

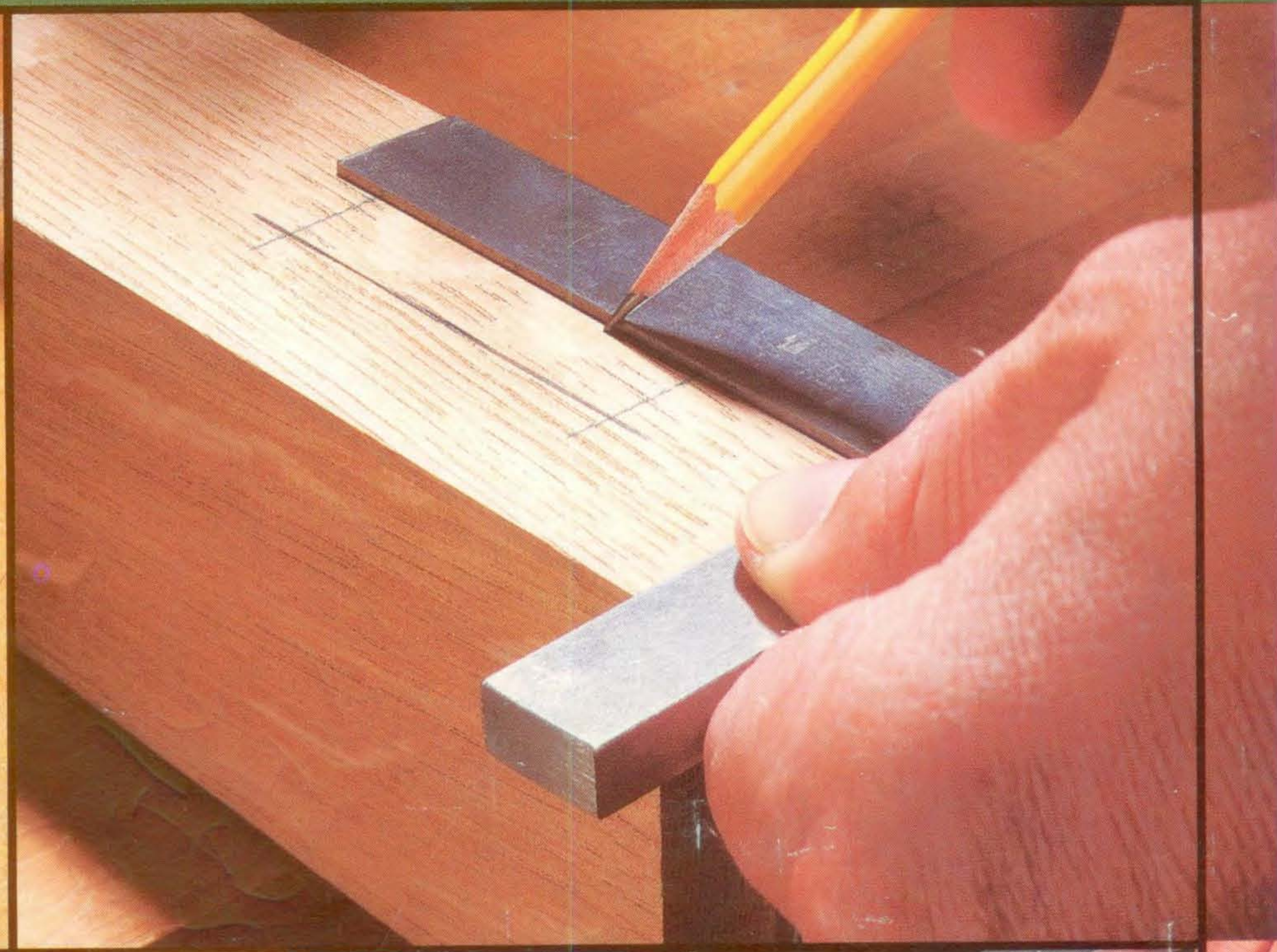
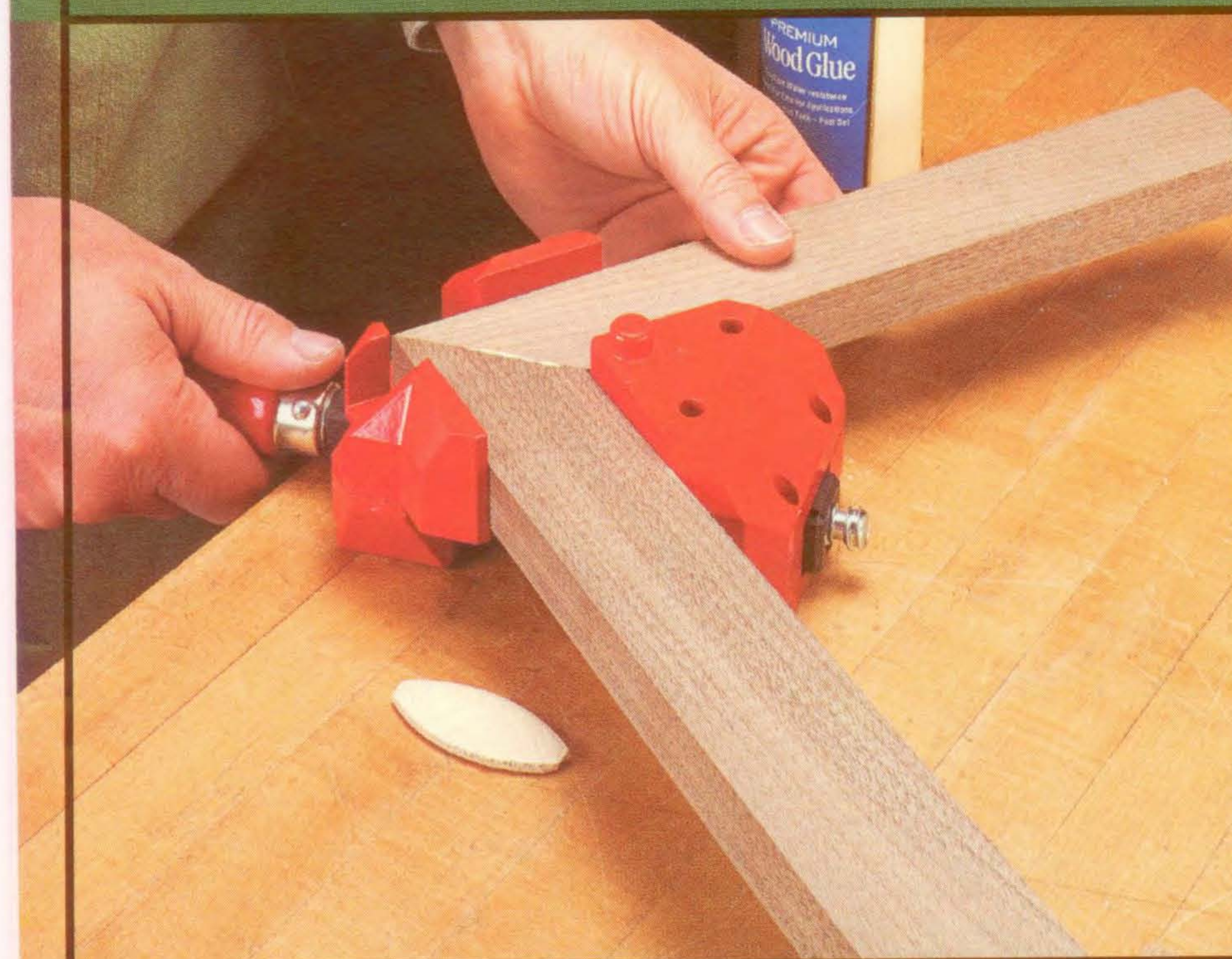
WORKBENCH

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FREE GIFT!

*Our Way of Saying
Thanks!*

120+ Tips & Techniques



120+ Tips & Techniques

Letter from the Editor

Every once in a while I'll pull up a stool and start thumbing through a few of the back issues that I have stacked up in my shop. Most of the time, I flip to the front of the magazine — where the tips and techniques are located. It's my favorite section and judging from the surveys that we take to find out what you like most about our magazine — it's your favorite as well.

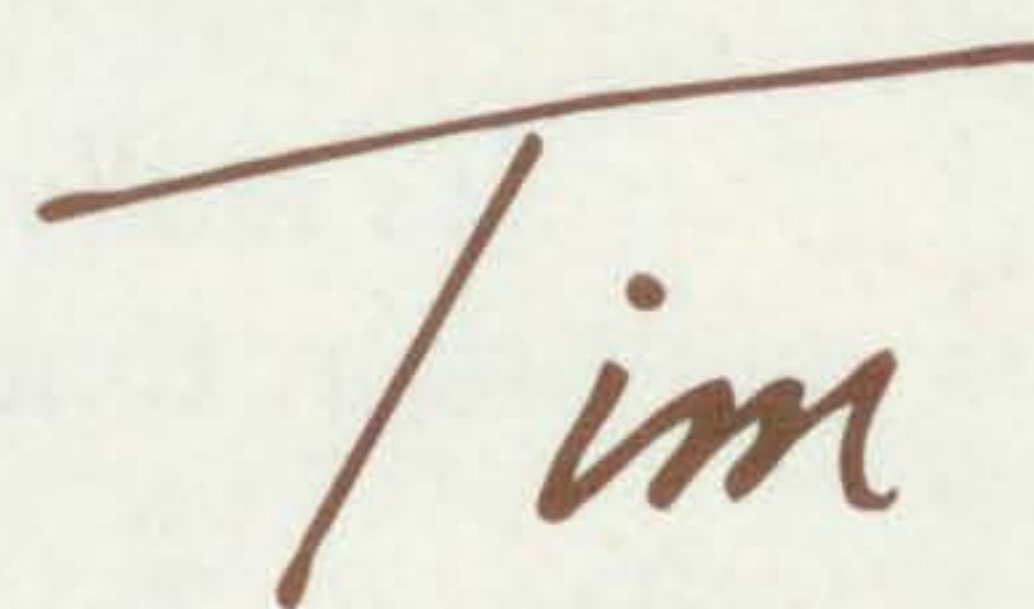
We spend hours in our shop trying to figure out the best way to do seemingly simple things (such as how to get a tight-fitting tenon or produce an invisible plywood edge), with the goal of passing this valuable information on to you. Then hopefully, you'll pass it on to another woodworker. And they'll pass it on to another. And so on.

Now a lot of these ideas for tips have been submitted to us by you, our readers. Others were generated by an editor, project designer, shop craftsman, or another member of our staff. But, regardless of where they came from, I'm always amazed at how much good information is available in each and every issue.

So what is it that we all find so fascinating about tips? Obviously, we want to stay informed. And it's nice that they're fun to read. But mostly, I think woodworkers really appreciate it when they find a practical, common sense solution to a problem.

The fact is, you could probably look through the tips and techniques you'll find inside and put at least one or two of them to work right away on your next project. And I think that's the most important benefit of this magazine — all this great information makes each of us a little better at our craft.

We've gathered over 120 of our favorite tips and techniques here just for you. I hope you enjoy reading them as much as we enjoyed putting them together.



Tim Robertson
Editor, *Workbench*

SHOP SAFETY IS YOUR RESPONSIBILITY

Using hand or power tools improperly can result in serious injury or death. Do not operate any tool until you read the manual and understand how to operate the tool safely. Always use all appropriate safety equipment as well as the guards that come with your tools and equipment and read the manuals that accompany them. In some of the illustrations in this book, the guards and safety equipment have been removed only to provide a better view of the operation. Do not attempt any procedure without using all appropriate safety equipment or without ensuring that all guards are in place. August Home Publishing Company assumes no responsibility for any injury, damage or loss suffered as a result of your use of the material, plans or illustrations contained in this book.

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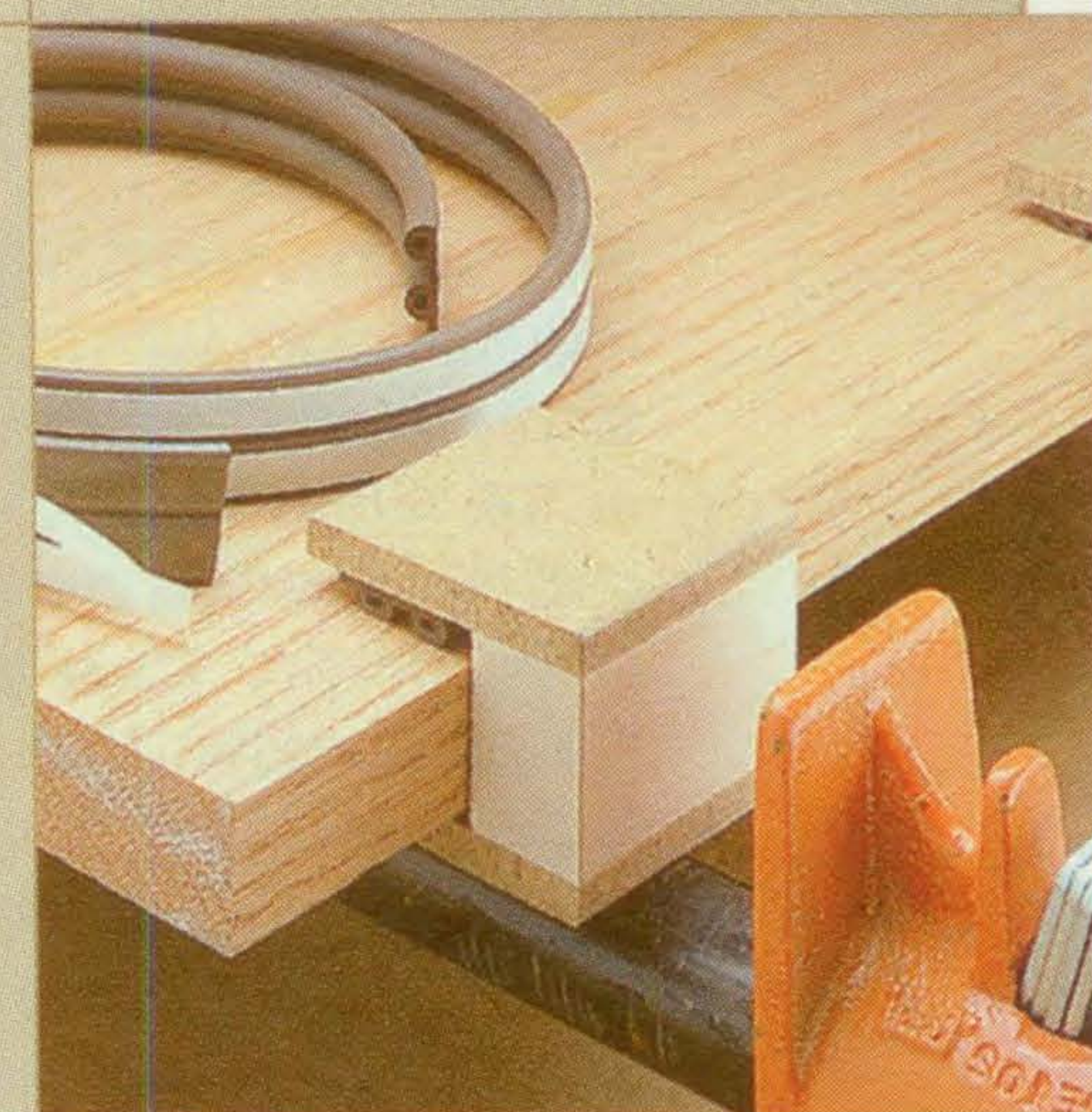
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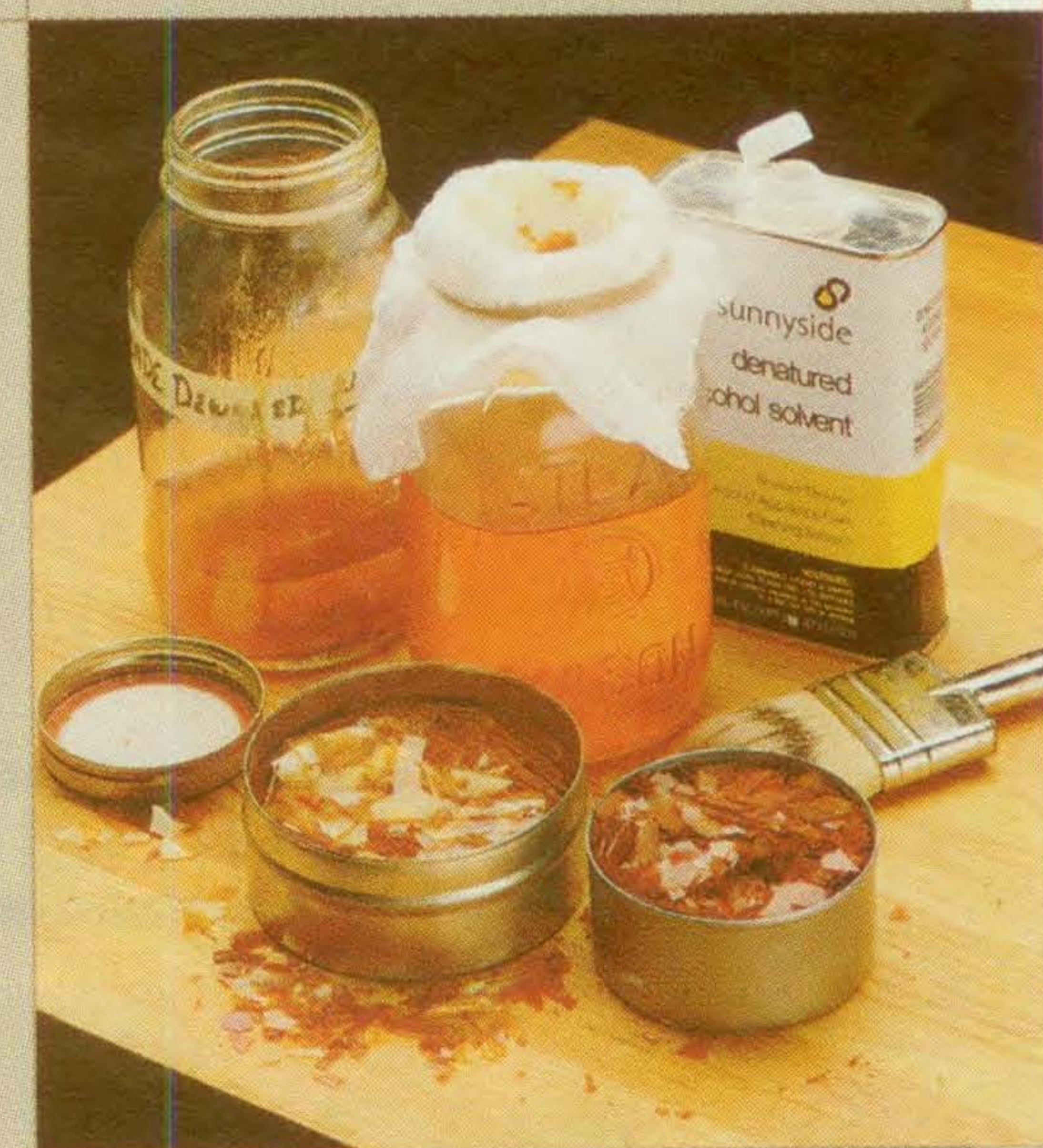
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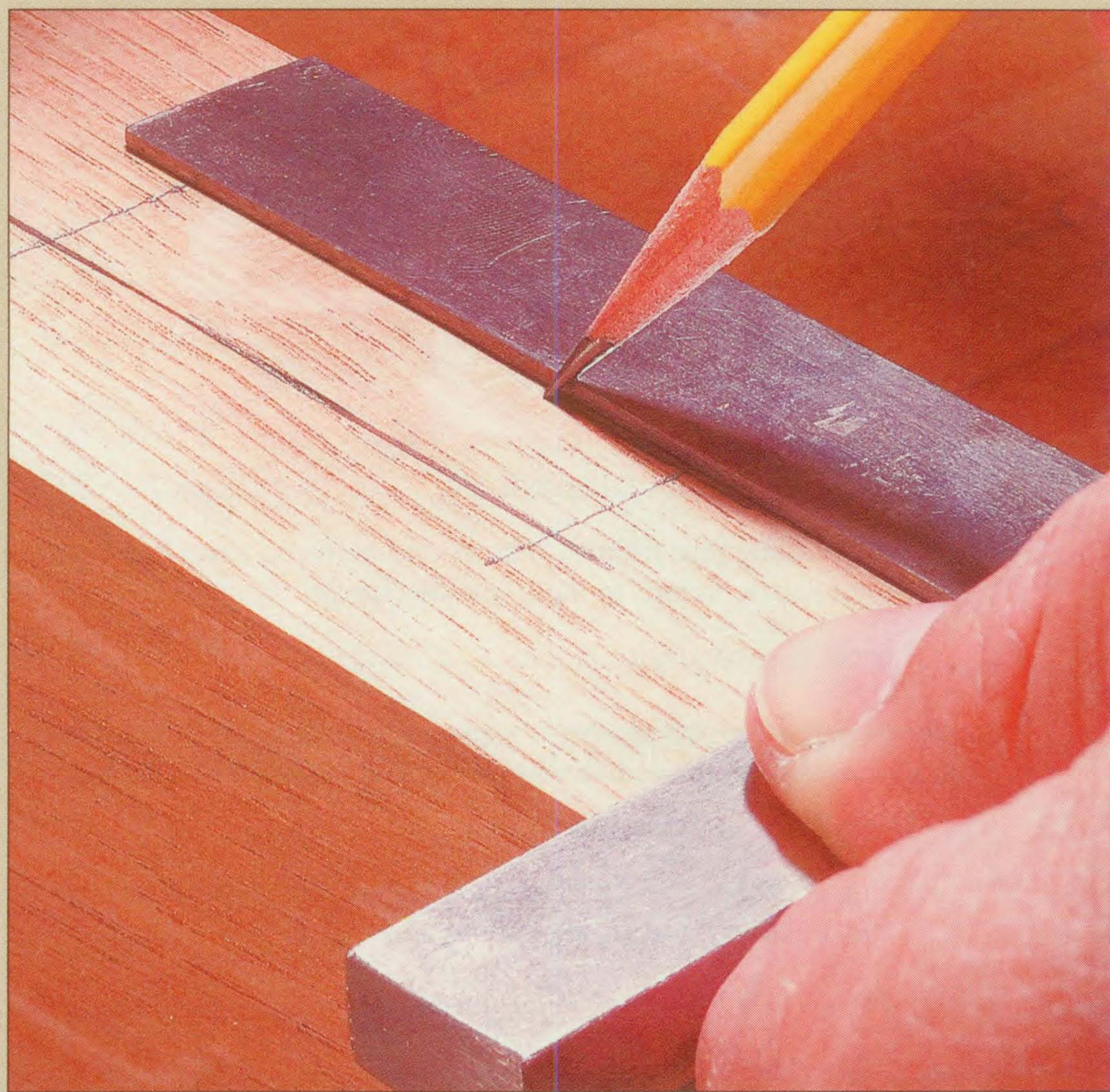
Your #1 layout tool

Pencils

You might not think of a pencil as a “shop tool.” But whether it’s tucked behind an ear or slipped into a pocket, I always have a pencil at the ready anytime I’m working in the shop. In fact, a pencil is the one tool I use on every project. And since they’re such a shop staple, it’s my opinion that pencils really deserve a closer look.

Quality – A standard wood pencil is such a common household item that few of us probably give it much thought. But like any other tool we use on a daily basis, there are big differences in quality among pencils. If you’ve ever used a cheap pencil you know what I’m talking about. In fact, you may be surprised to know that the “wood” is actually compressed sawdust and the pencil lead is hard and gritty.

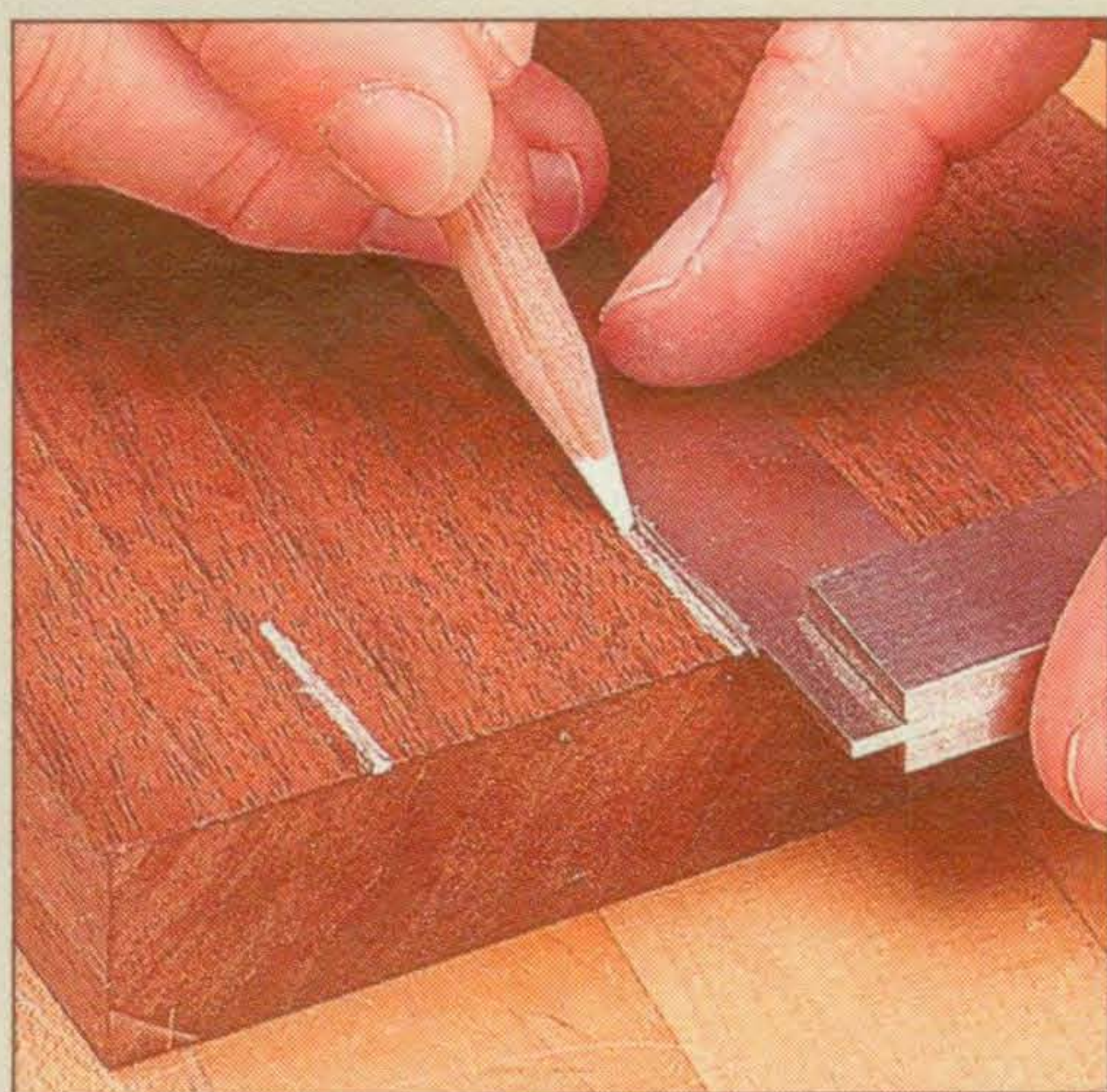
By contrast, better pencils are still made from incense cedar (which produces the pleasant, distinctive aroma when the pencil is sharpened). And the pencil lead (actually graphite — there is no lead in pencils) is carefully manufactured and graded. General, Dixon Ticonderoga, and Musgrave are a few of the U. S. manufacturers still making quality pencils.



