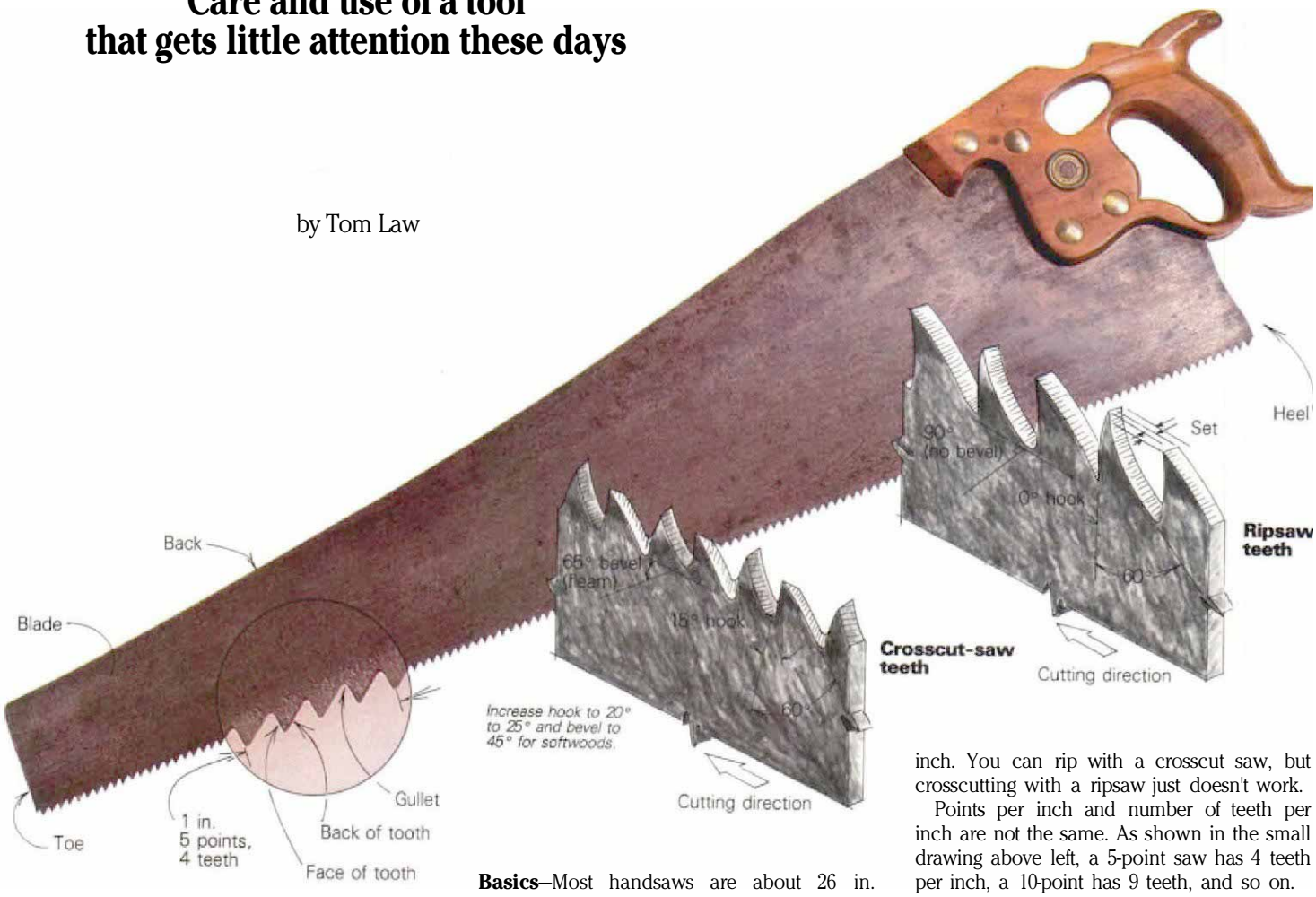
Handsaws

Care and use of a tool that gets little attention these days

by Tom Law



I have a special affection for handsaws. I was taught by carpenters who used handsaws almost exclusively. My first framing job as an apprentice was a highway bridge in a remote location with no electricity; all the cutting was done with handsaws. I learned to keep mine sharp, and ended up filing saws for the entire crew. In later years, I sharpened the saws for crews of more than 25 carpenters on large commercial projects.

Even though most of the cutting I do these days on the houses I build and remodel is with power saws, I still use my handsaws. It's surprising how often their slender profile, depth of cut, and lack of power cord make them handy. And the finest scribe-fitting I do almost always calls for a handsaw.

