

The Basics of the Bandsaw

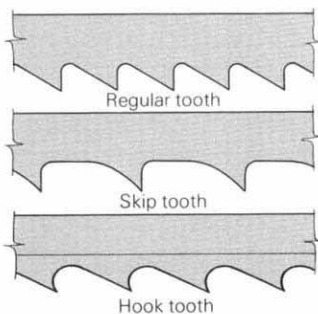
Setting up and using this versatile machine

by Tage Frid

The bandsaw is one of the most versatile machines in the shop. It can cut curves, it can rip, crosscut, resaw, and it can cut joints. It can also cut sides of beef with ease, so if you see bits of meat clinging to the wheels in these photographs, it's because that's what I've been doing lately. However, the bandsaw cannot make as smooth a cut as a table saw, because a table saw has a stiffer, thicker blade that stays straighter in the cut. A bandsaw blade must bend around its wheels, so it can also bend in the cut. It is a welded ribbon of steel. Because the two ends are difficult to weld exactly in line and the weld itself produces a raised surface on the blade, the blade pulses, both forward and back and sideways, when moving at high speed. This pulsing makes the cut uneven. Still, because the depth of cut is greater and the blade is narrower, a bandsaw can do things a table saw can't. It's best for cutting curves and for resawing wide stock with minimal waste.

To get the best possible cut on your bandsaw, you first have to choose the right blade and then install it properly. I had a 14-in. bandsaw for many years before getting the 20-in. saw (with a 2-HP motor) I have now. Besides its larger blade-to-column distance (throat) and its greater depth of cut, this larger saw can use a wider blade and run it under greater tension, two important factors in determining how smooth and straight the cut will be. You should always use the widest blade possible for the job. For straight cuts, as in resawing, I use a 1-in. wide blade. For most curve cutting, I use a $\frac{3}{8}$ -in. wide blade, which will cut to a radius of $1\frac{7}{16}$ in. For tighter curves a narrower blade is necessary; probably three blades (1-in., $\frac{3}{8}$ -in. and $\frac{1}{2}$ -in.) will cover most uses.

Another important factor in blade choice is the number and kind of teeth. Bandsaw-blade technology is most developed for metal cutting. There are all sorts of tooth styles and arrangements of tooth set, each one best suited for cutting a particular kind of metal, of a particular thickness, at a particular speed. The choices for wood cutting are not so numerous. For one thing, all wood-cutting bandsaw blades have every tooth set alternately; raker (or unset) teeth do not have an advantage in wood cutting. For a long time wood-cutting bandsaw blades had regular teeth, that is, like a handsaw, they had 0° rake and they were the same size as the gullets between them. This kind of tooth style is fine for cutting in thin stock, but by eliminating every other tooth and increasing the gullet size, chips clear better and the cutting is faster. This is called a skip-tooth blade. With the increased chip clearance, it's possible to put a rake on the teeth, usually 10° , which makes feeding easier, sawing faster. Depending on the



manufacturer, this is called a hook-tooth, claw-tooth, saber-tooth or gore-tooth blade, and it's what most people use now.