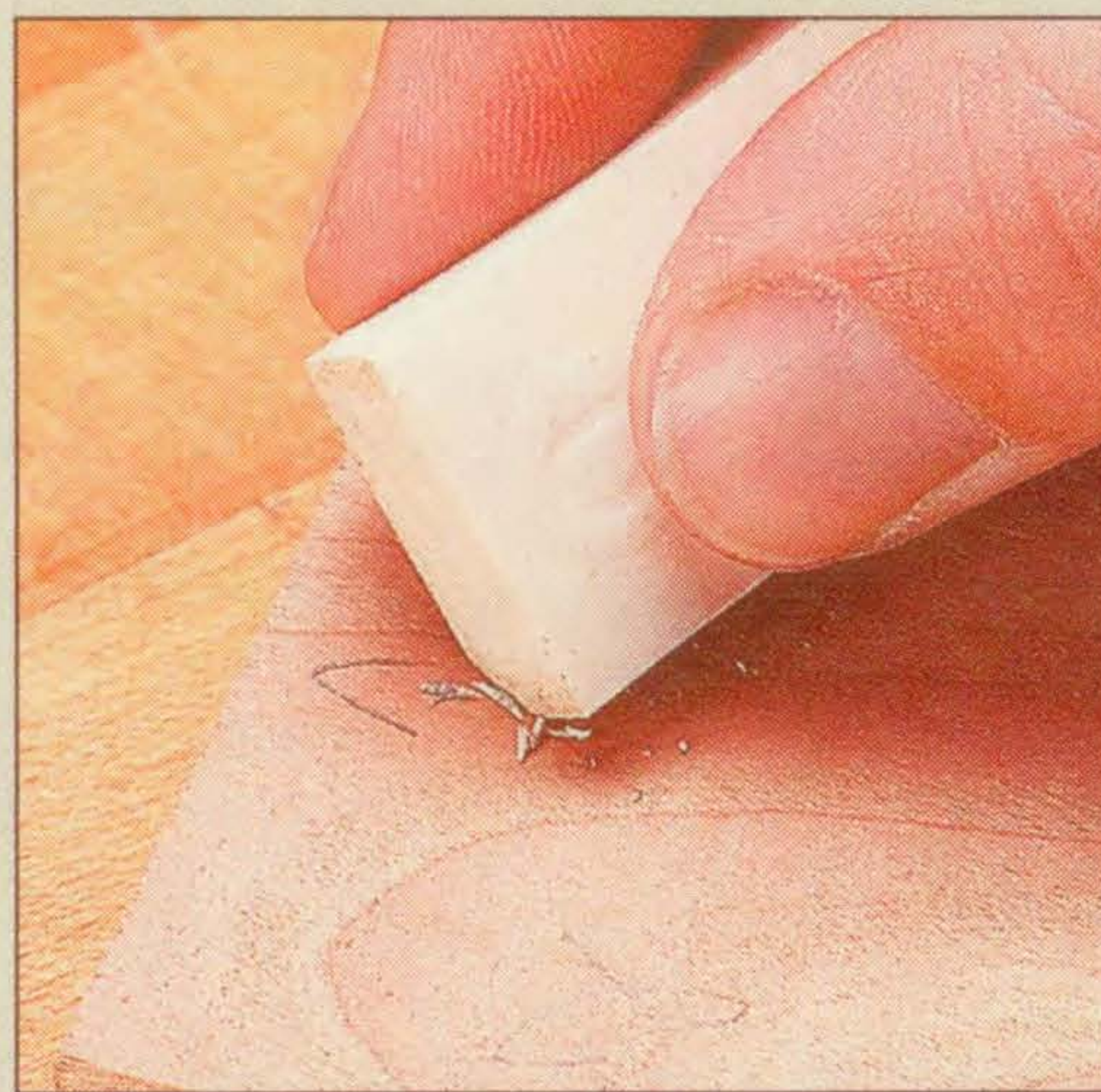
Pencil Grades – Selecting a pencil also involves making a decision on the hardness of the pencil lead. Everyday writing pencils are usually graded on a four-point grading system, with No. 1 being the softest and No. 4 being the hardest.

(No. 2 is the most common.) But pencils that are sold for drafting are available in up to twenty different grades, ranging from a 9H (hardest) to a 9B (softest). You can find drafting pencils at most art supply and craft stores.

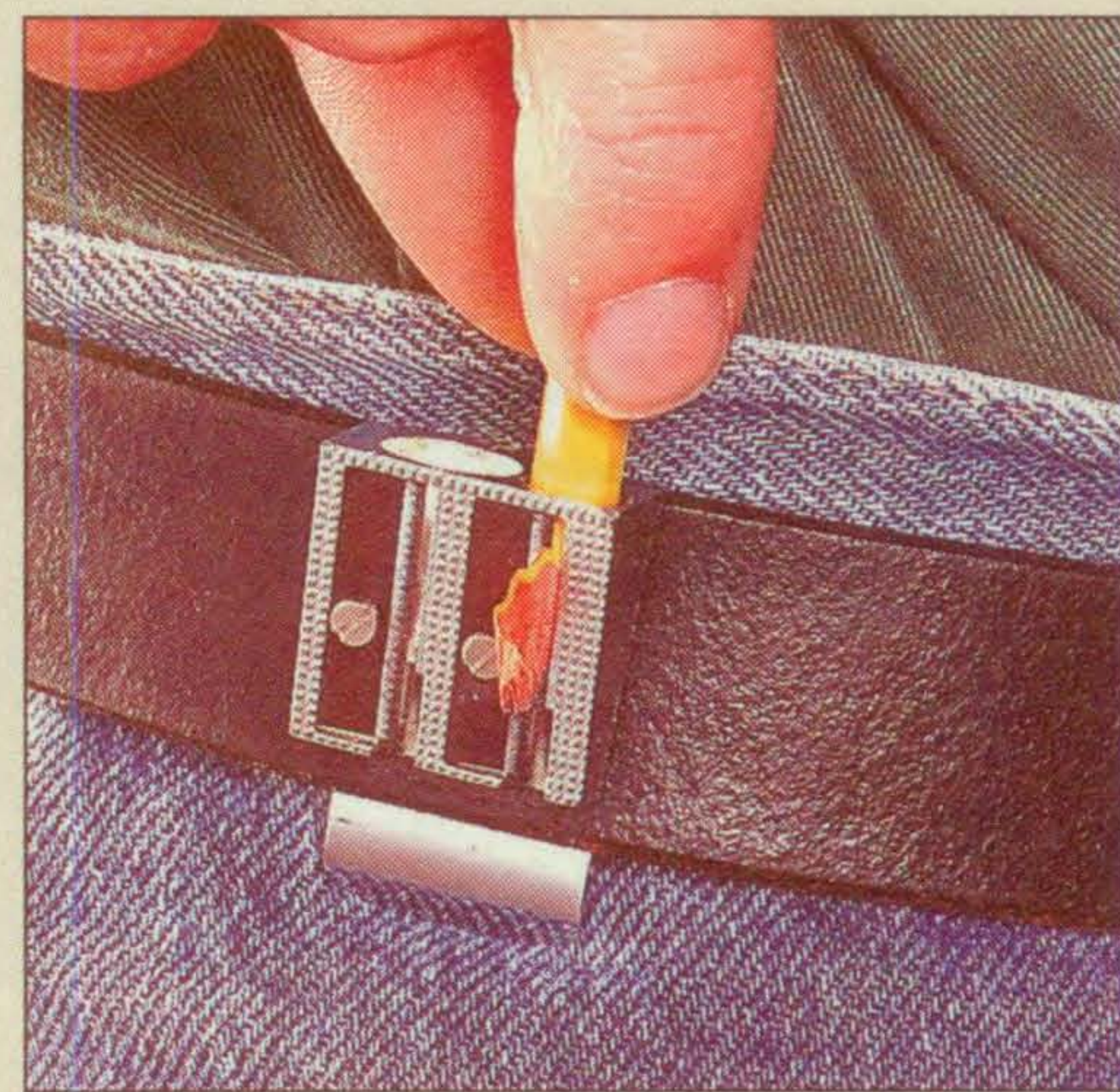
Shop Tips: The Write Stuff



▲ **White Pencil.** I use a white, colored pencil for marking dark woods (like walnut) where an ordinary pencil line won't show up.



▲ **Eraser.** Just as important as a pencil is a good-quality drafting eraser. I keep one in my shop apron for erasing layout lines.



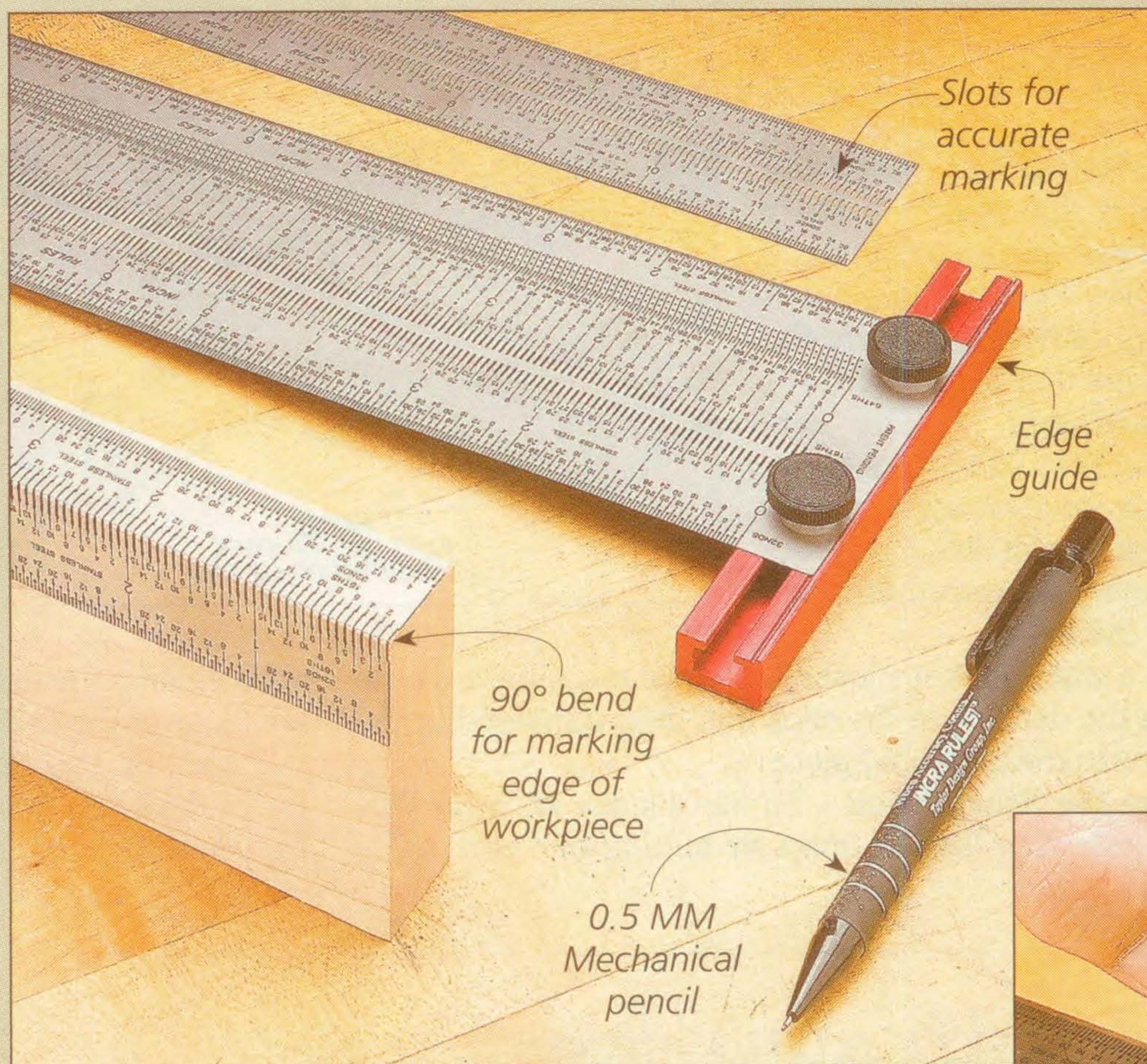
▲ **Clip-On Sharpener.** This pencil sharpener clips onto your belt so it's always within reach, allowing you to keep your pencil sharp.

In the drafting pencil grading system, the letter H stands for hard and the letter B stands for black. The numbers indicate the relative hardness or blackness of the graphite. So a 7H is harder than a 2H and a 9B is softer (and blacker) than a 3B. In the middle of the scale are two intermediate grades — HB (hard and black) and F (fine or firm) — that roughly correspond to a No. 2 and a No. 1½ pencil.

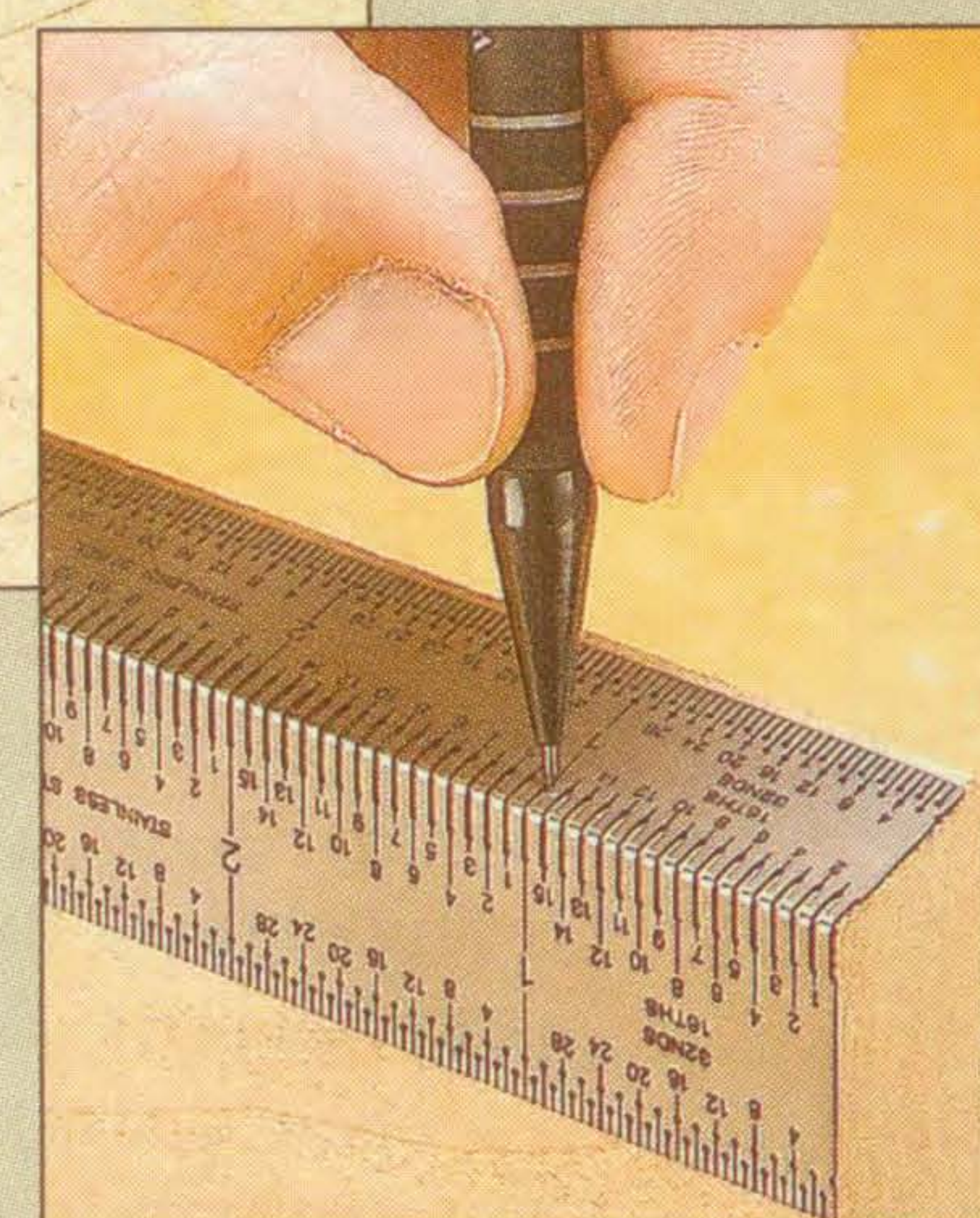
Most of the time, I stick with an HB or even a 2B. The leads of these pencils leave a dark line without having to bear down on the pencil. But I also like to keep a pencil with a harder lead (like a 2H) around in the shop. The harder lead doesn't wear down as fast and leaves a lighter mark I can erase easily.

Mechanical Advantage – Of course, wood pencils aren't the only choice you have. I know several woodworkers who prefer to use mechanical pencils. These pencils typically have a very thin lead. (A common lead diameter is 0.5 mm.) This gives mechanical pencils the advantage of being able to draw a consistent-width line, even as the lead wears away. This makes them a great choice for precise layout work. In fact, there are even some special layout tools for use with mechanical pencils (see photos above and at right).

Another advantage of mechanical pencils is that they don't need sharpening. You simply advance the lead as it wears down. Inexpensive



◀ These stainless steel rules have rows of precisely positioned slots and holes that are sized for the lead of an 0.5 mm mechanical pencil.



▲ Used with a mechanical pencil, the slots in this rule make precise layout automatic.

replacement leads are available once the original lead is used up. And like standard pencils, you can buy replacement leads in several different grades.

Carpenter's Pencil – There's one other type of pencil that I still keep around in the shop and that's a traditional, carpenter's pencil. Although I don't use it much for layout work, it's a good choice for less exacting tasks, like marking lumber for framing projects.

Carpenter's pencils have a wide, rectangular-shaped lead. So they

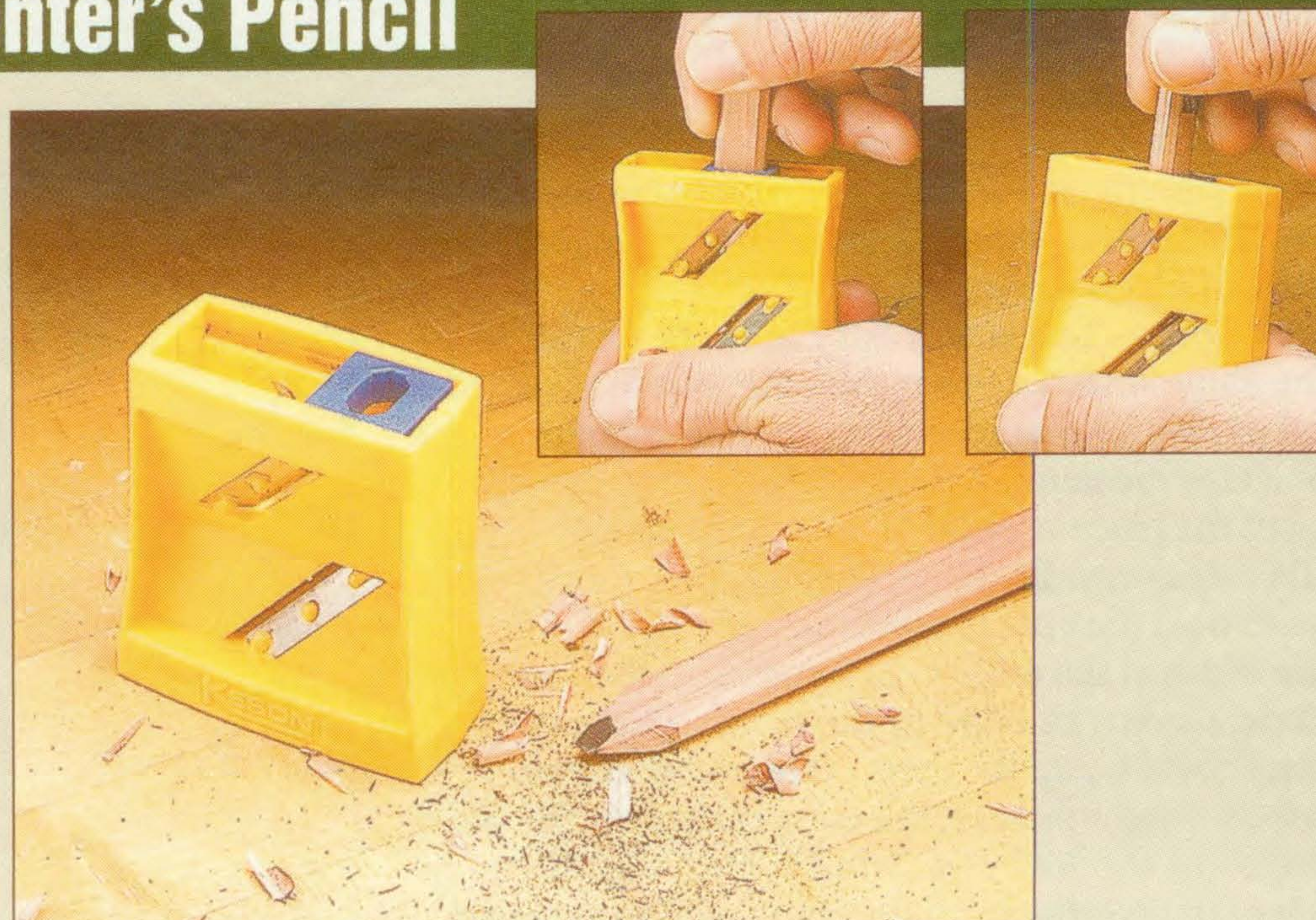
make a heavy line that's easy to see. But if you sharpen the pencil to a chisel-like point (see box below), you can also use it to draw a fine line. And like other pencils, you can buy carpenter's pencils with soft, medium, or hard lead.

Finally, for some tips on a few other pencils and pencil accessories that I like to use, see the box on the opposite page.

To the Point: Carpenter's Pencil

A properly sharpened carpenter's pencil should have a chisel-like tip on the end (see main photo at right). In the past, a utility knife was the only way to do this. But there are now sharpeners that make sharpening a carpenter's pencil a breeze.

Opposing Blades. These special sharpeners have two pairs of opposing blades. First, you insert the pencil in one end of the sharpener and move it back and forth over the blades to sharpen the faces of the pencil. Then you simply turn the sharpener over and insert the pencil in the other end to sharpen the sides (see inset photos).



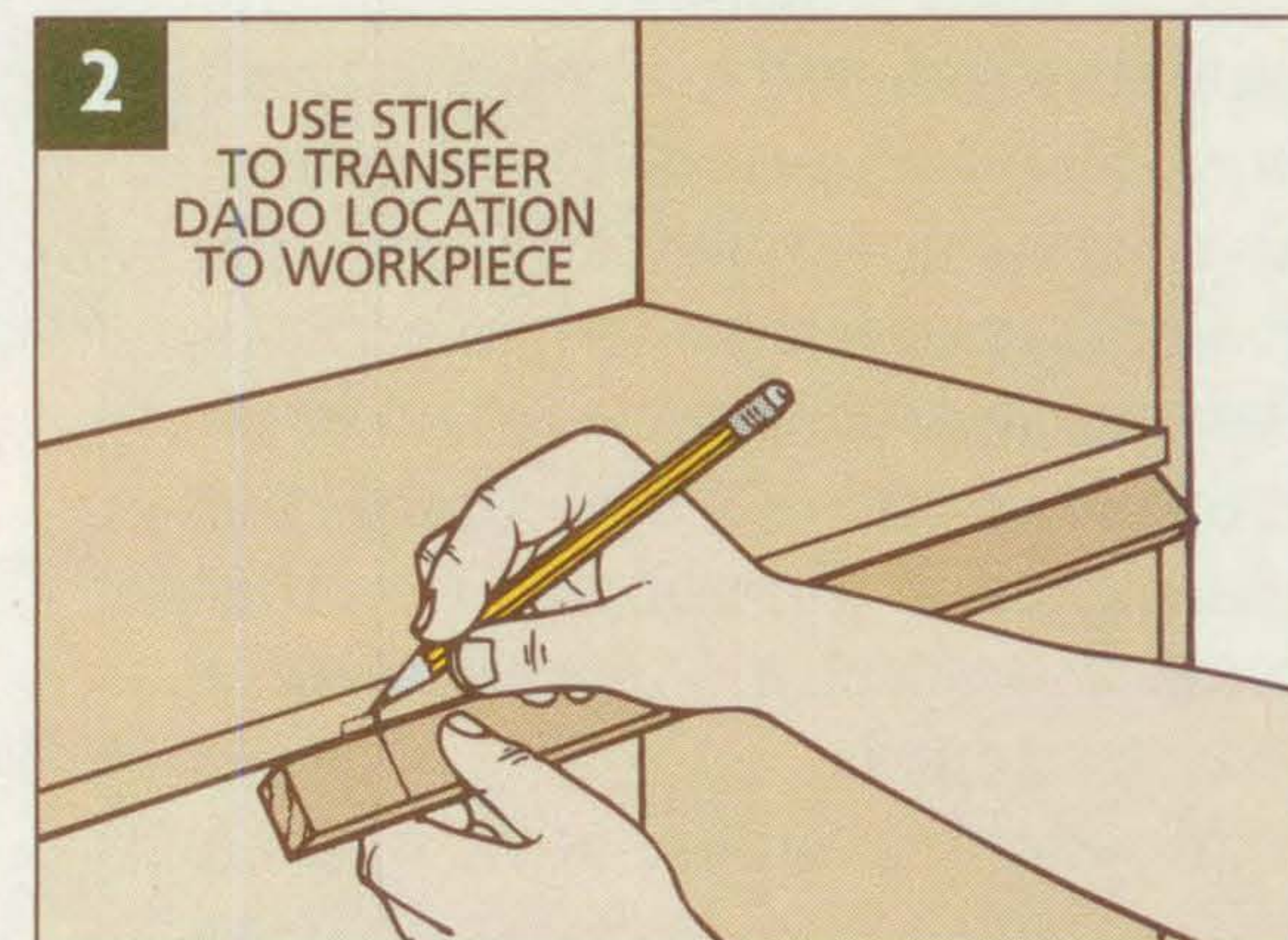
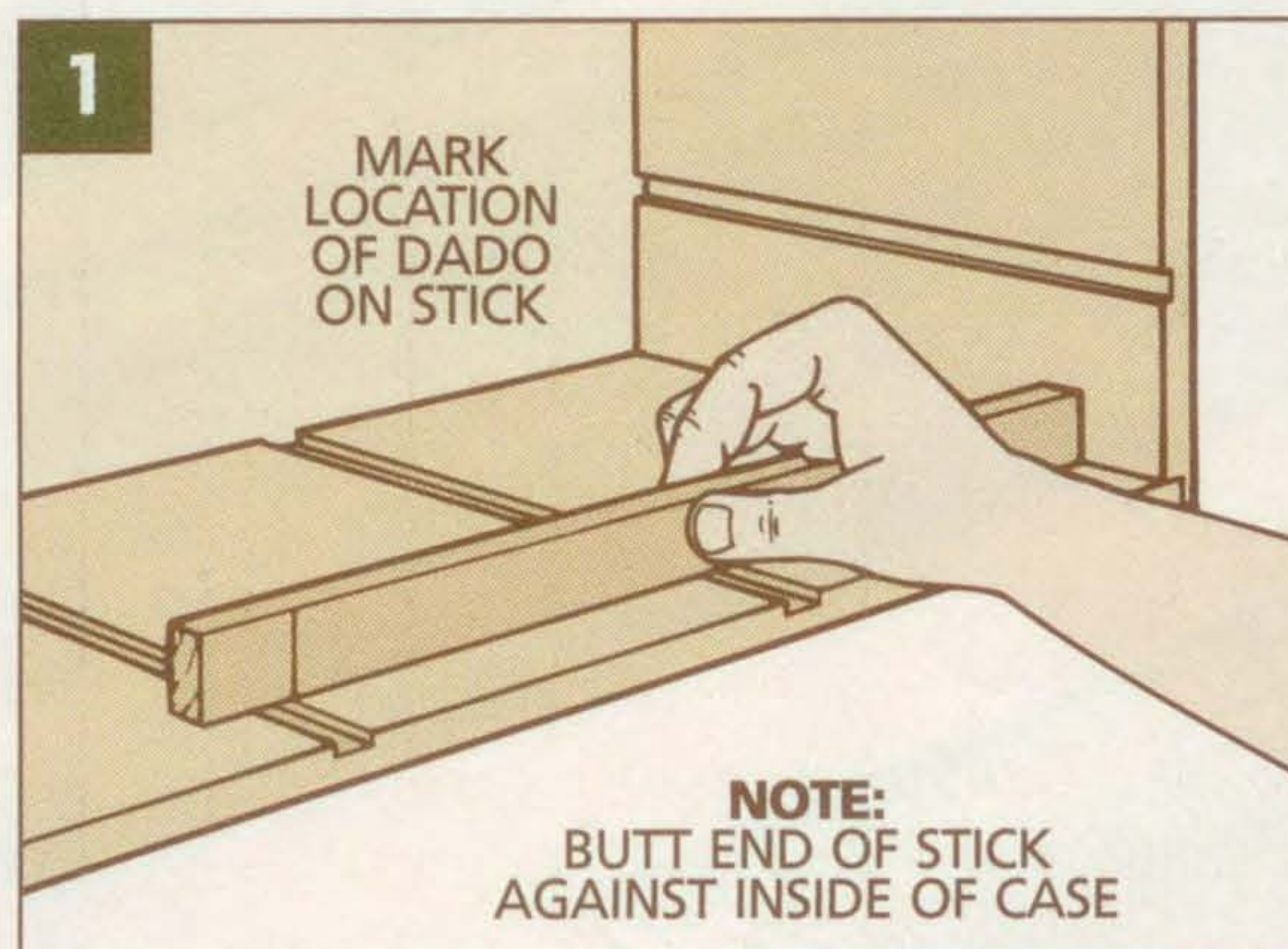
Secrets of the Story Stick

When laying out matching dados, I like to use a story stick. It's simply a piece of scrap that I use like a ruler, but it only has marks on it where the dados need to be cut.