But because of the dominance of power saws today, few in the generation after me have learned handsaw skills. With incorrect technique and an inferior saw that is dull or badly sharpened, bandsawing can be pure drudgery. But it doesn't need to be. The difference is in knowing how to pick out a good saw, how to joint, shape, set and sharpen the teeth, and how to use it once it's sharp.

Basics—Most handsaws are about 26 in. long. Shorter ones (24 in., 22 in. or less) are called bench saws or panel saws. The top edge of the saw, called the back, can be straight or skewed. Skew-backs taper from handle to toe in a gentle S-curve; they were favored in the first part of the century. Skew-backs are better at cutting a curved line, but I still prefer square-back saws. They make good medium-length straightedges, and you can even scratch a square line across the blade and use it as a framing or combination square. The front end of the saw is the toe; the rear, down below the handle, is the heel.

One of the first things to learn is the difference between a crosscut saw and a ripsaw. Crosscut saws are made to cut across the grain, and their teeth act like a row of knife points, severing the fibers as they cut. Crosscut saws come with 7, 8, 9, 10, 11 or 12 points per inch. The more points, the finer the cut. A 7-point, for example, is used for wet rough framing; an 11 or 12-point for fine trim work.

Ripsaws, like the Disston D-8 skew-back shown above, are made to cut along the grain. Their teeth act like a row of chisels and remove small chunks of wood as they go through the cut. Ripsaws have larger teeth and deeper gullets than crosscut saws, and 4½, 5, 5½ (the most common) or 6 points per inch. You can rip with a crosscut saw, but crosscutting with a ripsaw just doesn't work.

Points per inch and number of teeth per inch are not the same. As shown in the small drawing above left, a 5-point saw has 4 teeth per inch, a 10-point has 9 teeth, and so on.

Viewed from the side, each tooth on a handsaw forms a 60° angle. But how these cutters are tilted forward and aft (called pitch, or *hook)* is different for the two saw types. Still viewing the saw in profile, imagine a line that connects all the gullets. A line drawn down the face of the sawblade perpendicular to this represents zero hook. It is this lack of pitch that gives the teeth of a ripsaw their chisel-like quality. The tops of crosscut teeth, however, are pitched back from this perpendicular line (about 15° for cutting hardwoods).

Another angle to consider is the one across the tooth face. This *bevel,* or *fleam, is* determined by whether the file used in sharpening is held perpendicular to the sawblade or askew. Viewed from above, ripsaw teeth are filed at a right angle to the sawblade. Crosscut teeth are alternately beveled 65° to the face of the blade, producing a knife-like point on the leading edge of the tooth.

For crosscutting softwoods, the hook should be increased to 20° to 25°, and the bevel should be closer to 45°. This way the saw will cut the wood rather than tear it, which would cause the blade to bind in the kerf against the torn fibers.

One thing ripsaws and crosscut saws have in common is *set*—the alternate bending of

You can learn a lot about a saw by making it sing. The tone and its duration are good indicators of the quality of the steel and its thickness. To produce a note, the author has thumped the blade near the handle with his thumb to set the metal vibrating, and is varying the sound by increasing or decreasing the curve of the blade with finger pressure on the toe of the saw.

the top half of the teeth. Each tooth is bent either to the right or left of the body of the sawblade. Setting the teeth makes the cut, or kerf, wider than the blade thickness and reduces the friction of metal against wood. Good blades are also taper-ground; that is, the blade is thinner in section at the back than at the teeth. Taper-grinding improves the balance of the saw by lowering the blade's center of gravity, and works in the same way as set to reduce friction in the kerf to all but the teeth themselves. The thickest part of the blade goes into the new wood along the kerf, while the trailing metal is thinner.

A little history—Today I carry two saws—an 8-point crosscut for general work, and a 10-point crosscut for trim. The old-timers carried five or six saws in their own box. This "nest of saws" might include a 5½-point rip, a 7-point crosscut or an 8-point with wide set for wet lumber, an 8-point for general work, a 9-point for outside trim and a 10-point or 11-point for fine trim, and maybe an over-the-hill favorite for tight places or when there was danger of dulling against nails or masonry.

Turn-of-the century saws were wider than saws made today; the extra metal added weight to help make the cut. Moderate-width blades called *lightweights* were also made. Saws of this period were generally good, but the quality of the steel was sometimes inconsistent. A single blade could have some very soft teeth, while others were so hard they would ruin a file. Too, the metal could be so brittle that the teeth would snap off when being set. The best use for one of these is to hang it proudly on the wall as old grandpa's.

