Twist Turning

Traditional method combines lathe and carving

by Eric Schramm

Spiral or twist turning was introduced in Europe during the 16th century and was used widely for chair and table legs in 17th-century England. Today, the technique finds uses in antique reproduction and repair and for the Mediterranean-style furniture popular in the Southwest and West.

Spirals, solid and hollow, are not turnings in the true sense of the word because most of the work is really carving. A spiral resembles a screw thread; it has pitch and lead. Pitch is the distance from center to center of consecutive ridges or bines. Lead is the distance the spiral advances along the cylinder in each revolution. In a single-twist spiral, pitch and lead are the same. A spiral with a short pitch and great depth will be weak because much of the long-grain wood has been removed. A longer pitch will be stronger but less pleasing to the eye. I find that a pitch about equal to or slightly less than the cylinder's diameter produces the nicest effect. The precise pitch, however, is governed by cylinder length, if the spiral bines are to be spaced equally and are to start and finish their lead symmetrically.

To lay out a single spiral, you must divide the cylinder's circumference into four equal parts. A quick method is to wrap a strip of paper around the circumference and trim it so the ends just meet. Remove the paper and fold it in half once, and then in half again. The fold marks, which will quarter the cylinder, can be transferred directly to the workpiece with a pencil. With the cylinder on the lathe and the tool rest acting as a straightedge, draw four lines along the length of the workpiece passing through these marks (figure la).

Next divide the cylinder's length into spaces that are equal to or slightly less than the cylinder diameter (figure 1b). These marks are the pitch lines and represent the distance between the spiral's ridges. Pitch lines drawn, divide the space between them into four equal spaces. You can now sketch the spiral ridge by drawing a continuous line diagonally through one after another of the quarter spaces between the pitch lines. A scrap of sandpaper makes a good straightedge (figure 1c) for drawing the diagonal lines. If you've done things properly, the ridge line will cross a pitch line with each revolution. With the ridge line completed, draw in another line parallel to it to roughly locate the spiral's groove. The ridge line will remain intact through the carving process.

A double spiral, the most popular form, is layed out similarly. The pitch remains the same, but the lead doubles. So this time, divide the space between pitch lines into two instead of four sections. Draw one ridge line as before, passing diagonally through the squares. In the length of one diameter, this ridge line will traverse 180°. Start a second ridge line 180° from the first, and draw the diagonals so the line remains 180° from the first throughout the length of the cylinder. Triple spirals can be plotted by dividing the circumference into six parts and starting the ridge lines at 120° intervals.

Ridge lines can be drawn also by wrapping a strip of paper around the turning, leaving a slight space between turns. A pencil line is then traced through the spiral space.

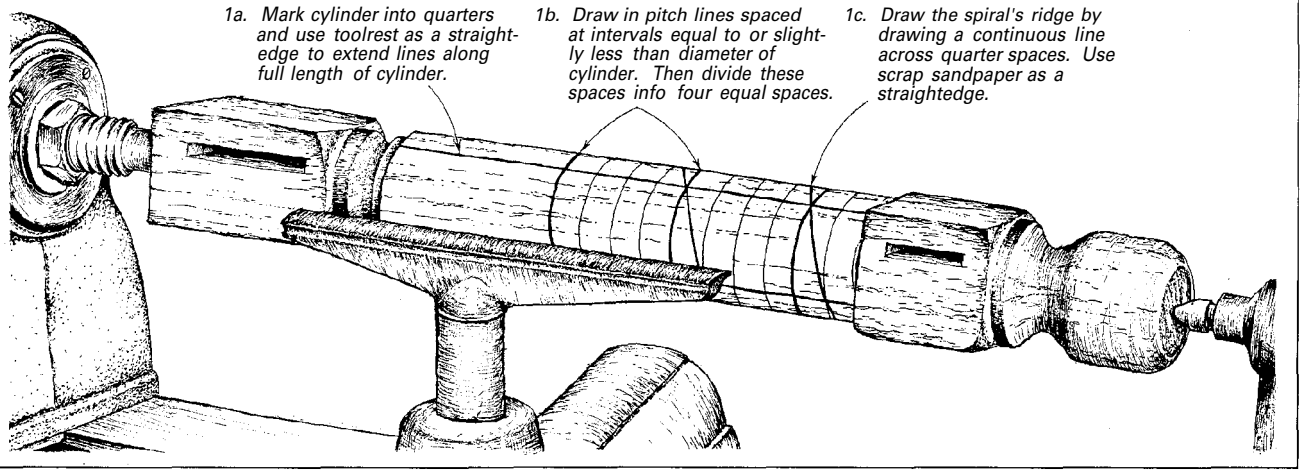
Actual cutting of the spiral is tedious but not difficult. First make a saw cut on the line that represents the bottom of the groove. Start with a saw with a strip of wood clamped to it or some masking tape to indicate the depth of cut, which should be about a quarter of the workpiece diameter (photo A). Rotate the work slowly while cutting so the kerf will follow the line. After sawing, the space between the bines is shaped by making broad V-cuts with a sharp chisel or No. 2 carver's gouge (photo B). Use a round file to clean up these spaces (photo C), then dress up the rounds with a flat cabinet file. The spiral can be rotated in the lathe by hand to permit longer file strokes and smoother results. The ridge line should be preserved throughout the process. Finish the spiral with sandpaper or use a shop-made pinwheel sander such as that described in *FWW* #30, p. 67.