Advantages – The real advantage of a story stick is you don't have to measure anything. (It's easy to make a mistake when using measurements and adding them up.)

With a story stick it's just a matter of marking the locations of the dados on the stick and then transferring the locations to the matching piece.

Using the Story Stick – To use a story stick for jobs like transferring dados, start by butting one end of the



stick against the inside of the case and marking the exact locations of the dados (Fig. 1).

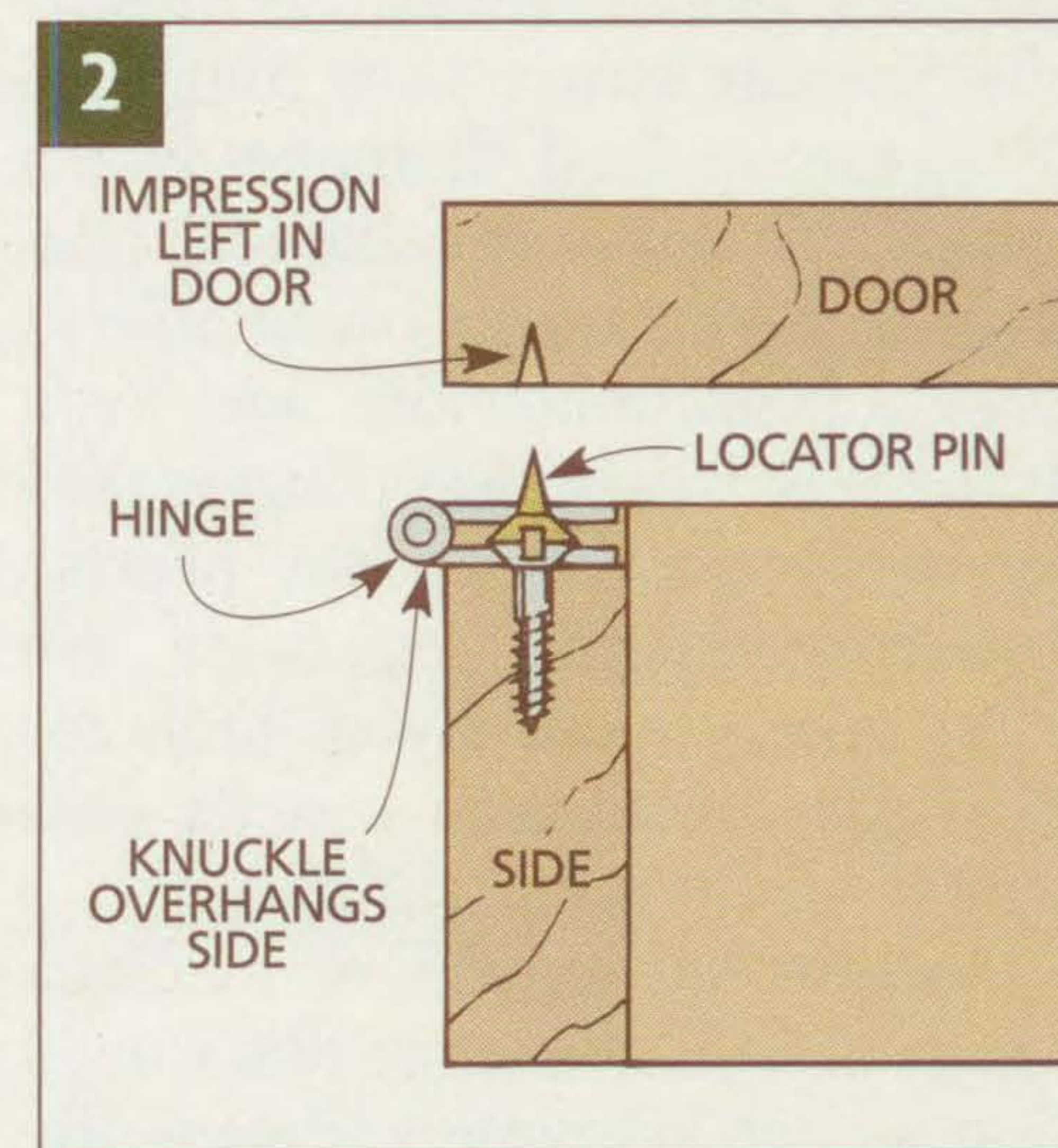
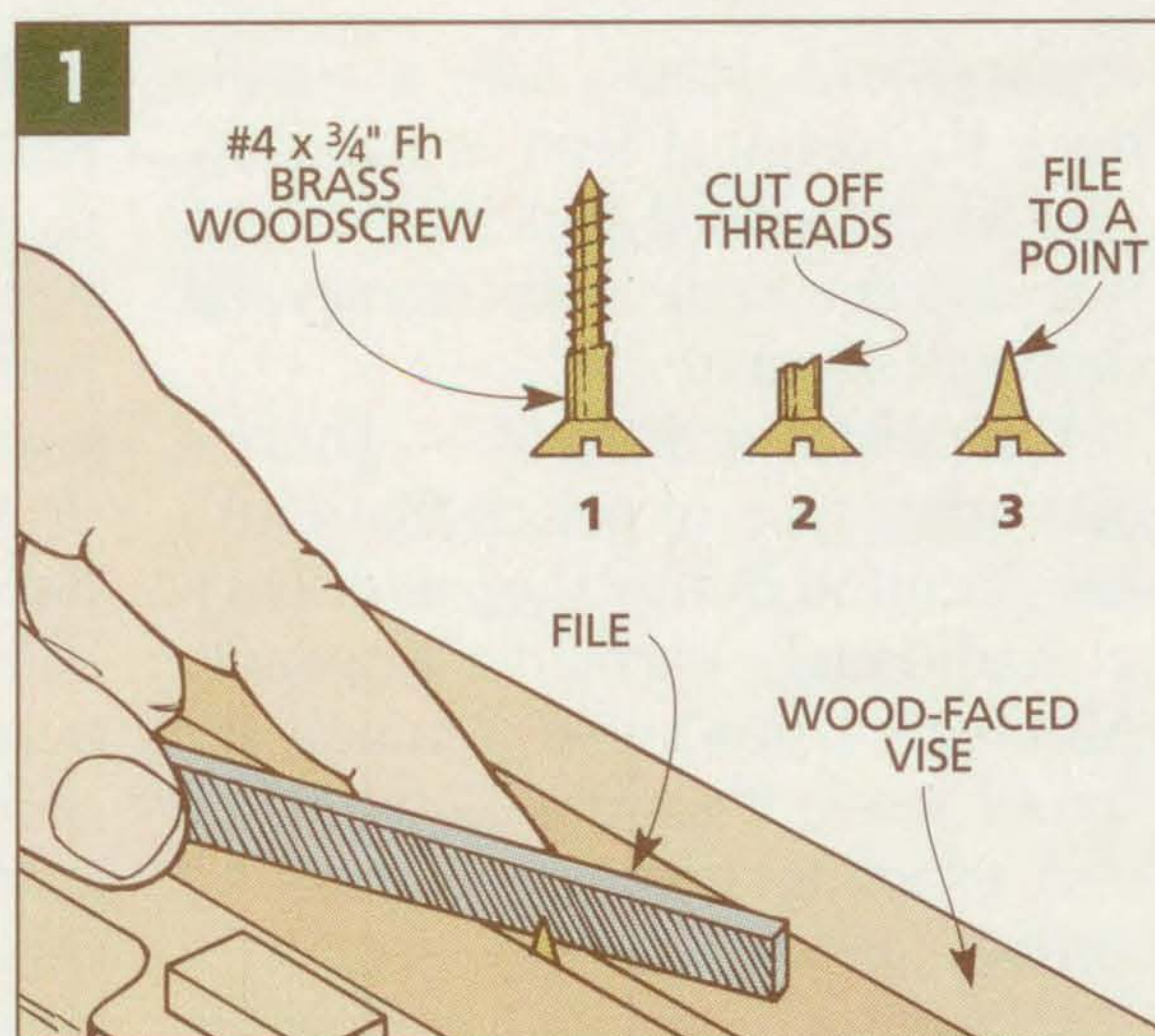
Then with the same end of the stick against the case, move the stick to where the dados need to be cut and transfer the marks (Fig. 2).

"Tip" for Locating Hinge Screws

It's easy mounting hinges for overlay doors to a cabinet. But trying to mark the matching screw locations in the door is a challenge.

I used a couple of shop-made pins to help with this. To make the pins, file two brass screws to a point (Fig. 1). (Brass screws file down easily.) Then trap a pin in each of the top and bottom hinges for one door (Fig. 2).

Position the door and press it against the pins to mark the screw locations (Fig. 2).



A Handy Layout Tool

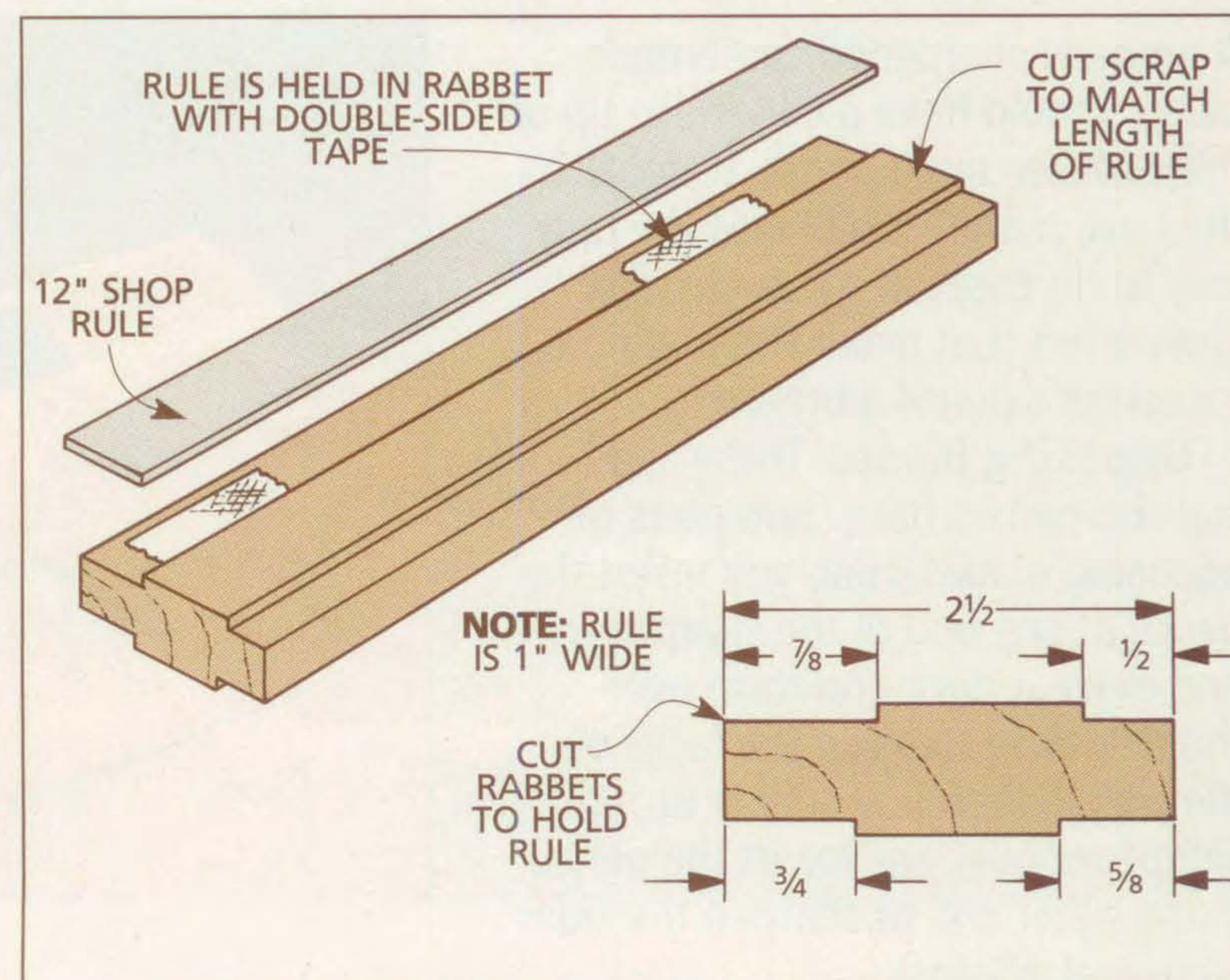
I like to secure my case backs with screws so they're easy to remove. Sometimes I've used as many as twenty screws or more, all spaced evenly around the plywood edge. That's a lot of screws to lay out.

Layout Tool – To make it easy to mark all the screw holes the same distance from the edge of the plywood, I mounted a ruler onto a piece of scrap. This eliminated the need for a tape measure.

First, cut the piece of scrap to match the length of a 12" shop rule (see drawing). Then, cut a shallow rabbet along the edge to hold the rule in position.

Cut the width of the rabbet narrower than the rule. This way it hangs over the edge of the scrap. The amount of overhang should equal the inset of the woodscrews.

To make it even more useful, cut a rabbet on the other three edges of the tool (see detail). This way, it can be used to lay out screwholes that require a different inset.



Double-Edged Spindle Turning Template

One year I made several identical projects for gifts. Each of them had ten spindles that I turned myself. When turning a single spindle to match a pre-determined pattern, all you really need is a ruler and caliper.

Template – But, if you're making multiple spindles, it's simpler and more accurate to transfer the pattern to a full-sized template first. Then turn each leg following the template, and they will all be identical.

The template is a piece of 4"-wide posterboard cut the same length as the spindle (*Fig. 1*). What makes this template different is that there are marks along both edges.

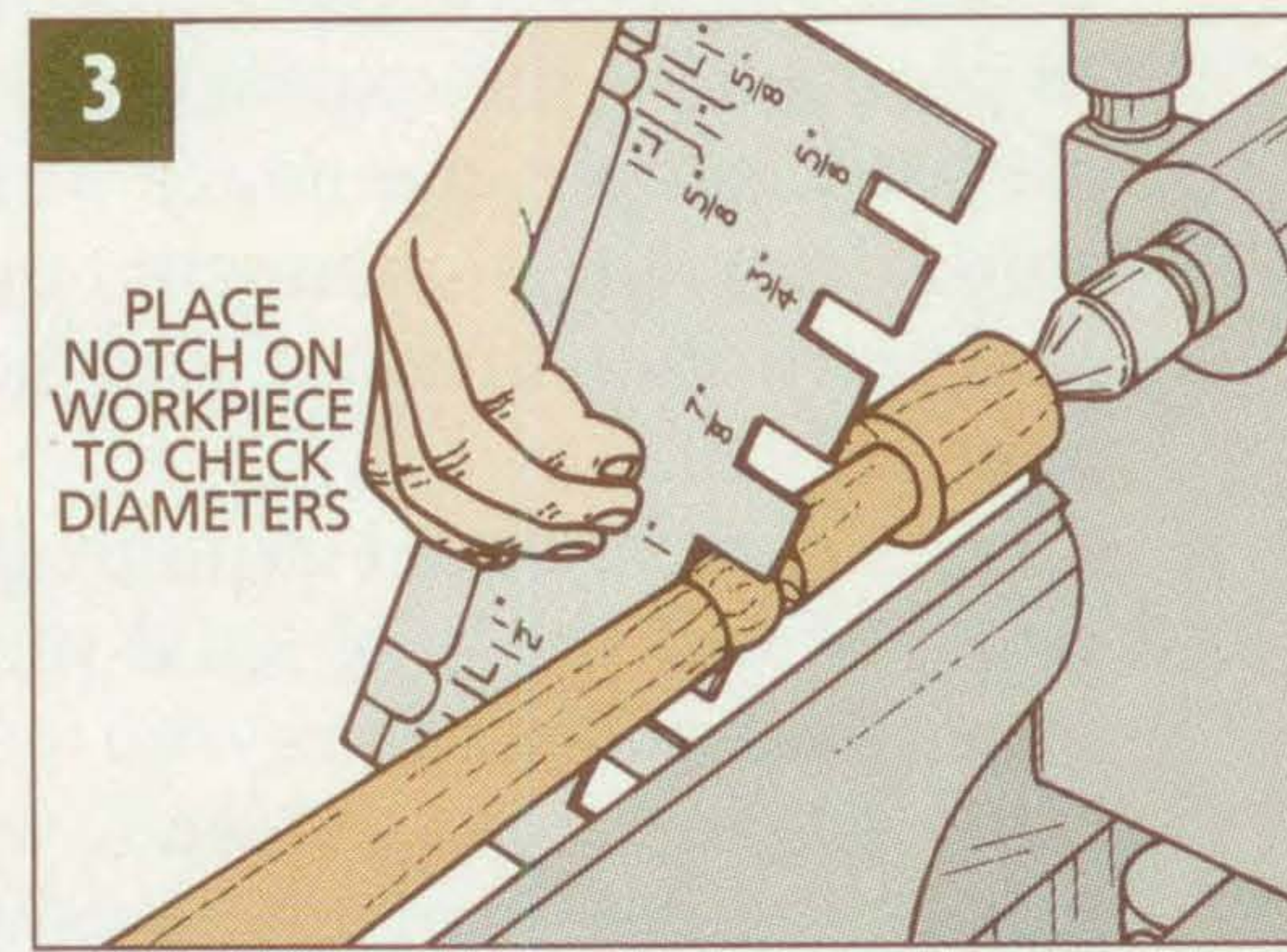
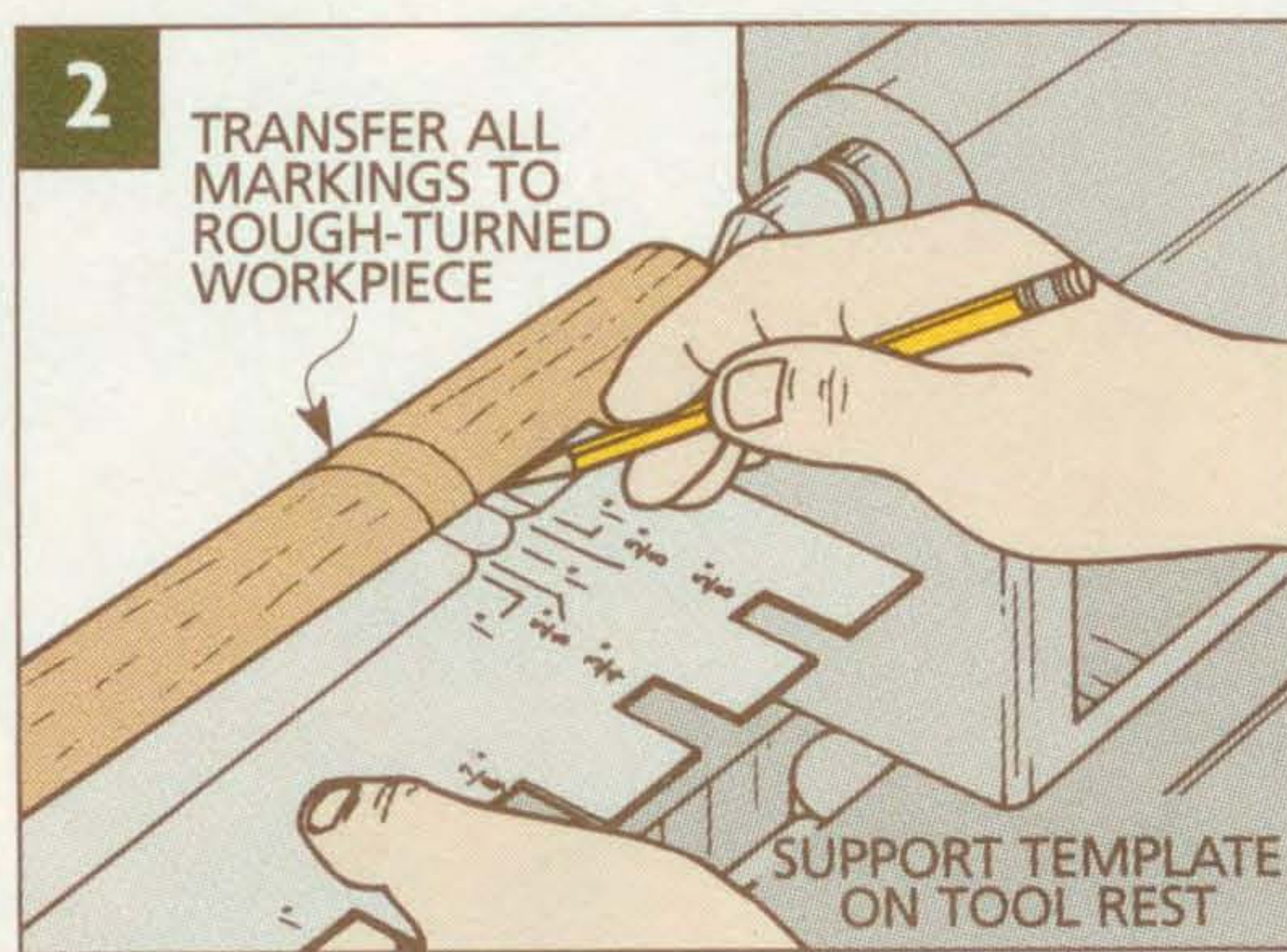
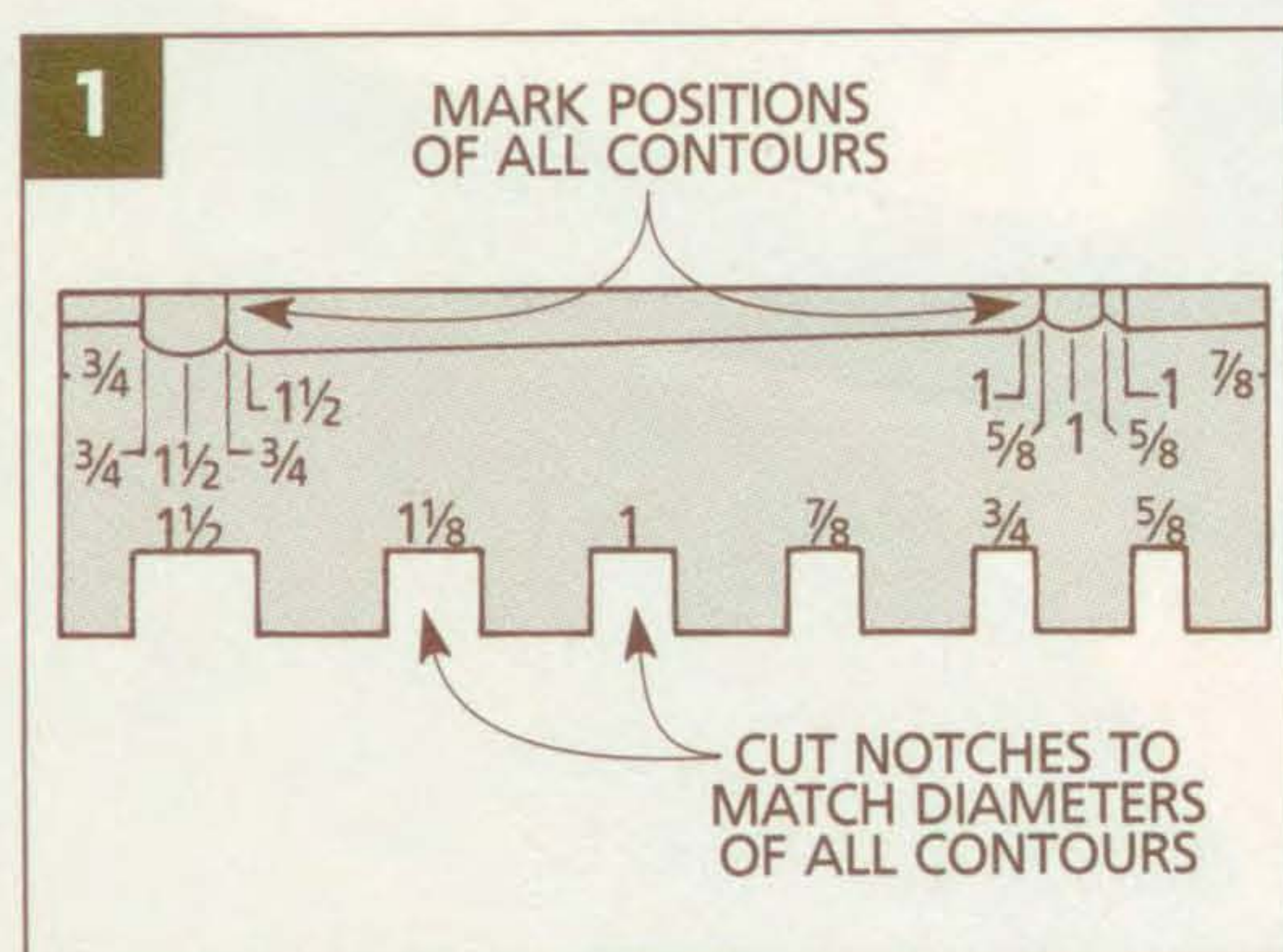
Along one edge is a line of "tick" marks that serve as a ruler for laying out the pattern. The other edge of the

guide has a series of cut-out notches used like a caliper.

Pattern Side – The pattern side of the template shows where the different contours of the leg pattern are to be positioned along the length of the workpiece. By holding this side of the template against the workpiece, the position of each contour can be marked with a pencil (*Fig. 2*).

Template Side – As the spindle is being turned, the other edge of the template works as an indicator gauge. It shows when you've reached the correct outside diameters of beads, tenons, and tapers, and the correct inside diameters of coves, fillets, and V-grooves (*Fig. 3*).

A template like this helps ensure all spindles turned from the same pattern look identical.



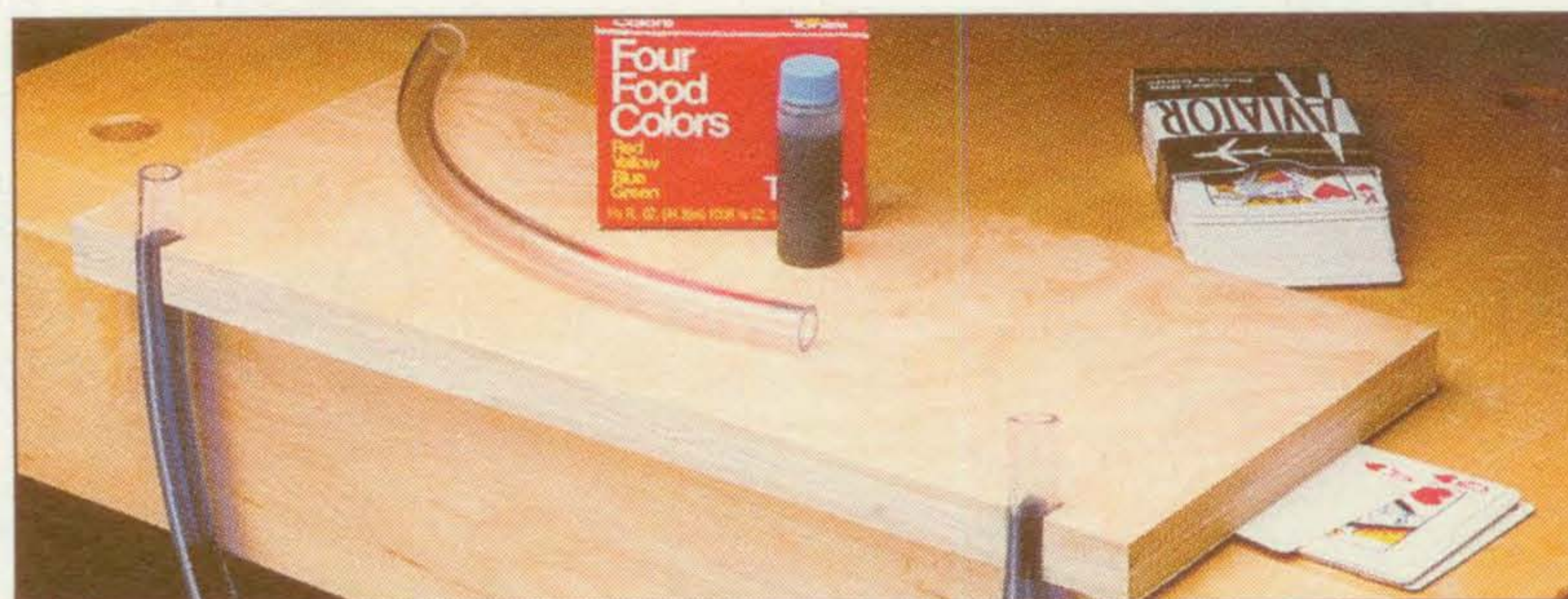
One Good Level Deserves Another

If you've ever had to replace a broken vial in an heirloom level, you know how hard it can be to install a new one. To get an accurate reading, you need to check it on a known level surface and adjust it if necessary.

But how can you check that a surface is level if you don't have a level? One way is to use a clear plastic tube filled with water (*see photo at right*).