One of the best blades I've seen was a Disston made in about 1941 with a V for victory and some patriotic words about the war effort printed on the side. Disston also made excellent saws after the war and into the 1950s. One of the best of these was the D-95, with its incongruous plastic handle. Atkins also produced excellent saws during this period.

While domestic manufacturers were going downhill in the 1960s, Sandvik of Sweden was producing strange-looking but marvelous saws. They came with plywood handles embossed with sea serpents. The best grade had a plastic handle—this at a time when quality was symbolized by walnut. The line of teeth was also peculiar; it was convex. The natural arc that is produced by the motion of sawing is the reason for the convex curve. When the saw is progressing toward the middle of the cut, the blade curves down to meet the increasing pressure most effectively.

The quality of American-made handsaws deteriorated rapidly during the 1960s and 1970s, as manufacturers responded to the market with lower quality and higher prices. Today's saws, wrapped in plastic and covered with promotional claims, are sad remembrances of what saws were 30 years ago.

Finding a good saw—My advice is not to get a new saw—buy an old one and fix it. Literally hundreds of saws have passed through my hands, and I can get a good idea of their quality just by filing a few teeth. The expression "They don't make them like they used to" is certainly true, but just because a saw is old doesn't necessarily mean it's good. If you have an old saw that is deeply pitted by rust or has sharp kinks in it, get rid of it. Although I've heard that slapping a saw on the surface of a body of water will straighten out a bend, you can't prove it by me. A kinked blade is damaged goods, and serious pitting means you're getting less steel than the original sawmaker thought you should have. But if a saw is only rusty, give it a few tests.

Take it by the handle and shake it back and forth; the front half should whip. If it moves very little, the metal is too thick and heavy, and the saw will be clumsy to use. If it moves so much that it's flimsy, it is cheap and too thin, and will be hard to control in the cut. If it moves just right, try this—pass your fingers through the hole in the handle and hold it by the cheeks; hold the toe end with your other hand, and bend the blade into an S-curve toe up, heel down (photo above). While starting the bend, thump the blade near the center of the handle with your thumb and it will emit a musical tone. The pitch and duration of the sound are indicators of the quality of the metal and balance of the blade. A dull sound of short duration indicates an unworthy blade; a high pitch of long duration indicates good quality and balance. There are some exceptions to this test. Some excellent old blades that are quite wide sound rather gutteral.

I've heard old-timers say that a good spring-steel blade should snap back straight after the toe has been passed through the hole in the handle. I think this goes a little far in inviting a brittle blade to snap, or even good steel to retain a bend, but you do want to flex the saw to check the quality of its steel.

If you've found an old blade, don't worry about the teeth—they can be recut. Clean off the rust by any method from sandblasting to hand sanding, and polish the blade bright with fine abrasive paper. Then make a new handle. Today's handles are just chunks of wood with scratches on the side, screwed onto the blade. Those scratches are barely recognizable as heads of wheat, an ancient symbol that proclaims the virtues of labor. Old handles were made to fit the hand and were scooped and curved in styles from graceful to grotesque. It may take a day or longer to make a nice handle, but that won't be much time if your grandchildren inherit the saw.

If the line of the teeth on your old blade is crooked or concave from toe to heel, it's because it has been improperly filed. Some old carpenters touched up their saws before they left the job each day, and filed only the dulled teeth. That practice has drawbacks. A sawblade doesn't get equal wear along its length as it moves through the cut. It's the center portion that gets the most work and wears the fastest, but it's a mistake to file only the teeth that are dull. This condition will disrupt the rhythm of each tooth contacting the wood when sawing and will give you a ragged cut.

Getting the teeth in shape—A saw with broken or very uneven teeth may have to be retoothed. This is best done by a saw shop,

Sharpening a handsaw

Jointing. A flat mill bastard file is used to joint (level and align) the tops of the teeth, left. This creates a line of saw points of equal height (or slightly convex on some saws) so that each one will be brought to bear on the wood when sawing. Here a simple L sawn from a pine block is used to hold the file perpendicular to the face of the sawblade. Manufactured metal jointers that clamp over the file and act as a guide on the blade give the same results. Even when the height of the saw teeth doesn't need correcting, the flattened tops of the teeth that result from a light jointing are a useful guide when shaping and sharpening the teeth.

