

Handplane Tune-up

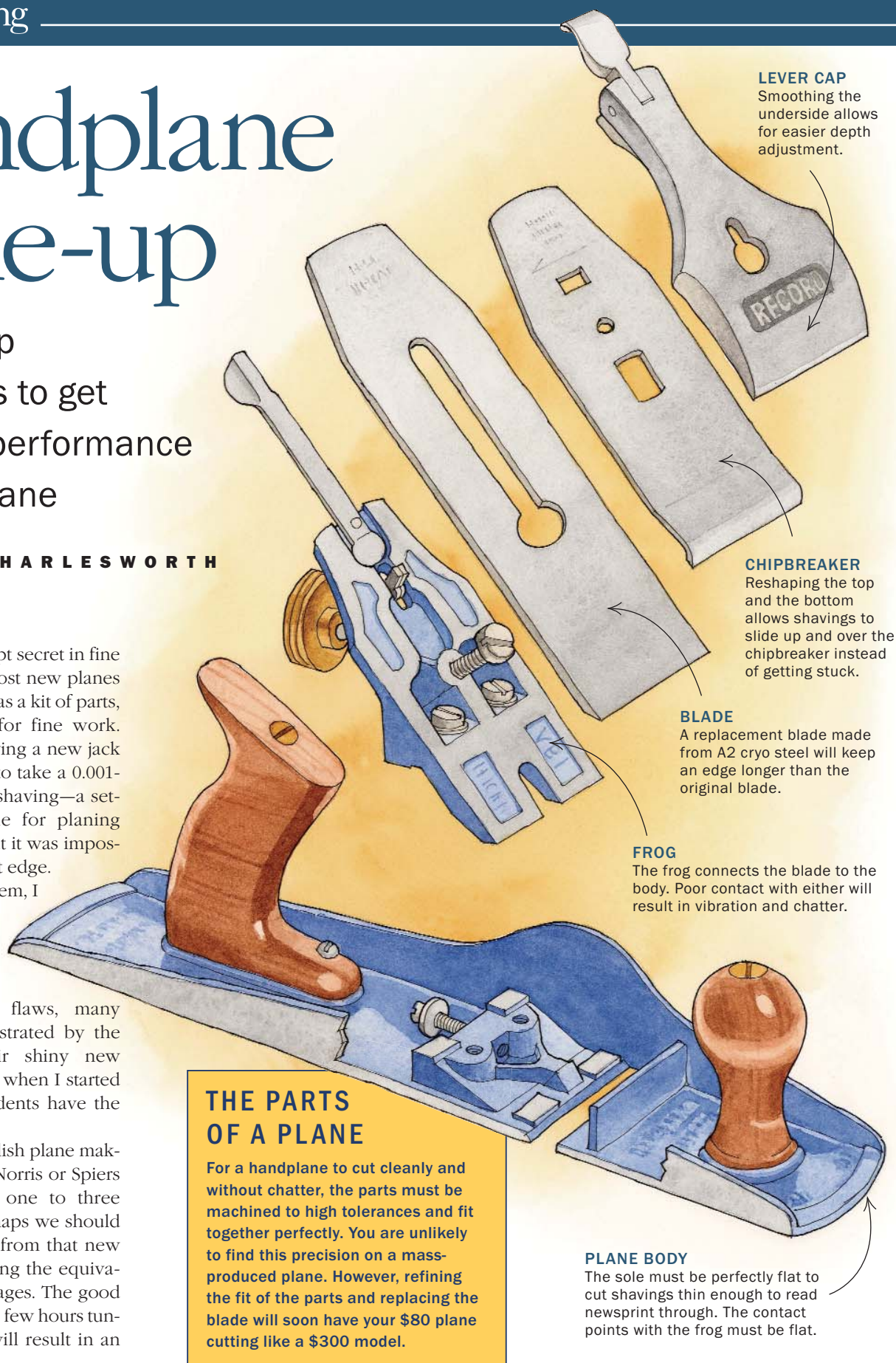
Step-by-step
instructions to get
maximum performance
from any plane

