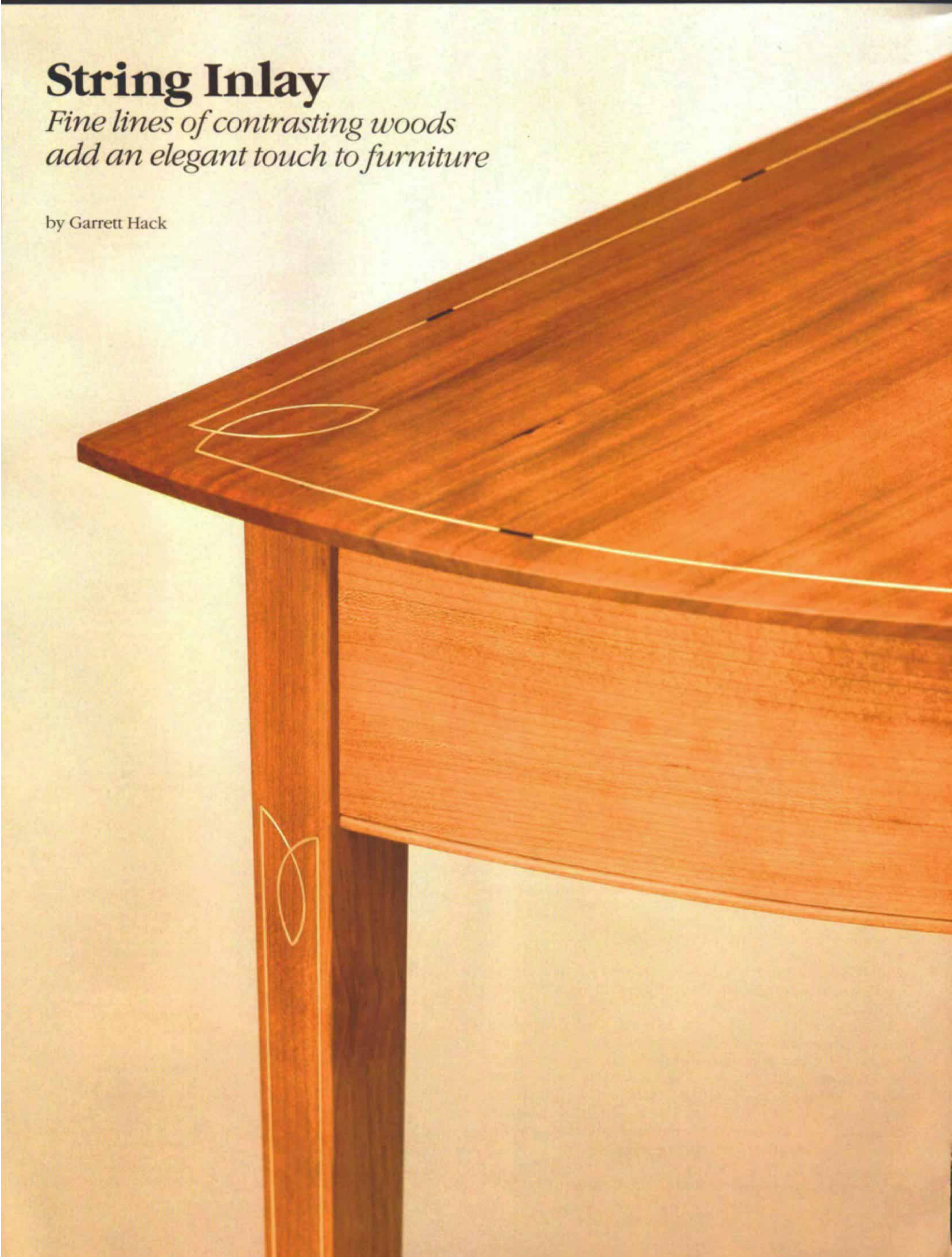
# String Inlay

*Fine lines of contrasting woods add an elegant touch to furniture*

by Garrett Hack



***A look borrowed from an earlier era**—Inlay only 1/16 in. wide on the author's table is reminiscent of Federal pieces.*