Setting. A saw-set is used to bend the top half of the teeth alternately to the left and right. As shown above, the plunger pushes on the saw tooth, forcing it against the anvil each time the pistol grip of the handle is squeezed. All saw-sets are adjustable for width of set. A handsaw used mostly on wet lumber should get a wider set than one used mostly on dry wood to reduce friction on the blade and to evacuate the moist sawdust more easily.

Shaping and sharpening. Using a triangular taper file held at a 65° angle to the face of the blade, the author sharpens a crosscut saw (right). On a ripsaw, the angle is 90°—perpendicular to the sawblade. In both cases, the file cuts only on the push stroke. Unless the saw has been abused or sharpened badly, shaping the teeth can usually be a part of the sharpening process. Every other tooth is sharpened on the first run down the blade, and then the saw is turned around in the vise to get the remaining teeth. You'll have done the job well if the gullets are equally deep, and if none of the saw points reflects light. If any of them do, they either haven't been filed yet (below), or they need another stroke or two.

whose machines will punch or grind out a new line of teeth in minutes—something that would take hours by hand. But when it comes to sharpening the teeth of a saw that hasn't been badly abused, I like to do it myself.

Sharpening a saw involves four operations—*jointing,* which makes the teeth the same height; *shaping,* which evens out the size of the teeth and the depth of the gullets; *setting,* which bends the teeth alternately to either side of the blade; and *sharpening,* which gives each tooth its precise point. When saws are maintained in good condition, not all of these operations have to be performed each time. That's one of the problems with sending your saws out to be sharpened. Often, all you'll need is a light touchup with a file, but most saw shops have just one price—$3 to $7 for the full gamut of operations. And they'll end up keeping your saw for a week.

Also, sharpening machines that use a file will produce the same big-teeth little-teeth pattern as hand filing (sidebar, above right). Corrective filing for this condition is a matter of judgment, not what a machine is good at. Even a saw fresh out of its wrapper needs some hand work. It will have the right angles on the teeth, but they probably will not be very sharp. I don't like machine setting either, because it tends to push the whole tooth out rather than bending just the top half.

Learning to hand-file a saw takes some practice because the result has to be near perfect. But don't hesitate to try it. You can always correct your errors. After all, each time you file a saw, you are making new teeth.

Hand-filing a saw that is just slightly dull takes me about 15 minutes. No jointing, shaping or setting is required, just two or three lightly controlled strokes on each tooth. Lightly jointing, resetting and sharpening a saw take me about half an hour; reconditioning a misshapen saw takes me about two hours. But I've had a chance to practice some. When I was filing for a crew, I would average three saws an hour, or 24 a day. A 26-in., 8-point saw has 184 teeth; 24 saws a day is 4,992 teeth.

Before you begin filing, the first thing you need is good light; your eyes will be in close concentration for a long time. The best is natural sunlight on a bright but cloudy day. When I'm inside at my bench, I work under four 40-watt fluorescent lamps.

The next thing you need is a saw vise. You could make yourself a wooden one, but manufactured metal ones are more common. Most of these are about 12 in. long and hold the sawblade, teeth up, with an eccentric rollerbar or cam lock. Saw vises are short enough to be carried in the toolbox, but you have to keep sliding the saw along in the vise as your filing progresses. The vise I like best is a Lodi, made in California, but unfortunately, it's not being manufactured any longer. The jaws hold the saw along its entire length, with clamps at each end. In any case, the vise should be set up so that it's about 4 in. above your elbow.

With the exception of a flat mill-bastard file used for jointing, the tool that will be doing all the cutting is an ordinary triangular taper file. These come in lengths from 5 in. to 8 in., and cross-sectional thicknesses called regular, slim, extra slim and double extra slim. Which one you use isn't critical, since all triangular files have equal 60° sides, but for most saws I use a 7-in. double-extra slim. The reason I use this thickness is that the apex of the triangle is sharper than on thicker files, and this serves to cut the gullet deeper. The narrow cross section also makes it easier to judge the angles on longer teeth. I like the longer files because I get more cutting per stroke.

Jointing is done to correct the line of teeth and make them all of equal height. This line should be either straight or convex. A saw in good shape won't need much jointing, but the resulting flat tops of the teeth will be useful later on in shaping and sharpening.

To joint, put the saw in the vise with the teeth up and about 2 in. of the blade showing. Using long strokes with a flat mill file, keep working the tops of the teeth, flattening the points until the top of each tooth has been struck (photo facing page, top). It's important that the file be perfectly perpendicular to the sawblade. You can make a simple wood block to ensure alignment, or buy a metal handsaw jointer that does the same thing.