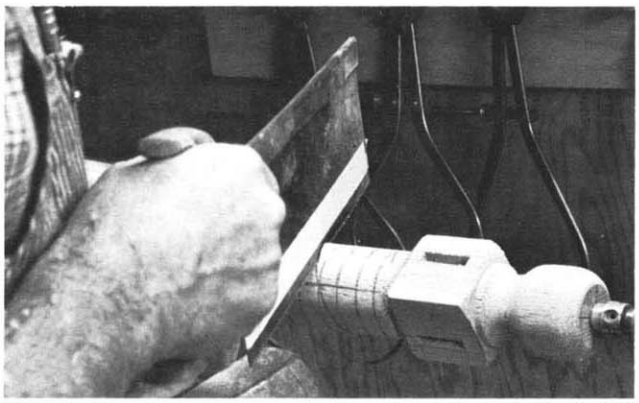
Another variation of the double or triple spiral is the hollow spiral where the bines of the spiral are separated by an opening. Hollow or open spirals generally lack sufficient strength for furniture legs, but are quite effective as candlesticks or lamp bases. The work is layed out as for the double or triple spiral, with the cutting line that represents the bottom of the groove used as a drilling line. A V-block is used when drilling to assure accuracy (photo D). The holes go through the turning and are best drilled half way through from each side to avoid splintering. Finish the shape with chisels, files and sandpaper (photo E). One of the best tools for cleaning out the inside is an ordinary sharp carving knife. Irregularities and tool marks can be removed with strips of sanding belt, pulled back and forth around the bines (photo F). Make the final strokes in the direction of the grain. A great deal of patience and skill is required for neat work. The wood used should be tough, hard, and free from defects.

Tapered spirals for flame finials are also possible. To lay out a taper, you must make the pitch vary so that it equals the diminishing diameter of the workpiece. Begin as above by striking four lines along the length of the taper. Then measure the diameter of the taper's large end and mark this distance on one of the four longitudinal lines. At this mark, measure the diameter again and mark this length along the taper. Repeat this process until you reach the end of the cylinder. Adjust the various pitch lines you have drawn so that they diminish proportionately. Draw in the ridge line and proceed with the cuts as in straight work. To make a flame finial, draw four ridge lines starting at 90° intervals from the large end of the taper. Use double ridge lines about ⅛ in. apart, and use gouges and files to remove the waste. I find a Moto Tool with a round burr a good tool for forming the flame. □

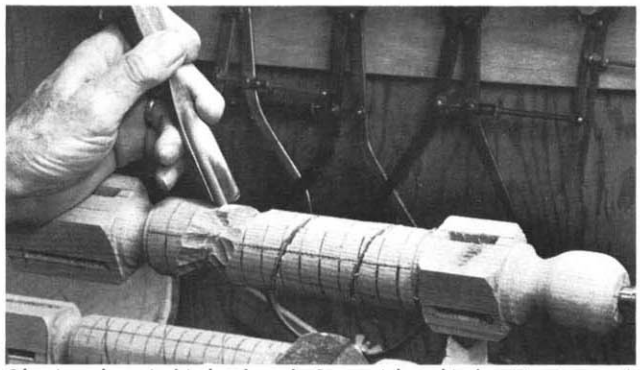
Eric Schramm designs and builds custom furniture in Los Gatos, Calif. Photos by Robert Schramm.