BY DAVID CHARLESWORTH

There is a well-kept secret in fine cabinetmaking. Most new planes should be treated as a kit of parts, not as a tool ready for fine work. Recently, while reviewing a new jack plane, I set the plane to take a 0.001-in.- or 0.002-in.-thick shaving—a setting not unreasonable for planing figured hardwood—but it was impossible to plane a straight edge. The cause of the problem, I discovered, was the plane's sole, which was 0.003 in. hollow in its length.

Unaware of these flaws, many woodworkers are frustrated by the performance of their shiny new planes; I certainly was when I started out, and my new students have the same problem.

In the heyday of English plane making, a plane made by Norris or Spiers cost a cabinetmaker one to three weeks' wages, so perhaps we should not expect too much from that new Stanley or Anant costing the equivalent of a few hours' wages. The good news is that spending a few hours tuning up these planes will result in an



LEVER CAP
Smoothing the underside allows for easier depth adjustment.

CHIPBREAKER
Reshaping the top and the bottom allows shavings to slide up and over the chipbreaker instead of getting stuck.

BLADE
A replacement blade made from A2 cryo steel will keep an edge longer than the original blade.

FROG
The frog connects the blade to the body. Poor contact with either will result in vibration and chatter.

THE PARTS OF A PLANE

For a handplane to cut cleanly and without chatter, the parts must be machined to high tolerances and fit together perfectly. You are unlikely to find this precision on a mass-produced plane. However, refining the fit of the parts and replacing the blade will soon have your \$80 plane cutting like a \$300 model.

PLANE BODY
The sole must be perfectly flat to cut shavings thin enough to read newsprint through. The contact points with the frog must be flat.

outstanding improvement in their performance. The methods I'll describe can be applied to any Bailey-type plane with a metal body, whether old or new.

Invest in a replacement blade

The quickest way to improve a plane is to purchase a high-quality A2 steel replacement blade that has been cryogenically treated. These blades are available from Ron Hock and Thomas Lie-Nielsen (see Sources on p. 40), but if you buy from the latter, be sure to order the 0.095-in.-thick blade because the thicker 0.130-in. blade may not fit in your plane. Even the 0.095-in.-thick blade will be significantly thicker and stiffer than a stock blade, greatly reducing vibration and chatter.

Fit the frog to prevent distortion

The first step in the tune-up process is to disassemble the plane, remove the frog, and check its seating—the four contact points between the body and the underside of the frog. A badly seated frog screwed down tight will distort the thin area of the sole just behind the throat of the plane.

To determine how well the surfaces fit, work the relevant areas of the body casting with a black felt-tip pen. Remove the fore-and-aft adjustment plate, press the frog in place, and slide it back and forth. The ink will be scraped off where the surfaces make good contact. If the frog rocks, only two diagonal points are making contact.

Work on the contact points until you achieve about 60% contact on all four surfaces. Although it is slow, I prefer to scrape rather than file the contact points of the sole casting. With a file, it's easy to remove too much material and ruin the tool. If you don't have an engineer's scraper, you can make one by grinding a 6-in. file so that the last inch of the two flat sides is slightly hollow, while the end has a convex profile.

To perfect the fit, apply pinches of 180- or 220-grit silicon carbide and a drop of water to each scraped surface. Work the frog to and fro for a few minutes, leaving the surfaces matte gray. Aim for 90% contact.

The top of the frog comes next—With many new planes, you may find a pro-

FIT THE FROG

The frog connects the blade to the body of the plane. It is important that the frog seats securely to the body and provides a flat mounting surface for the blade. A properly fitted frog goes a long way toward reducing chatter.

1 SCRAPE HIGH POINTS

Use an engineer's scraper to remove the high points and enlarge the areas of contact where the frog is seated to the plane body.



