane edges flat and square.

Lay out the boards for the tabletop or box side on a flat surface. Arrange them so the grain pattern and colors please you. If you have a slightly bowed board, place it between straight ones—it can be pulled into alignment when you clamp up. Run all the grain-direction arrows you made earlier in the same direction, so you'll be less likely to tear the surface when planing it flat after glue-up. Finally, mark the relative positions of the boards by drawing a

large V across their faces—reconstituting the V will restore the order.

Sharpen the plane blade before edge-jointing, and set the chip breaker within $\frac{1}{32}$ in. or less of the cutting edge. Make sure the cutting edge is parallel to the sole, then adjust the iron during the first few strokes to take a heavy shaving for roughing out the edge, or a fine one for finishing.

Put the first board edge-up in a bench vise. (Long boards narrower than 2 in. to 3 in. should be planed edge-up on the benchtop between dogs or against a nail, so they won't bend under the pressure of planing.) Sight down the length of the edge to determine if it's convex or con-

Edge-planing

Edge-planing strokes should be slower and more controlled, but no less rhythmic, than flattening strokes. Power the plane with your body; orient it with your hands. Put pressure on the toe at the start, and on the heel at the finish of a stroke.



cave. Check the edge for squareness to the faces with a try square. You can sight down the edge as you slide the square along it, marking high spots as you go.

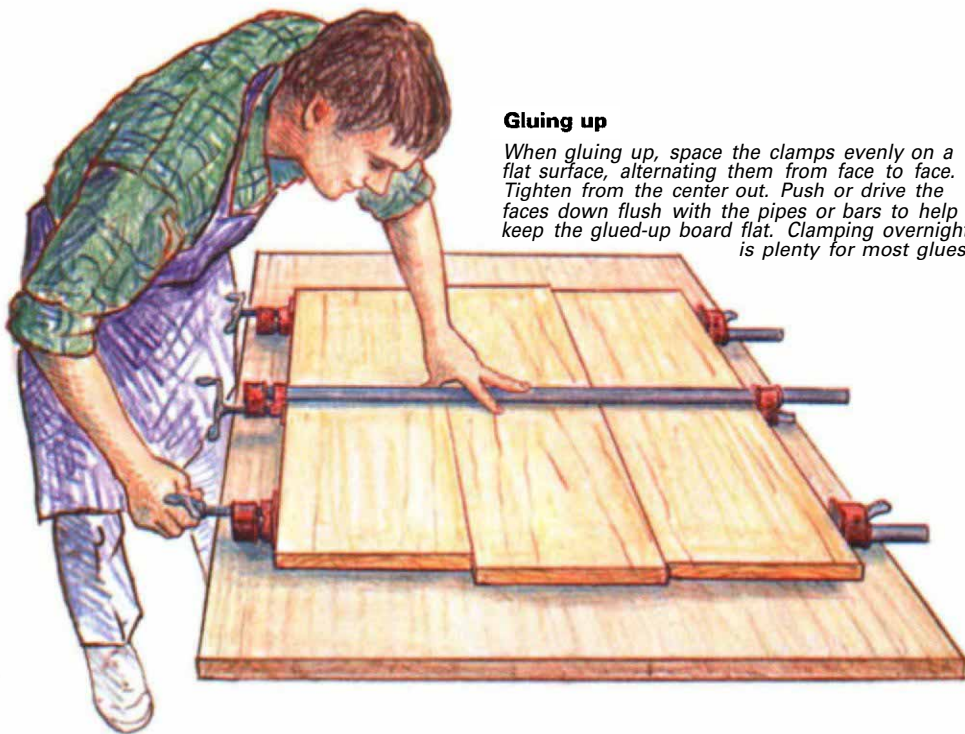
The secret to edge-planing is to always hold the plane with its sole perpendicular to the faces of the board. I extend three fingers of my left hand over the edge of the plane, where they rub against the wood, forming a fence and giving a surprisingly accurate sense of the angle of plane to face. Use your whole body to power the plane; control it with your hands. Get the edge roughly in shape with rapid strokes, but finish evenly and deliberately. (When there's a machine jointer handy, I rough out the edges on it and finish them with the hand plane to remove the any ridges created by the machine.)