Early American furnituremakers used string inlay for much the same reason they used moldings—to outline and highlight parts of their furniture. In rooms where dim light was often the norm, the narrow bands of inlay emphasized the vertical lines of a table leg (see the photo at left) or carried the eye around a curved apron. String inlay is most common on pieces from the Federal, or Hepplewhite, era (late 18th century through the first quarter of the 19th century). Designs from that period are among my favorites because the lines of the furniture are simple, yet the stringing adds high-style sophistication. That combination still works well today.

At one time, applying string inlay looked intimidating to me. Surprisingly, it's one of those techniques that looks more difficult than it really is. There are three main steps: cutting the groove, making the inlay and fitting the string to the groove.

## Cutting the groove

I've always liked fine inlay, single-color strings no wider than 1/16 in. and about 3/32 in. deep. String this thin is very delicate in appearance and adds subtle detail, yet it's strong enough visually that it won't be missed. To inlay thin string, you must cut a very narrow groove in the workpiece. Most of the time, the best way to do this is with simple shop-made hand tools. I've come to distrust the power of a router, which can ruin work in an instant. Just the same, a template-guided router may be the best way of cutting grooves with complex curves. It's certainly the most efficient method, but you have to be prepared for the consequences of a momentary slip, because things happen quickly at 20,000 rpm. Each situation has its own best solution.

***Cutting straight or gently curved grooves***—Most grooves I cut can be made with a modified marking gauge. I removed the pin, used a bandsaw to cut a slot lengthwise on the beam of the marking gauge and inserted a cutter made from an old heavy-duty (about 1/16 in. thick) hacksaw blade (see the top photo on p. 60). The cutter, held in place with a pair of small nuts and bolts, is ground so that a tooth protrudes about 3/32 in., with sides beveled at approximately 5° (see the top drawing on p. 60). The bevel helps the inlay go into the groove more easily. When grinding the tooth, I cool it often to avoid removing the temper, which would be easy with such a small profile. After grinding, I hone the four sides and bottom so that all of the edges are very sharp.

If you don't want to modify a marking gauge, you could pick up an old Stanley No. 66 beader or the reproduction of it now being made by Lie-Nielsen Toolworks (Route 1, Warren, Maine 04864; 800-

Photos these two pages: Scott Phillips

327-2520). Either of these tools will hold a cutter similar to the one I made, and Lie-Nielsen also sells cutter blanks.

It's easiest scraping with the grain, so I do these grooves first. I hold the fence of the tool tightly to the edge of the workpiece while rolling the tooth slightly back and scraping forward with smooth, light passes. The beauty of this scraping tool is that it cuts forward and backward. Once the groove is started, I deepen it, moving in both directions until the beam of the tool is rubbing against the work surface. The slight taper of the tooth helps keep the tool tracking down the groove. I keep the passes light, with the fence firmly pressed to the workpiece, and stop often to clear the tooth of accumulated scrapings. A light waxing of the fence and arm helps keep things running smoothly. It is not a rapid process, but part of what I enjoy most about woodworking is the quiet coordination of hand and eye.

My marking gauge also works well cross-grain as long as the tooth is sharp and the initial cuts are light with the tooth slanted well backward. Still, there is a tendency for the grain to rip a little in all but the hardest woods. It helps to use a sharp marking knife to score along the grain. I use a square or steel ruler as a guide and cut just inside of the lightly started groove. I repeat this when the groove is about half-cut. This decreases the resistance on the tooth, allowing it to cut more smoothly. The slight bevel of the tooth helps make the groove less fuzzy as it's deepened.

It's hard to scrape into the corners, so I use a sharp chisel, a marking knife and a second chisel I ground to fit easily within the groove (see the bottom photos and the drawing at right). Working with these three tools, I can make sharp corners.