2 GRIND THE SURFACE



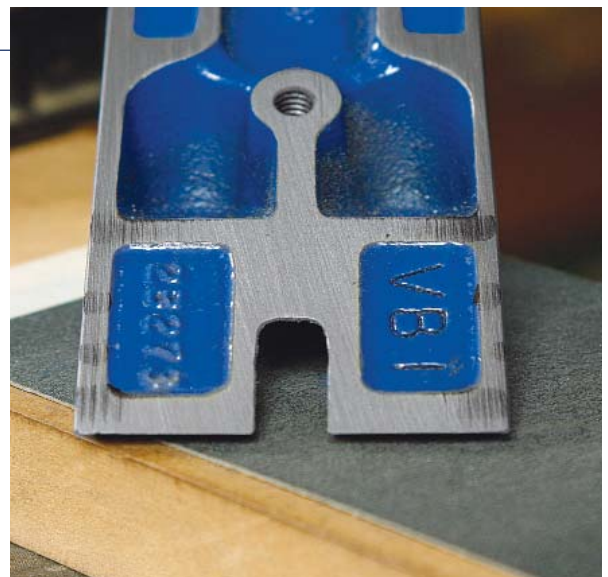
Apply a small amount of silicon-carbide powder to each contact point, add a drop of water, and then slide the frog back and forth to give the metal a smooth finish.



3 SMOOTH THE TOP



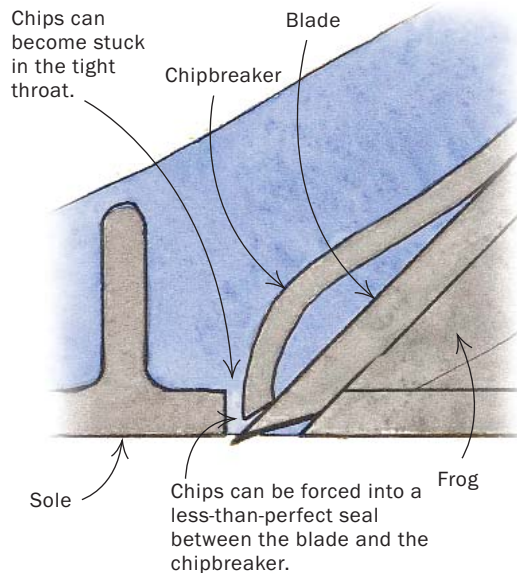
After marking the top of the frog with a felt-tip pen, grind it on 240-grit wet-or-dry paper stuck to a smooth, flat surface. The center felt-tip lines should be removed.



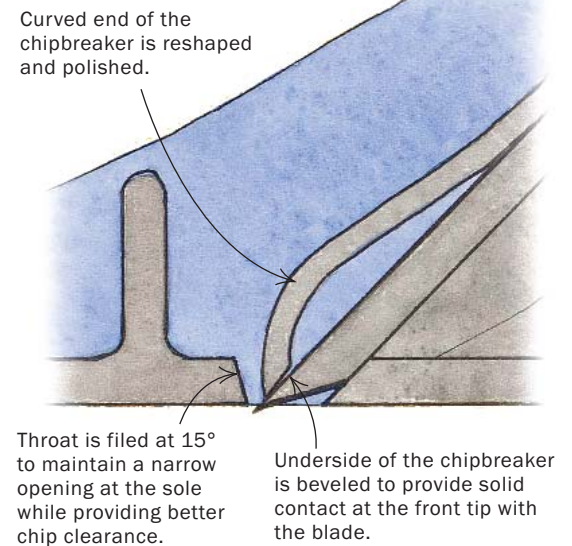
MODIFY THE THROAT FOR CLOG-FREE PLANING

A narrow mouth helps prevent tearout but in an unmodified plane is likely to also trap shavings in the throat. Filing the front edge of the throat at a 15° angle and refining the shape of the chipbreaker provides more room for shavings to escape.

