The scroll saw is a versatile tool *that excels at fretwork, inlay, marquetry and other intricate work that requires little or no sawkerf. Extremely fine work is easier if you use an auxiliary top of hardboard, which provides zero blade clearance for full support of fragile materials. And the extra top helps to prevent small pieces from falling to the floor.*

Getting the Most from a Scroll Saw

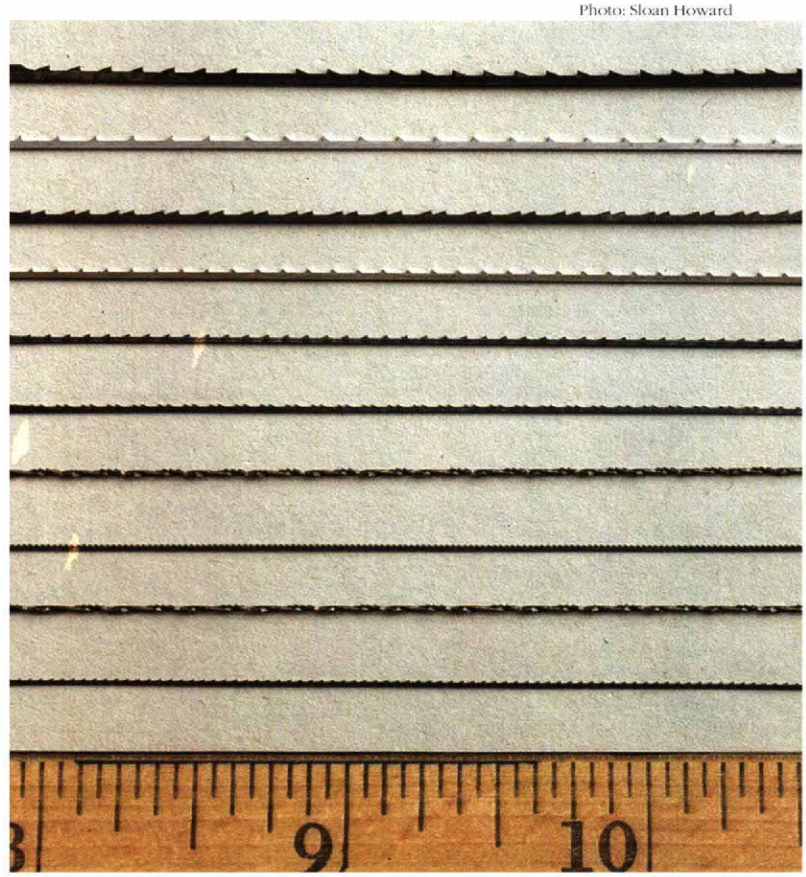
These versatile saws cut everything from abalone to zinc

by Spider Johnson

Photos except where noted: Charley Robinson

Checking blade alignment is easy. *Place a credit card against the side of the blade, and rotate the motor by hand. Any misalignment shows up as a gap between the blade and the card.*

Photo: Sloan Howard



Scroll-saw blades come in a variety of styles and sizes *for most cutting needs, from softwoods to hard metals. Sizes, shown here in various tooth designs, range from the fine no. 2/0 to a heavy-duty no. 12.*

If you're considering a scroll saw or if you already have one that sits unused and dust-covered in the corner of your shop, you're missing out on an extremely versatile tool. A scroll saw is good for a lot more than making knickknacks for the county fair. It can handle fretwork, inlay and marquetry. Scroll saws cut a fine kerf with excellent control in a wide range of materials including wood (up to 2 in. thick), paper, metal, plastic, rubber, wax, leather, glass, ceramic tile, plastic laminate, bone and abalone.

Basically, a scroll saw is a motorized coping saw. It holds a fine blade and moves the blade in short vertical strokes, cutting on the down stroke. Because of this cutting action and the small teeth on its blade, scroll saws are remarkably safe tools, a quality to remember if you have young woodworkers in the house. The tool's simplicity, modest maintenance requirements and ease of use make it a great tool for beginners. And the saws are more affordable than they used to be.

The scroll saw's unique quality comes from its vertical cutting motion and blade tensioning system. Modern scroll saws are not the same animal as the old saws that broke blades by the boxful. Modern parallel-arm scroll saws maintain constant blade tension and can be adjusted to use extremely small blades—qualities old scroll saws couldn't match. The straight up-and-down cutting action leaves a smooth cut. And the blade-speed control offered on some saws allows extremely fine work on fragile materials. With just a little attention to machine and stock preparation, anyone can produce excellent work on one of these machines.