Fig. 1 Laying out the spiral

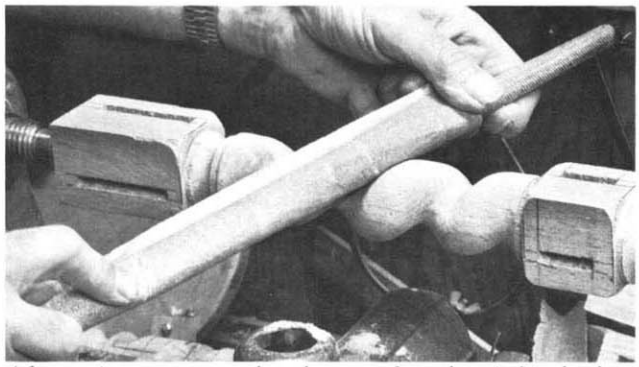




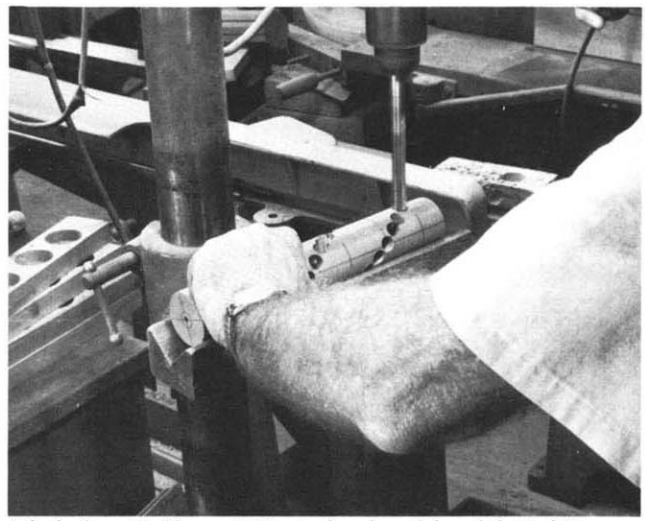
A *With the layout complete, use a backsaw to cut the initial kerf which will serve as a guide for carving the spiral's grooves.*



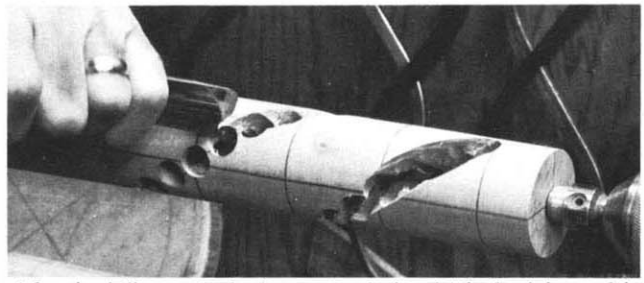
B *Shaping the spiral is hard work. Start with a chisel or No. 2 carver's gouge. You can control the shape of the grooves and ridges by varying the angle of your chisel cuts.*



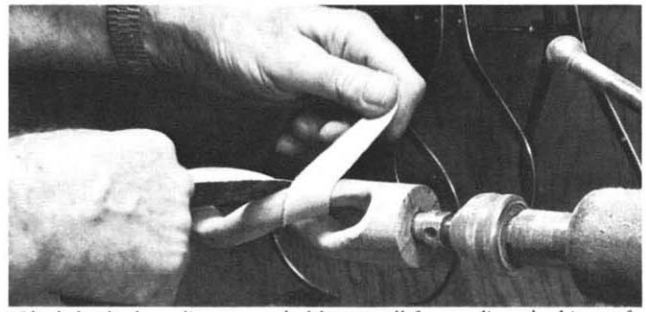
C *After carving, use rasps and sandpaper to form the spiral in the shape you want. Here, sandpaper is wrapped around a rasp that acts as a sanding block to maintain the radius.*



D *The hollow spiral layout is identical to that of the solid spiral. To waste the center of a hollow spiral, Schramm uses a drill press with the stock anchored against turning and slipping by a V-block.*



E *After the drill press, it's back to carving by hand. The final shape of the hollow spiral is done with chisels, knives, rasps and sandpaper. Lathe-mounting allows the work to be positioned while carving.*