To take advantage of this, fit the ends of the tube into notches in a flat piece of plywood and add water (a drop or two of food coloring makes it easy to read the level).

Then slide one end of the tube up or down until the water column is flush with the surface of the plywood. This will move the water column at the opposite end either

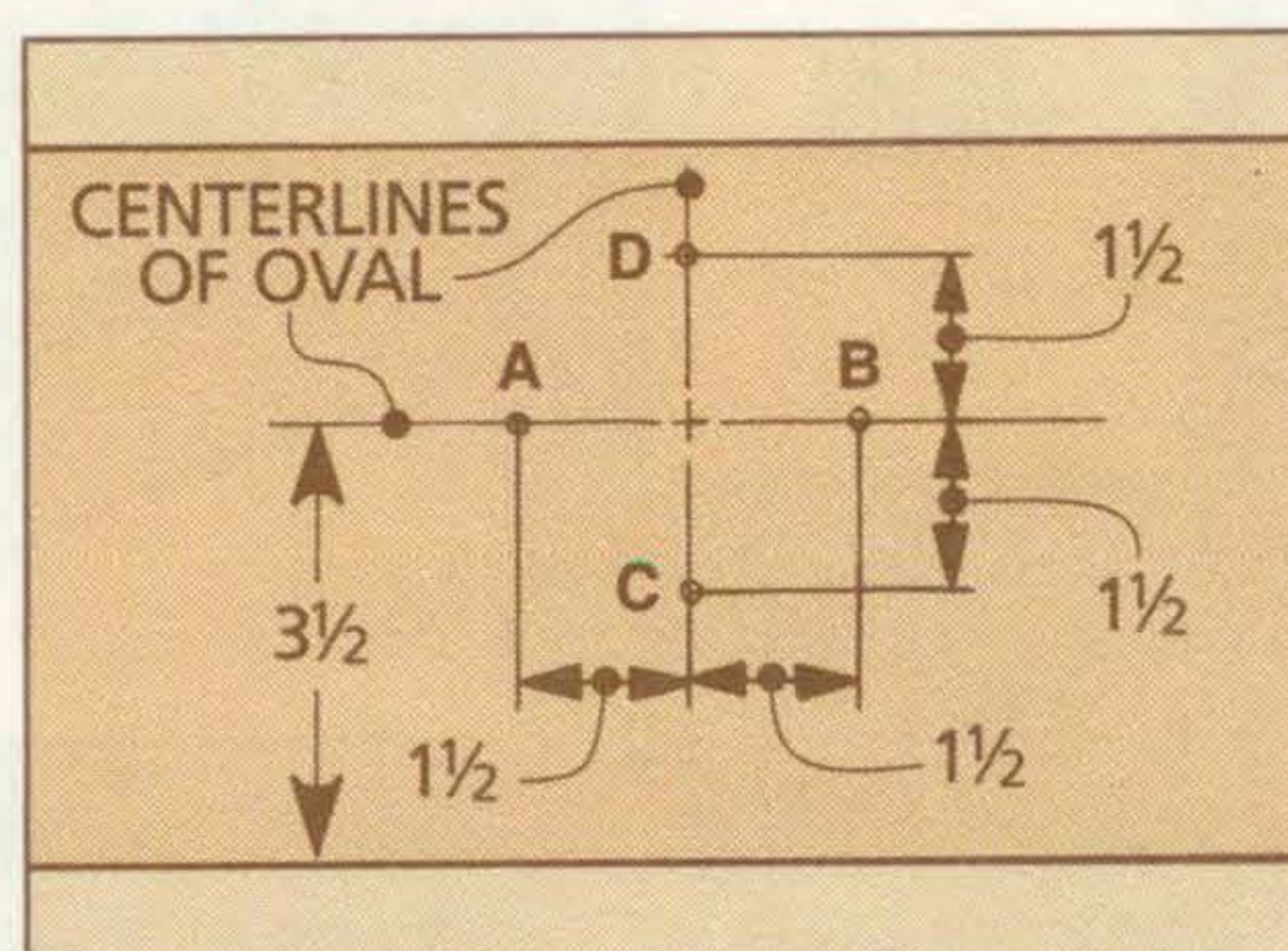


higher or lower. Then simply shim under the side of the level where the water is highest until the water columns are equal. (I used playing cards for shims.) Now use the surface to check your level.

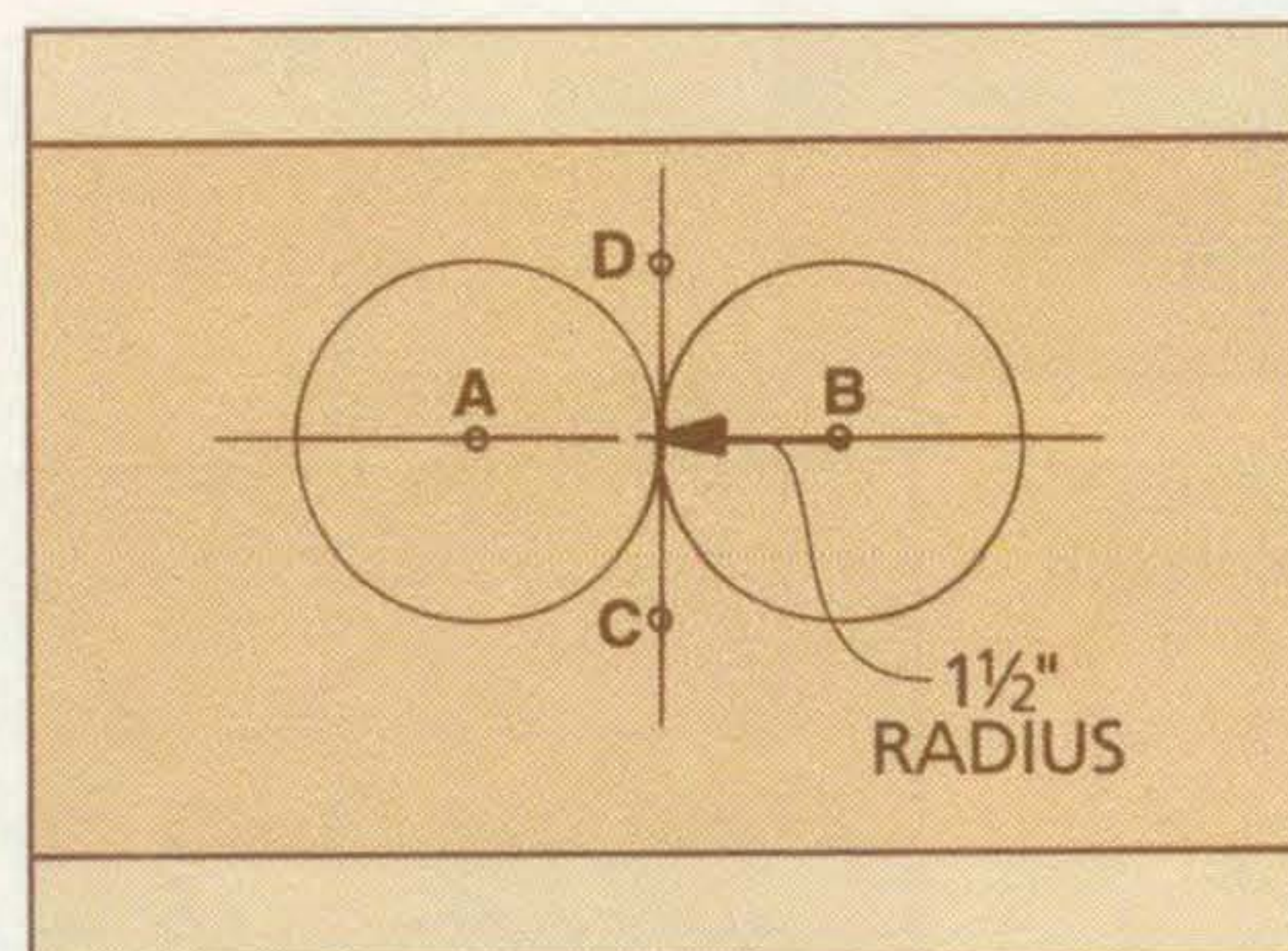
Drawing a Simple Oval

You don't have to be a whiz kid in geometry to draw an oval.

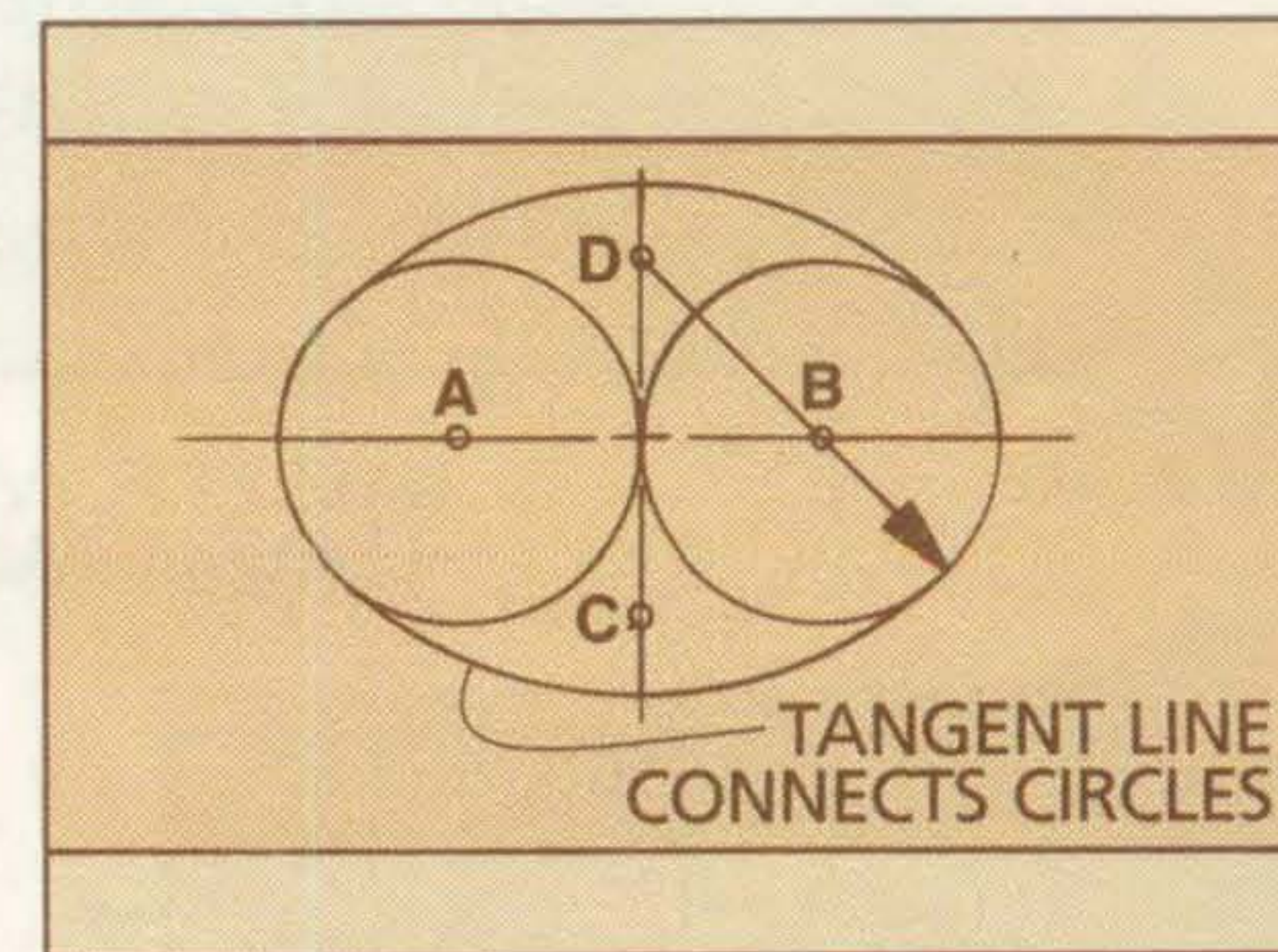
Points, Circles and Arcs – First, only four points need to be drawn. Then all you have to do is draw two "circles" and two "arcs" using a compass.



1 From the center of the oval, measure and mark the centerpoints A, B, C, and D.



2 Use centerpoints A and B to draw two 3" circles to form the ends of the oval.



3 Use centerpoints C and D to draw arcs connecting the tangents of the circles.

Get an Invisible Plywood Edge

You want to hide the edges of your plywood panels, but you don't want the edging to show. It's not as hard as it sounds.

I use plywood in my projects all the time. It makes the job go easier and the quality of the project better. But there is one drawback to plywood — the exposed edges. To put it simply, the edges of plywood can be downright ugly. And more often than not, they need to be hidden.

For some projects, I'll simply glue on a 1/4"-wide strip of solid wood, trim it flush and not worry too much if the edging doesn't "blend" well. But other times, you might want to apply an edge to the plywood that's a little more subtle — an invisible edge. Sound impossible? Well there are actually a number of ways to accomplish this without too much extra effort.

A thicker edging strip can be trimmed to leave a thin edge. ▼



▲ Heat-sensitive veneer tape can be easily applied to the plywood edge with a warm iron. When trimmed flush, the thin veneered edge won't be noticed.

Make It Thin

When your edging is thin enough, it becomes nearly impossible to see. Edging that's only 1/32" to 1/16"-wide won't be noticeable except under the closest examination. And there are several different "thin" options.

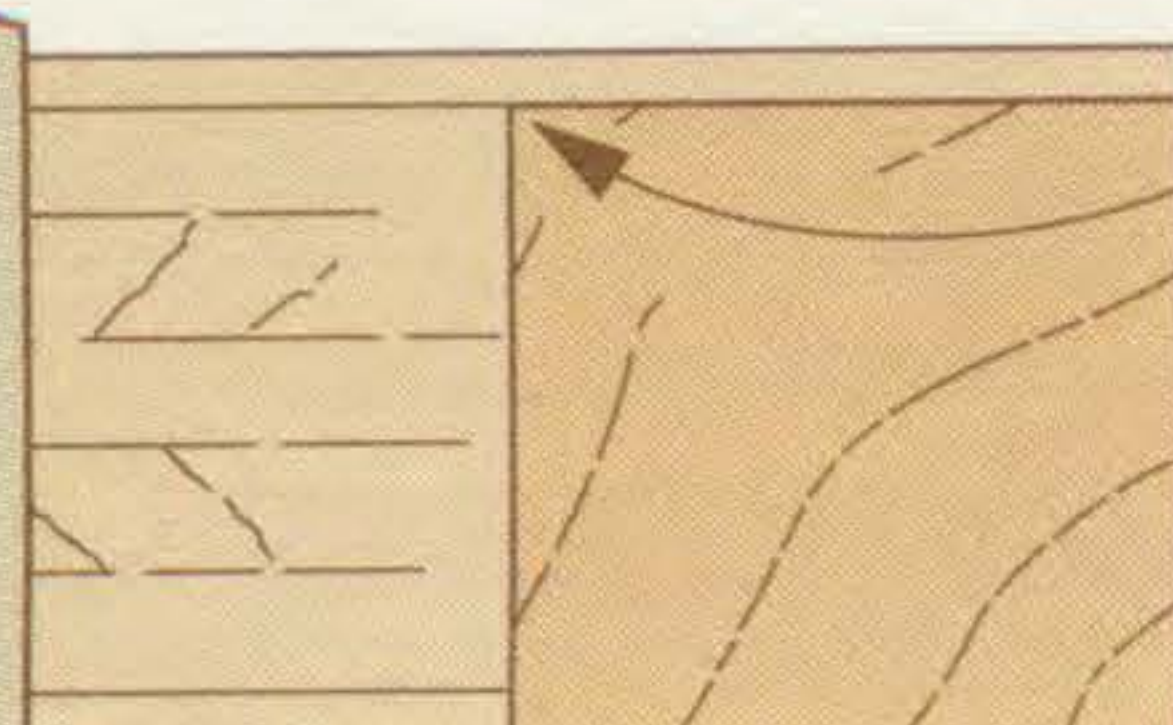
Edging Tape – One of the quickest and easiest options for thin plywood edging is adhesive veneer

tape that's made specifically for this purpose. It comes in rolls and is made from very thin hardwood veneers. You can find it in most of the common wood species.

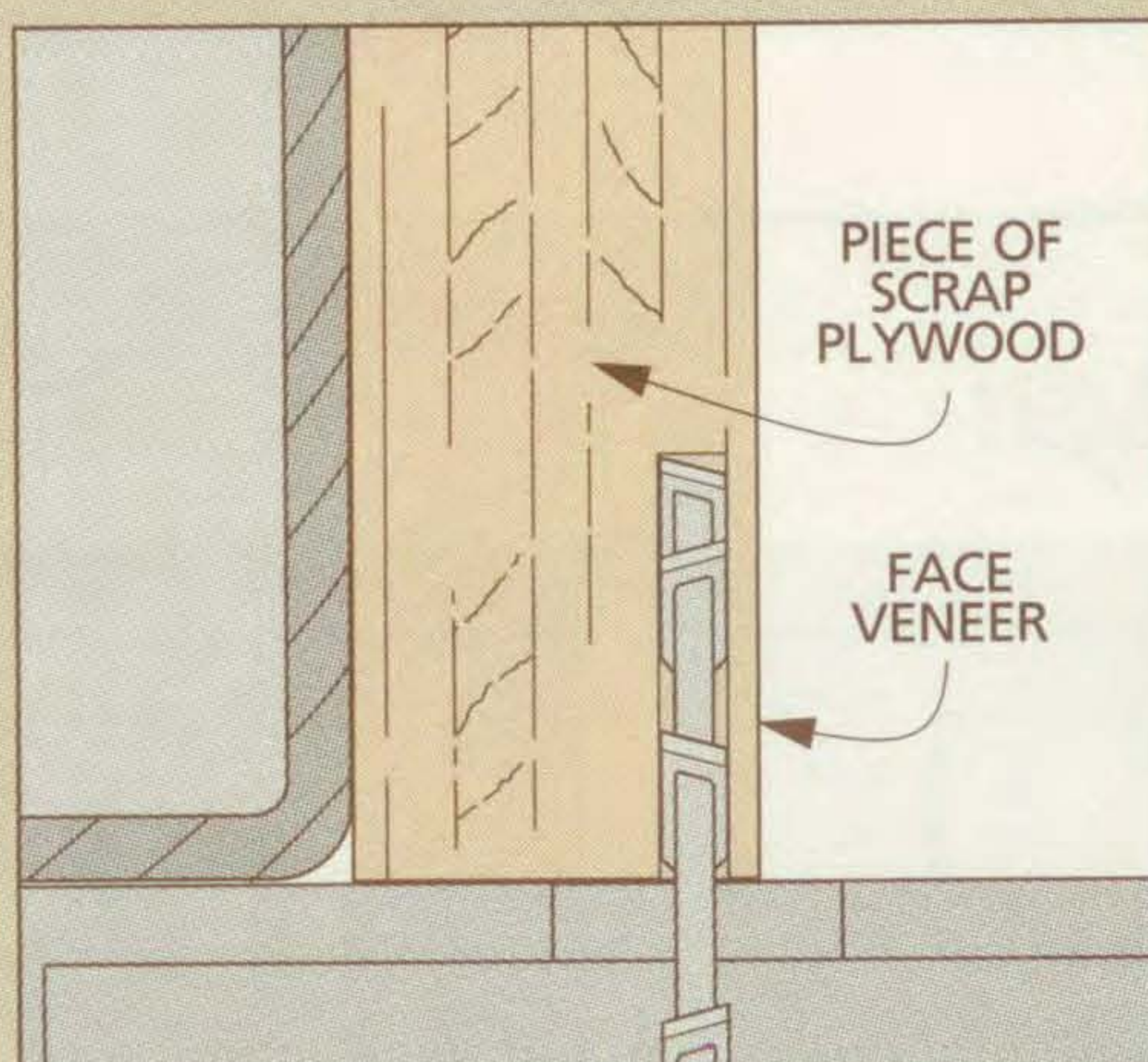
There are two types of edging tape and both are pretty easy to apply. The self-adhesive type works just like sticky tape. It can be applied with just some firm pressure.

◀ A thick edging piece glued into a rabbet in the edge of the plywood leaves an invisible seam.

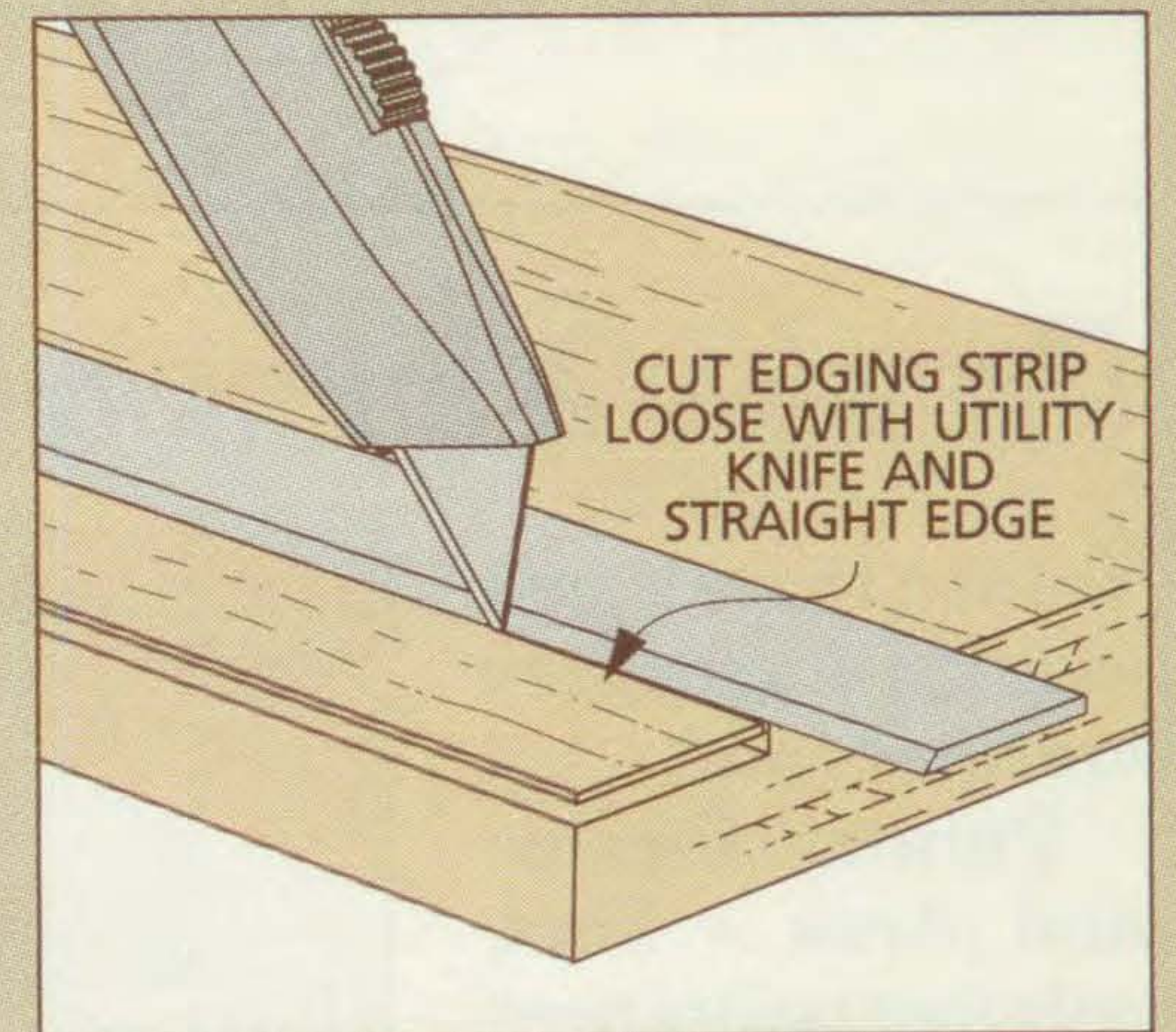
RABBET PLYWOOD EDGE LEAVING FACE VENEER



THICK EDGING STRIP GLUED INTO RABBET



Edging From Plywood. To make thin edging from plywood scraps, first make a saw cut on the joint line between the face veneer and the plywood core.



Cut It Loose. Next, use a sharp utility knife to cut the veneer strip from the plywood panel. The edging will be a perfect match in grain and color.

The heat-sensitive edging tape takes only a little more work. It has a coating of adhesive on one side that can be activated with “gentle” heat. All you do is set it in place and use an iron to apply the heat, as shown in the photo above. Both types of edging tape are made slightly oversized in width. Once the tape is stuck firmly in place, you trim it flush to the surface of the plywood and you’re done.

Trim It Thin – Sometimes I want a thin edge that will hold up to a little more wear and tear than edging tape. So in this case I make my own slightly thicker edging, as shown in the upper example at far left.

The easiest way to do this is to start thick and end up thin. By this I mean you apply a thicker edging (about 1/4" thick) to the plywood and then trim off the excess on the table saw. A final thickness of about 1/16" gives you a little more durability at the edge, but it still isn’t thick enough to be noticed.

A Perfect Match – If you want to apply a thin edge and also ensure a perfect match between the edging and plywood face, the two drawings on the opposite page show you how. This method uses the thin, face veneer from a scrap piece of the same plywood as the edging piece. When it’s glued to the workpiece, you have both a thin edge and one with the same grain and color as the plywood face veneer.

A Different Approach – Another way to go “thin” with edging takes a unique approach. Here, the plywood veneer provides the thin edge. A thicker edging strip is used,

but still creates an invisible edge on one face of the plywood.

The trick here is shown in the lower example and drawing at left. First, the plywood edge is rabbeted so that only the thin face veneer of the plywood remains on one side. When a thick edging strip is glued tightly into this rabbet, the joint line between the thin face veneer and the edging strip disappears. You end up with what looks like a seamless, solid-wood edge. This technique involves a little more work, but it works like a charm.

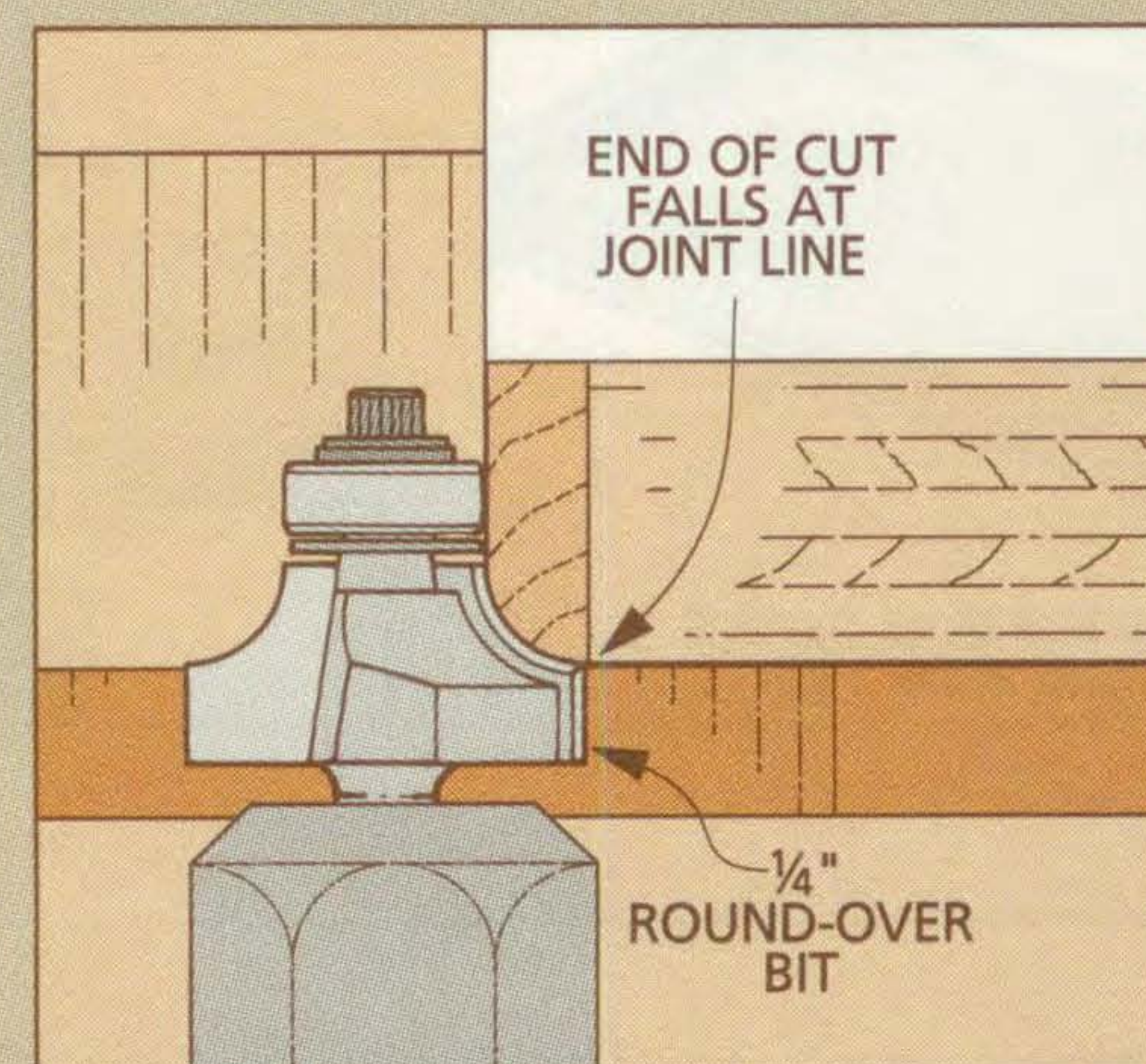
Disguise It

Making it thin isn’t the only way to hide your plywood edging. Another strategy involves using a thicker edging piece and then disguising it. The idea is to visually blend the the plywood and the edging piece so that the transition from one to the other won’t be noticeable.

