



Flattening Tabletops

Surface large slabs and panels without big machines

BY ROB HARE

I build furniture that incorporates large slabs of wood. Early in my career, I had no access to large machines, so I developed a method for flattening large planks using winding sticks, a power planer, a marking gauge, a belt sander, and a palm sander. The process is so reliable and efficient that I continue to use it for most wide panels, even for small tabletops. While this article focuses on a thick, wide plank, a slight variation of the technique will work for glued-up panels and slabs, such as the top of a workbench or trestle table.

Inspect the slab before planing it

Begin by assessing the curvature and grain pattern of the plank to gain insight into how the tree has grown and how the wood has moved up to this point. Then sight down the surface of the rough plank to get a feel for where wood needs to be removed and how the plank might respond to being cut. Also, measure the edges, looking for variations in sawn thickness. Be aware that variations at the edges can be deceiving, leading one to think the plank is stressed and twisted rather than just unevenly sawn.

If the piece of wood is to be cut down in width or length, do that before attempting to flatten it. Try to eliminate the areas that are the most twisted or seem the most stressed, based on your initial survey. Leave an extra ½ in. of length and width on all four edges, to be trimmed off later. The additional surface area at the edges will add stability for the planer and sander.

Placing the slab on sawhorses keeps the



Too big for a jointer or planer. You can take all the warp or twist out of a large tabletop using handheld power tools.

READ THE SURFACE

A rough idea. Lay winding sticks at each end of the plank and sight over the tops of them to get a general idea of where cupping, bowing, and twisting are occurring.



work at a comfortable height. I often cover the sawhorses with moving blankets to protect the edges and surfaces of the wood. Do not clamp the plank to the sawhorses, which will restrict the wood and give inaccurate readings as the plank is being flattened. You can fasten stops to the horses or on your workbench to keep the workpiece from shifting.

Winding sticks are your guide

You'll need a set of three shopmade winding sticks, 1 in. wide by 2 in. thick, and

12 in. longer than the width of the plank. Winding sticks point out inconsistencies in a surface: twist, when the four corners of the surface are not in the same plane; bow, which is curvature along the length; and cup, which is curvature across the width.

To see how winding sticks work, lay all three at equal intervals across a known flat surface, such as a tablesaw or workbench top, and sight across the tops. Note how the top edges of all three sticks are parallel. Then place a 1/4-in.-thick scrap under the end of one stick and sight across them again. The difference should be easy to see.

Now you are ready to work on your rough slab or warped glue-up. Place a winding stick at each end of the workpiece, perpendicular to the grain. Lay the third stick across the middle and slide it end to end on the plank. You usually will see some cupping across the

width. Place the plank convex-side-up on the sawhorses, use a well-placed wedge to minimize rocking, and mark the high areas with a lumber crayon.

Use a third stick to find high spots. Move a third winding stick up and down the plank to find high spots, and mark them with a lumber crayon.

Rough the slab to size. If possible, cut away the most stressed or warped areas. Also, leave 1/2 in. of extra material on each edge.



Power-planing is a gradual process

It is important to remember that, even though the plank may be considered dry, it will react (change shape) as wood is removed. Removing the outer growth rings from the convex side will relieve some of the pressure that has been causing the wood to cup, reversing the cupping as you work. It is easy to remove too much wood from one side and have a plank go from convex to concave. That is why flattening a slab is a process, involving partially leveling the high areas on one side, checking

START ON THE CONVEX SIDE



Ease the ends of the planer blades. To avoid very deep ridges when power-planing, relieve the corners of the planer blades. Grind back the last $\frac{3}{4}$ in. of each corner by about $\frac{1}{16}$ in., but maintain sharpness.