Five factors for smooth, clean cuts

There are five keys to controlling the quality of cut: blade speed and alignment, proper blade selection, preparation of the workpiece, blade lubrication and cutting technique.

Blade speed and alignment—Despite what you may have heard, blade speed by itself is one of the least important factors for good results. Soft materials need a slower blade speed for a controlled cut. Higher speeds will cut harder materials faster. My rule of thumb is to match the speed with your ability to control the cutting. A high-speed-only saw, for instance, makes it difficult to cut intricate shapes in soft materials. But with a well-aligned saw and proper preparation, most materials can be cut on any saw.

More important is blade alignment: How straight does the blade track as it makes a cut? To check a scroll saw's alignment, place a small, light object with a straight edge, like a credit card or business card, on your scroll-saw table next to the side of the blade. After unplugging the saw, rotate the motor by hand so that the blade moves up and down, and watch the credit card to see if there is any side-to-side movement of the blade (see the top photo). The more side-to-side movement, the more difficult it is to control the cut and the more frequently blades will break as they bounce off the sides of the kerf with each stroke. Try to check a saw before buying it because I don't know of any way to correct improper alignment. If your saw is out of alignment, though, don't throw it out. Proper cutting techniques, as I'll discuss later, can help compensate for some misalignment.

Picking the right blade—The blade is just as important as the saw it's mounted in. Most scroll saws use 5-in.-long blades that range in size from no. 2/0, the finest (.022 in. wide by .010 in. thick), up to no. 12, the heaviest, which are .061 in. wide by .022 in. thick (see the bottom photo on this page). For my marquetry

Blade selection guide

Use this chart as a starting point. You'll get the best results by experimenting to find the best blade for your technique and application. Blade sizes vary in thickness and width by manufacturer. The best direct comparison of blades is teeth per inch (tpi). Here are four axioms for blade selection:

1. There is no "right" sawblade for a particular job. Each size blade will accommodate a range of thicknesses and materials.
2. Generally, finer blades are best for thin materials. Feed rates should be slower. Fine blades make smoother cuts but break more frequently.
3. Select the coarsest blade that still makes a satisfactorily smooth cut.
4. The final compromise between smoothness, speed and durability is based on personal preference and experience.

Material	Thickness	Teeth per inch	Blade
Softwood	½ in.	20	Standard
	1 in.	15	Standard
		10	Ground
	1½ in.	14	Standard
		8	Ground
Hardwood	½ in.	16	Standard
		10	Ground
	1 in.	14	Standard
		8	Ground
	1½ in.	6	Standard
		10	Rip
Veneer	⅛ in.●	30	Standard or double
	¼ in.●	25	Standard or double
	⅜ in.■	30	Double
Soft metal	1/16 in.	50	Jewelers
(brass, aluminum,	⅛ in.	36	Jewelers
zinc)	¼ in.	40	Jewelers
Hard metal	1/16 in.	36	Jewelers
(steel, hardened	⅛ in.	40	Jewelers
aluminum)	¼ in.	25	Jewelers
Plastic	¼ in.	16	Standard
		10	Ground
Rubber	¼ in.	14	Standard
Synthetic	½ in.	14	Standard
countertop	¾ in.	12	Standard
		10	Rip
Paper	¼ in.▲	16	Standard
		10	Ground
	¾ in.▲	14	Standard
		10	Ground
Wax	1 in.	32	Spiral
Leather	¼ in.	10	Ground
Glass, ceramic tile	up to ¼ in.	none	Diamond
Bone	⅛ in.	16	Standard
	¼ in.	14	Standard
		10	Ground
Plastic laminate	⅛ in.●	23	Standard
	¼ in.●	18	Standard
Mother-of-pearl	⅛ in.●	25	Standard
or abalone	¼ in.●	20	Standard

● Thickness of backer board that piece is mounted on
■ Thickness includes veneer stack with poster board on top and bottom.
▲ Thickness of stack

work, I use as thin a blade as possible, usually a 2/0 with the appropriate number of teeth per inch for the material being cut, as shown in the chart at left. Thin blades break more often than thick ones, so beginners will probably be better served by starting with a no. 5 to a no. 9 blade to avoid the frustration of frequently breaking blades.

Blades also vary by tooth design. Standard blades with evenly spaced teeth are designed for cutting wood or plastic. Double-tooth blades have pairs of teeth that are separated by spaces. They clear chips quickly and cut smoothly in a variety of materials, such as wood, plastic, rubber, bone, ivory, horn and paper.