UNMODIFIED FACTORY PLANE



MODIFICATIONS THAT ALLOW CHIPS TO EXIT A TIGHT MOUTH



1 ANGLE THE THROAT



To prepare the throat for filing, mark the sole with a black felt-tip pen, then scribe a line as close to the mouth as possible (above). Then clamp the plane body in a vise, angling it 15° from vertical. Keep the file parallel to the top of the vise and gradually file the throat back 15° (right) until the new bevel reaches the scribe line.



nounced hollow in the critical area on top of the frog that supports the blade just behind its bevel. This hollow can cause chatter during planing. A rough surface also may impede smooth blade adjustment. It is not necessary to remove every scratch from the top of the frog; just aim for an overall flatness.

Begin by taping 240-grit wet-or-dry paper to a flat surface. Draw lines across the top surface of the frog with a felt-tip marker and use the marks to gauge your progress. Rub the frog back and forth on the sandpaper, being careful not to rock the casting. You will have to work the top of the slope by hand with a small block wrapped in sandpaper because of the protruding lateral adjuster rivet. Take the opportunity to ease any sharp, ragged edges of the casting with a fine file.

I also like to polish the contact points of the Y adjustment lever, where they touch the turned groove of the brass adjustment wheel. Sometimes the finish on the Y lever is rough from sand casting, which eats away at the wheel's soft brass, causing increased backlash over the years.

Refine the throat to prevent trapped shavings

Begin by filing the front edge of the throat. Degrease the sole and blacken the area next to the mouth's front edge with the felt-tip marker. Scribe a light line across the sole as close as possible to the existing

2 MODIFY THE CHIPBREAKER

Slightly bevel the bottom of the chipbreaker on a diamond stone or other medium-grit honing stone. Maintain the proper angle by resting the end of the chipbreaker on a scrap of wood (right). Then shape the top of the chipbreaker by clamping it in a honing guide and working it on a stone (bottom left). Reposition the chipbreaker in the jig to create a series of facets that will be honed and polished further to form a gentle curve (bottom right).

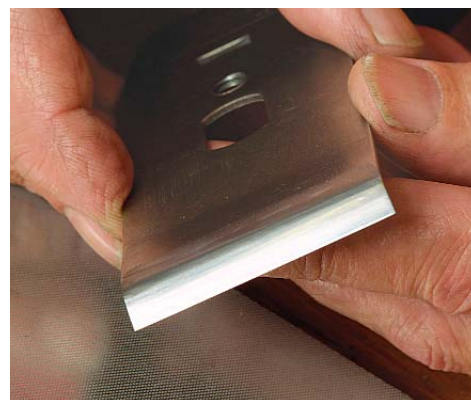
front edge. Use this line as a reference for the next step, filing the throat.

Grip the plane body at 15° in a vise. It is vital that the jaws of the vise squeeze only where the sides of the casting are supported by the crosswise rib. Pressure in any other position might snap the brittle, cast sides of the plane.

Concentrate on keeping the file horizontal, using the top of the vise jaws as a guide. As you file, a bright surface will indicate where metal has been removed. Gradually, a minute wire edge is formed on the sole of the plane. Check the scribed line as you go to be sure you are keeping the mouth even and narrow. Take special care not to remove metal from the sides. A fine 00-grade file will give a smooth finish and crisp, square corners. Next, polish with 600-grit wet-or-dry sandpaper, then rub the mouth with metal polish and steel wool for a wonderful result.

Hone the chipbreaker—Chipbreaker edges are one of the areas of a bench plane with the most variable quality. The underside of the chipbreaker must make perfect contact with the blade to prevent shavings from getting trapped between the two surfaces. To ensure this, slightly bevel the bottom edge by grinding it on a diamond stone or 240-grit wet-or-dry paper. Support the chipbreaker on a piece of wood to maintain the correct angle (see the top photo above). Examine the result by checking that no light shows between the chipbreaker and the back of the blade.