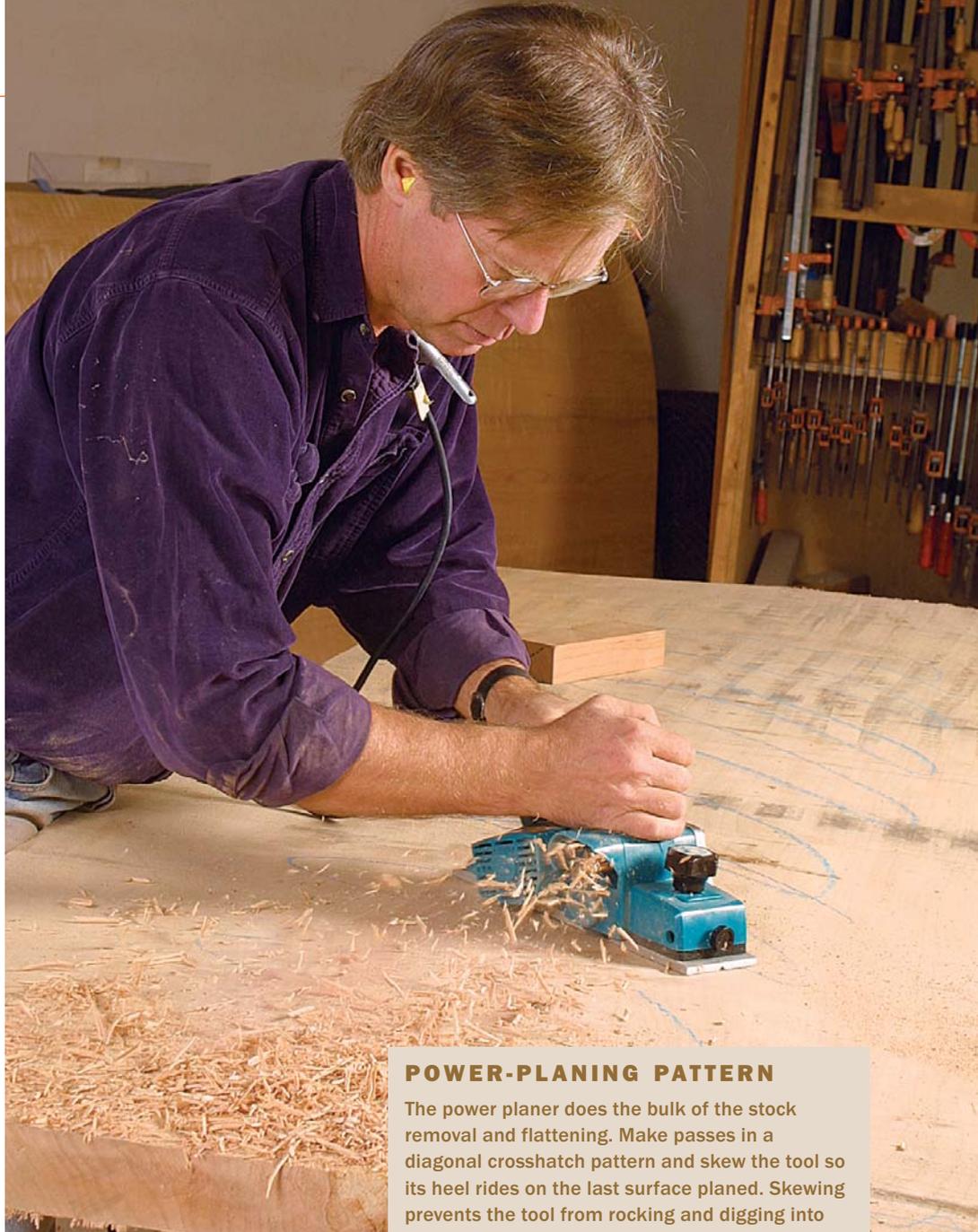
your progress, flipping the plank, and repeating the process.

The handheld power planer can remove a lot of volume in short order, so make a habit of planing less than you think is necessary. After each series of passes, sweep chips and dust off the top and check your progress using the winding sticks.