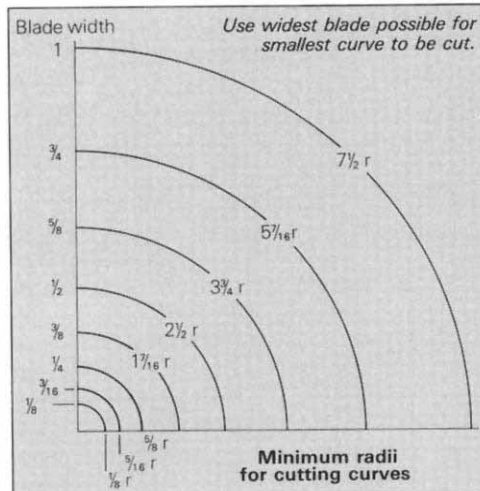
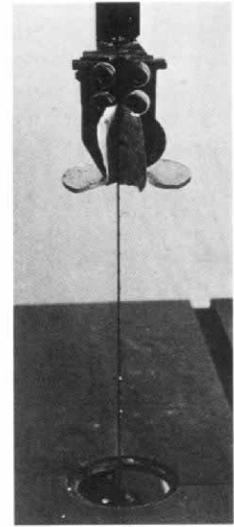
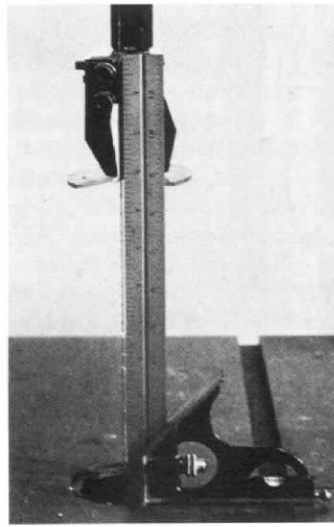
The number of teeth per inch is also important for getting the best cut. The thicker the stock, the fewer teeth per inch you should use. Two or three teeth per inch is considered a coarse blade and is best for resawing. Ten or more teeth per inch will cut the best in thin stock. Most of my blades have around five teeth per inch, good for general work; all are high-carbon steel with hardened teeth and flexible backs.

Installing the blade—Some people spend a lot of time installing a blade, going back and forth over the adjustments, really making it more trouble than it has to be. The trick is in doing things in the right order. First unplug the saw, loosen the tension on the upper wheel and back off all the blade guides; this way you can slip the blade easily around the wheels (make sure the teeth are going in the right direction) and concentrate on tensioning and tracking without the guides getting in the way. Tension the blade by turning the tensioning knob that spreads the two bandsaw wheels apart. Most bandsaws have a tensioning gauge that shows the proper tension for each blade width (the wider the blade, the greater the tension). If your saw doesn't have a tensioning gauge, you'll have to develop a feel; some people pluck the blade like a guitar string and seem to know by the sound when the tension is right. Too much tension and the blade can break, too little and it will wander in the cut. When you've tensioned the blade enough to keep it on the wheels, track it. Tracking is done by turning a knob that tilts the axis of the upper wheel, which makes the blade move back and forth on the rubber rim. Rotate the upper wheel with one hand and as the blade coasts, adjust the tracking knob with the other hand until the blade rides in the middle of the rim. Finish tensioning the blade and test-track it again by hand. Now close the doors, plug in the saw, and test at higher speeds by bumping the motor on and off before letting it run continuously. If the blade runs true, you can proceed; if not you have to stop the blade (here's where a foot brake is a time-saver) or let the blade coast to a stop before opening the doors and retracking by hand. Never track the blade or open the door with the blade running at high speed. If the blade slips off or breaks, you want those doors between you and it.

With the blade tensioned and tracked, square the table to the blade; then you can adjust the blade guides. Bandsaws have two sets of blade guides, one below the table and one above. The top set adjusts up and down for different depths of cut. Each set of blade guides consists of a rear thrust bearing and two side supports, which may be ball bearings, hardened-steel blocks or pivoting plates. Ball bearings are best because then can be brought right up in touch with the blade, but they are expensive and clog easily with sawdust. Blocks and plates have to have some clearance, and blocks



Installing a new blade on the bandsaw is easier if you do things in the right order. With all the blade guides backed off, the blade is slipped around the wheels and tensioned. Next the blade is tracked, left, by turning the upper wheel of the bandsaw with one hand while adjusting the tilt of the wheel's axis with the other. Never track the blade with the motor running and the door open. Next adjust the blade guides, first the thrust bearings, upper and lower, then the left-hand side guides. Use a square, right, to make sure you're not pushing the blade out of line, and a piece of paper between the blade guide and the blade for clearance. Then use the same piece of paper, far right, to set the right-hand side guide with the proper clearance.