Shaping corrects any teeth that have been deformed by bad sharpening or, more likely, contact with a nail. It ensures that the teeth are all of uniform size and spacing. If the saw is in good condition, some shaping can be done while sharpening. Hold the file at a 90° angle to the face of the sawblade, whether you are shaping a ripsaw, which will also be sharpened this way, or a crosscut saw that will get sharpened with alternating bevels. Sharpening will take a bit longer this way, but you'll be able to shape more accurately.

Place the saw in the vise with the handle to your right, letting the teeth show about ¼ in. If too much blade is out of the vise, the metal will bend when the file is in motion, causing the file to chatter and wear down quickly. Select the first tooth from the toe that is set toward you, and place the file in the gullet to the left of this tooth. Hold the file horizontally, an end in each hand, and push it straight across. As the file passes through the gullet, the left side is cutting the back side of one tooth and the right side is cutting the front side of another tooth. File until one half of the flat top made by jointing is worn away, skip the next gullet and go to the next tooth set toward you. File it as before, and then move down the length, skipping every other gullet. When you've finished that side, turn the saw around and again select the first tooth from the toe that is set toward you. This will be the one you skipped the first time through. File this side the same as the other, using the flat tops as a guide—when the tooth comes to a point properly, the top will seem to disappear, as it will no longer reflect light. Check the depth of the gullets as you progress to make sure that they are the same.

Setting tends to distort the leading edge of the tooth and should always be done before sharpening. It is done with a tool called a saw-set, which works on the principle of hammer and anvil, although the hammer is called the plunger and is activated by squeezing the pistol or plier-grip handle. The anvil is beveled and adjustable for different-size teeth, usually with a dial that adjusts for the saw's number of teeth per inch.

As with jointing and shaping, setting is not always required. Under average conditions, a saw can be sharpened about three times before it needs resetting. At this point, the teeth have been filed so much that the set near the middle of the tooth is eliminated. Wet lumber requires wide set, while dry wood requires little. Set also affects the smoothness of the cut—a 10-point saw with almost no set will make as fine a cut as an 11-point saw.

To use a saw-set, index the plunger with the top half of a tooth that is bent away from you and squeeze the handle (photo facing page, center left). The plunger will bend the tooth over against the anvil. Take it easy, though; too much pressure will cause the plunger to slip over the top of the tooth. Move down the blade, skipping every other tooth just as in filing, then reverse the saw and set the other half of the teeth.

Sharpening. I was taught to sharpen by placing the saw in the vise with its handle to my right and to work from the toe to the heel, so I'll explain it this way, although you can start wherever you like. Hold the saw just ¼ in. above the top of the vise. Start with the first tooth that's bent toward you, and place the file in the gullet to its left. For a crosscut saw (photo facing page, bottom right), hold the file horizontal, point the front of the file toward the handle of the saw at a 65° bevel to the face of the sawblade, and tilt the file for

Big teeth, little teeth

Even when the saw filing is done as prescribed—file held perfectly horizontal, at the proper bevel and hook angles, with consistent and even strokes, it will eventually produce a sawblade best described as having big teeth and little teeth. The teeth on one side of the saw will be larger than on the other. This will make the saw wander from the cutting line. The reason lies with the file. The teeth of the file are set at an angle. When it is placed in a gullet, the teeth on the left side of the file tend to cause the file to ride up, while the teeth on the right side of the file tend to cause the file to dig in. This way the saw teeth to the right of the file receive more cutting. When the saw is turned around in the vise, the same teeth again get the most cutting.

To correct this imbalance, side pressure must be applied. With the saw in the vise with the handle on the right (you'll also be filing to the right), apply pressure to the left. When the handle is reversed and you are working your way left, apply pressure to the right. How much pressure is a matter of experience. Side pressure seems contradictory because it's applied to the back side of the tooth, not to the front side, which does the cutting. But the result is sharp, even points. *—T. L.*

the hook to 15° away from vertical. For a sharper point, hold the handle of the file slightly lower than the tip. If you're cutting softwoods, change the bevel to 45°, the hook to 20° or 25° and keep the file handle lower.

File on the push stroke only, then lift slightly and return to start and stroke again. File until half of the flat top is removed if you are shaping and sharpening in one operation, or until half of a sharp point is produced if you are just sharpening. Once you're finished on this side, reclamp the saw so that the handle is on the left, begin again at the toe, and file the gullets that you deliberately skipped on your first run. When you have completed every other tooth with the saw in this position, examine the points for reflected light—sharp points will be invisible. Refile any that gleam.