The top of the chipbreaker also must be reshaped. Remove metal by setting the chipbreaker in a honing guide, at 45°, and working it on a diamond stone. By extending the projection from the guide $\frac{3}{32}$ in. several times, you'll form a series of flats that can be blended by hand using 400-grit paper. The final step is to polish the surface



with metal polish so that wood shavings slide over the surface unimpeded.

Work on the lever cap—The underside of the front edge of the lever cap often has a rough, sand-cast finish, which can be smoothed by rubbing on 240-grit wet-or-dry sandpaper taped to a flat surface. A smooth lever cap clamps the blade more securely and makes adjustments easier.

Assemble the plane and adjust the frog Before reassembling the plane, oil any unpainted cast surfaces under the frog to prevent rust. The fore-and-aft adjustment plate sometimes needs a sideways twist to center the frog in the body. Tighten the frog's holding screws gently so that the fore-and-aft screw will drive the frog forward and

backward. To determine the correct position of the frog, insert the blade and adjust it for a fine even or balanced shaving. Drawing a small piece of wood across the mouth helps show where the blade is cutting.

Now examine the mouth from the underside of the plane: The edge of the blade must be parallel to the front edge of the mouth. If it is not, twist the frog without disturbing the lateral adjustment lever until the blade is parallel to the mouth. Last, drive the frog forward to reduce the opening of the mouth. I suggest 0.020 in. or a full $\frac{1}{64}$ in. for beginners. Experienced woodworkers can set the opening to 0.006 in. for their favorite fine finishing plane. For small adjustments it sometimes is easiest to tighten one of the frog's holding screws so that the frog pivots on this point. Be pre-

FLATTEN THE SOLE



Mark the toe, both sides of the mouth, and the heel. When these four lines are sanded away at the same time, the plane is ready to use. On a flat surface such as float glass, stick down a few different grades of wet-or-dry sandpaper. With the blade installed but backed off, flatten the sole by sliding the plane over the sandpaper.



pared for a few attempts to get the position of the frog exactly right.

When you are satisfied that the blade is parallel and that the mouth has the correct opening, remove the blade without disturbing the frog so that the frog's holding screws can be set to final torque. Don't use too much force, because it might crack the thin sole adjacent to the back edge of the throat. Tighten only to prevent movement.

It is best to set up all of the working tensions and retract the blade before flattening the sole, as it is possible that the pressure exerted by the lever cap will affect the shape of the sole. (This is particularly true for rabbet, shoulder, and block planes.) The lever-cap screw should be set so that the lever action is firm but can be operated without straining your thumb.

The lever-cap screw often fits loosely in the tapped hole in the frog. As you extend and retract the blade, it rocks forward and

backward, contributing to backlash. Solve this problem by counting the number of turns it takes to remove the screw, degreasing it, adding a few drops of Loctite medium-strength blue threadlocker to the hole, and then inserting the screw with the same number of turns.

Make certain the sole is flat

Flattening the sole will improve the plane's performance more than any other single step. For flattening, I use a piece of ½-in.- or ⅜-in.-thick perfectly flat glass known as

float glass. The glass is slightly flexible and may pick up errors from the surface it is sitting on, so check it with a precision straightedge and shim with sheets of newspaper. It is preferable for the length to be minutely hollow rather than convex, just enough to slip a cigarette paper under the middle of the straightedge.

Apply sheets of wet-or-dry paper to the glass with spray adhesive, leaving a ½-in. gap between adjacent sheets. In most cases start with 100-grit paper, but for a No. 7 or No. 8 plane, or even a No. 5 that's badly out of shape, start with 60 grit. Work up through 150- and 180-grit paper, finishing with 240- or 320-grit paper. Flattening is perfected on the coarsest grit; subsequent finer grits are purely to polish out the previous grit's scratches. The coarser grits may be used dry and vacuumed during use, but kerosene (known as paraffin in some countries) is necessary to stop the 240 and 320 grits from clogging.