Two basic operations on the bandsaw: Cutting curves, above, should be done with the widest possible blade for the curve; the chart gives the limits of various blade widths. Using too wide a blade will result in heat and stress on the blade as its back rubs in the kerf; this can break or damage the blade. When sawing curves, be sure to keep your hands behind or to the sides of the blade. Resawing, right, is done with the widest blade the saw will handle and an L-shaped fence at the blade. The fence is rounded over where it rides against the planed surface of the board. This way the board can be fed on an angle to compensate for the tendency of most bandsaw blades to lead to one side or the other.

tend to wear at the front and to lose their setting from vibration. I'm happy with the plate side guides that came with my saw because once the plates are mounted, the support from the teeth to the back of the blade is fixed and their sideways position locks down good and tight.

The thrust bearings should be adjusted first. It doesn't matter if you do the upper or lower one first, but both should be set before adjusting any of the side guides. Bring the bearing up so it just touches the back of the blade. As mentioned earlier, a running bandsaw blade tends to pulse, so you'll have to check the adjustment as you turn the wheel by hand. As it runs, the back of the blade should just kiss the thrust bearing. Too close and it can wear the surface of the bearing; too far away and the blade will wander in the cut.

Set the upper and lower left-hand guides next, rather than both upper or both lower. I use a piece of paper (the thickness of a brown grocery bag) between the guide and the blade to gauge the clearance; with ball-bearing guides clearance is not necessary. It's important here that you use a square on the table to make sure you're not bending the blade to the right

with too much pressure from the guides. Besides proper sideways adjustment, you also have to set the guide properly in relation to the front of the blade. It should be just flush with the back of the gullets—too far forward and teeth will wear the guide; too far back and the guide won't provide adequate support. With both left-hand guides set, adjust the two right-hand guides, again using the piece of paper for clearance. Test the way the blade moves through the guides, turning by hand before switching on the machine. Be sure that the weld moves freely through the groove.

Basic bandsaw technique—Probably what you'll be doing most on the bandsaw is cutting curves. The important thing here is to keep your fingers to the side of the blade or behind it—never in front. And, of course, as with all bandsaw cuts, be sure to lower the blade guard to within 1/2 in. of the top of the stock you're cutting. This guides the blade better and lessens the risk of injury. The most common mistake most people make on the bandsaw is to cut a thick piece and then cut a thinner one without sliding down the guard. While

leaning over, concentrating on the line you're cutting, not only are you liable to stick your head into the moving blade, but if the blade breaks, pieces can fly all over like shrapnel. Never use a blade too wide for the radius you are cutting. The stress of the back edge rubbing in the kerf can break the blade. Getting a smooth cut is a matter of evenly feeding and turning the work. Stopping in the middle of a cut can produce an uneven surface, as the blade's vibration widens the kerf. Plan your moves. If a shape will require tight curves or cutting in and backing out the blade, make relatively straight cuts in the waste to remove most of it; then you can concentrate on the contour line without the blade binding. Never force the work into the blade. If the blade doesn't want to follow the line you're cutting, head for the waste side and come back for a closer second cut.

The bandsaw is excellent for cutting circles. A jig similar to

the one I use appears in the Methods column, *FWW* #6, Spring '77. This jig can also cut arcs of a circle, particularly useful when making forms for curved laminations (photos, facing page, top). The curved ribs of these forms must be identical; because of the bandsaw's depth of cut, you can stack and cut them all at once, thus ensuring uniformity.

The bandsaw is also most useful for resawing wide boards. Sometimes I will take a wide board and kerf it along either edge on the table saw, raising the blade between passes, before bringing it over to the bandsaw to complete the cut. Bandsawing thus goes faster and it's easy to keep the thin bandsaw blade in the wider table-saw kerf. But when I have a minimum of material to waste, as is often the case with figured wood I am bookmatching, I will resaw it on the bandsaw alone (last photo, previous page). I use a plywood L-shaped guide at the teeth of the blade, its vertical edge

Straight-line cutting and the bandsaw touch

by Arthur Reed

Although most shops reserve the bandsaw for curves, it's unequalled for cutting straight lines. We have two bandsaws in our shop, a 10 $\frac{1}{4}$ -in. Inca and a 36-in. American, and together they do most of our sawing. We rip rough stock in thicknesses up to the blade-guide capacity, we resaw for veneer, and for matched panels, and we size stock for furniture and cabinets. We even rely on the bandsaw for joinery.