I start by gluing a standard 1/4"-thick edging strip to the plywood and then trimming it flush to the surface. Then I add a little something extra. A molded edge that easily draws your eye from the edging to the plywood face can successfully hide the joint line or any grain or color difference between the two pieces.

The drawing and the photo above give you the idea. The edges of the routed molding cuts (chamfer or round-over) on the edging strips fall right at the joint line. And if the

▲ A round-over or chamfer routed onto the edging strip will provide a disguise for the joint line.



Smooth Transition. A carefully routed round-over ending right at the joint line between the edging and the plywood can fool the eye.

panel will be seen from both sides, make a second cut on the bottom edge. You still have edged plywood but you would have to look pretty close to see it.

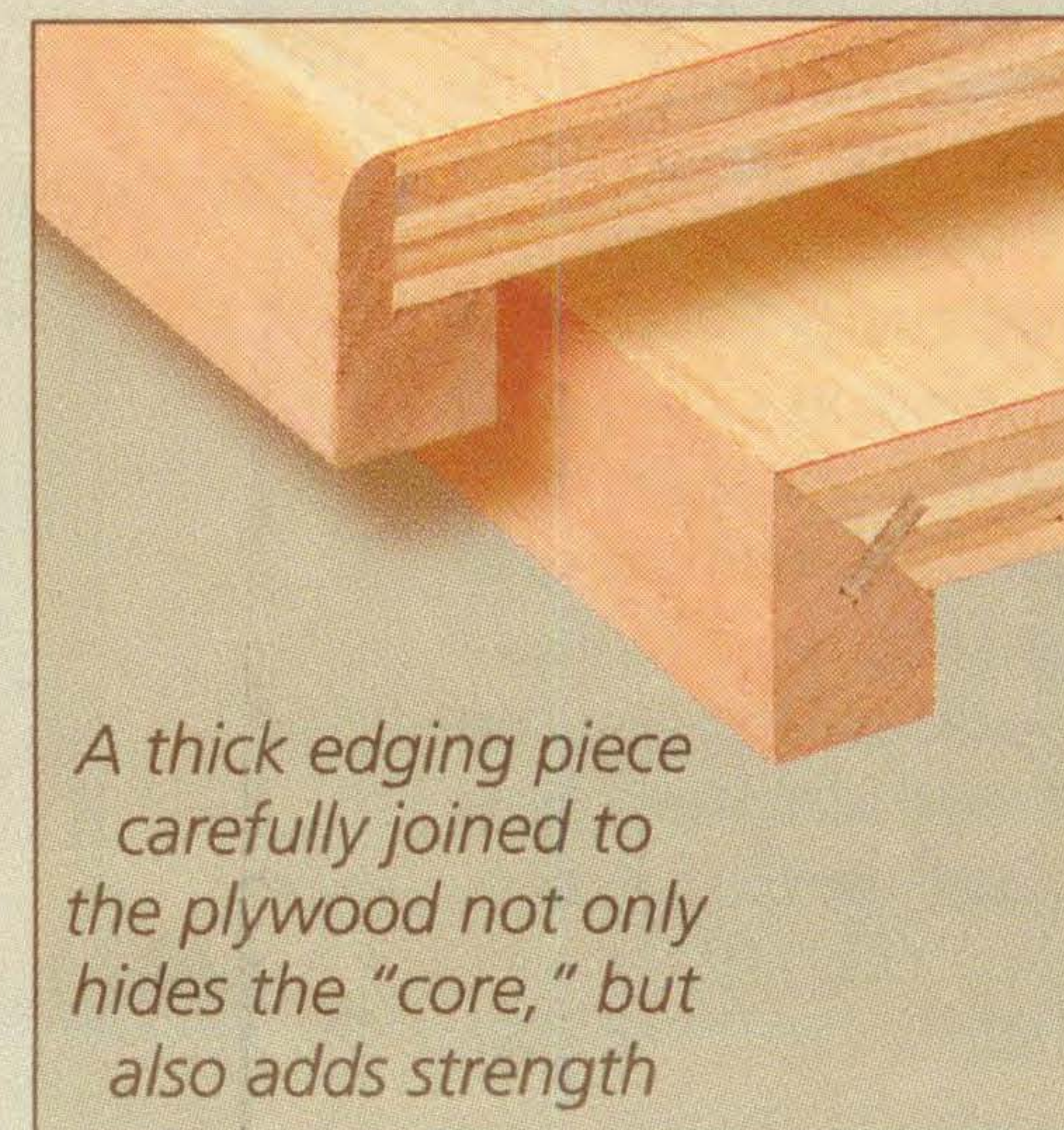
Shelves: Beef It Up

On occasion you not only need to hide the edge of the plywood, but also add some extra strength and thickness. Heavy-duty bookshelves come to mind. So how do you do this and not make it look obvious? Well, a couple solutions are shown in the photo at right.

Rabbeted Edging. The first example (photo of top shelf at right) shows a thick rabbeted strip applied to the plywood that adds both visual thickness and a considerable amount of stiffness.

And then notice how I borrowed the trick shown above to disguise the edge. A simple round-over creates a seamless flow from the plywood panel to the solid-wood edging.

Splined Miter Edging. The second example (lower shelf) uses a similar idea but with a different style of joinery. Here I applied a stout piece of edging with a carefully cut splined miter joint. The resulting invisible joint and crisp edge will leave anyone guessing — is it plywood or solid wood?



Shop-Built Door Pulls

I like to build authentic-looking wooden door pulls for my Craftsman-style furniture. The fact is, they're simple to make and all you need to do it is a long piece of scrap, a couple of router bits, and a 1/4"-wide dado blade.

Start by selecting an extra-long blank for a couple of pulls (Fig. 1). (I used a piece of 3/4"-thick cherry for mine.) The extra length makes the blank safer to work with.

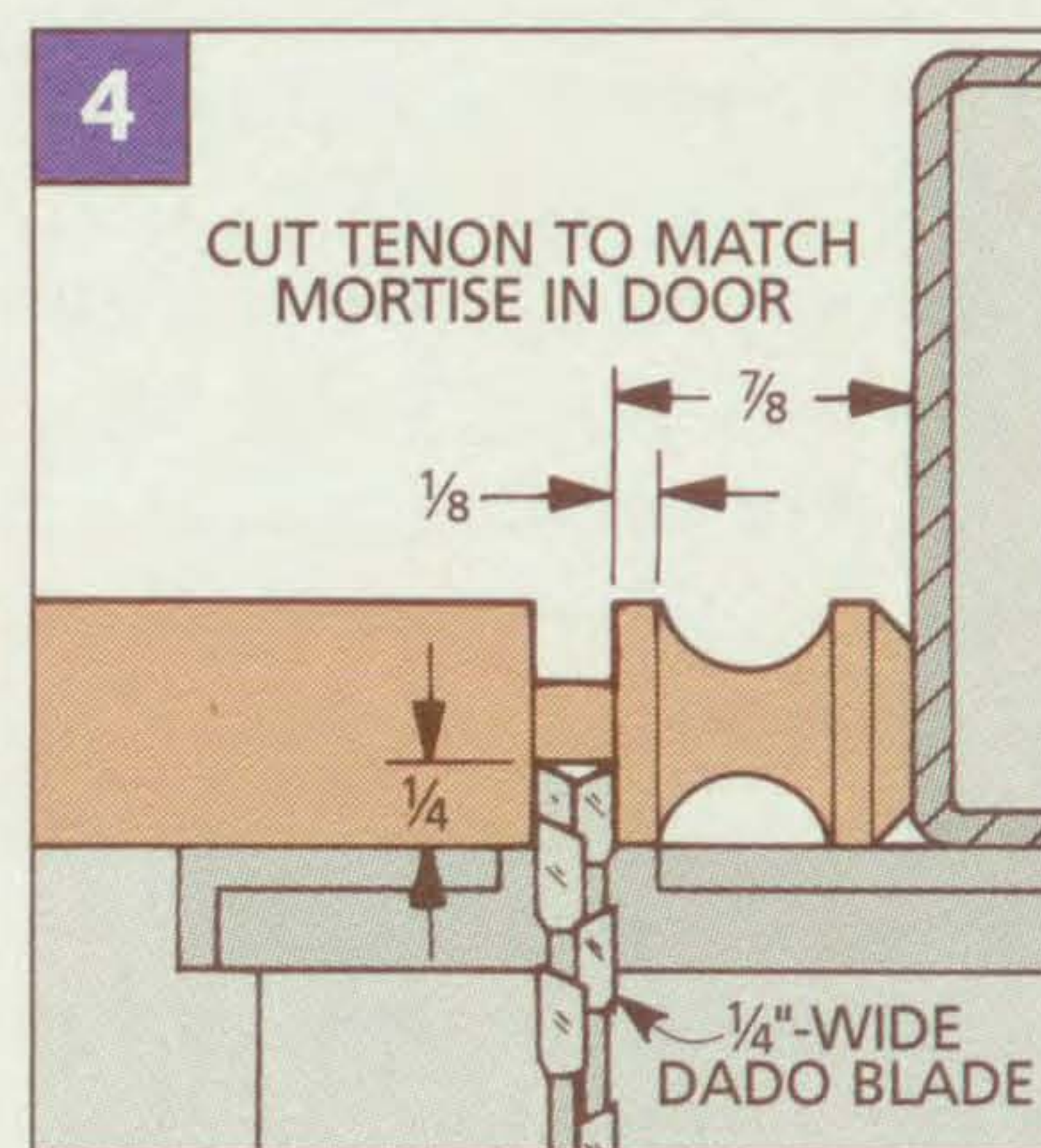
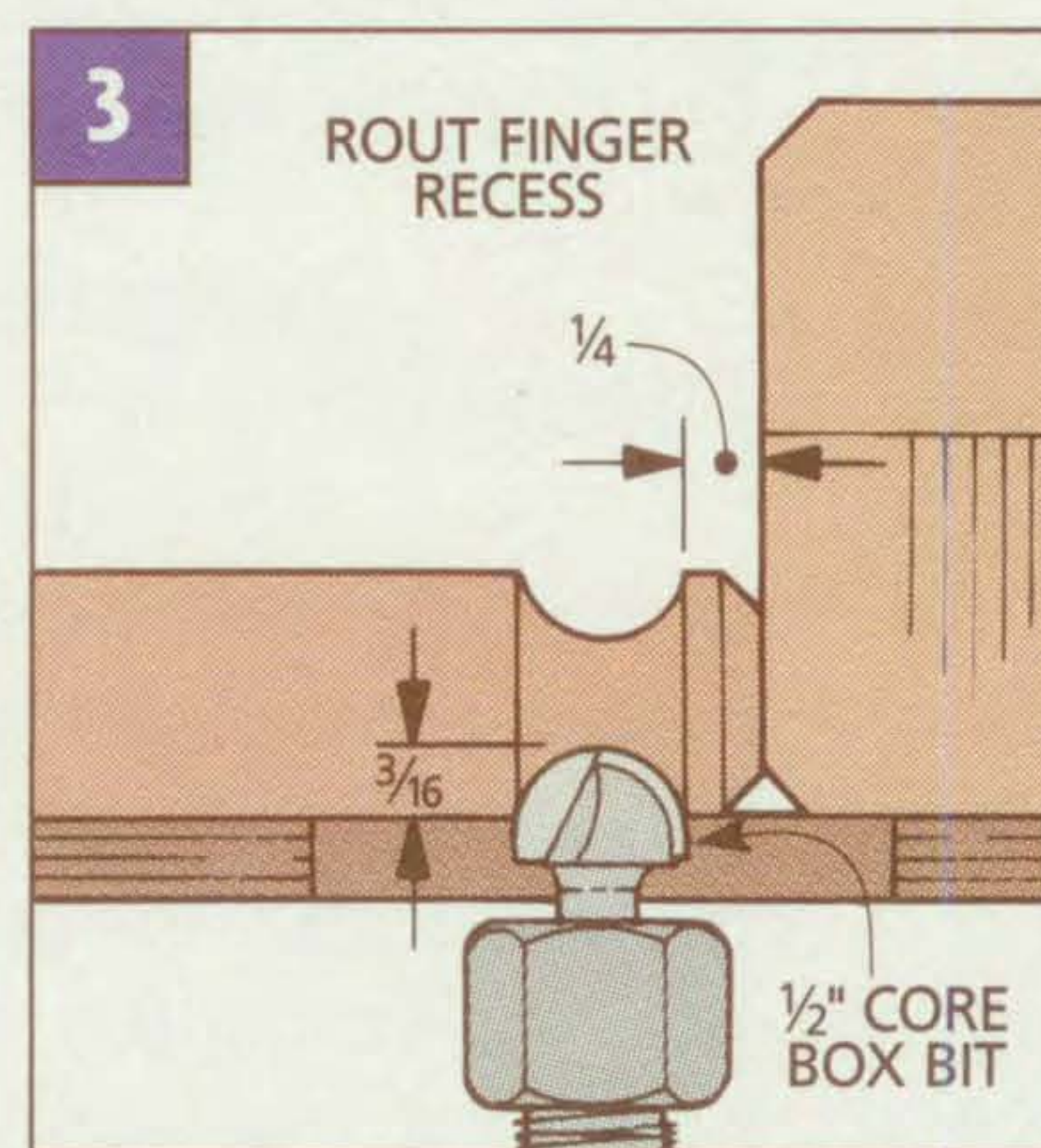
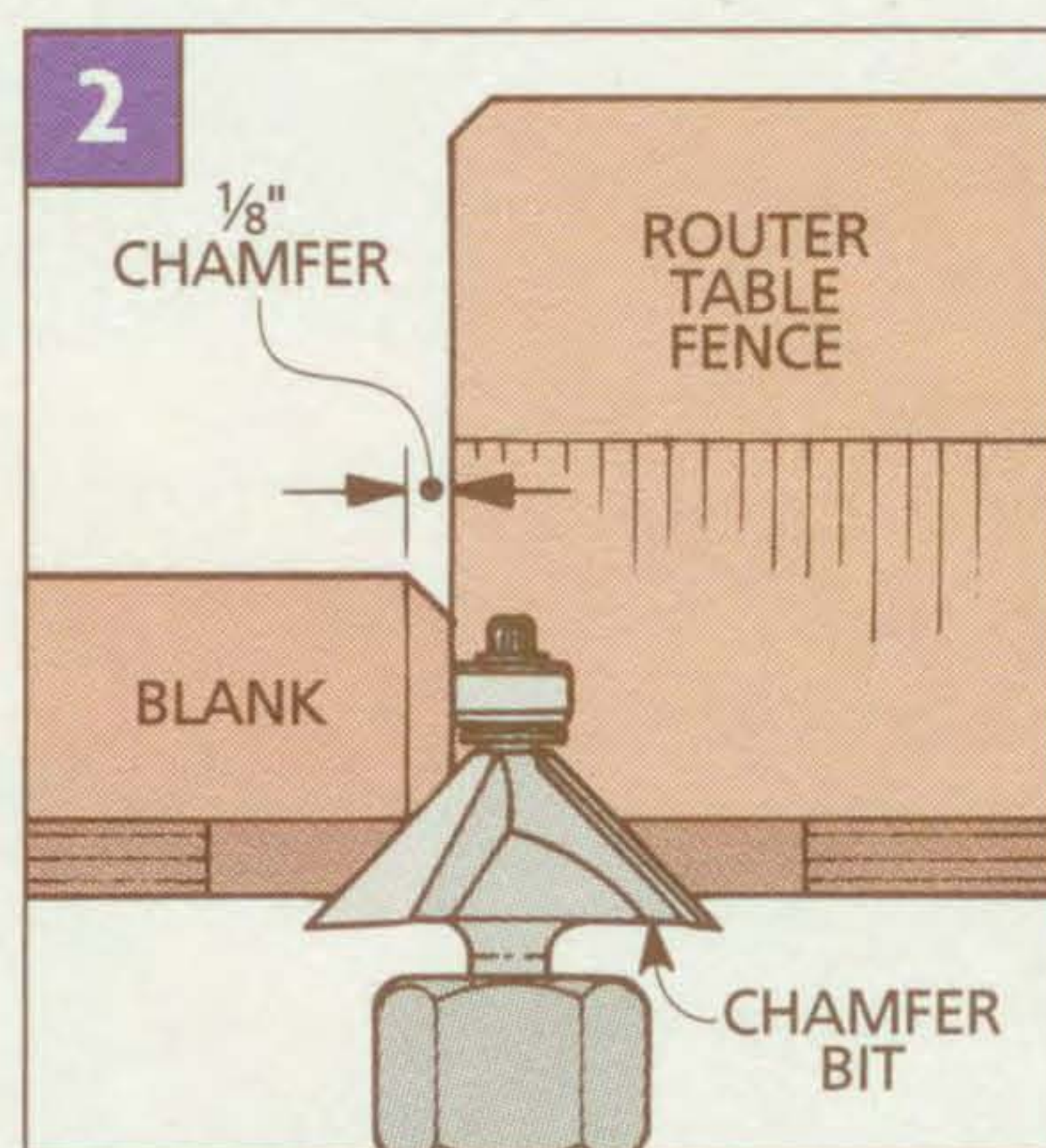
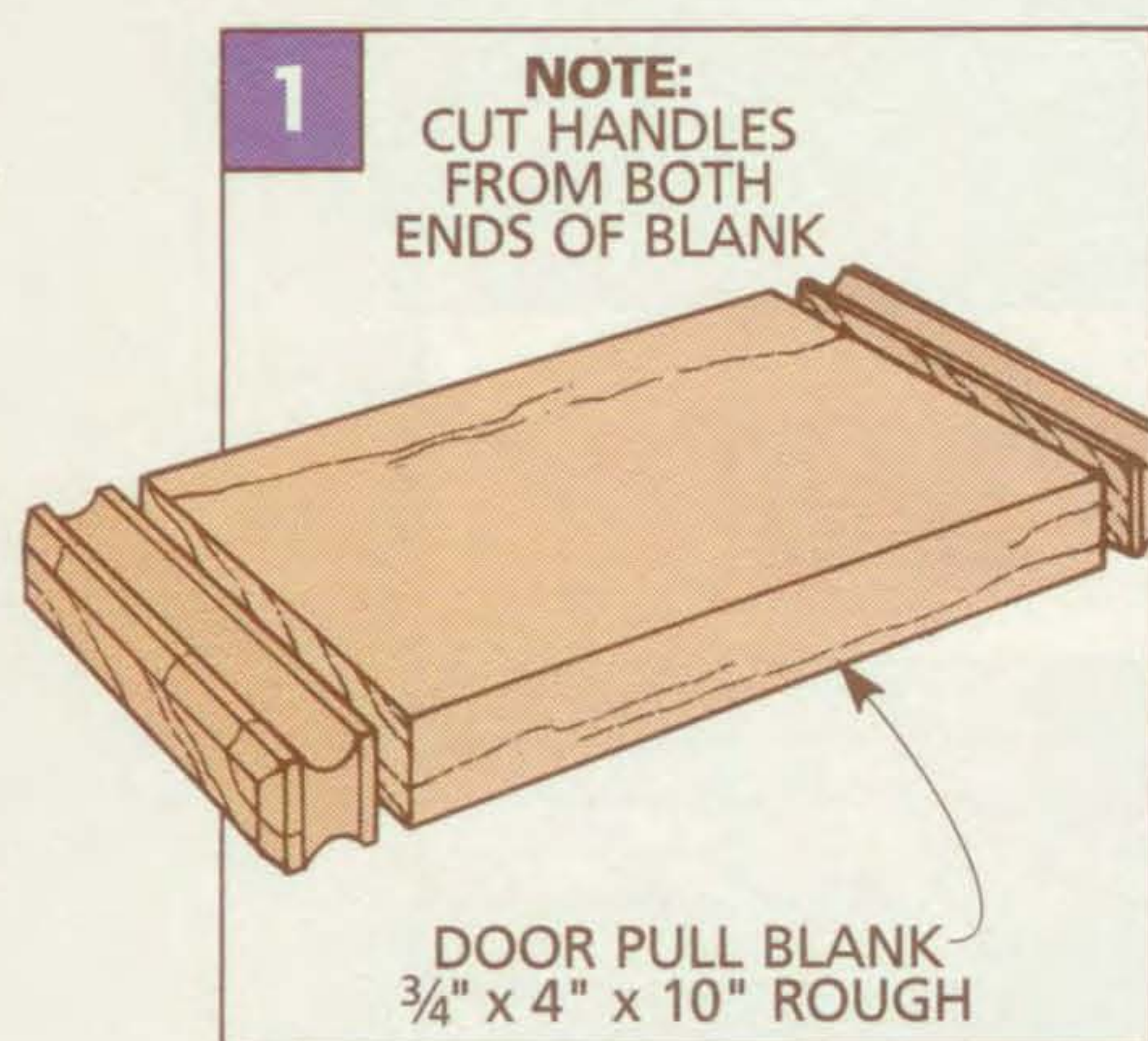
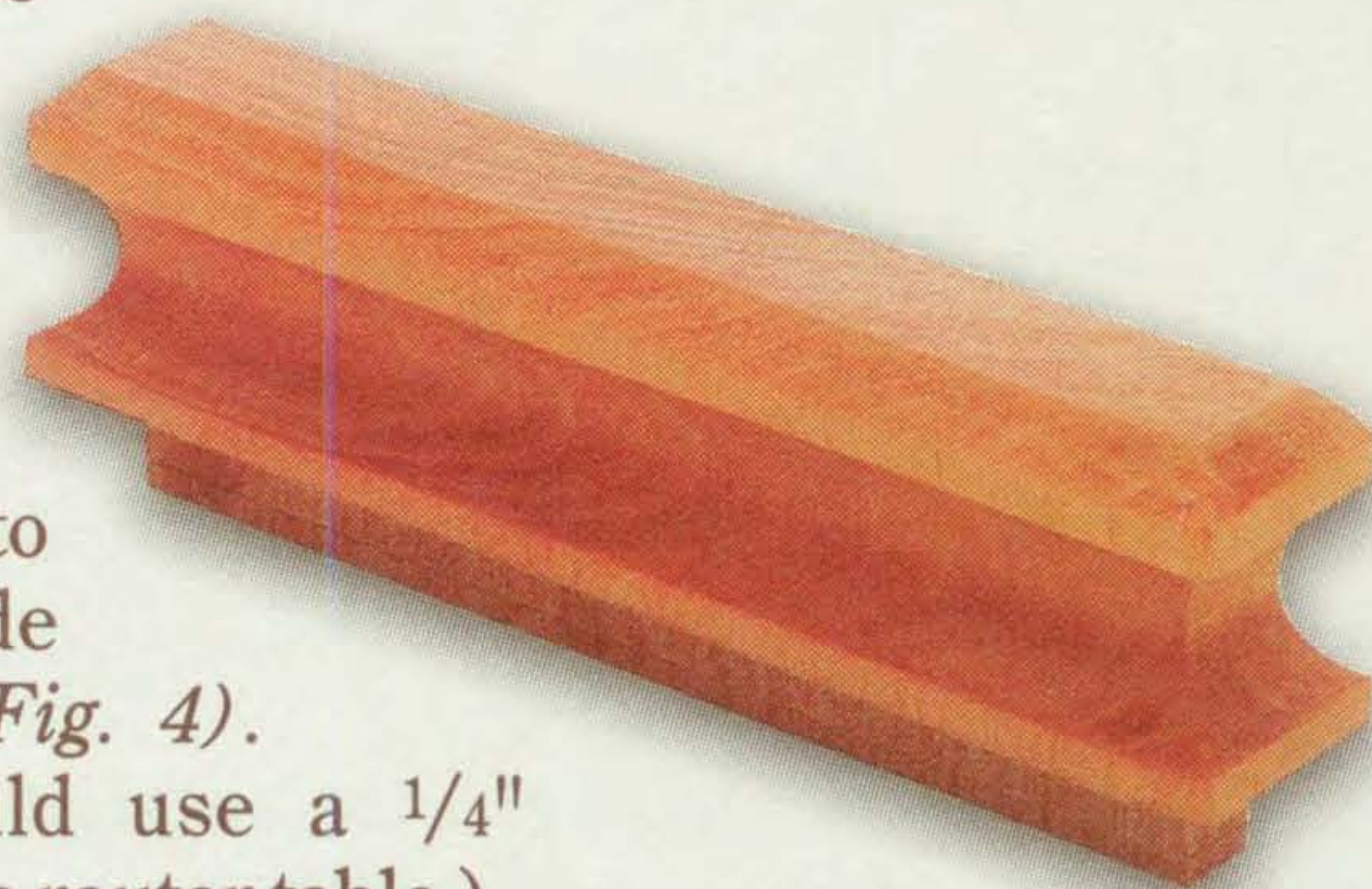
The first step in shaping this style of pull is to rout a chamfer around each end of the blank (Fig. 2). Next, rout a cove around each end using a 1/2"-dia. core box bit (Fig. 3).

Now, before cutting the pulls from the blank, it's best to form the tenons that fit into mortises that are cut in the doors. Since the tenon is in the middle of the blank and not at the end, this cut looks a little odd.

To form the tenons, you simply cut a narrow dado all the way around the blank. I like to use a 1/4"-wide dado blade (Fig. 4).

(Or you could use a 1/4" straight bit in a router table.)

All that's left now is to sand the pulls smooth and cut them from the blank. Then glue them into the mortises in the doors.



Making and Using a Push Stick

Every table saw should come with a good push stick. Most don't — so the best solution is to make one of your own.

The one shown here is big enough to keep your hands away from the blade. And it can easily be made (or repaired if it gets chewed up). But most important, it allows you to hold the workpiece down tight against the table as well as push straight ahead.