Each pass guides the next one—For flattening a large plank, I use a power planer that has a $3\frac{1}{2}$ -in.-wide base. It weighs only about 6 lb., so it remains easy to handle as I make pass after pass over a big slab. I relieve the ends of each blade about $\frac{1}{16}$ in., starting about $\frac{3}{8}$ in. from each end, to stop the corners from digging into the wood.

For the flattest possible cut, each stroke should slightly overlap the previous one, with the heel of the machine skewed slightly (see the drawing and photos at right). Also, make each series of passes from right to left so that the chips are ejected away from the area to be planed next. After making a series of cuts in one direction, make the next series perpendicular to the previous cuts. You should see a crosshatch pattern.

Flip the plank, and repeat—After taking off less than half of the necessary material



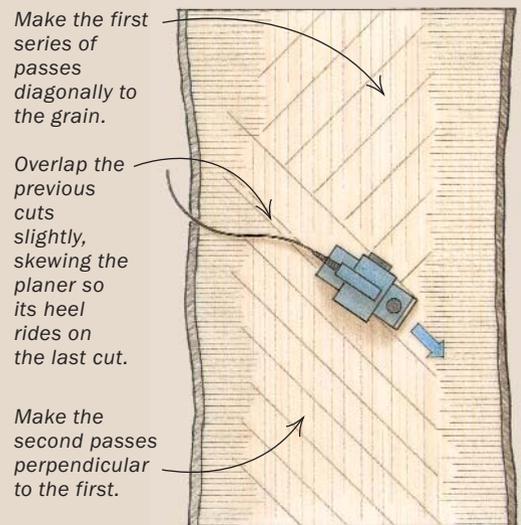
Hit the high spots. Make passes diagonally, skewing the planer so that its heel rides partially on the previous cut.



A second pass. This pass should be perpendicular to the first, creating a crosshatch pattern.

POWER-PLANING PATTERN

The power planer does the bulk of the stock removal and flattening. Make passes in a diagonal crosshatch pattern and skew the tool so its heel rides on the last surface planed. Skewing prevents the tool from rocking and digging into the surface and helps reduce tearout.



SECOND SIDE AND BEYOND

Go to work on the flip side. With some of the crown removed from the plank, it's time to flip the plank to begin removal of the cup.



on the convex side, flip over the plank so that the concave side is up. Check for flatness, mark the high spots, and plane them with the crosshatch pattern. Work the power planer from the center toward the edges. Again, take off less wood than seems necessary.

Now flip over the piece so that the convex side is up and check the surface again with the winding sticks. You'll find that the planing done on the opposite side has relieved some pressure and already improved the flatness of this initial side of the plank.

Repeat the process of planing the high



Use winding sticks again. Planing done on the opposite side relieves stresses in the plank's interior, leaving less work to do on the cupped side.

Work from the center out to remove the high spots along the edges. Again, remove less than half of the high areas. Flip the plank and repeat the process repeatedly, creeping up on a flat, stable slab.



spots, inspecting with the winding sticks, remarking high spots with a crayon, and flipping the plank. It's helpful to spread this process over three days or more to allow the slab time to adjust. With large planks, you'll need a few breaks. Even a one-hour lunch break can result in visible change.

Note: It's important to check thickness throughout the process. Correct problems as you go, checking the surfaces with winding sticks and measuring thickness at

the edges to be sure you are working toward a flat slab of uniform thickness.

Continue to plane, inspect, and flip until both surfaces show no more than 1/16-in. variation in twist, bow, cup, or thickness. Take lighter and longer passes until there is just a hint of the original surface in the lowest area of each side of the plank. Inspect yet again with the winding sticks.

Scribe final thickness and take a few light passes—At this stage, if the plank is more than 1/8 in. thicker than the desired finished thickness, continue to plane, inspect, and flip the plank until it is just 1/8 in. oversize—again, remembering to proceed slowly. Be on the lookout for movement.