Many woodworkers harbor prejudice against the bandsaw, probably from the frustration of having tried to saw a straight line without being familiar with the balance of forces that allows the machine to work. Perhaps more than any other machine, the bandsaw requires a delicate, learned touch.

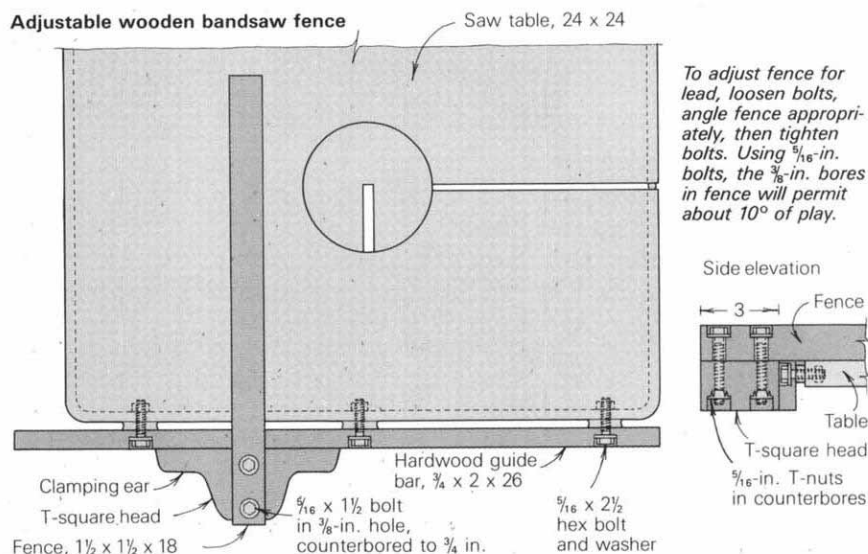
One key to success is accurate and careful setting of the guides, so the blade can travel freely through the stock and yet be supported in its travel. Similar coordination is required between blade and rip fence. Bandsaw teeth form a narrow corridor in the stock, a corridor that must pass around the body of the blade without contacting it. Otherwise, the side pressure will twist the blade and make it cut unevenly. Thus the characteristic cutting path of the blade must be determined, and the rip fence must be aligned with it. Since this path is rarely parallel to the sides of the table, we assess the drift of our blades regularly.

True up one face and edge of a piece of 2x4 stock about a foot long. Mark a

pencil line on the face opposite the trued face, parallel to and about 2 in. from the trued edge. Slowly feed the stock, trued face down, into the blade with moderate force and feel for the drift by moving the cut away from and back onto the line. After about 8 in. of feed, you'll find the angle that keeps the saw cutting easily along the line. Turn off the saw, bring up the rip fence and adjust it to hold that angle. The Inca fence allows this adjustment; if yours doesn't, either mark the line on the table and clamp a board fence parallel to it, or make yourself an adjustable fence as shown in the drawing. Finally, take another piece of scrap and rip it along the fence. If the scrap seems either to pull away from the fence or to bind the blade, re-adjust. Otherwise, once set, the drift angle should be constant for the life of the blade, regardless of grain structure, hardness, softness or thickness of the stock cut.

It's also important to develop a technique for feeding the stock into the bandsaw. This determines to a great extent the quality of the cut. Feed should be constant and smooth, though the amount of pressure and sometimes its direction vary; they constitute the "touch," the operator's sense of how the cutting is going. On thicker, harder stock, be aware of the greater work the bandsaw teeth have to do, and feed at a rate the blade can handle. It takes time to develop the correct touch, to learn to back off when certain sounds are heard or when a familiar feeling is replaced by something not quite right. Developing touch is a matter of making mistakes and learning from them. □

Arthur Reed operates a custom wood-working shop in Elmira, N. Y.