Jeweler's blades are tempered blades with very fine teeth, from 36 teeth per inch (tpi) to 50 tpi. They are designed to cut only metal because their fine teeth will clog quickly in wood. Most blades are milled out of metal. But you can buy ground blades. They're more expensive (about $7-$12 per dozen vs. $4-$5 for milled blades), but they're sharper and have no set, so they deliver the smoothest cut (for sources of blades, see the box on p. 74).

The chart at left will help you pick the right blade for the job. But in general, when cutting wood, select the smallest usable blade based on the total thickness of the material. When inlaying a thinner material, like brass, into wood, choose a blade appropriate for the thicker material.

Softwoods with a high moisture content, like some cedars, or the powdery sawdust of dry white pine can create lots of friction, meaning lots of blade breaks. In these cases, a skip-tooth blade that's slightly larger than recommended in the chart at left will yield better results.

For soft or hard metals, the proper blade is a hardened, metal-cutting blade, fine enough so that three teeth always touch the material being cut. This can vary a little, depending on how fast you want to go (bigger blade) or how smooth or intricate a cut you want (smaller blade).

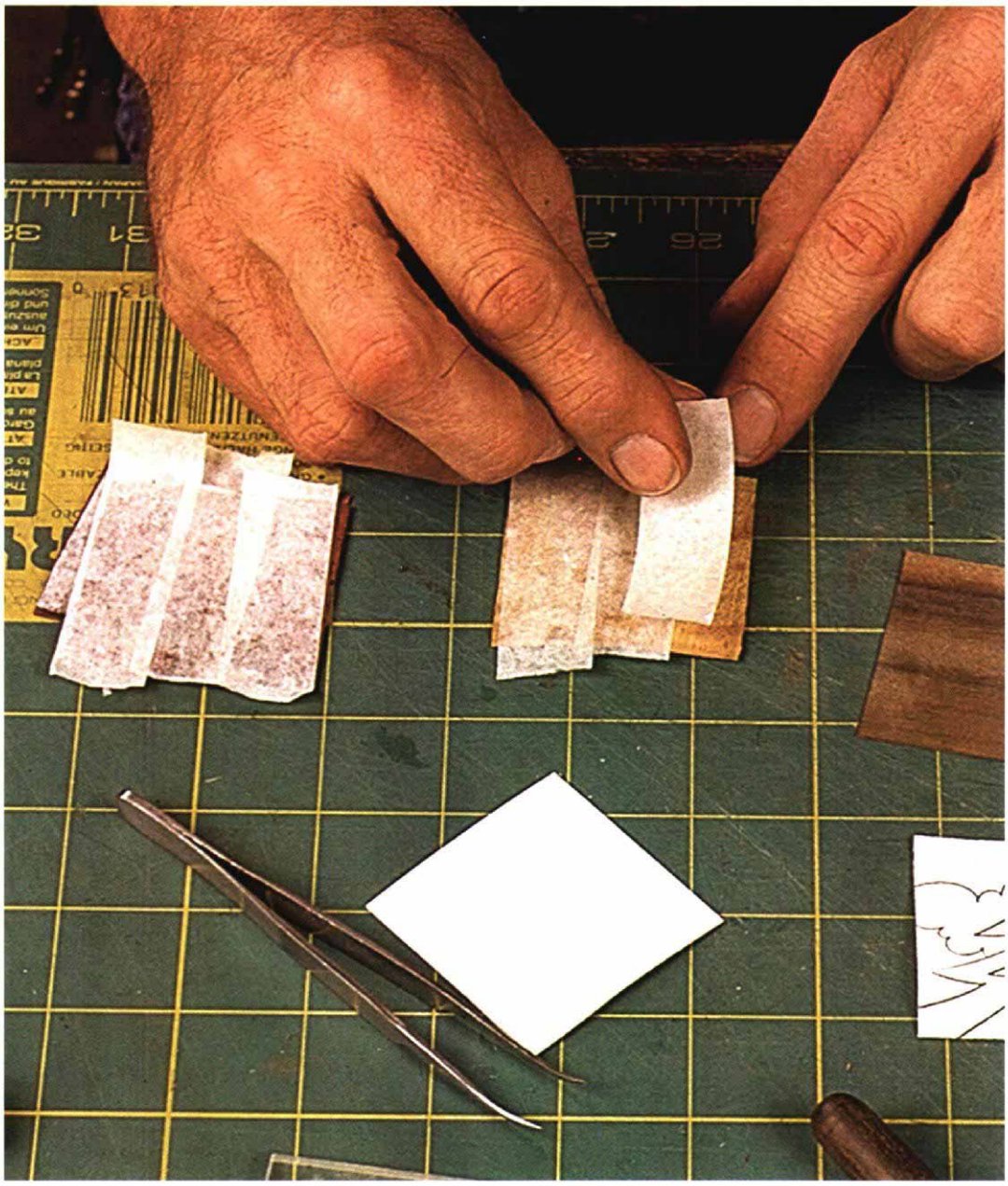
Impossibly intricate shapes and inside cuts can be made in glass or ceramic tile using a round diamond-coated blade.