F *Cloth-backed sanding paper holds up well for sanding the bines of a hollow spiral. Old sanding belts can be cut into strips for this job. Use progressively finer grits to get a good finish.*

Drawing: Karen Pease

A Mechanical Twist

The tablesaw can be used to lay out a helix and to cut its initial kerf at the same time. Then with a molding head on the saw and a guide pin running in that kerf, the bulk of the waste can be machined away. The basic method is to clamp an angled fence across the saw table just ahead of the sawblade, which is raised only ¼ in. above the table surface. A blank cylinder, lodged against the table and the fence and rotated over the blade, will feed itself along the fence regularly and automatically. The result is a helical kerf whose pitch is governed by the angle of the fence. A cylinder turned between square pommels, what you'd want for chair or table legs, can also be tablesawn in this way by screwing free-spinning end-blocks onto the stock, as shown at right. The end-blocks raise the stock off the table and away from the fence so its square sections don't interfere with its rotation.

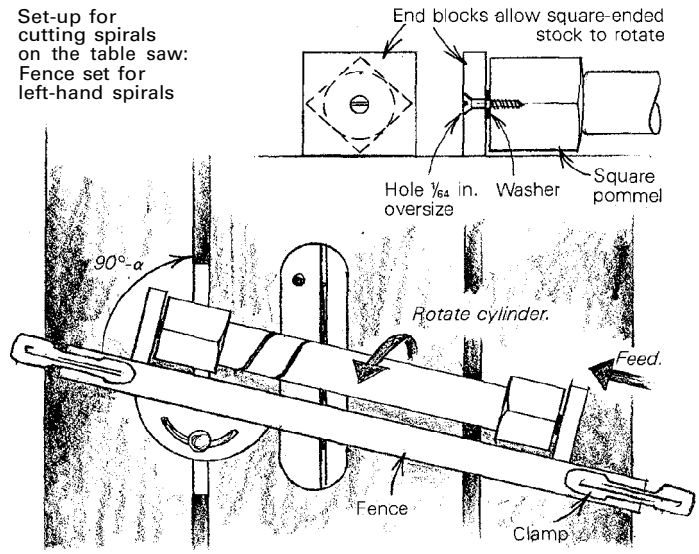
As in all twist turning, the first step is to turn the blank cylinder, straight or between square pommels, depending on the application. There's uncertainty in these procedures so make five blanks if you need four legs. Then choose the pitch angle (α), which determines how quickly the helix rises—that is, its pitch, or lead, how far apart its ridges are. A pitch angle around 18° saws a helix whose lead (L) about equals its diameter (D). This pitch angle is set by locking the miter gauge at 72° (that is, 90° minus 18°), and using the gauge to locate the fence on the saw table. Whatever the angle, the fence should be located so that the center of the blank cylinder is directly above the center of the sawblade. Moving the fence forward or backward has the same effect as changing its angle. To saw a double helix whose ridges are still one diameter apart, use a pitch angle around 32°, which means set the miter gauge at 58°. Pitch angle (α), diameter (D) and lead (L) can be figured with the following formula:

$$\tan \alpha = \frac{L}{\pi D}$$

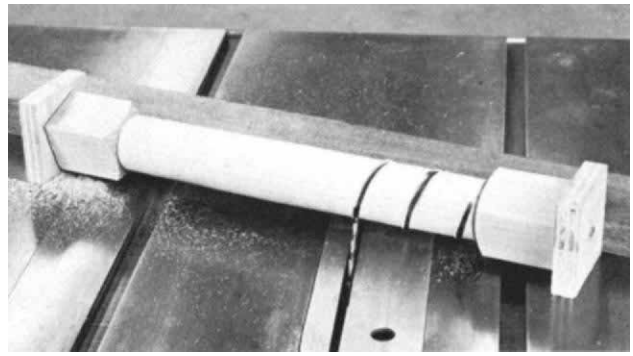
Always use a sturdy fence that's more than twice as long as the stock—a length of 2x4 is good. When the fence slopes away from the operator from right to left, the resulting helix will be like a left-handed thread. When the fence slopes away from left to right, the helix will be right-handed. Always feed the stock from the near side of the sawblade (the downhill side), always rotate it against the sawblade's rotation (so the blade doesn't self-feed), and always keep your hands well clear of the blade's path. For a double spiral, start the second kerf at a point 180° opposite the first.