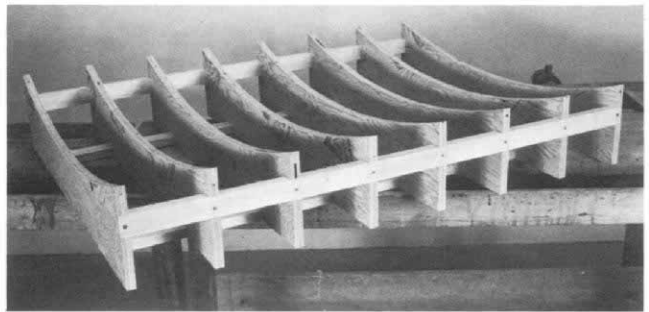
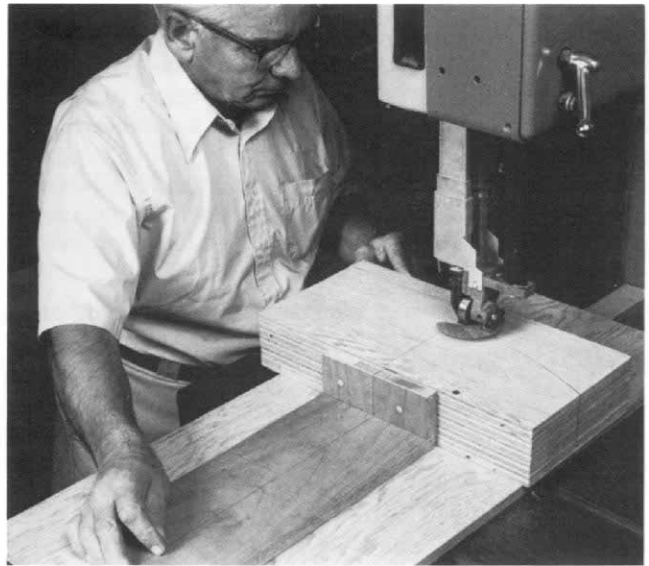
rounded over, and follow by eye a scribed line. Because of variations in set or sharpness, sometimes through wear, sometimes on new blades, most bandsaw blades will lead to one side or the other. With this L-shaped guide you can shift the angle of feed to follow the lead of the blade. (One of my former students claims proficiency in using no guide at all; he prefers to resaw freehand and thus eliminates the possibility that blade-lead will bind the stock against the fence.)

To resaw with the L-shaped guide, first plane one face and joint one edge of the board. Draw a line on the unjointed edge, parallel to the planed face, and saw with the planed face against the guide and the jointed edge on the table. Push evenly and slowly; don't crowd the blade; let it cut. Keep the feed constant, and keep your hands away from the blade, especially toward the end of the cut; use a push-stick or reach around the blade and pull the board through. Whatever you do, don't push those last couple of inches through with your thumb on the end of the board.

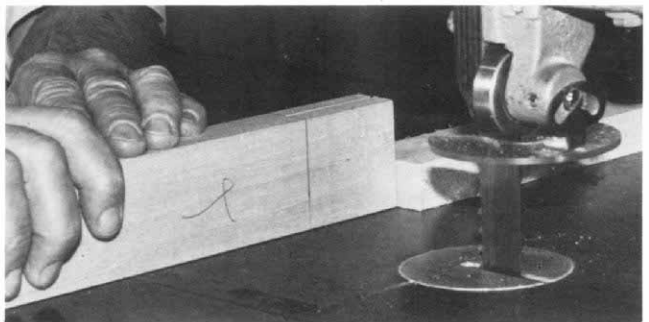
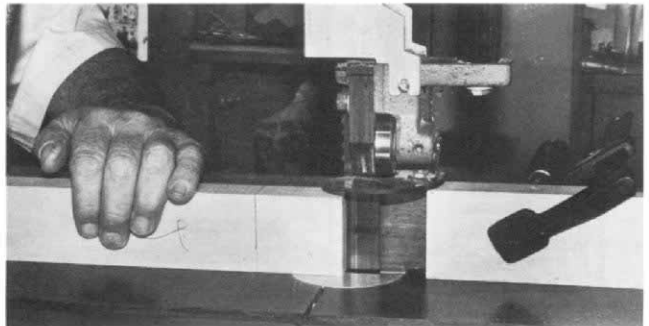
Resawing satisfactorily requires using as wide a blade as possible with two or three teeth per inch for adequate chip clearance. A 1-HP motor is the minimum; 2-HP to 3-HP is best for green wood. Make sure your blade is sharp and properly tensioned, and that the blade guides are adjusted and close to the work. If the cut bellies, it's probably because of inadequate chip clearance. Slow down your feed and/or use a blade with fewer teeth per inch. If you are getting deep striations on the sawn surface, it means one or more of the teeth on that side of the blade are damaged or set wrong. Try holding a carborundum stone flat against that side of the blade while it's running. Keep in mind that even when you get a smooth, flat surface from the saw, there is a good chance the board will cup because moisture content is rarely consistent throughout a board, and resawing exposes new surfaces to the air. You must allow for this and saw your stock thicker than you need. It is also a good idea to put resawn boards aside for a few days before finish-planing and jointing, so they will reach equilibrium with the shop atmosphere. How much stock can you expect to lose in resawing? There's the waste to the kerf, the waste to the jointer (when resawing a number of thin boards from one thick one, it's best to joint the sawn surface of the thick stock after each sawing) and the waste to cupping—figure on losing at least $\frac{1}{4}$ in. for each sawing.