Preparation of workpiece—The scroll saw can make cuts that other saws can't, such as the enclosed cuts in fretwork or sharp-cornered cuts with tiny kerfs that need no sanding. For most work in solid stock, you can sit down at the scroll saw and begin cutting without any special preparation of the material. But for cutting thin or fragile materials, I've found some tricks that increase my success rate and yield better results.

Thin, brittle veneer can break apart when being cut. By applying a layer of thin veneer tape, as shown in the photo on the facing page, and then rubber-cementing the veneer tape side to a piece of cardboard or poster board, almost any design can be cut successfully. (Veneer tape is available from Constantine, 2050 Eastchester Road, Bronx, N.Y. 10461; 800-223-8087.)

The design you're cutting out can either be drawn or rubber-cemented on top of the veneer tape. Rubber cement can be removed easily from the bottom of the veneer with a rubber-cement eraser before gluing the veneer to a ground piece later. Be sure to remove all traces of rubber cement before gluing because any remaining cement will inhibit good bonding when using water-based glues.

A similar method also works for cutting lots of other materials, such as thin sheet brass, bone, synthetic countertop materials, mother-of-pearl or abalone. The first step is to apply a design to the piece. Then, using double-faced tape or rubber cement, stick the piece to a ground piece (for inlay work) or cardboard backing piece. Especially fragile materials, such as mother-of-pearl or abalone, should be sandwiched in cardboard (avoid breathing the



Protecting fragile veneers— *To prevent tiny pieces of veneer from breaking, the author applies a layer of veneer tape to the face of the material. Then the veneer is rubber-cemented to a poster board or cardboard backer for support. The pattern can be drawn on or rubber-cemented to the veneer tape.*

dust because it can contribute to silicosis, a lung disease). When cutting bone, be sure to flatten the back side on a belt or disc sander to prevent the piece from rocking on the saw table. The rocking will break blades.

The cardboard-sandwich technique also works for cutting several layers of veneer at the same time. I apply veneer tape to the face of each layer of veneer. Then I stack the veneers, adding random dabs of rubber cement on 4-in. by 5-in. or larger pieces to keep the veneers from slipping around. I sandwich the veneer stack between cardboard, rubber-cement the pattern to the top of the sandwich and saw the sandwich along the pattern lines, as shown in the top photo on p. 74.

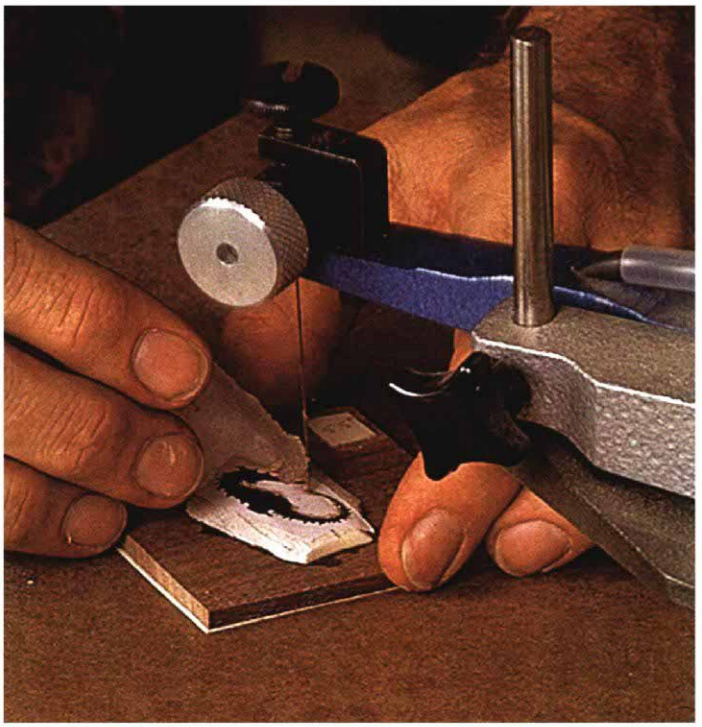
Fretwork shows up frequently on period pieces, architectural detailing and musical instruments. Fretwork is a natural for the scroll saw because the cut is so smooth that little, if any, sanding is needed. To simplify cutting repetitive patterns, make several photocopies of your original artwork, tape the copies together to create a pattern and rubber-cement the pattern to the stock before cutting. If the wood is thin, layer two or three pieces together in a sandwich, and cut several at once from the same pattern.