To judge flatness and progress, draw lines across the sole with a black felt-tip marker. The most important areas are the toe, the heel, and the areas just in front of and behind the mouth. If these lines disappear at the same rate, the plane is flat enough to perform really well.

Remove sharp edges and protect the metal from rust—I create a ¼-in. bevel on the edges of the sole on the final sandpaper used and file the front and back to a wider 30° bevel. The last area to bevel a little is the back edge of the throat, which can otherwise scrape the wood.

Vacuum up any metal particles, then rub the sole vigorously with 0000 steel wool and metal polish. Finish the sole and the sides of the plane with several coats of a paste wax that doesn't contain silicone, as this gives good protection against corrosion. At the end of every session, before the plane is put away, I rub camellia oil onto the unpainted sides and sole. Before use, I remove the oil with a cloth.

It is time for some test shavings on tight-grained wood such as cherry or maple. With a properly sharpened blade (see the facing page), shavings 0.001 in. thick, the sort you can read newsprint through, should be easily obtainable. □

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David Charlesworth teaches woodworking in his shop on the north coast of Devon, which is in southwest England.

SOURCES OF SUPPLY

REPLACEMENT PLANE BLADES

Hock Tools
www.hocktools.com; 888-282-5233

Lie-Nielsen Toolworks
www.lie-nielsen.com; 800-327-2520

Preparing a new plane blade

Even if you have bought a replacement blade, the back still may need flattening, and the tip certainly will need sharpening. I prefer to use artificial Japanese waterstones. The procedure for flattening the back of a plane blade is identical to flattening the back of a chisel (see *FWW* #169, pp. 32-33), except for a final polishing on an 8,000-grit stone.

FLATTEN AND POLISH THE BACK OF THE BLADE

A flat back forms half of a clean, straight, sharp edge and creates a smooth surface for the chipbreaker to seat against.

The slurry on the surface of a polishing stone creates a powerful suction against the surface of a plane blade. I mount a piece of wood to the top of the blade with double-faced tape to act as a handle. Once I am ready to polish the back of the blade on the 8,000-grit stone, I can see no benefit in polishing more metal than is necessary for a razor-sharp edge, so I came up with what I call the ruler trick.

Having created a slurry on the surface of the 8,000-grit stone with a nagura, I stick a 0.5-mm or 1/2-in.-thick stainless-steel, 6-in. ruler on the right-hand, long edge of the stone. After being slid to and fro a couple of times, the ruler sticks by surface tension. It is important to keep the top surface of the ruler dry. The plane blade is placed crosswise so that its edge is about 1/4 in. off the left-hand edge of the stone with the middle being supported on the steel ruler.

Gentle pressure is applied with three fingers, just behind the top of the grinding bevel, and the blade is drawn back no more than about 1/2 in. from the edge of the stone. I usually use about 12 to 15 strokes for a normal resharpening, but a new blade may need a few repeats to establish a polish. This is seen as a narrow band, immediately adjacent to the cutting edge. The fact that a 1° bevel has been imposed at the tip of the flat side has no noticeable impact on a plane blade's cutting ability, and a great deal of time and effort has been saved.