Because planing edges is so exacting, its success depends upon all sorts of factors—chiefly, practice. So don't fuss too much with the first edge; when you feel it's straight, flat and square to the faces, plane the mating edge on the next board. Then, while the second board is still in the vise, place the first edge on the second to check the fit. The top board should rest steadily on the bottom one. If it rocks, one or both of the edges is convex and/or twisted.

A concave or convex edge is easy to see; a twisted edge is not so easy. Press down on one end of the top board and look closely at the joint at the other end. If an edge is twisted, the surfaces will touch only at one corner; if they don't touch at all, the edge is convex. (Edges may, of course, be convex and twisted at the same time—I try to correct the convexity first.) You can also check for twist with a try square. If there are diagonally opposed high spots at the ends, the edge is twisted.

It doesn't hurt if the edges are slightly concave—but not more than $\frac{1}{32}$ in. over 3 ft. To fix an excessively concave edge, take a few strokes off each end and one the full length, then recheck. To flatten a convex edge, work out from the center, taking three or four progressively longer strokes, finishing with a full-length stroke.

A twisted edge requires a more delicate fix. As when flattening a twisted face, you want to plane from corner to corner to remove the diagonally opposed high spots. If the sole of the plane is perpendicular to the board's faces, you should be able to take a shaving from just the high spot at the near end, reach a full-width shaving in the center of the edge, and nip off the other high spot at the opposite end. When you think the twist is gone, take a full-width shaving from end to end, and



Gluing up

When gluing up, space the clamps evenly on a flat surface, alternating them from face to face. Tighten from the center out. Push or drive the faces down flush with the pipes or bars to help keep the glued-up board flat. Clamping overnight is plenty for most glues.

check against the mating edge. If the boards still rock, the mating edge may need work. This can go on for some time. Don't lose heart—think of all the skill you're accumulating.

Twisted edges need to be fixed, but it doesn't matter if mating edges are at slightly other than right angles to their adjacent faces—as long as the angles are complementary, the boards will form a flat surface. To check the surface, stack the boards edge-to-edge and place a straightedge against their faces. If the surface isn't flat, adjust the angle of one edge to its face and check them again. After edge-planing all the boards to be glued together, stack them up and make a final check for flatness.

Hand-planing mating edges is a difficult skill to master. Over and over again you'll introduce one fault while trying to correct another. When the edges are close to mating perfectly, force yourself to try one more time to correct that last niggling fault. If it still isn't right, then say the hell with it, and move on to the next pair. Among the virtues of modern glues is their ability to join edges that are far from perfectly matched. There may be gaps, the joined boards may not be perfectly flat, but they will stick together. The simple table and bookcase are nice projects because you get a lot of practice while making something useful. It's up to you how much practice you can stand before you need to see the completed piece before you.

Gluing up—When all the pairs of mating edges have been planed, I glue up with $\frac{3}{4}$ -in. pipe clamps and Elmer's Glue-All (a white glue), first making a dry run to de-

termine the position and number of clamps. Place clamps 12 in. to 15 in. apart, starting and ending about 3 in. from the ends of the boards. Alternate the clamps top and bottom to equalize their pull and avoid cupping the glued-up boards.

Lay the bottom clamps on a flat surface and spread glue on all the edges to be joined. Better too much glue than too little—the excess will get squeezed out of a tight joint anyway. Place the boards on the clamps and rub the mating edges together until glue squeezes out. Draw the joints together with the center clamp, then work out toward each end. I align the faces of the boards with a 16-oz. hammer and a hardwood block, driving them down on the clamps, which helps keep the boards from cupping or twisting as a unit.

It's important that the surface of the glued-up boards lie in a single plane while the glue cures. Whether the boards lie flat or lean against a wall, you can sight over the clamps just like over winding sticks, and shim up low corners to align them.

The glued-up boards can be treated like a single board now, and cleaned off with a sharp plane. Chances are the surface will be slightly cupped, but I don't worry too much about that. The understructure of a table or the corner joints of a box can pull it fairly flat. At this point, the whole question of flatness boils down to what irritates you more: a gently rolling tabletop with wobbling plates and teacups, or seemingly endless tabletop planing. □

Roger Holmes is an associate editor at Fine Woodworking.