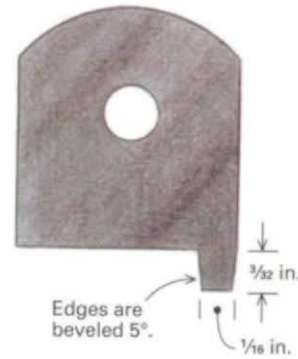
For gentle curves, I use the same modified marking gauge, as long as the fence has enough surface bearing on the workpiece to remain stable. Sometimes, I make bolder curves by attaching a specially curved fence to my marking gauge. Or sometimes, I mount the cutter from my marking gauge in a specially made scratch stock with a fence whose curve matches the workpiece. With a curved fence, however, the tooth can't be tilted backward. This means that the tooth contacts the wood squarely, which calls for even lighter passes initially.

***Cutting grooves for complex curves—*** There are situations where the curves are just too much for the modified marking gauge. To inlay a string line with complex curves, I generally resort to using a pattern

## TOOLS FOR CUTTING STRAIGHT GROOVES

### Scratch tool cutter

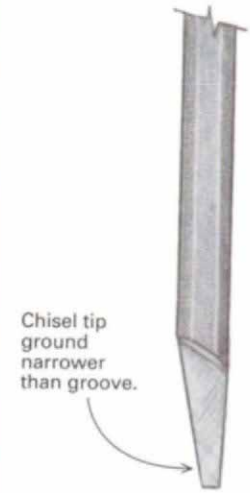
Cutter is ground to a slight bevel (about 5° on each side) to make it easier to fit the inlay to the groove.




***A scratch tool for cutting grooves parallel to an edge.*** *The author made his from an old marking gauge and a piece of hacksaw blade.*

***Make grooves with light cuts.*** *To use the tool, the author cants the tooth backward so that it scrapes lightly over the surface. With each pass, the tooth can be tilted more toward the perpendicular.*

### Squaring up the ends of a groove




***Custom chisel****—Any good piece of tool steel can be made into a chisel for cleaning up the end of a groove.*

***Square end of groove*** *with the custom chisel. A marking knife and standard bench chisel are also used.*

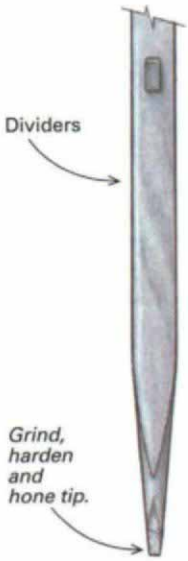


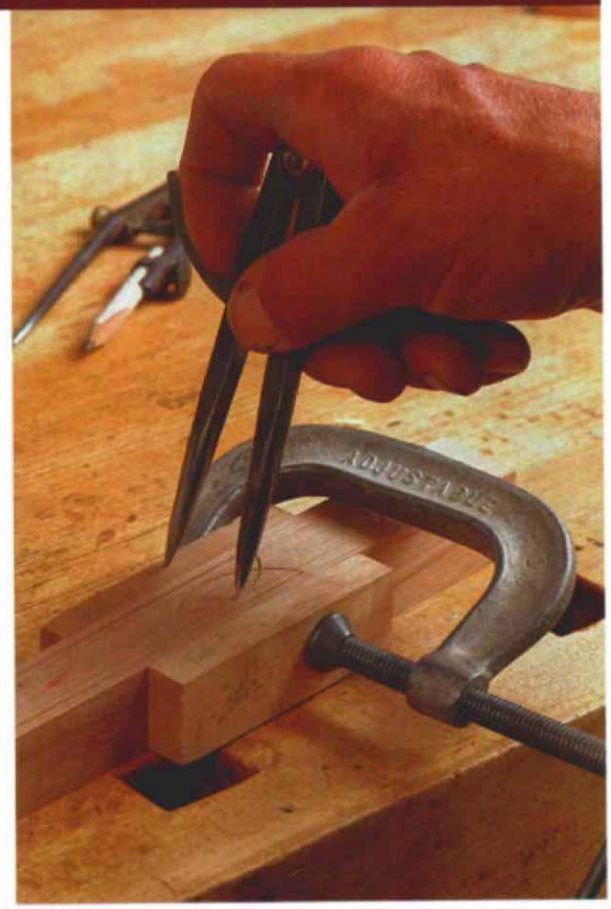
Photos except where noted: Vincent Laurence