Metals 1/16 in. thick and thinner must be sandwiched between pieces of cardboard or poster board to keep the sheets from distorting as they're being cut. The sandwiching material can be rubber-cemented to both sides of the metal or taped in place. Thin sheets of metal, such as brass or copper, can be layered for cutting multiples. Rubber-cement the sheets together. Apply the rubber cement evenly to both surfaces, wait for it to dry and then press the pieces together. Then tape their edges to prevent the sheets from sliding around or creeping.

The protective paper attached to both sides of sheet plastic seems to keep the plastic from melting when cutting. If this paper is missing, use rubber cement to glue on a replacement piece.

An auxiliary table, made from thin aluminum or hardboard, attached to the scroll-saw table will prevent small pieces from falling through the table's blade opening, as shown in the photo on p. 70. This auxiliary table is particularly useful when sawing small veneer pieces, which seem to have a remarkable ability to blend perfectly with any sawdust on the floor.

Stack veneer to cut multiple copies. *After applying veneer tape to the face of each layer, sandwich the veneers between cardboard or poster board, and then tape them together. A pattern on top of the stack guides the cuts.*



Lubrication is the key to cutting hard or delicate materials. *In most cases, a block of paraffin that's rubbed frequently against the blade works quite well, even when cutting something as fragile as a bone inlay.*

Lubrication—Blades cut easily and last longer if they're lubricated. This is especially helpful with metal and important when cutting synthetic countertop material, bone, glass, ceramic tile or dense woods, such as ebony, cocobolo, rosewood, lignum vitae, desert ironwood and osage orange.

For the occasional small part you might need to cut, no fancy or messy oil-lubrication jigs are needed. A piece of paraffin rubbed frequently against the sawblade, as shown in the bottom photo, works well. I like paraffin best, but almost any lubricant will work, from hand lotion to Vaseline to pipe-cutting fluid. Small amounts are sufficient—too much lubricant makes a mess.

To cut a thick sandwich of several layers, use waxed paper inserted between the layers. The waxed paper acts as an extra lubricant to reduce blade breakage.

A small, spray bottle of water works well for cutting glass or ceramic tile with a diamond blade. A paper towel under the bottom blade holder helps control the mess.

Cutting technique—Proper cutting technique is a combination of machine setup and correct feed rate for the blade, material and thickness of material. To start, tighten the blade tension until there is only about ⅛ in. of blade deflection when you press on the front of the blade. Adjust the nozzle for the blower that keeps dust away from the line of cut so that the air blows away from you. If your machine doesn't have a blower, consider adding a bellows, compressed air line or even a small aquarium pump.

Beginners should use the hold-down arm for cutting most materials until they are used to holding the stock firmly against the table (the blade tends to lift the stock off the table on the upstroke). Always use the hold-down when cutting metal, and be careful not to get your fingers between the material and the table. They'll get pinched if the blade grabs the workpiece.

Feed rate depends on how well you can control the cut. Soft, delicate materials should be fed with light pressure and slow blade speed (if blade-speed control is available). Generally speaking, use a slow speed for soft metals like silver, gold, aluminum, soft copper and brass. But remember that metal will take much longer to cut at slower speeds than wood. For thick metals, use a faster speed, and plan to break a few blades, even when you keep them lubricated. With ¼-in.-thick steel, you'll cut roughly 1 in. per blade.

To prevent binding, practice relaxing your grip on the workpiece every few strokes. This technique will allow the blade to snap the piece back into alignment before you feed the stock into the blade again. □

Spider Johnson has collaborated with his wife, Lora Hunt, on their marquetry murals and sculptural pieces in Mason, Texas, since 1979. Ron King of Wilmington, Del., has worked with scroll saws for more than 20 years and offered technical assistance on this article.

Sources of supply

The following manufacture or supply scroll-saw blades.

American Intertool, Inc., 1255 Tonne Road, Elk Grove Village, IL 60007; (708) 640-7766

The Olson Saw Co., 16 Stony Hill Road, Bethel, CT 06801; (800) 272-2885

Advanced Machinery Imports, PO Box 312, New Castle, DE 19720; (800) 220-4264