Sharpening a ripsaw is considerably easier. In most cases, the file should be held horizontal, the bevel is 90° to the sawblade, and the there is no hook, which means holding the file face straight up and down. Some carpenters give the teeth an 8° hook so they can crosscut with their ripsaw if they have to.

Human eyes are not calibrating devices that display angles of bevel and hook on a scale, but when the eye and the mind form a partnership, you can make very fine judgments about consistency. The key here is practice, but as an aid in the beginning, crosshatch the top of your vise at the desired angle and hold the file parallel to these marks. There are commercial devices that hold the file at the correct angle, but I think these are a hindrance to learning the stroke freehand.

The final step in sharpening is side dressing. Old-timers did it to remove metal burrs from the sides of the teeth. Lay the saw flat on the bench or up high in the vise, and lightly run a file or oilstone down the side of the teeth, as shown in the photo below. Then repeat on the other side. I do this to reduce the set slightly.

When you have finished filing, hold the saw with the teeth up. They should feel sticky when touched with your fingertips. Sight down the line of teeth—it should be straight (or slightly convex), the points should look identical in shape and size, the gullets should form a straight line, and the set should be equal on each side. If the saw is filed and set correctly, a needle will slide down the valley formed by the set in the teeth. But the real test is how the saw cuts.

Take a flat piece of 1x6 and clamp it edgewise on a workbench. Mark a 45° line across the top, and a plumb line on the side. Start a cut across the board using long rhythmic strokes. Stop the saw in various positions and examine the kerf; you should be able to see the tiny V-cuts on each side, and they should be equally deep. If the points of the teeth are even, the saw will go right down the line with only a pushing-ahead motion. If the saw wanders and must be pushed to one side, the teeth are not even and it's back to the vise.

Using a handsaw—Hand-sawing is straightforward as long as you relax. Muscling the saw won't do you or the saw any good. With the stock laid on sawhorses, bring the saw to the cutline. Place the teeth on the waste side of the line, and brace the blade with the thumb of your free hand. Slowly draw the saw back, letting the teeth drag on the wood. This will start the cut. Push the saw lightly forward to cut a little deeper. Now move your thumb away; too much pressure on the first few strokes may cause the saw to jump out of the kerf, leaving you with some lifetime scars.

Now angle the saw about 45° above horizontal for crosscut saws and 60° above horizontal for ripsaws. Three or four moderate strokes should start a reasonable kerf so that you can begin using longer strokes. Most amateurs use short jabbing strokes. This wastes energy and sacrifices control. Instead, stand so that your shoulder, elbow and hand are in line, and the saw is an extension of the line. Use the full length of the blade with long rhythmic strokes. If the saw chatters on the return stroke, you are not pulling it straight back, or the blade is bent.

As you saw, the center portion of the blade does the most work. The toe end is just for starting and requires less pressure to keep it from jumping out of the kerf. Pressure is applied progressively toward the middle and then decreasingly until the heel is reached; then you lift and return for the next stroke. To me, this kind of motion feels more like slicing than sawing. The stroke motion is not a straight line, as it would seem. Because the elbow is lower at points than the hand and shoulder, the motion is actually a segment of an arc. Straight saws will have a barely perceptible rocking from toe to heel as they cut, while a convex line of teeth won't.

Generally, ⅛ in. is the shortest piece to cut off with a handsaw. When there is no resistance on one side of the blade, it will wander to that side. Backcutting is one alternative if you are fitting only one face of a board. The wood on the underside of the cut will provide the needed resistance. Another way is to block the end of the piece to be shortened. For example, if you have a piece of molding that is just one blade thickness too long, take a piece of the same molding and clamp or nail it in the miter box at the saw guide, butt the molding against the piece and saw through. The block provides the required resistance.

Some expert sawyers can saw square cuts and miters freehand without lines. The trick is to use the polished sides of the saw as a mirror. The reflected image in the sawblade tells you when the angle is right.

Base molding is more easily cut with a handsaw than by machine because you don't have to move the wood in and out of the box. Use a sawhorse with a 2x6 nailed onto the side of the top. Make a kerf in this 2x6 for a one-sided miter box. Then move the molding to the end of the sawhorse for any bandsawn straight cuts, and finish the molded part with a coping saw. For flat moldings, perfect joints can be made by tacking a miter joint together and then sawing through the joint itself. □

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Side dressing. **Several quick strokes with an oilstone or file along each side of the blade remove any burrs produced by sharpening. It is also useful in reducing the set of a saw slightly.**