## TOOLS FOR CUTTING CURVED GROOVES

### Cutting gentle curves

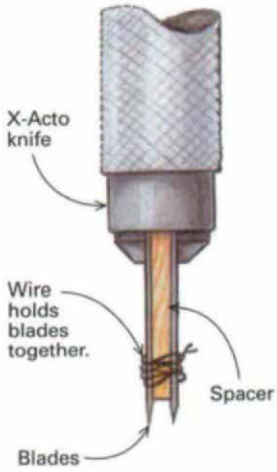
***To cut an arc, use a set of dividers.*** *File one tip of the dividers to a slightly beveled square profile, and then harden and hone it.*



### Cutting tight curves

***Cutting a groove that doesn't follow an edge—*** *An X-Acto hobby knife with two blades separated by a spacer outlines the groove around a plywood template. The author cleans out the waste with his custom chisel.*




and a specially made two-blade knife. This method also is useful anytime my design calls for a string line of some shape not parallel to an outside edge, such as outlining an oval reserve on a table apron (see the bottom photo and drawing).

I make a pattern of thin hardwood or plywood to follow either the inside or outside edge of the intended string, whichever is easier. The knife is simply a pair of honed X-Acto blades, a thin spacer between them, mounted in a handle.

Lightly, at first, I score all around the pattern and then lift out the chips with my fine chisel. This process usually needs to be repeated a few times to get a sufficiently deep groove. For the final few passes, I hold the cutter from my marking gauge with my fingers and scrape carefully to get a groove of consistent depth and width.

***Grooving with a router***—Though I have done so a number of times, I don't like using a router to cut inlay grooves. Other woodworkers may not share my aversion. Outfitted with a template guide, the router's strength is its ability to follow a template of whatever shape. I've found it easier to follow an inside curve than an outside curve, so when I do use a router, I usually make a template with a cutout, remembering to account for the diameter of the template guide when sizing it. Router bits generally aren't available any smaller than 1/8 in.

In these wider grooves, I usually inlay multicolored lines glued up from veneer. I have ground a high-speed-steel router bit down to a little less than 1/16 in., for a single band of string. I rough out the groove with this bit and then clean it up with the cutter from my modified marking gauge.

***Grooving an arc of a circle***—To cut a groove that's an arc of a circle, I modified a pair of dividers, shaping the end of one leg to the same profile as the cutter from my modified marking gauge. The tooth scrapes a groove as the dividers are swung through an arc (see the top photo and drawing on this page).

Because the steel used for the dividers was soft, I hardened the tooth so it would stay sharp. I heated the tip to red hot with a propane torch and quenched it in water. I cleaned the tip with some fine sandpaper so the steel was shiny again; then I tempered the tip by reheating it until it was a light-straw yellow. I let it cool slowly and honed all edges of the tip.

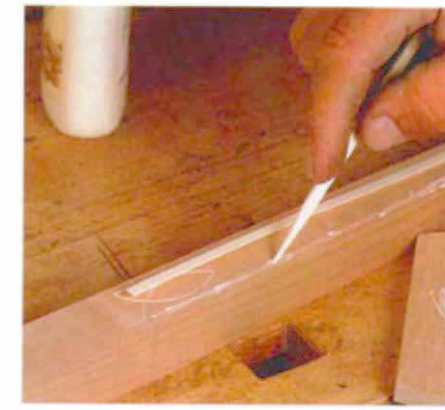
I use the tool as I do the modified marking gauge, taking light passes at first to define the curve and reduce tearout in the