After the helical kerf is cut, you can remount the stock on the lathe for carving, or you can further shape it with the molding head. Use coving knives in the head, and make a snugly fitting wooden insert for the tablesaw throat. Set a small dowel in the face of the fence (photo), just long enough to catch in the kerf. Fit this fence pin into the kerf and use the miter gauge (set as before) to locate the stock in relation to a molding knife. Clamp the fence to the saw table and rotate the stock into the molding head, slowly and carefully. The pin will automatically feed the stock. Shaping with the molding head has to be done in one pass because the cut removes the guide kerf. After the molding knives have done what they can, the helix can be cleaned up with carving tools, rasps and sandpaper. A strip of cloth-backed sandpaper in a bowsaw frame will speed the chore.

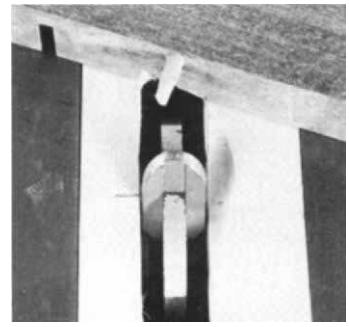
—Larry Green



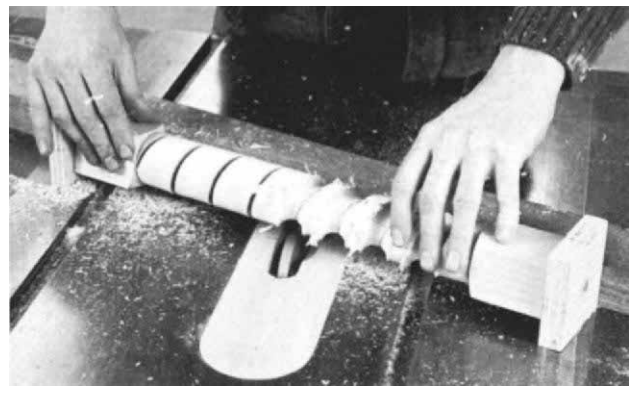
Position fence so stock center and saw arbor are vertically in line. Use miter gauge to set fence angle. Raise sawblade to cut ¼ in. into cylinder. Free-spinning endblocks provide clearance for square pommels, as shown in the detail at top.



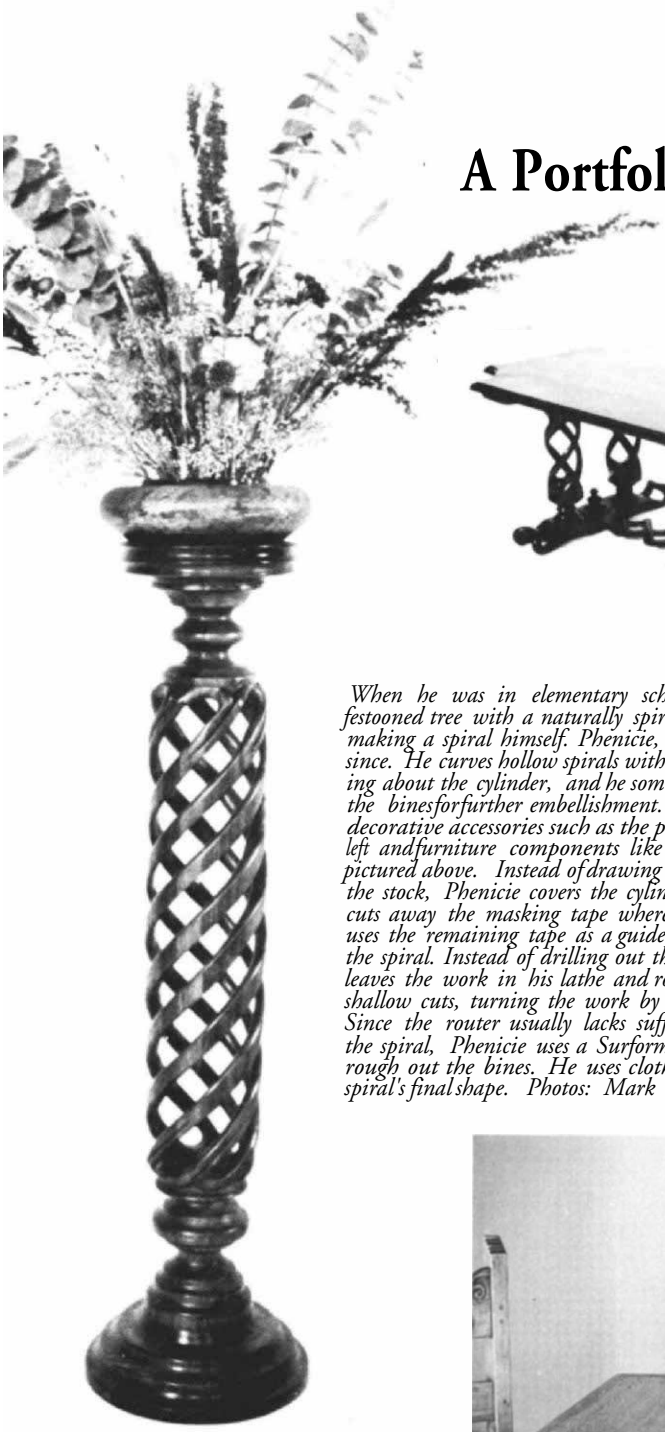
Rotate cylinder into the sawblade to cut helical kerf, above. It will feed itself along the angled fence.