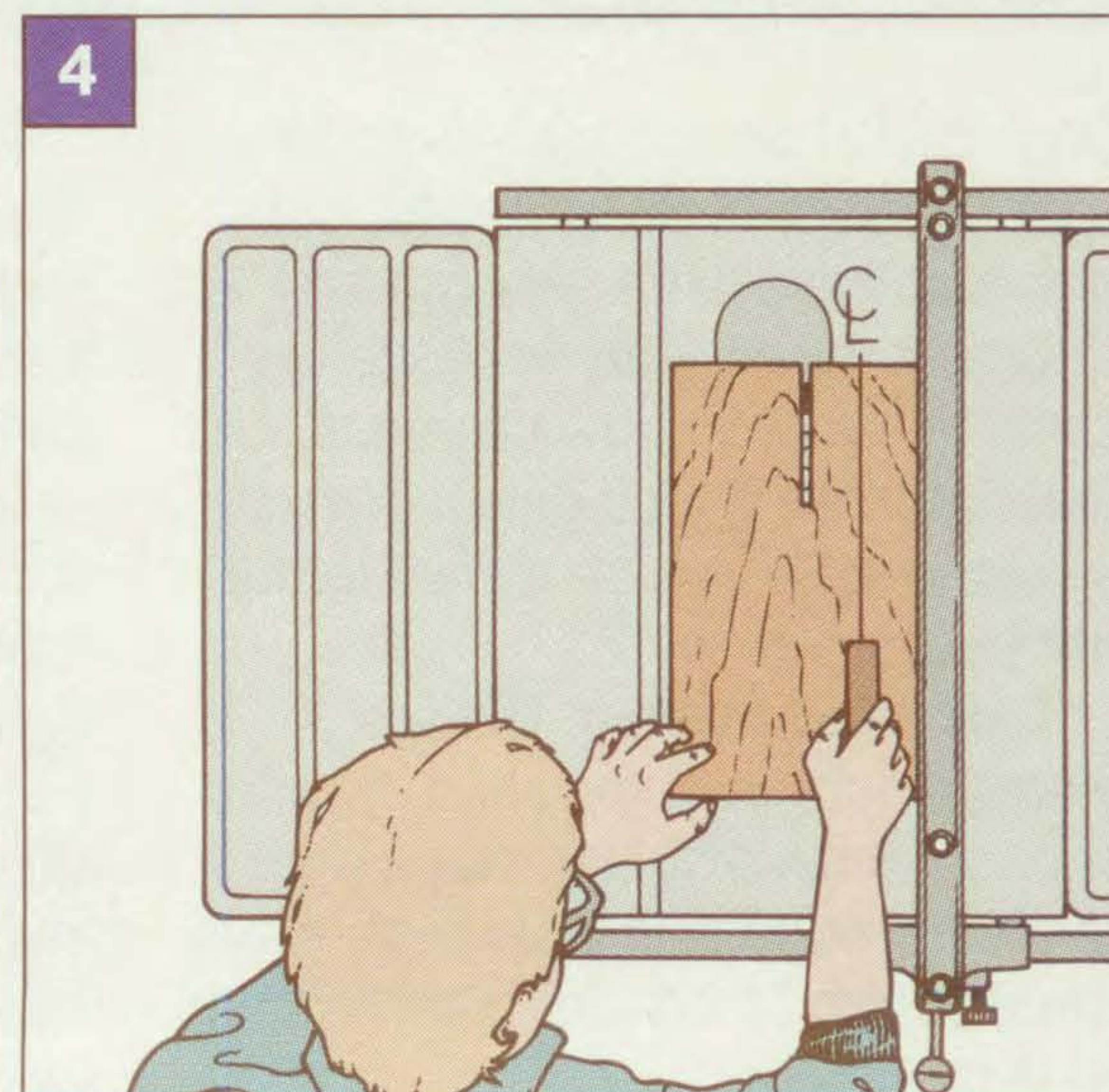
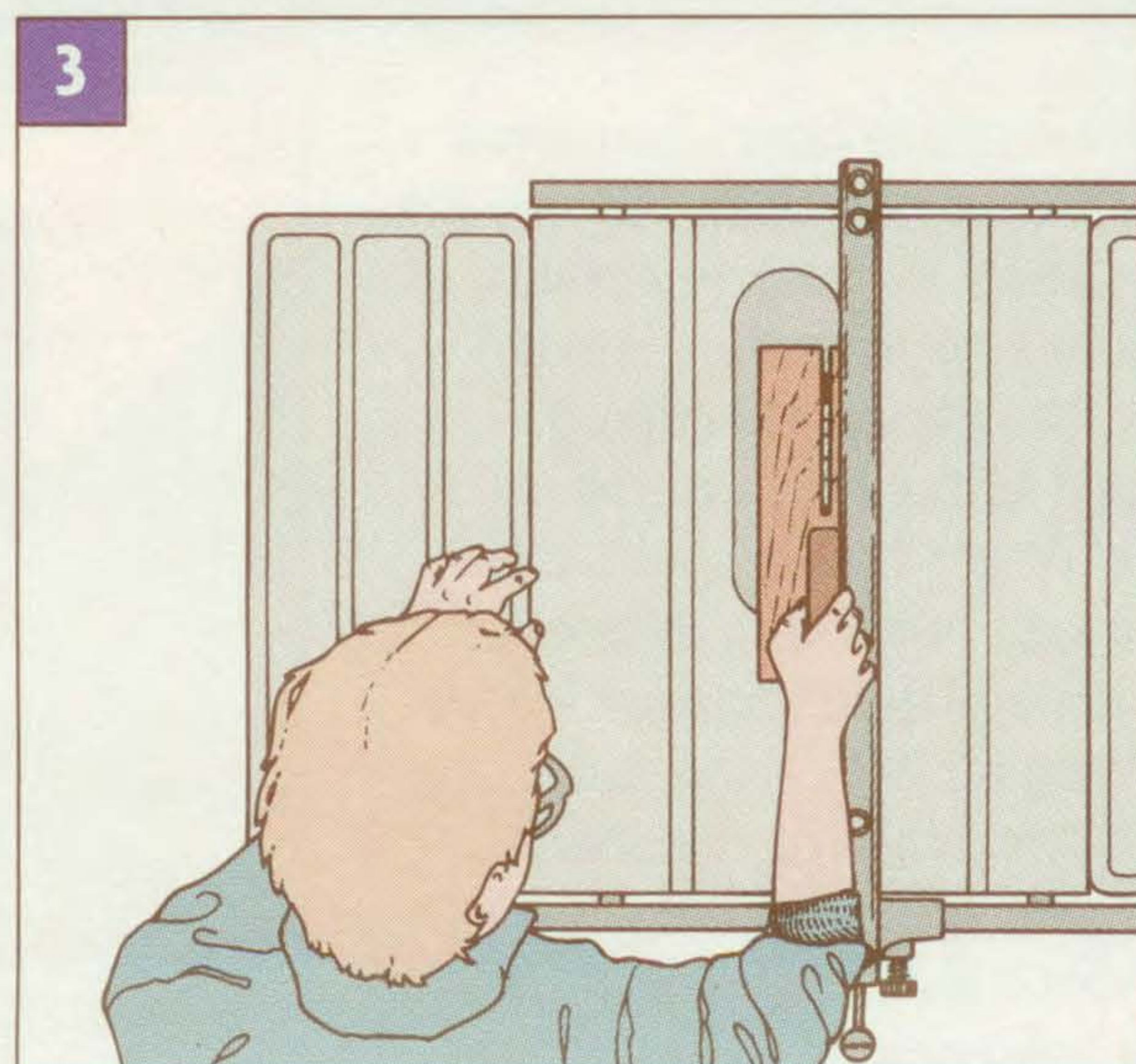
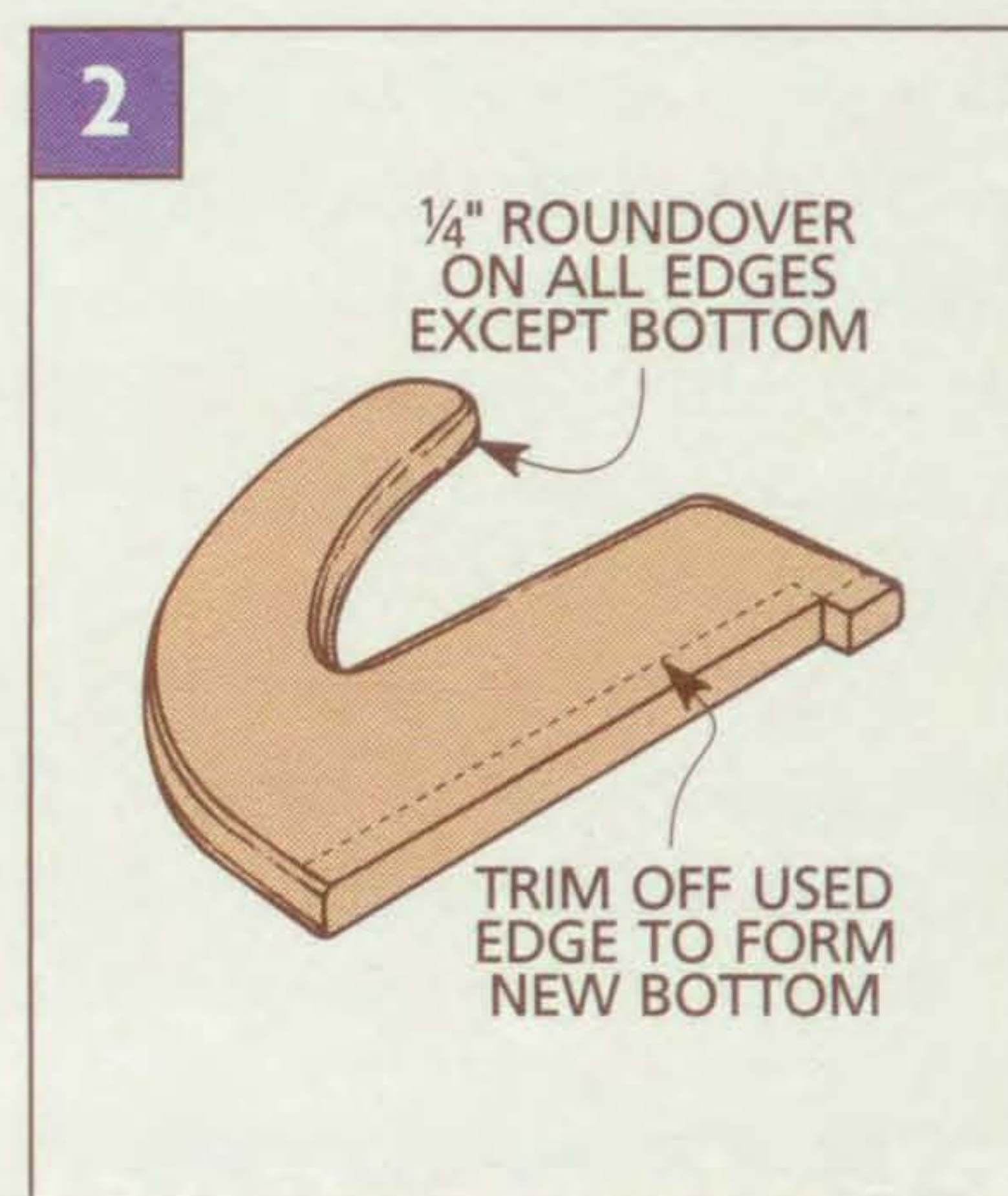
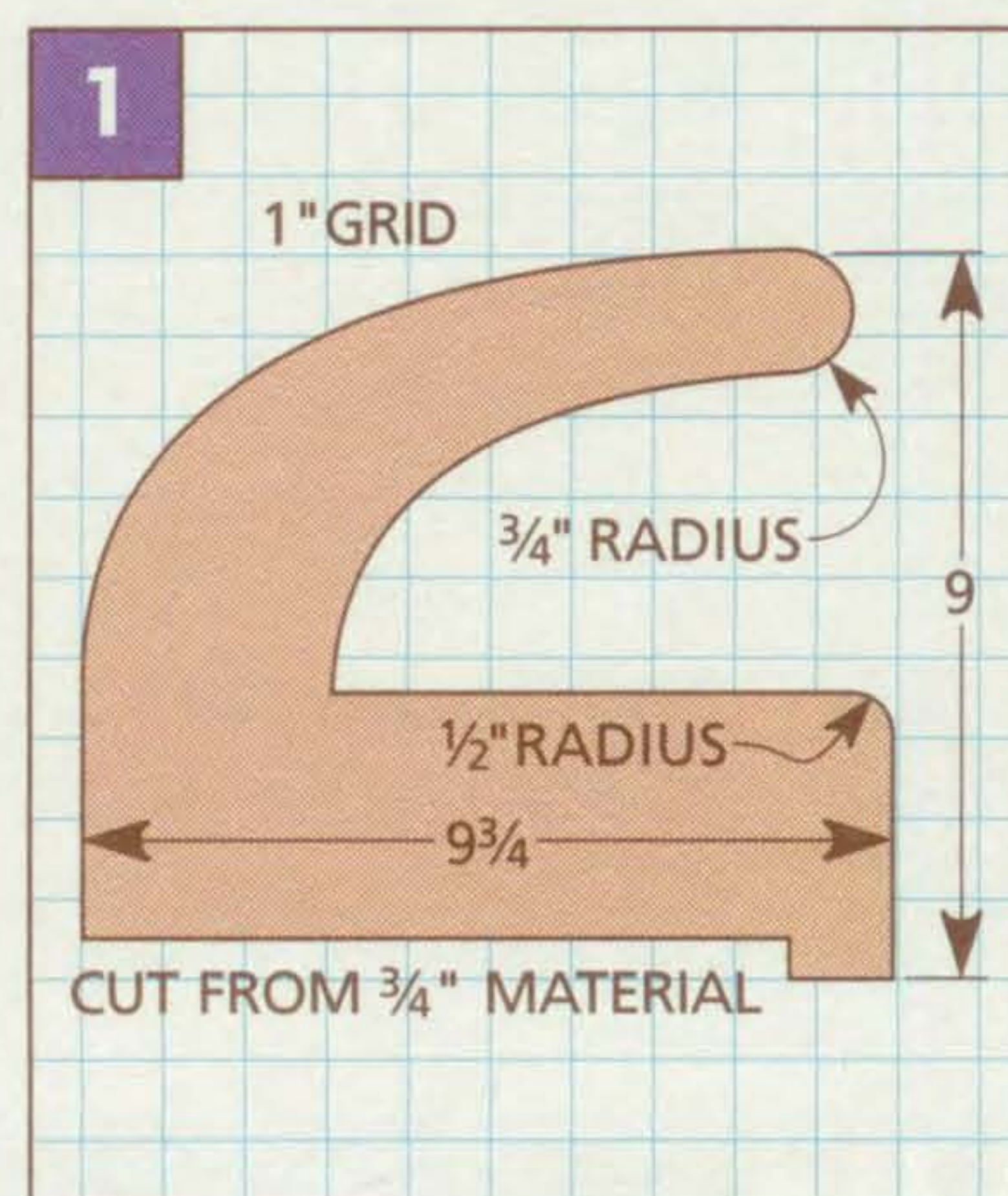
I made my push stick out of a piece of scrap 3/4" medium-density fiberboard (MDF) but you could also use plywood. First cut it to the shape shown in the grid drawing (Fig. 1). The base area is wide so that you can recut it and create a new bottom and heel if it gets chewed up (Fig. 2).

To make it easier to grip and comfortable on the

hand, I rounded the handle with a 1/4" roundover bit.

To prevent kickback when cutting thin strips, be sure that the heel of the push stick hooks over the strip between the blade and the fence (Fig. 3).

When ripping wider pieces, center the push stick between the blade and the fence (Fig. 4).



Aligning and Clamping Edging

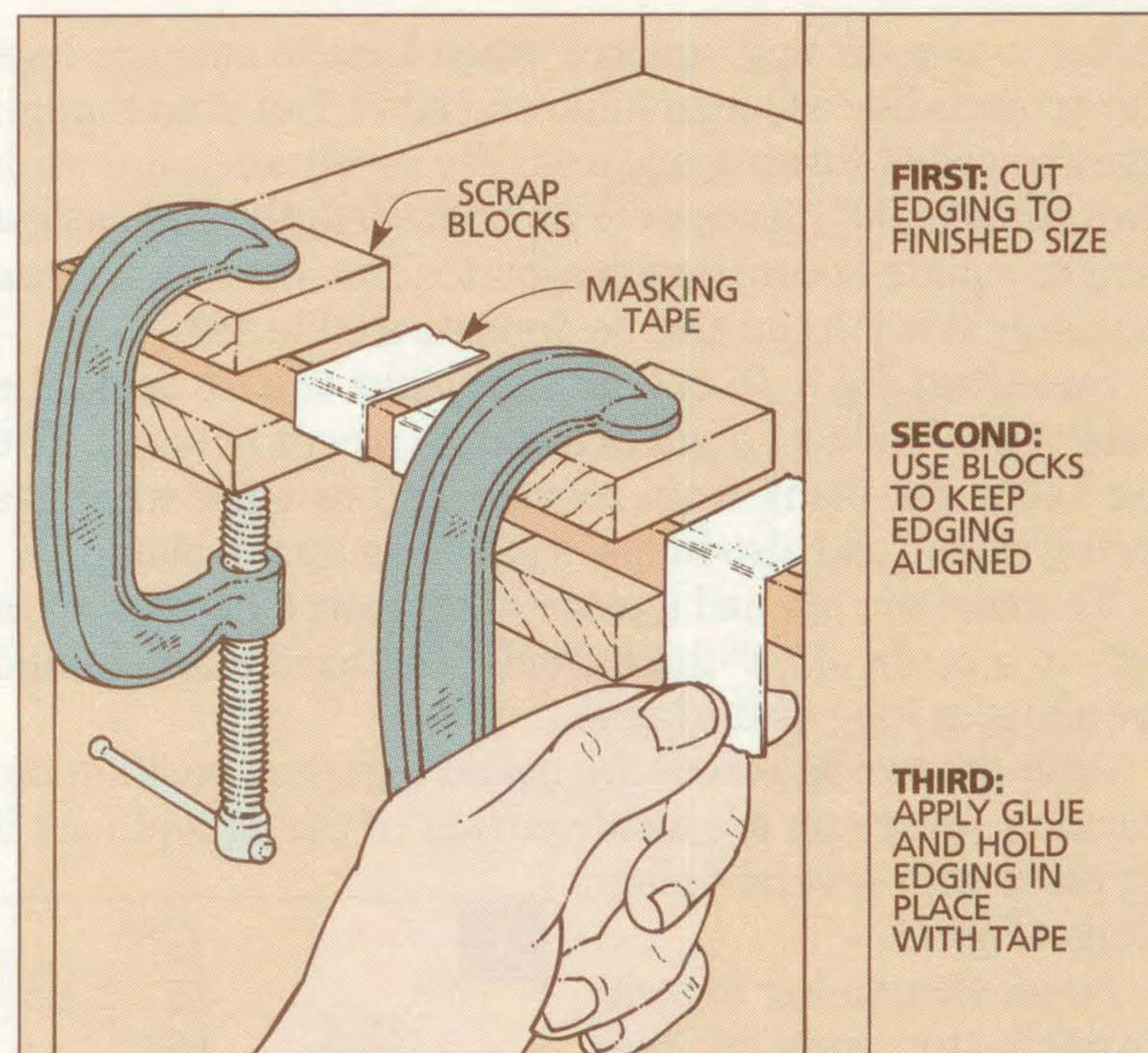
When I install edging onto a set of fixed shelves in a bookcase, I like to do things a little differently than normal. Instead of installing oversize pieces that get trimmed flush before the shelves are installed, I prefer to cut the edging to exact size and glue it in place.

The reason for doing things differently is the narrow edge on the shelf. It's too easy for the router and flush trim bit to tip and gouge the edging. By cutting the edging to an exact fit, only a little light sanding is needed.

But one problem you run into when applying edging this way is keeping it aligned with the edge of the plywood. After the glue is applied, the edging seems to want to slide out of place.

My solution to this problem is to use scrap blocks to help align the edging. First, I clamp the scrap blocks to both sides of the shelf (*see drawing*). The blocks form a slot for the edging to fit into.

To "clamp" the edging in place, I'll use masking tape to pull it tight against the shelf until the glue dries.



Burnishing a Miter

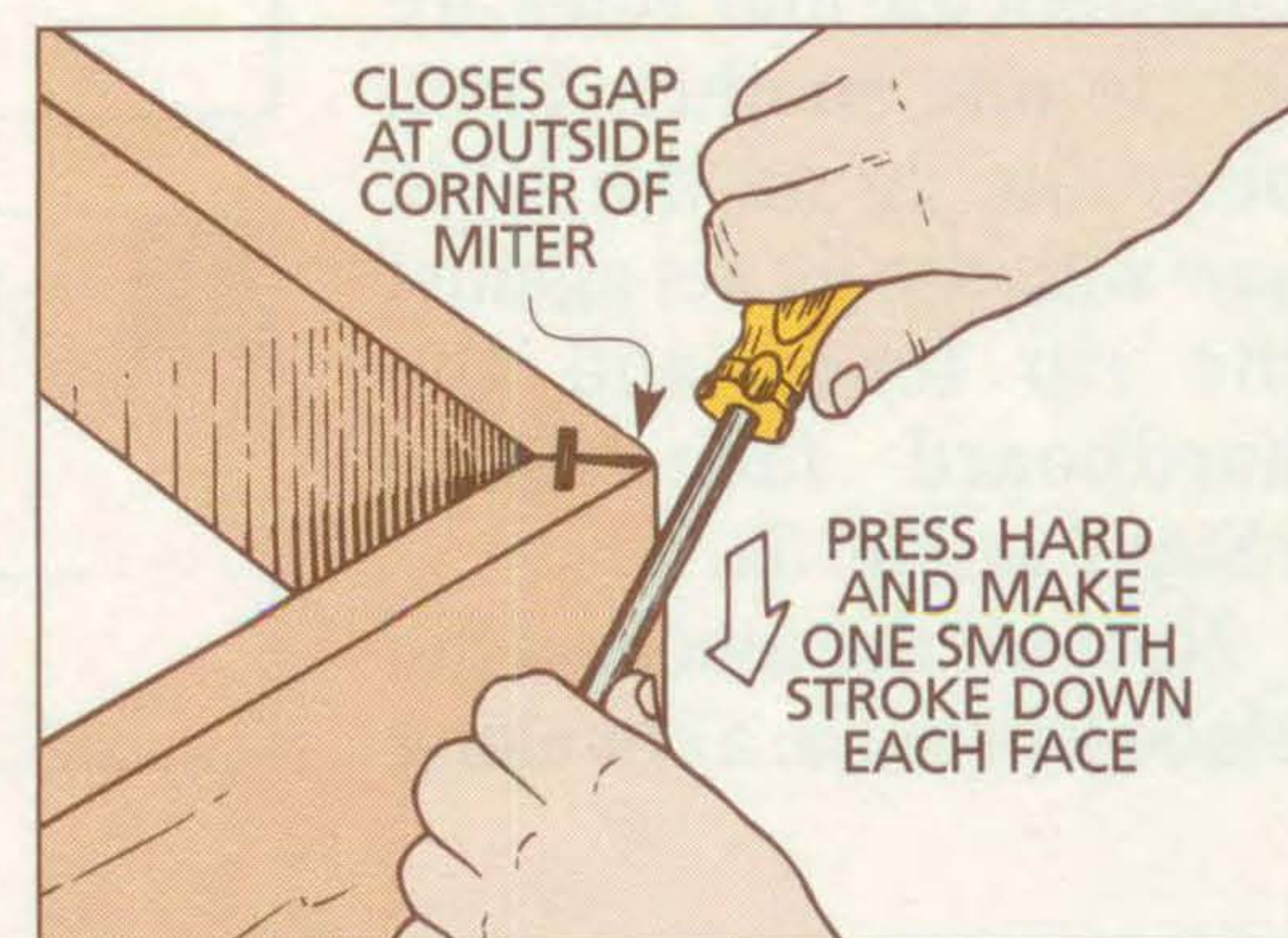
Building a box with mitered corners looks great. But a lot times, I end up having a problem at one or more corners of the box — the miter joints have a slight gap on the outside edge.

Luckily, there is a neat little trick for closing

outside miter joints that's commonly used on base moldings in houses. You just "burnish" the corners.

When an outside miter has a $1/16$ " or less gap you can roll both sides of the joint over to fill the gap.

To burnish a miter like this I simply use a screwdriver. The trick is to hold the screwdriver at a very slight angle to the workpiece. Then press down hard to bend the fibers slightly as you stroke down the miter joint.

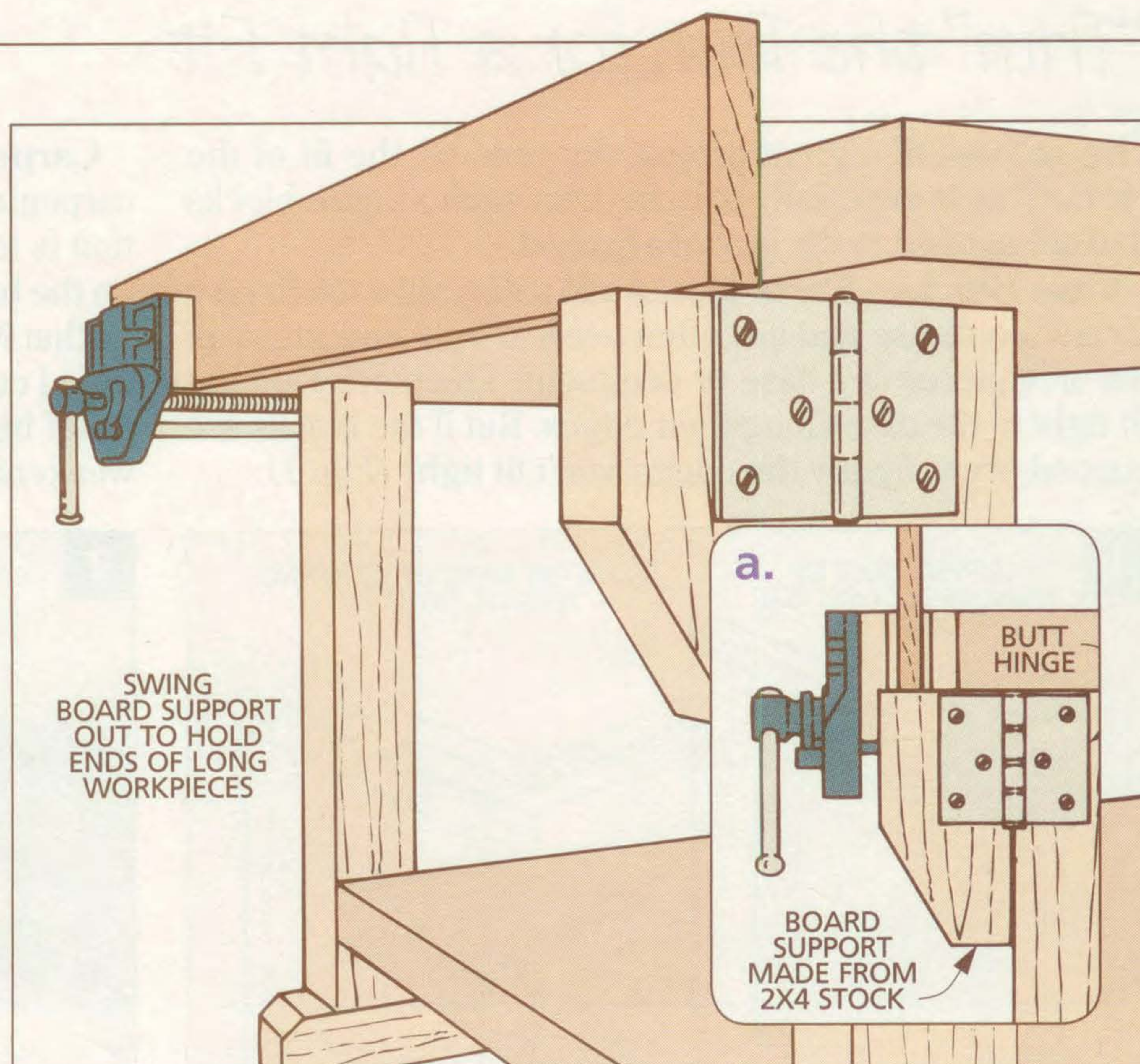


Bench Board Support

A lot of the old, heavy traditional-style workbenches had a big, bulky support called a bench slave for holding the ends of long boards that are clamped up in a bench vise. They were used mostly when jointing the edges of longer boards with a hand plane. The problem is a bench slave takes up a lot of space when it isn't being used and it's a hassle to drag it out every time you need to use it.

Recently, I built a new, heavy-duty workbench for my new shop. And with my new bench, I decided to use a simpler design for the support. To do this, I made a board support out of a scrap piece of 2x4 (*see drawing and detail at right*). Then I attached it to the leg of my workbench with a butt hinge.

Now, when I need to clamp up a long board, I just swing out the board support. When I'm done, it just folds back under my bench.



Saw Your Leg Blanks Square

I like to use turning squares when I make cabriole legs for projects like a Queen Anne end table. But even though they're called turning squares, I've rarely seen one with two square (90°) faces over its entire length. The easiest way to square one up is with a jointer. But, if you don't own a jointer, this job can also be done on a table saw.

Squaring Jig – To cut the leg blanks square using the table saw, I built a jig out of a couple pieces of scrap. The jig keeps the blank from rocking and twisting while it's being ripped and also helps in squaring up the blank.

To make the jig, nail a piece of tempered hardboard at 90° to a scrap of 3/4"-thick stock. The hardboard should be about as long as the blank.

After the two jig pieces are nailed together, position the turning square on the inside corner of the jig and tack it in place with several finish nails (*Fig. 1*).

Note: Remember to tack toward the ends of the blanks where the nail holes can be cut off when cutting out the leg profiles.

Four Steps – Next, I follow a sequence of four cuts until the four sides are 90° to one another. First, place the jig on the table saw with the jig set against the rip fence and the hardboard face down (*Step 1 in Fig. 3*).