Bandsaw joinery—There are several joints it makes sense to cut on the bandsaw, especially if there are a large number of them to do. Through dovetails can be cut almost completely on the bandsaw, tilting the table to saw the pins and freehanding the tails after marking them from the pins. Some joints can be done on the bandsaw in conjunction with the table saw. In cutting tenons or lap joints, for instance, the bandsaw can waste the cheeks after the table saw has cut good, clean shoulders. I prefer to make the two cuts on the table saw, but if you don't have a table saw, both shoulders and cheeks can be cut on the bandsaw, as shown in the photos at right.

To saw cheeks on the bandsaw, first mark on the stock the lines for both cheeks and shoulders. Install the widest blade possible and set up a rip fence a distance from the blade equal to the thickness of the cheek waste. Because this is a relatively short cut, it usually isn't necessary to angle the fence to compensate for blade drift (lead). You can set up the fence parallel to the table edge. Next clamp a stop to the fence that will keep the stock from traveling farther into the blade than to



The bandsaw is ideal for cutting circles or arcs of circles when it's equipped with a plywood plate and pivoting trammel to which the stock is pinned. Top, plywood ribs are being cut to identical arcs for use in a bent-lamination form, above.



To saw tenon or half-lap cheeks, top, use a wide blade, a fence set to the thickness of the cheek waste and a block behind the blade to stop travel at the shoulder line. To saw the shoulder, above, use the miter gauge; clamp a block to the table for quick and accurate positioning of repetitive cuts.

the line of the shoulder. Hold the stock firmly against the fence and feed it into the blade up to the stop. Saw the cheeks for one side of all the stock you are joining. Don't flip the stock; reset the blade-to-fence distance before cutting the other cheeks to make sure variations in stock thickness do not produce variations in tenon thickness.

If you are also sawing the shoulders on the bandsaw, remove the fence and use the miter gauge. Place one of the pieces of stock against the miter gauge, positioning it so that

the blade is in line with the shoulder to be cut. Without moving the stock on the miter-gauge fence, pull the stock and miter gauge back to the front of the table and mark the table where the stock ends. Clamp a stop block to the table at this mark, and you can use it for quick and accurate positioning of each piece to be cut. I don't find it necessary to put a stop block behind the blade to control the depth of the shoulder cut; with the cheeks already sawn it's a simple matter to stop feeding when the waste falls off. □

A bandsaw sawmill

by Lawrence Westlund

I have a 12-in Sears bandsaw and lots of large branches and small tree butts wanting to be sawn into small boards for boxes and the like. I built a free-standing table with a cutout into which my bandsaw table can be positioned and on which slides a carriage, complete with knees and dogs for holding round wood while the carriage is cranked past the blade. The mill for my saw, shown in the photo and drawing, can handle 7-in. diameter logs; dimensions, of course, can be varied for other saws. Most of the work is bolting the stock together to form the table. I did weld the iron for the knees and dogs, though these could be bolted as well. □

Lawrence Westlund is an amateur woodworker in Klamath Falls, Ore.



Frances Westlund

Bandsaw mill