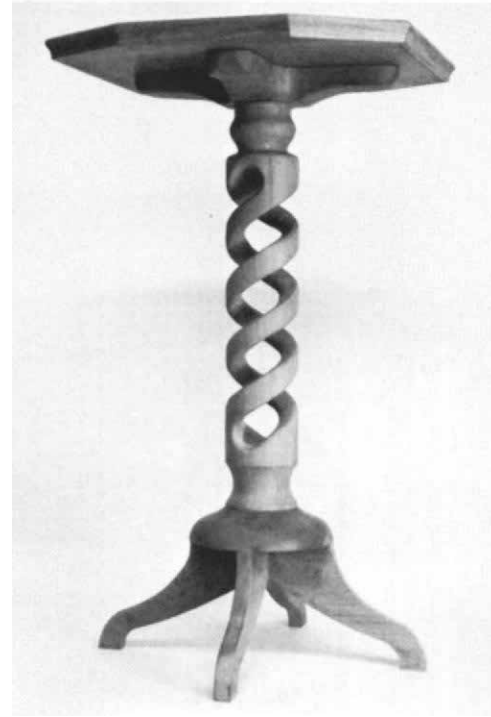
Dowel pin set in fence will guide kerfed cylinder past molding head (right). Cut must be deep because a second cut is not possible (below). Go slowly to minimize tear-out.



A Portfolio of Spirals



When he was in elementary school, Mark Phenicie saw a vine-festooned tree with a naturally spiraled trunk that inspired him to try making a spiral himself. Phenicie, of Berwyn, Pa., has been at it ever since. He curves hollow spirals with as many as six separate bines winding about the cylinder, and he sometimes adds V-grooves to the face of the bines for further embellishment. Phenicie's spirals go into making decorative accessories such as the pedestal plant stand in the photo at left and furniture components like the coffee table legs and stretcher pictured above. Instead of drawing the spiral's ridge line directly on the stock, Phenicie covers the cylinder in masking tape first. He then cuts away the masking tape where the spiral's groove will be and he uses the remaining tape as a guideline when cutting out the center of the spiral. Instead of drilling out the waste, Phenicie uses a router. He leaves the work in his lathe and routs out the grooves with a series of shallow cuts, turning the work by hand to better position the router. Since the router usually lacks sufficient depth to completely hollow the spiral, Phenicie uses a Surform tool to finish the hollowing and to rough out the bines. He uses cloth-backed sandpaper to smooth the spiral's final shape. Photos: Mark Phenicie.



Fred Johnson of Andover, Mass., used the drill-press method to hollow the spiral for this pedestal table. He used a keyhole saw, rasps, rifflers and 'sheet upon sheet' of sandpaper to finish the piece. Photo: Fred Johnson.

J.R. Thomas of Cerrillos, N.M. designs spirals into his Spanish-influence furniture. But he doesn't use fancy formulas or complicated layouts to make them. "I just screw around with a bevel gauge until I get something that pleases my eye," Thomas says. The pieces shown here were done for a Santa Fe builder. Thomas carves his spirals entirely with V-gouges and in-cannels. He puts all the legs for a piece in his vise, carves them at once on the square stock, and finishes each individually with rasps and sandpaper. Photo: J.R. Thomas.