Now set the fence so the blade will make a cut along

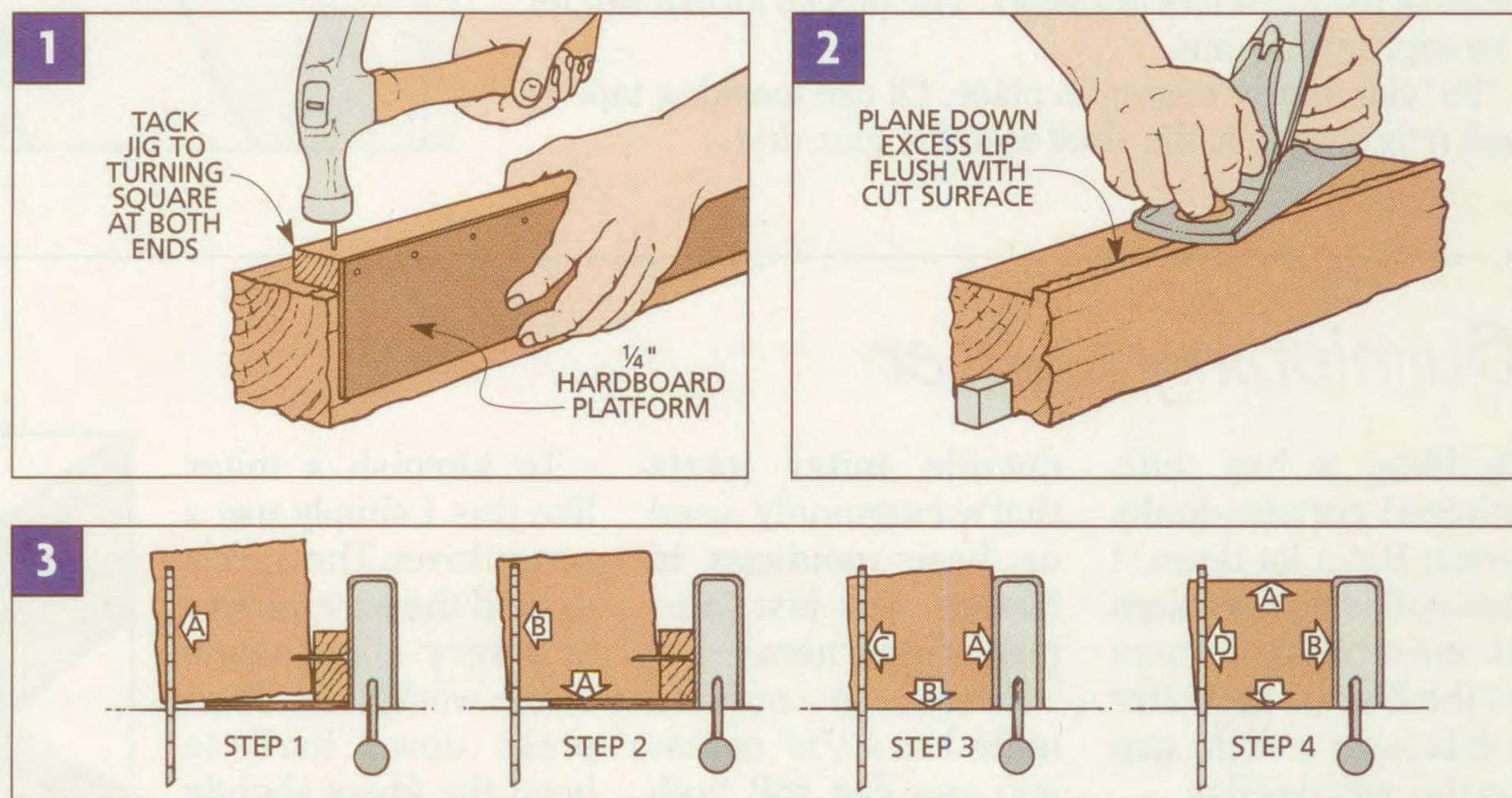
face "A." For a clean cut, I ripped this face in shallow increments, raising the blade slightly between each pass.

Here's where you'll have a bit of a problem. A 10" blade can't be raised high enough to cut all the way through a 3" turning square. So to solve this, I removed the square from the jig and planed down the extra lip (*Fig. 2*).

Next, turn the square one quarter turn (*Step 2*), nail it back in place on the jig, and adjust the rip fence to cut the next surface "B."

Two Square Sides – Once again, make the cut in increments and plane it flat. At this point surfaces "A" and "B" should be square to one another.

To make the final two cuts, the jig won't be needed. Just set the rip fence for the finished width and cut surface "C" (*Step 3*), and finally surface "D" (*Step 4*).



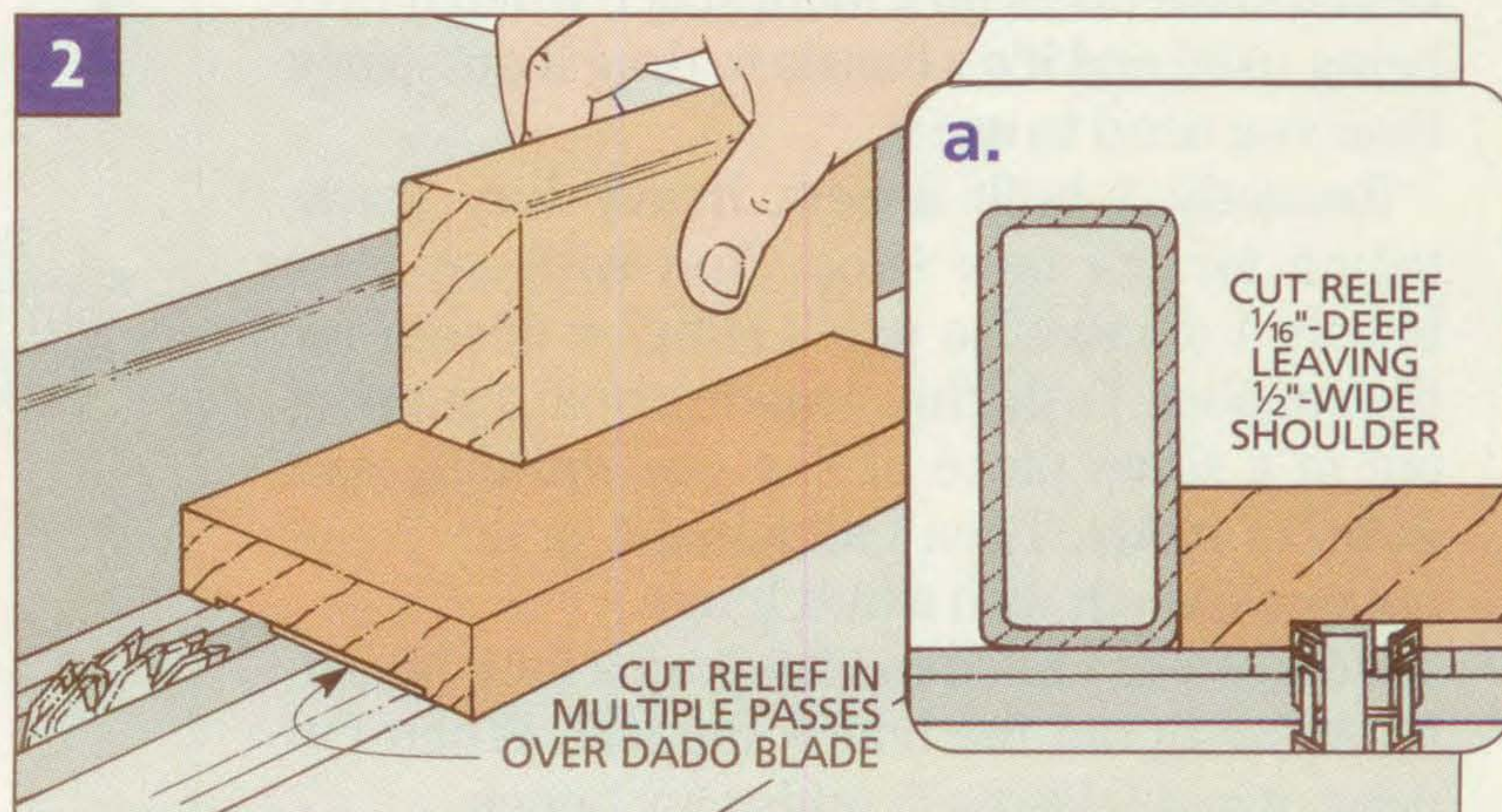
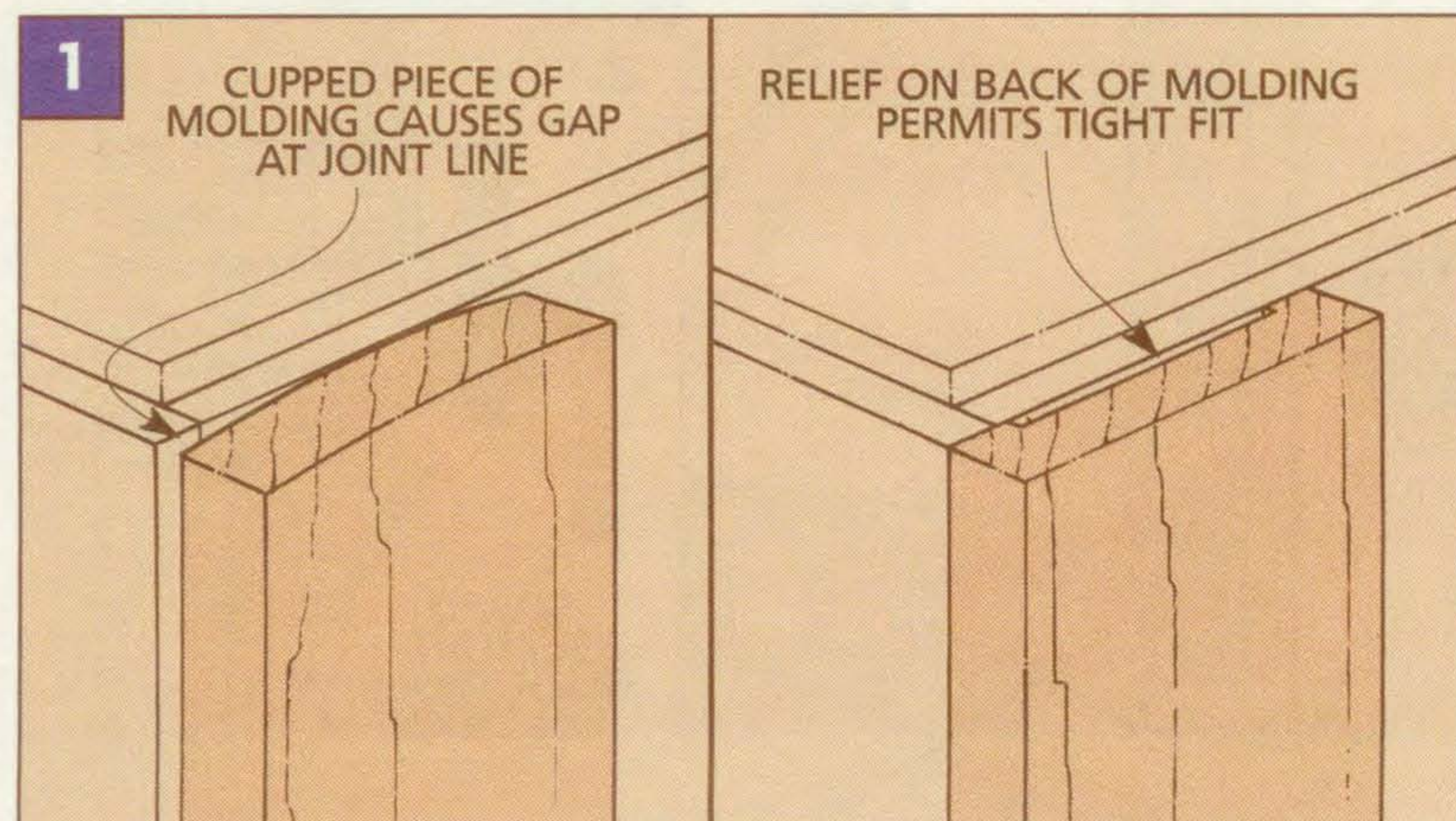
"Trim" the Trim for a Tight Fit

The success of a great project depends on the fit of the parts. This is especially true for trim such as case blocks that are applied to the face of a project.

Case Blocks – These blocks add a distinctive touch on a formal bookcase and are often used to hide end grain on the side pieces of a base or pediment. The blocks should fit tight to the case along their edges. But if the blocks are cupped even slightly the edges won't fit tight (*Fig. 1*).

Carpenter's Fix – This is the same problem faced by carpenters who install trim molding in houses. Their solution is to use molding that's milled with a shallow "relief" on the back side. With the relief cut the piece is able to flex so that it fits up tight against a wall.

So I cut a shallow channel across the back side to create relief behind the block (*Fig. 2*). **Note:** In order to avoid weakening the block, only cut the channel 1/16" deep.



Applying Flexible Veneer

When veneering a small project, I typically use flexible veneer. (Other types of veneer are available, but they don't work as easily.)

Paper Backing – Flexible veneer has a paper backing that keeps the thin hardwood veneer from cracking as it's rolled onto a project. (Don't try to remove this paper.)

Before applying veneer, clean up the substrate. For the best bond, it must be smooth and free of voids. If

there are any voids in the surface, use a wood filler to level them out.

After applying a wood filler, sand the surface smooth. Then, I like to remove any dust by wiping the surface with denatured alcohol.

Now, cover both the veneer and the substrate with two coats of nonflammable, solvent-based contact cement.

After the cement dries (in about 15 minutes), the veneer is ready to be applied to the substrate.

Instant Bond – But a word of caution. As soon as the two cemented surfaces touch, they're stuck for good.

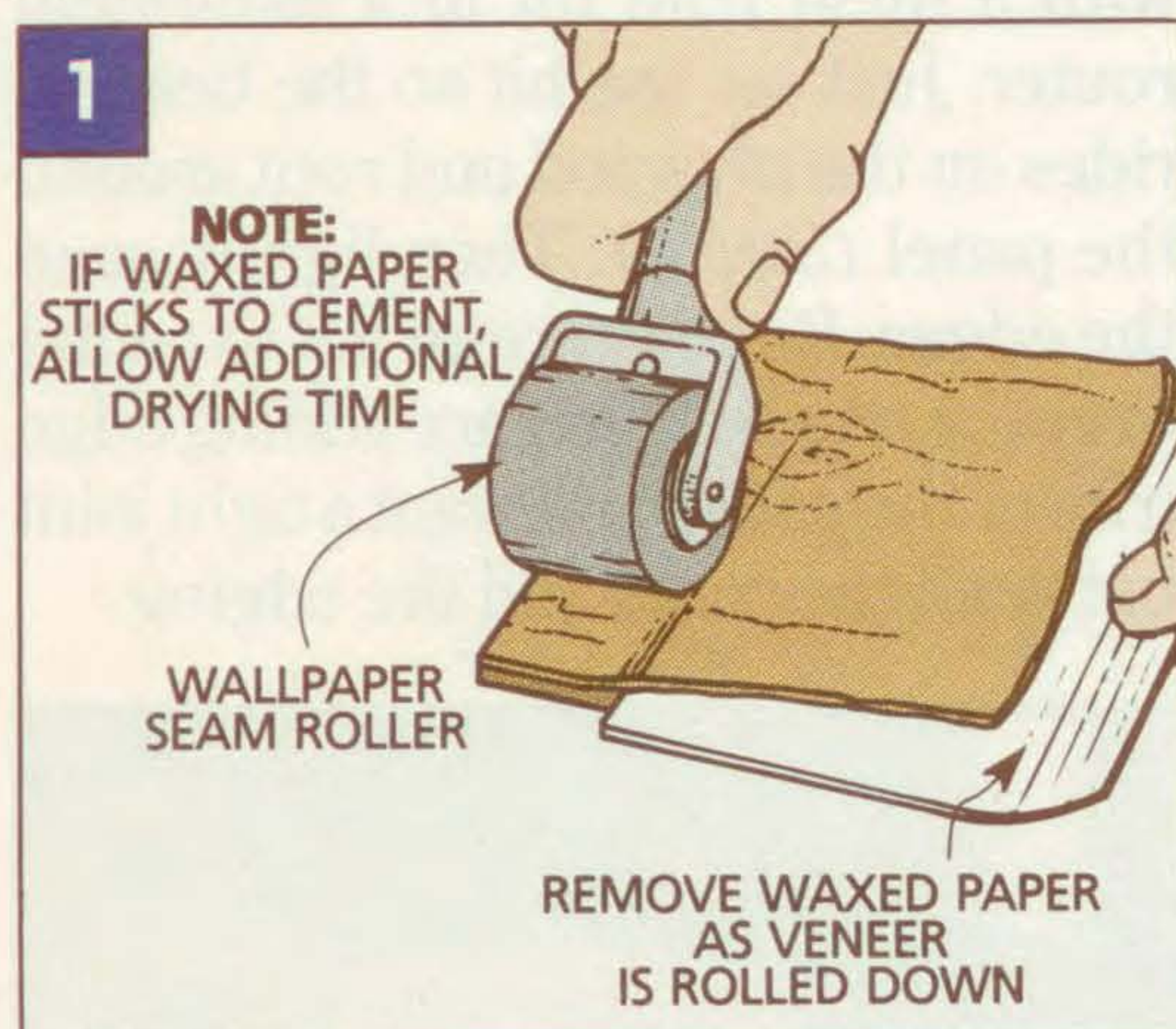
So, to avoid prematurely sticking the two pieces, first cover the dried substrate with a sheet of waxed paper. Then position the veneer.

When the veneer is down, slowly pull out the waxed paper (*Fig. 1*). As you're removing the paper, flatten the veneer with a roller. This improves the glue bond and squeezes out air bubbles.

Roll It Out – After the waxed paper is removed, I roll out the veneer again, starting in the center and rolling towards the edges.

After rolling out the bubbles, the veneer can be trimmed to the edges of the workpiece with a razor knife or veneer saw (*Fig. 2*).

Note: Before trimming the edges, inspect the grain direction on the veneer. Then cut with the grain first to avoid tearout.



Old-Fashioned Way To Install a Drawer

Sometimes, I'll install drawers so that they ride on simple wood guides. To make this work, you have to cut grooves in the drawer sides. And to get the drawers to slide in and out easily, the grooves need to be sized exactly.

Note: Before I install the wood guides, I like to chamfer their outside edges first (*Fig. 1a*). This prevents the corners from breaking with use.

Two Steps – Getting all the grooves to fit the guides is a two-step process. First, I cut the grooves so each drawer fits tightly on its guides. Then I sanded the grooves until the drawers slid smoothly.

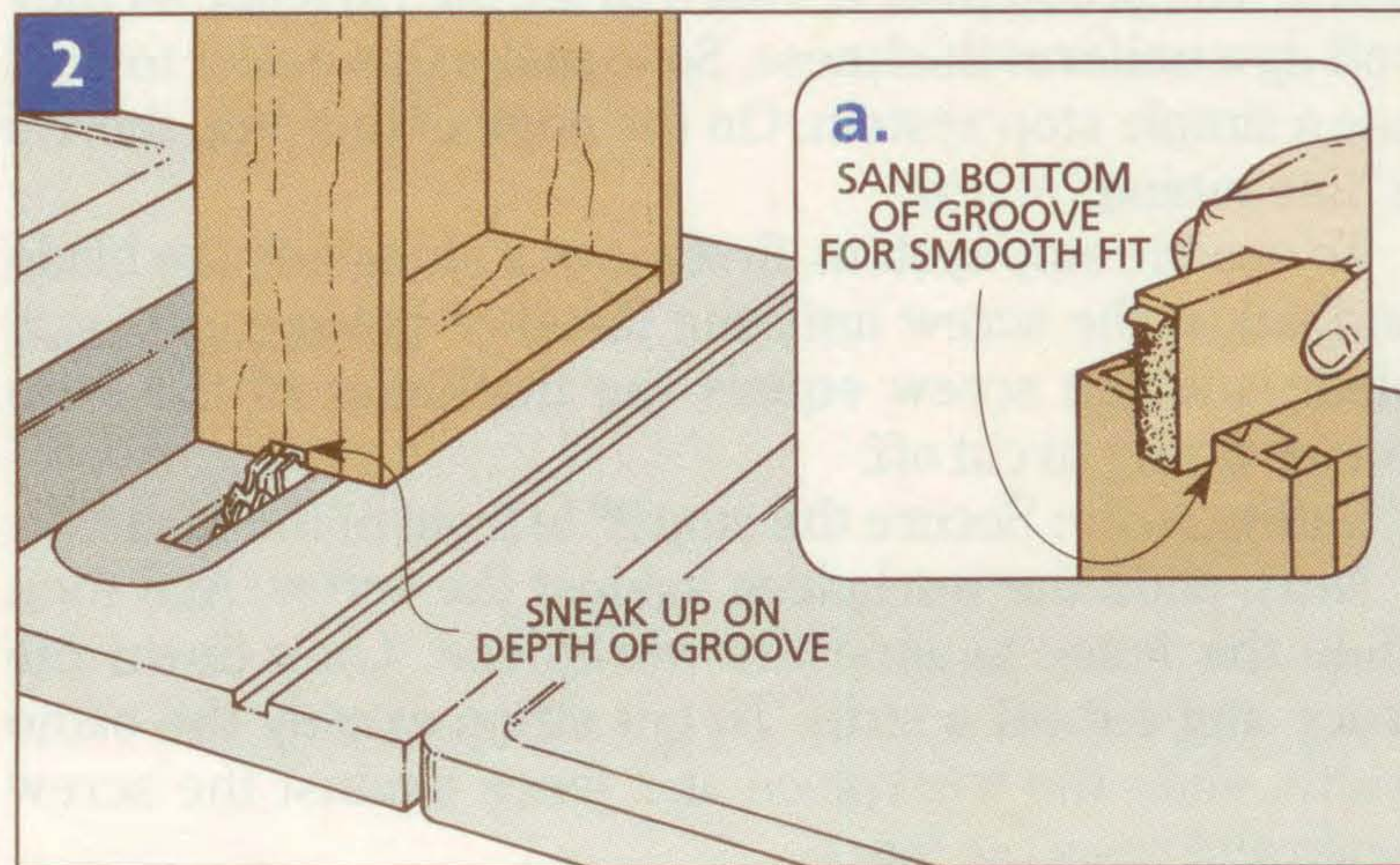
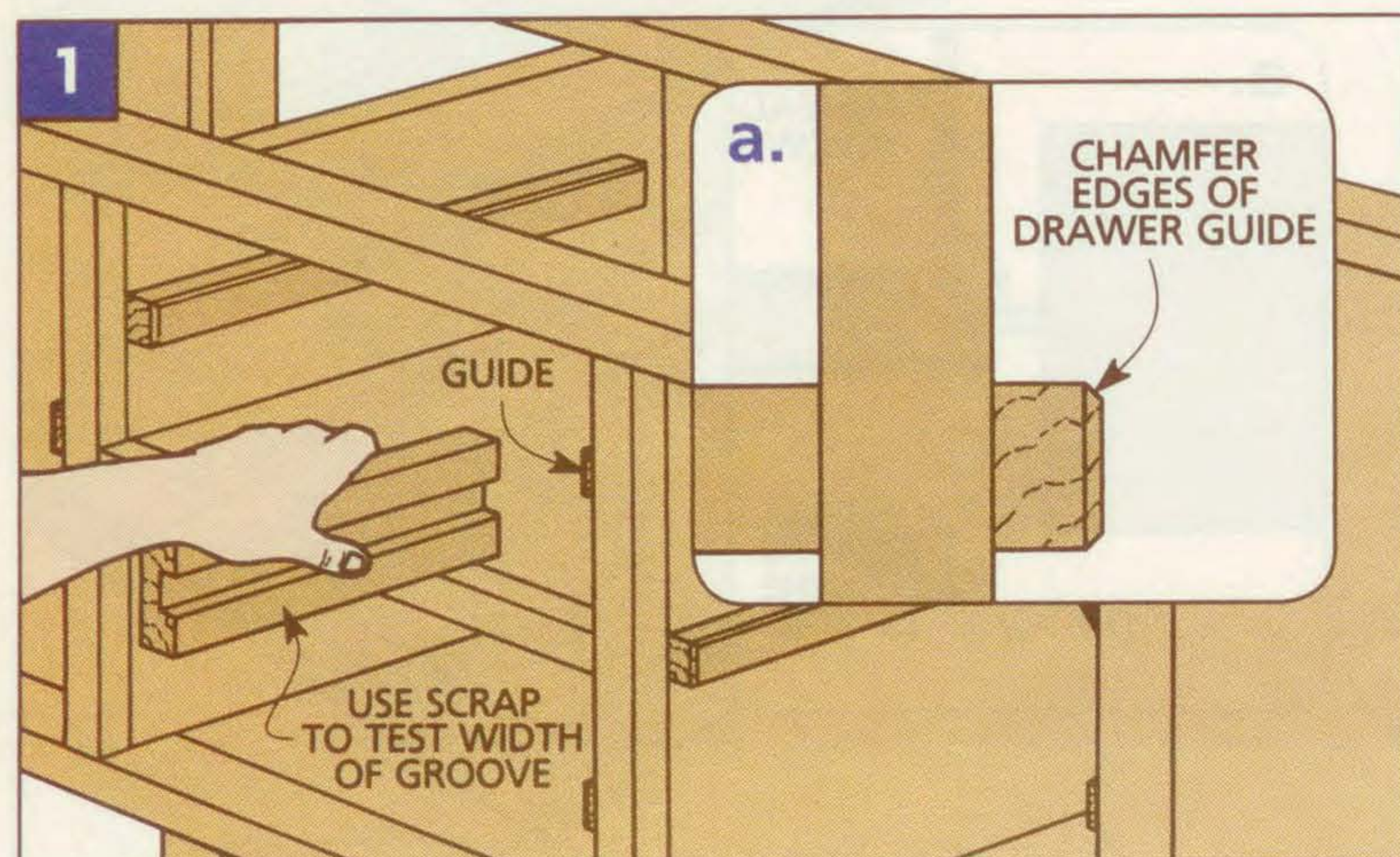
A dado blade in the table saw works best to cut the grooves. Use a scrap piece to test the width (*Fig. 1*). Then set the rip fence so the grooves are centered on the sides of the drawers.

Now the depth of the grooves needs to be established. Your goal is a tight fit with no side-to-side movement. The best way to do this is to sneak up on the final depth (*Fig. 2*). (I started by cutting the grooves just under 1/4" deep.)

After making a pass on each side of a drawer, test the fit of the drawer in its opening. If it fits too tight (or doesn't fit at all), raise the blade a hair and cut the grooves again. But remember, you'll be cutting both grooves deeper, so make blade adjustments very small.

When each drawer fits snug in its opening, sand the bottom of the grooves until the drawer slides smoothly (*Fig. 2a*). But don't sand the full length of the grooves, only the high spots.

Finally, apply some wax to both the grooves and the drawer guides for even smoother sliding drawers.



Apply Your Own Laminate

I recently finished building a bedside table with a pull-out tray. I really liked it because it provided a convenient place to set a drink or snack. And because the tray is covered with plastic laminate, I didn't need to worry about a spill ruining the finish.

But applying laminate can be tricky and you can quickly get yourself in trouble if you don't follow a logical sequence. The easiest way to do it is to use contact cement, a roller, and a flush trim bit to even up the edges.

Contact Cement – Many experienced woodworkers prefer using contact cement to attach laminates and veneers to a substrate. That's because once the mating surfaces touch, that's where they will stay. There's no sliding around on wet,

slippery glue. And the instant bond allows you to roll out the surface to remove air bubbles.

The first thing to do is to apply a coat of contact cement to both the oversized laminate and the plywood tray panel. You'll know the pieces are ready to be joined when you touch the cement and it feels tacky, but doesn't stick to your finger.

Spacers – When you're ready to fasten the laminate to the tray, you don't want the pieces to touch until the laminate is properly positioned over the plywood. To allow you to do this, set some dowels on the panel to serve as spacers (*Step 1 below*).