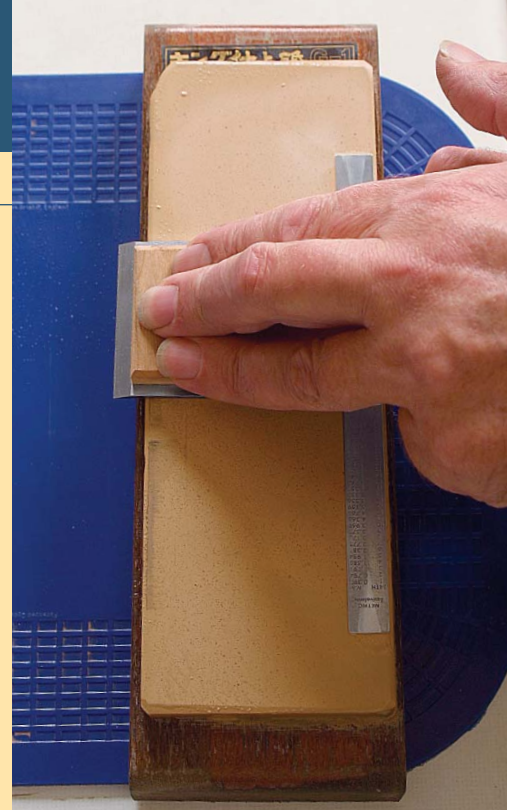
SHARPEN THE BEVEL

I like to sharpen my finishing blades with a very slight convex profile to avoid leaving sharp lines on the wood between adjacent strokes of the plane. Using a vise-type honing guide with a narrow support wheel, establish the desired angle, and then draw the blade back on an 800-grit stone. Apply pressure first on the left side of the blade for eight strokes, and repeat with pressure on the right side. Next, move the pressure point closer to the center of the blade and use four strokes on each side. With pressure in the center, use only one stroke. If you highlight the bevel with a felt-tip marker before starting, the resulting curve will show up as a shiny steel band.

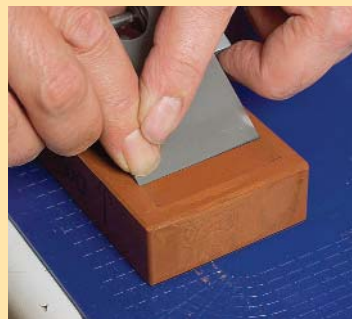
When you are happy with the profile, move to the 8,000-grit stone to polish the bevel, using all of the same pressure points. Finally, remove any wire edge by giving the back a few strokes on the same stone, employing the ruler trick.

FLATTEN THE BACK

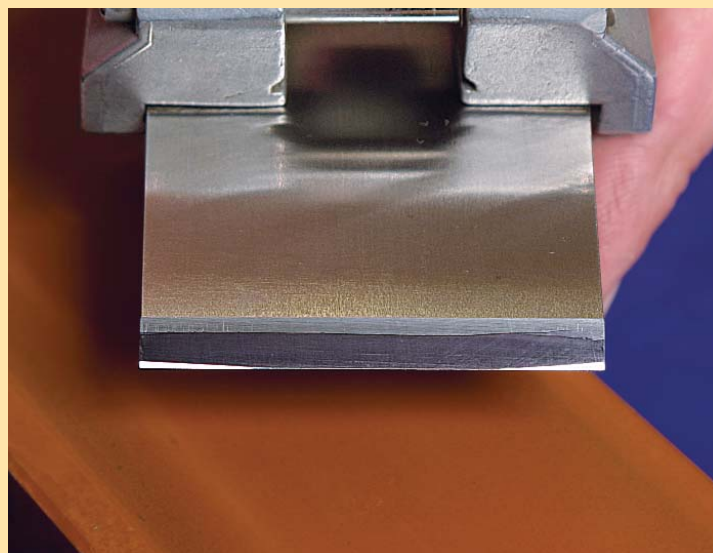
For better leverage, use double-faced tape to attach a small piece of wood to the plane blade to act as a handle (below). On the finest stone, rest the middle of the blade on a very thin ruler so that only the very tip of the blade's back is polished, saving a great deal of time and effort (right).



HONE THE BEVEL



Create a curved edge. By concentrating pressure first on one side of the blade and then on the other, the cutting edge acquires a slightly convex profile.



Refine the curve. Darkening the blade with a marker makes it easy to gauge your progress. When you have achieved the profile you want, move to the finest stone and repeat the process.