Drawings: Heather Lambert

## CUTTING AND GLUING IN THE STRING

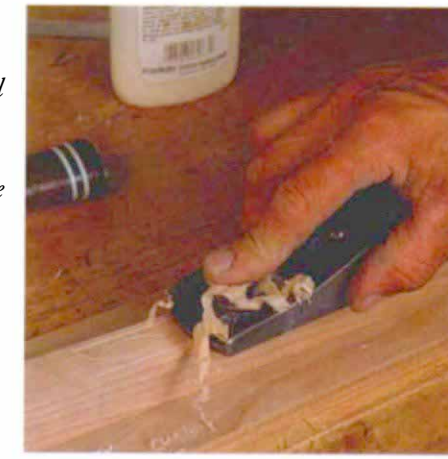
***Rip strips of inlay on the tablesaw.*** *Because the inlay stock is so thin, take it off on the waste side of the blade (above). Slice strips to 1/4 in. or so with a knife and straightedge. Plane to width with a block plane (right), beveling slightly to match the groove. Check the fit frequently.*

***Don't be fussy with the glue.*** *Once the glue starts flowing, you have to move quickly because the moisture in the glue will swell the walls of the groove.*



***A burnisher seats the strip of inlay securely.*** *Tap the strip of inlay into the groove with a hammer and a block of wood. After removing most of the excess with a plane, make several passes with a burnisher. Apply more pressure with each pass until the inlay is seated.*

***Plane inlay flush and leg smooth*** *after the glue has set up. Don't sand it, though, because that can muddy the crisp colors of the inlay. The leg is now ready for assembly.*



cross-grain areas. Slanting the tooth back from the cut also helps, as does outlining the cut with a knife. The pivot point needs to be well-anchored. I sometimes can place the pointed leg in an area that will be inlaid later. If not, I glue down a small scrap of hardwood and chisel it off later or clamp a block to the piece I'm grooving.

### Inlay materials

I use string inlay to outline or highlight, so I prefer to use a wood that contrasts with the primary wood. Black or white lines or some combination of the two work well because these colors hold better. Traditionally, holly has been used for white string because it stays the whitest and has almost no figure. I suspect white birch also has been used, but I prefer aspen, which stays nearly as white as holly and is so plentiful here in Vermont.

Ebony is another favorite of mine. I use it alone for black lines and in combination with aspen to make thicker stringing of alternating colors. Almost any wood that can be worked in thin dimensions can be inlaid, as can metals like brass and pewter.

When making string from solid stock, I rip it from a dressed board on the tablesaw to a dimension slightly wider than the groove it will fit. I find it safer and more accurate to pass the board against the fence, using the strips from the offcut side for the inlay (see the top left photo above). This means the fence needs to be reset every pass. Rather than turning off the saw, waiting for the blade to coast to a stop and then measuring to get an offcut of precise thickness, I gauge it by eye. Small varia-

tions in thickness are unimportant because each piece is planed to fit its groove.

### Fitting string to groove

I start with a piece of inlay that will protrude from the groove by as much as 1/8 in. A piece this wide is easier to hold while it's being planed to thickness and beveled. I mark one edge and designate it the top, so 1 can keep track as I'm planing and, later, when I'm gluing. The bevel, which should roughly match the groove, helps the inlay get started. And if I plane the inlay too thin, I can plane the bottom edge a bit so that the inlay will set deeper in the groove and snug up at the top. This is another good reason for leaving it wide when you start planing it.

Getting a good fit is simply a matter of trial and error. The inlay should fit snugly into the groove over its whole length. I miter the corners where inlays meet at an angle, using a chisel and splitting the angle by eye. When the strips have been beveled and planed to thickness, I rip them to about 3/16 in. with a knife and straightedge. That leaves no more than 3/32 in. of inlay above the surface of the workpiece. I also undercut the ends slightly and leave the inlay just a whisper long, so the ends will compress together when the inlay is tapped home.