At this point, the grain patterns of both sides are visible. Select the top, or show, face of the plank. Then set a marking gauge 1/16 in. beyond the finished thickness and scribe around the edges of the plank, working from the bottom edge upward, leaving the waste on the show face. Then, taking shallow passes with the heel of the planer riding on the previous cut, plane the show side to the scribed line.

Sand to final thickness

Begin with an 80-grit belt and work your way up through 100, 120, and 150 grits, moving the sander straight across the plank but keeping it in line with the grain, with each pass overlapping the last one by 50%. (See the drawings at right for my sanding pattern.) I usually trim the plank to size after sanding with 120-grit paper.

Finally, use a random-orbit palm sander, starting with 120 and 150 grits and finishing with 180 grit. Watch for belt-sanding marks you may have missed in earlier passes. If they are deep, you may have to retreat to 100 grit with the belt sander. The key is to use these machines uniformly. A belt sander can leave deep scratches, and a palm sander can leave dimples, both of which will show up dramatically when finish is applied.

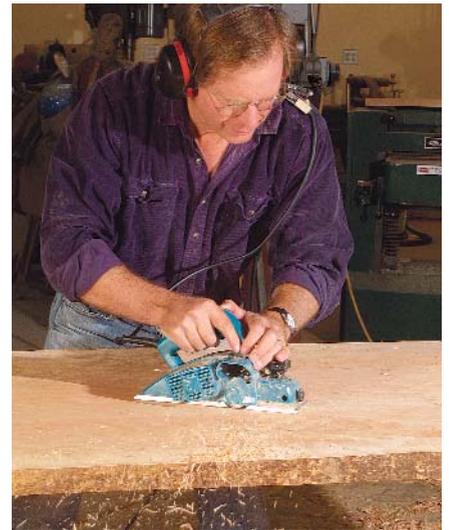
If the plank must be stored before it is finished and tied into a piece of furniture, it can be stood on end or stickered; just make sure to leave room for free air movement on all sides. □

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Scribe 1/16 in. over final thickness. Pick a show face and scribe from the bottom of the plank for your final passes with the power planer. Hare uses a shopmade marking gauge to work around live edges.

PLANE AND SAND TO FINAL THICKNESS



Watch chip output to determine flatness. Set the planer to a lighter cut. If the surface is flat, the planer should send out a steady stream of fine shavings.

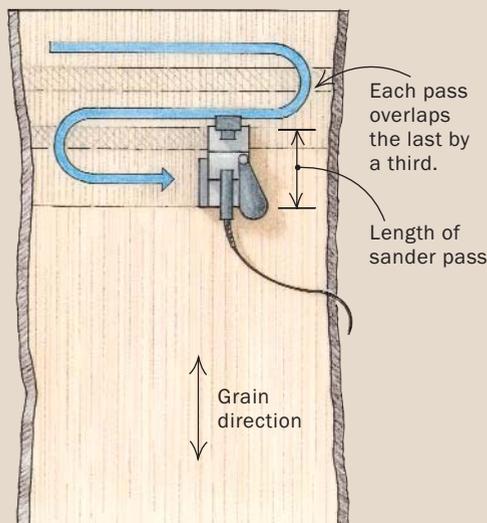
Use a belt sander to finish the job

A belt sander maintains the flat surface left by the power planer while removing the ridges. Progressing through successively finer grits removes the deep scratches left by the rougher sanding belts. In both cases the belt sander is always held in line with the grain and is never lifted. Finish with a palm sander, working through 120 to 180 grits.



ROUGH SANDING (80 AND 100 GRITS)

Move the sander from side to side on the slab while keeping it aligned with the grain. Each pass should overlap the previous one by about a third.



FINE SANDING (120 AND 180 GRITS)

Make continuous 2-ft. to 3-ft. strokes in the direction of the grain, working your way across the slab. Each pass should overlap the previous one by about a third.