As thin and flexible as inlay is, it sometimes won't make the bend when set into tightly radiused grooves without being soaked in water for a few minutes and bent around a form. I try to plan ahead when I have tight radii to inlay, so I can let the pieces dry overnight on the form before working with them.

Gluing in the string requires quick and careful work because the moisture in the glue swells the parts. I try to put a fine bead of glue in the groove using a whittled piece of scrap thinner than the groove (see the top right photo on the facing page). It's not always a neat process, though. I quickly position the string and, working from one end to the other, lightly tap it in using a hammer and a block of scrap to protect the inlay strip.

With my block plane set for a moderate cut, I plane off most of the excess and then set the inlay with an oval burnisher (see the center right photo on the facing page). This snugs the inlay in place and works out any extra glue at the corners. When the glue has set, I level the whole surface with a sharp plane (see the bottom right photo on the facing page). □

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# *String inlay deserves a good ending*

***Cuff inlay,** which is a band encircling a leg near the floor, is the traditional termination for string inlay.*

A good way (and the traditional way) to terminate string inlay is to run it into a cuff inlay, which is a narrow band running around a leg just a few inches off the floor (see the photo at right). A cuff inlay defines the transition point between the primary taper of a leg and a secondary taper for the foot.

I vary the cuffs width, depending on the piece I'm making, but I always make the groove for it between 3/32 in. and 1/8 in. deep. This makes the cuff less vulnerable if it's kicked or bumped. I use a router and an adjustable fixture to create the groove (see the photo below).

**The fixture compensates for taper:** Because the leg is tapered, the trick in making the fixture is figuring out the angle that will create a continuous groove, with edges that line up perfectly all the way around. I do this by trial and error with a bevel gauge and pencil. Once I'm able to make a continuous pencil line around the leg, I use that bevel-gauge setting to position the front fence of the fixture and the plywood that will guide the router. I glue and tack these together.

After the glue has set up, I position the half-completed fixture so that the bottom edge of the plywood is properly situated to guide the router for the cuff groove (don't forget about the template guide). Then I clamp the fixture and another piece of scrap (the back fence) around the leg. I center a single screw through the plywood into the back fence and countersink the head. The fixture is ready to go.

**Start the groove at the inside corner:** I position the inside corner of the leg against the top edge of the front fence so that if the groove doesn't meet itself perfectly, the flaw will be less noticeable. Whenever possible, I use a template guide and bit that will cut the desired groove width in one pass. Occasionally, though, I have cut wider grooves in two passes by tacking a shim between the edge of the plywood and the template bushing for the first pass. Then I remove the shim and make a second pass, with the template guide directly against the plywood.

I adjust the depth of cut in the front fence so the first complete pass is perfect. This groove helps me align the leg for subsequent passes. After each pass, I unclamp the leg and turn it toward me, lining up the routed groove in the leg with the one in the fixture. I'm careful to keep the orientation of the router the same on each pass, because router bases aren't always perfectly round.

**Making, cutting and inlaying the cuff:** I make my own inlay bands, laminating them from veneers or solid stock depending on the design. I start by gluing up a blank that will be ripped into strips of banding a little wider and thicker than the groove is wide and deep. (For more on inlay bandings, see *FWW*#103, pp. 67-69.)

I cut the strips to length with a dovetail saw and miter them using a 45° shooting board and a wide chisel. Then I adjust the width of the banding with a block plane, creating a slight bevel on the edges. This helps when setting the banding into the groove. I clamp each face, one at a time, using a small hardwood block as a caul. When the glue has set, I level all of the inlay with a sharp plane. If there's a secondary taper for the foot, I cut and plane it now. —*G.H.*

***A jig for cuff inlay**—A scrap of plywood glued and nailed to a fence guides the router when cutting the wide groove for cuff inlay. Extra pieces on either side of the leg help locate the cuts and steady the router.*