Roll Out – Once the laminate is in position, start from one end and remove one dowel at a time. Use a

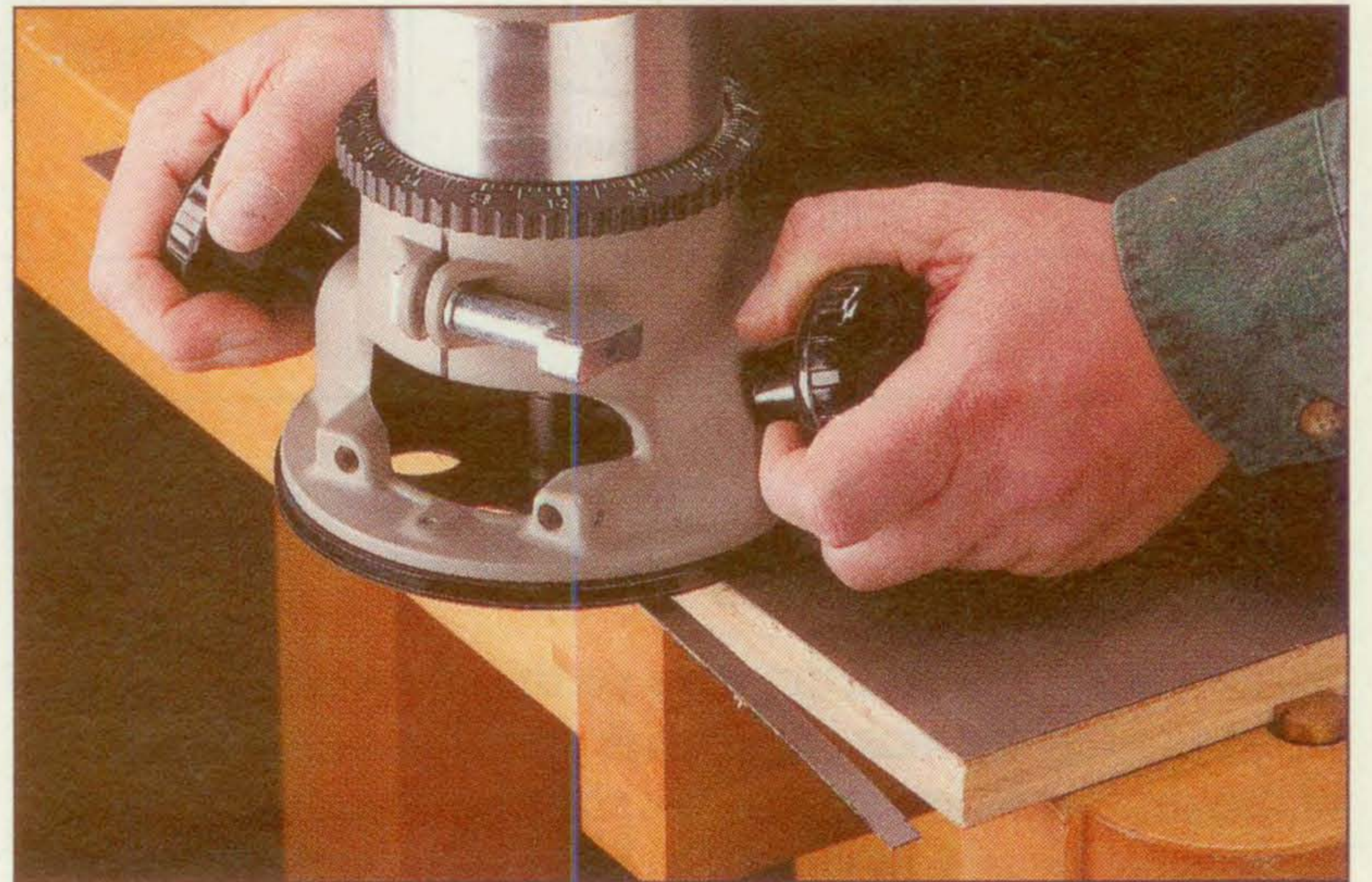
roller to press the laminate down as you go (*Step 1*).

After the dowels have been removed, use the roller to work from the center of the panel out to the edges. This will help remove any trapped air bubbles. And don't be afraid to really bear down on the roller. The more pressure you apply, the better the bond will be.

Trim Flush – After the laminate is in place, it needs to be trimmed to match the panel. This is easy to do with a flush trim bit in a hand-held router. Just set the bit so the bearing rides on the plywood and rout around the panel (*Step 2*). Then lightly sand the edges. But be careful not to round over the edges. If you are adding edge trim to the panel, you want a tight joint between the panel and the edging.



1 Before positioning the oversized laminate, lay a series of dowels on the plywood. Then when the laminate has been properly placed, remove the dowels one at a time and roll the laminate down.



2 There's a good reason for cutting the laminate oversized. This way, you have some "play" room when you position it over the plywood. Trim the laminate even with the plywood with a flush trim bit in a hand-held router.

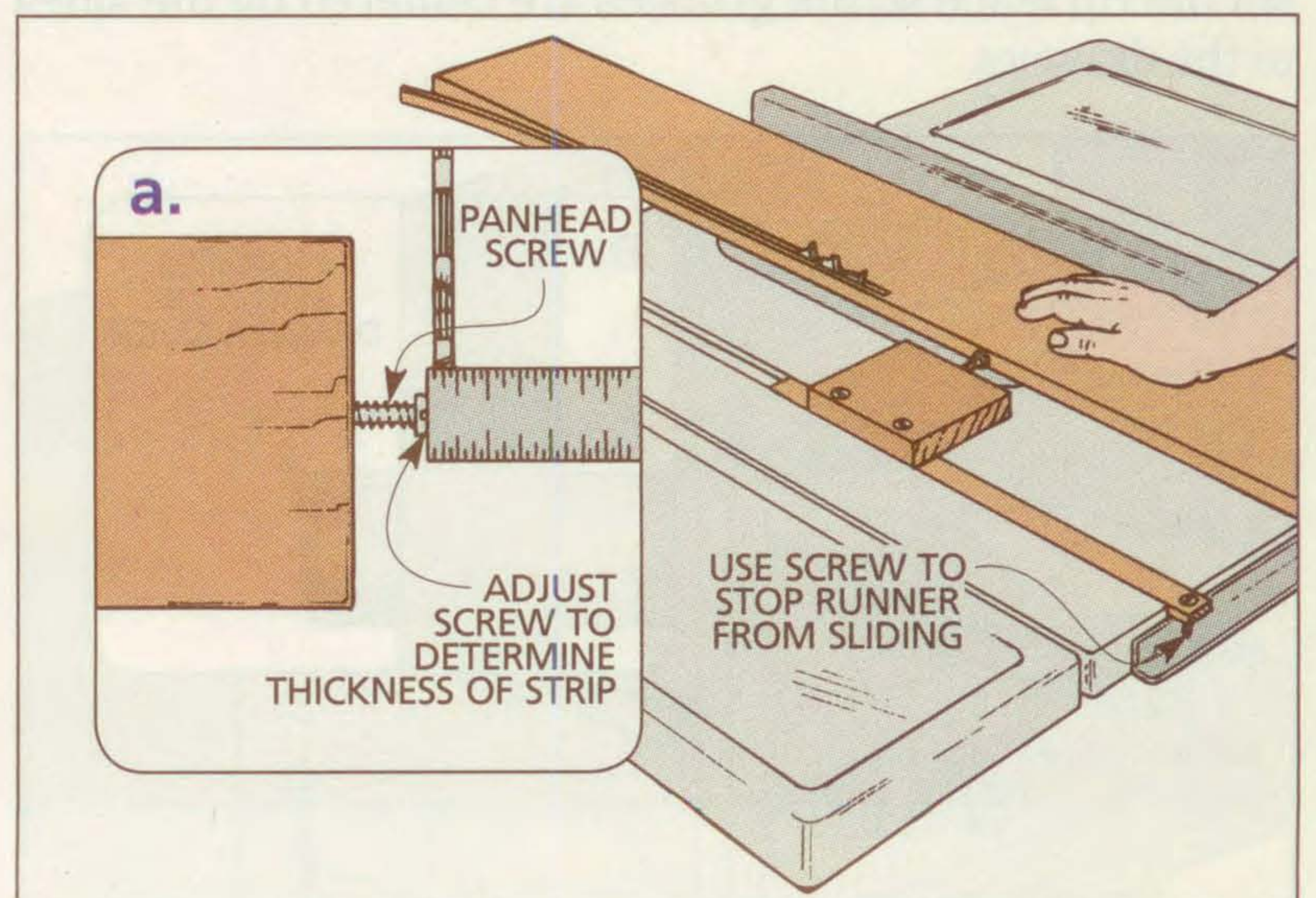
Safely Cut Thin Edging Strips

To cut thin strips safely, I rip them off the waste side of the stock. The problem is, it's hard to set the rip fence so they end up a uniform thickness. So to make this easier to do, I use a simple stop system. On the edge of this stop there's a "fine tuning" screw.

To use the stop system, first move it alongside the blade and adjust the screw until the distance between the saw blade and the screw equals the thickness of the strip you're trying to cut off.

Safety Note: Secure the stop 3" in front of the blade.

Next, slide the workpiece against the screw. And then slide the fence against the workpiece. Lock down the fence and cut off a strip. To cut strips exactly the same width, slide the workpiece and fence against the screw again and reset the fence.



Label Cutoffs

Have you ever considered how much time you waste sorting through a stack of scraps in your scrap bin, looking for “just the right piece?” As you know, it can be really frustrating.

Magic Marker – Even in a large stack of cutoffs, it’s quick and easy to find the size you need if you mark the dimensions on the ends of the stock. I keep a wide-tipped permanent felt marker in the workshop to make the markings easy to read.

If you have enough space, it even makes sense to separate the scraps by species, like you can see in the photo below.



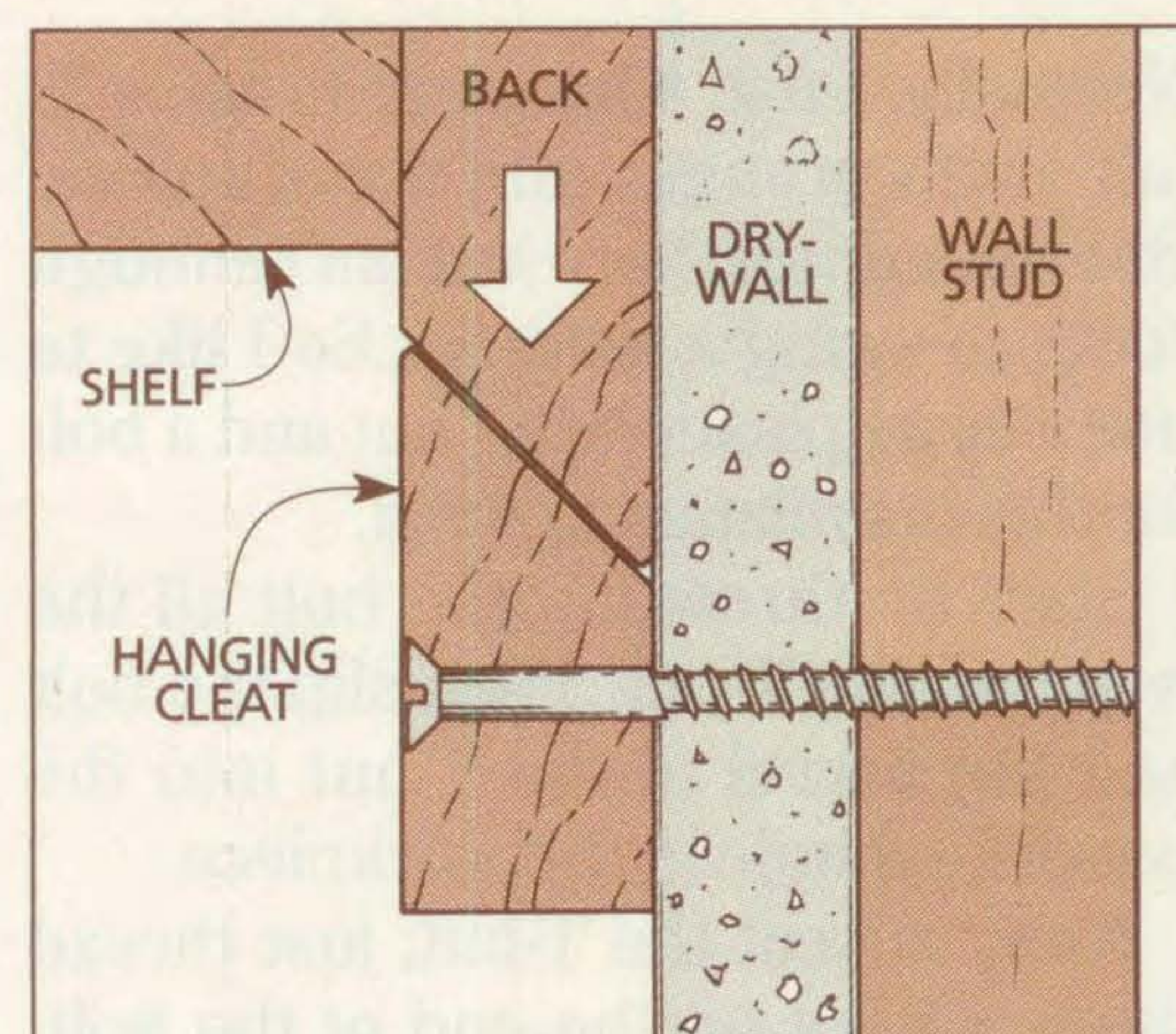
Invisible Cleats for Hanging

This hanging system works great for heavy shelves that hang on wall studs. It consists of two beveled strips that interlock and permit the mounting screws to be located anywhere.

The beveled cleat is ripped from one edge of the back piece. Then the cleat is screwed to a pair of studs.

After it’s finished, hang the shelf on the cleat so the mating bevels interlock.

Note: This system can be easily adapted to just about any project.

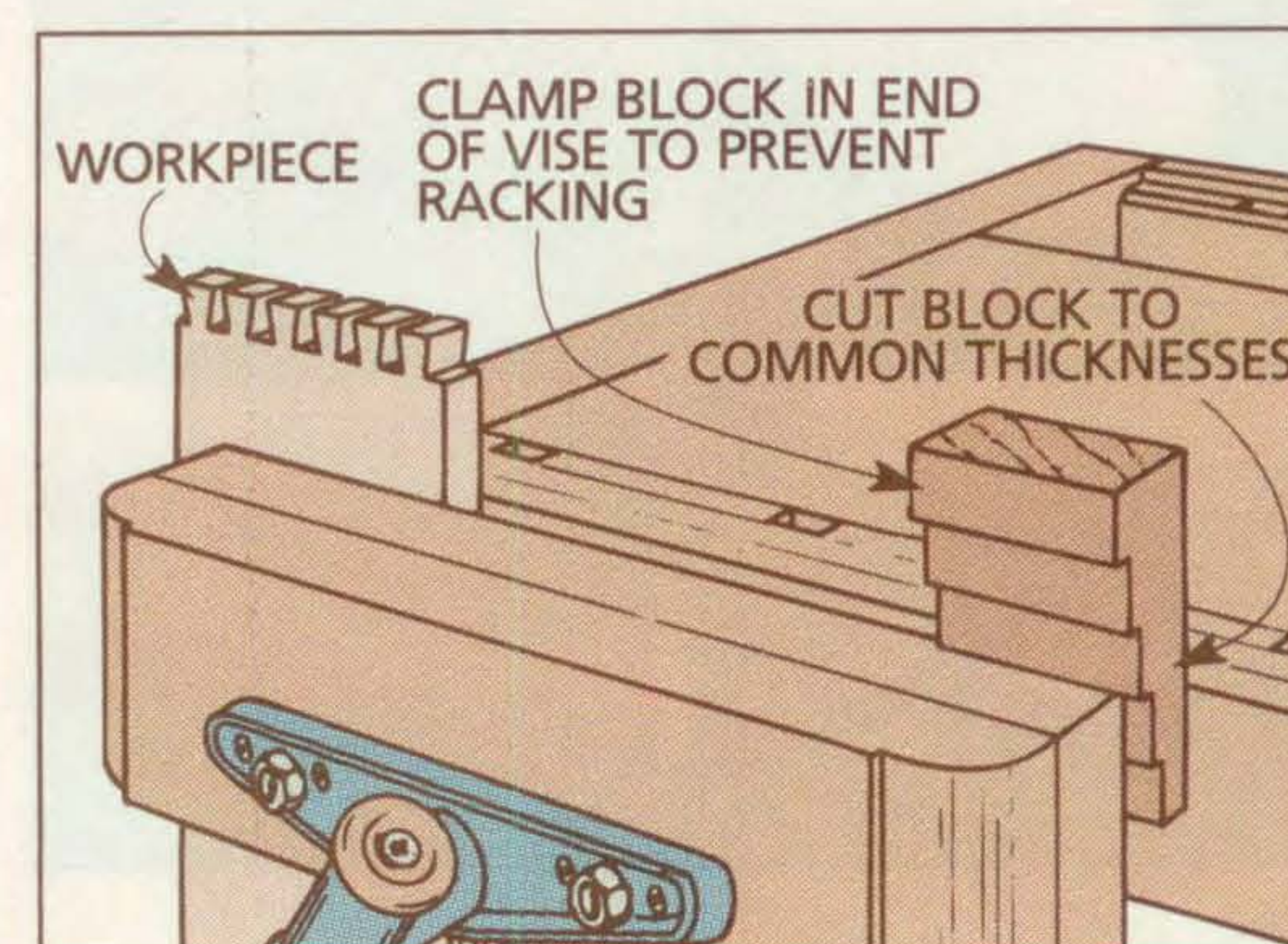


Preventing Vise Rack

One of the problems with vises is that they can rack. If you tighten down a piece of wood in one end of the vise, the other end toes in.

This racking means pressure will be applied only to one edge of the workpiece, causing the assembly to pivot or spin as you work on it.

To prevent this, I made a stepped block. Then I choose the thickness on the block closest to my workpiece and slip it into the other end of the vise. Once it’s tightened down, the workpiece is held tight.

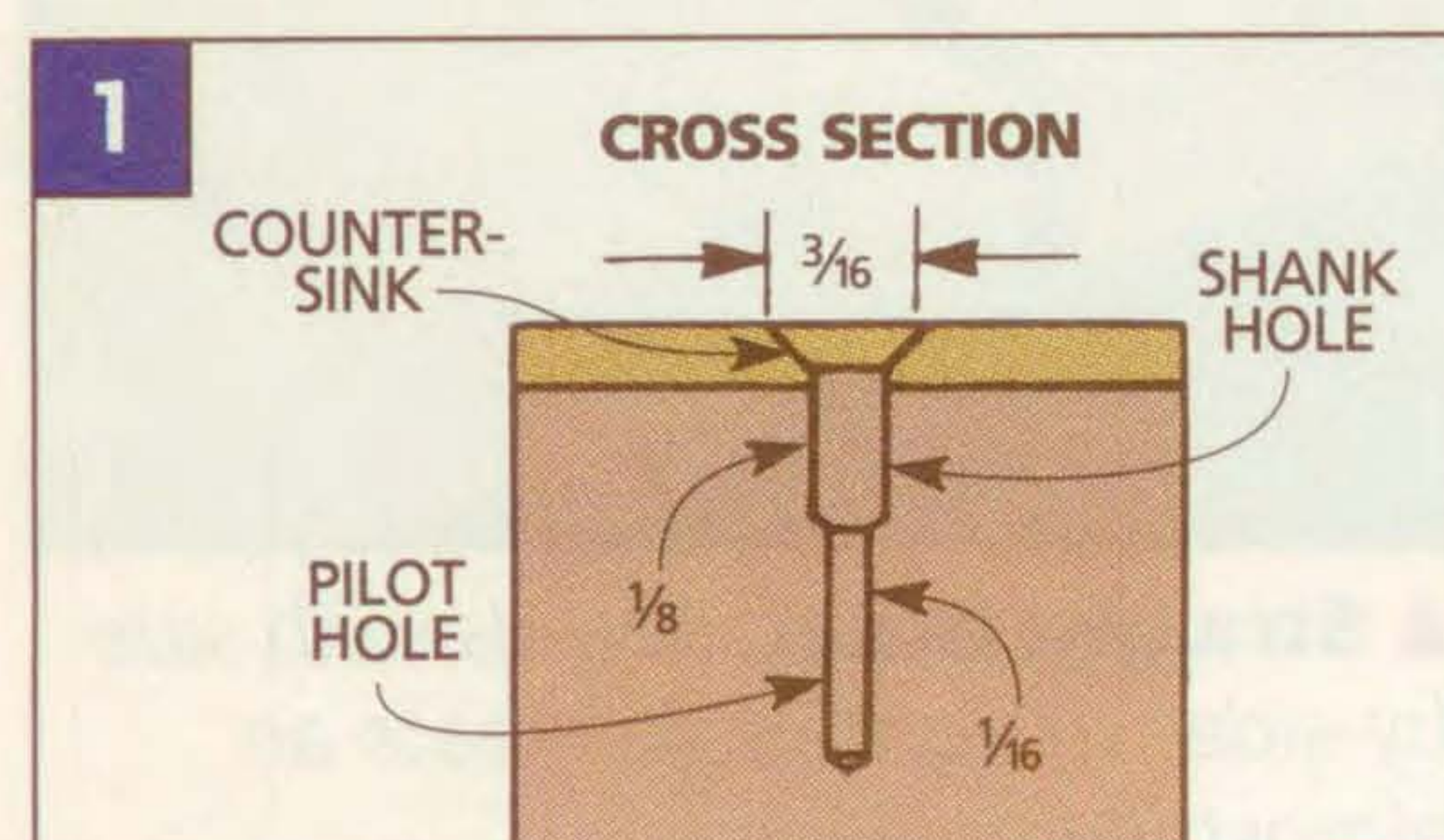


▲ **Notched Block.** For workbenches that have a heavy bench vise with a wood face, I use this notched block to prevent vise rack.

Quick Tips for Attaching Brass to Wood

When I need to attach brass to wood, I like to use cyanoacrylate glue (CA) and brass screws. The “instant” glue holds the brass in place temporarily while I drill pilot and shank holes and the countersink (Fig. 1).

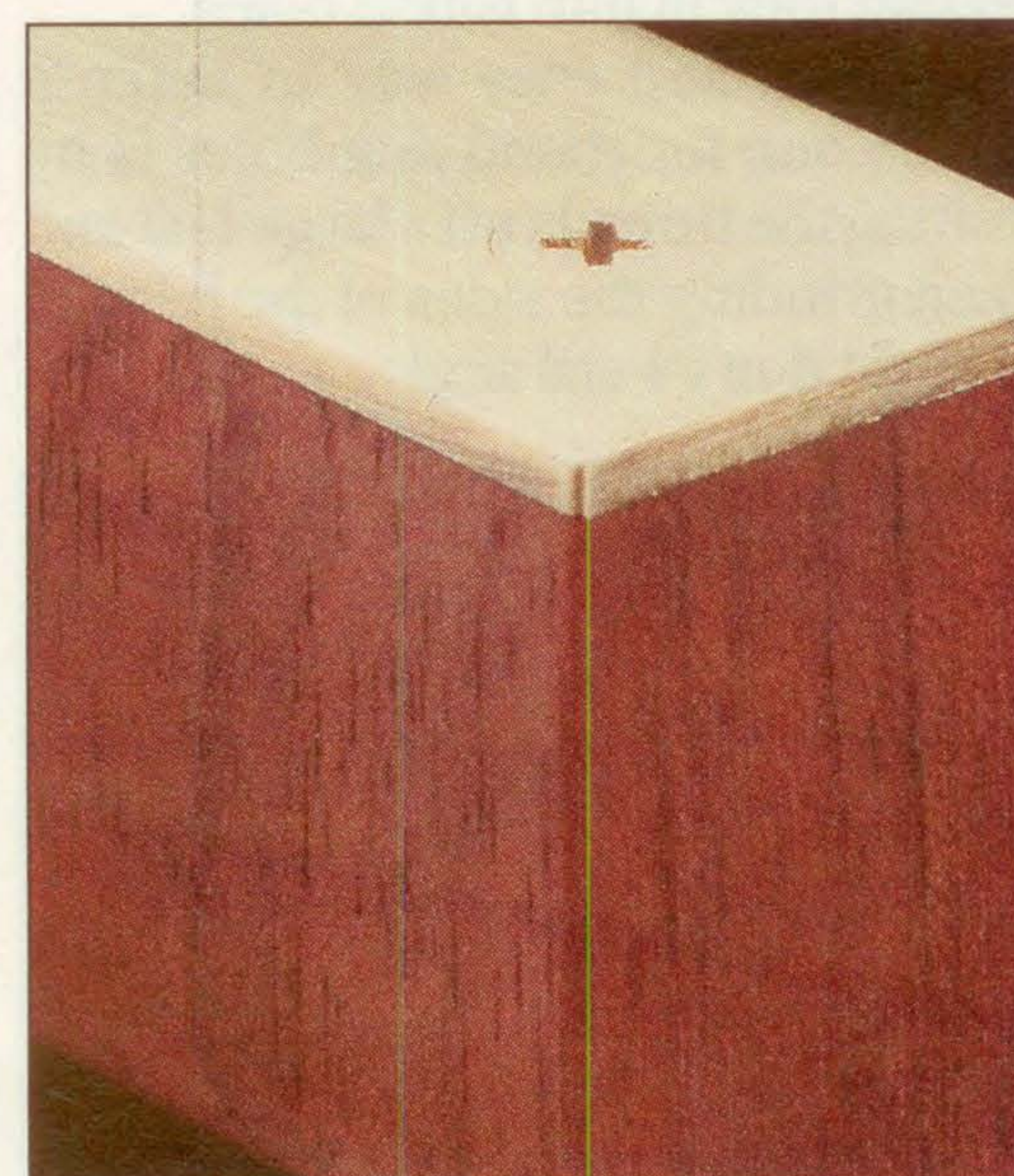
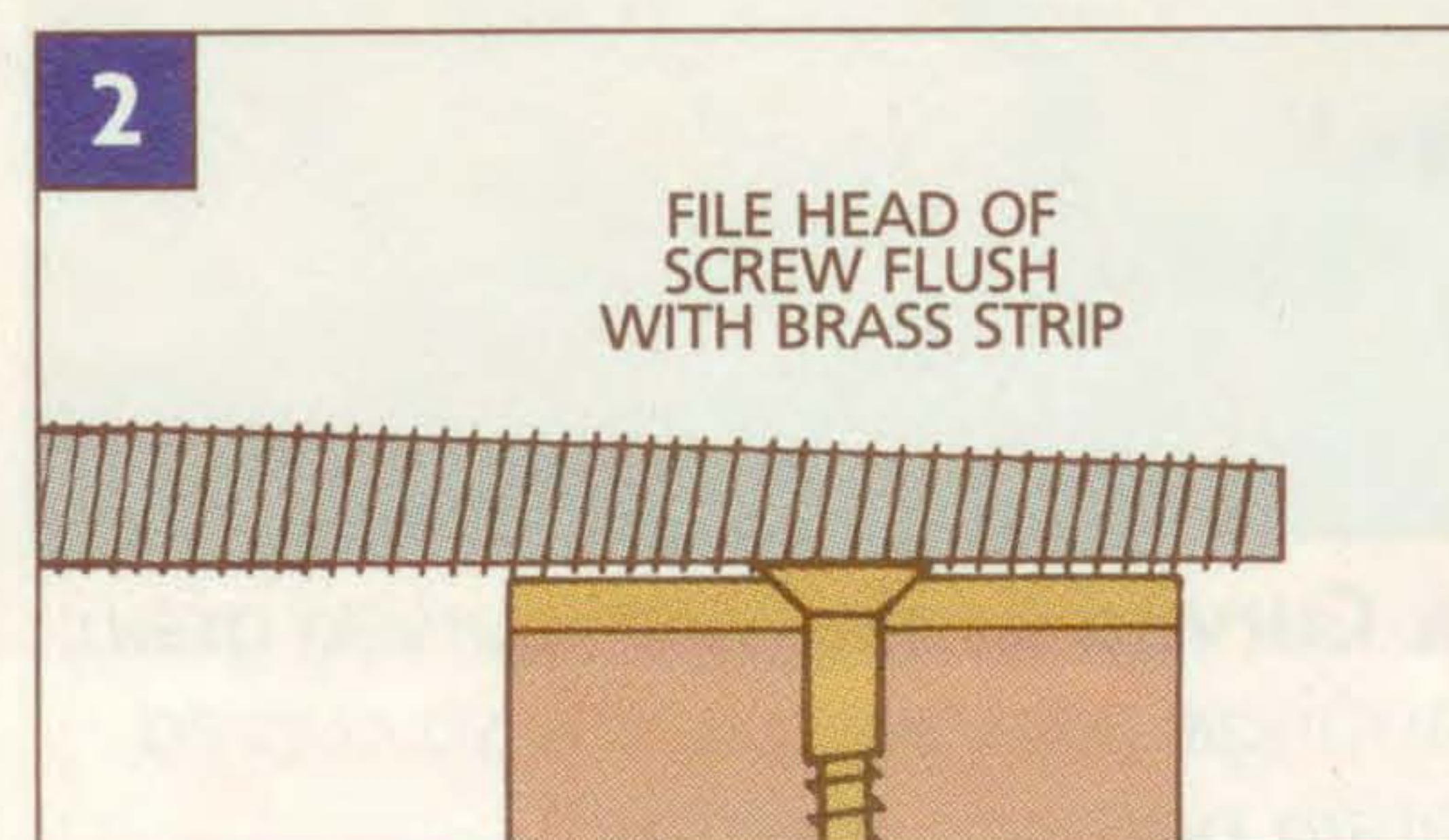
Pilot Hole – Most of my projects that incorporate brass inlays or overlays, are custom-made hand tools that require small brass screws. So to install them I start by drilling a 1/16"-dia. pilot hole, 1/2" deep, through the brass and into the workpiece.



Shank Hole – Next, I switch to a 1/8"-dia. bit and drill a 3/16"-deep shank hole centered over the pilot hole.

Countersink – Finally, I add a shallow countersink to the brass plate. The reason you’ll want this countersink a little shallow is to leave the screw head standing just proud of the brass strip.

The screws keep the brass strips attached over time. After the screws are in place, the heads are filed off flush and sanded smooth (Fig. 2).



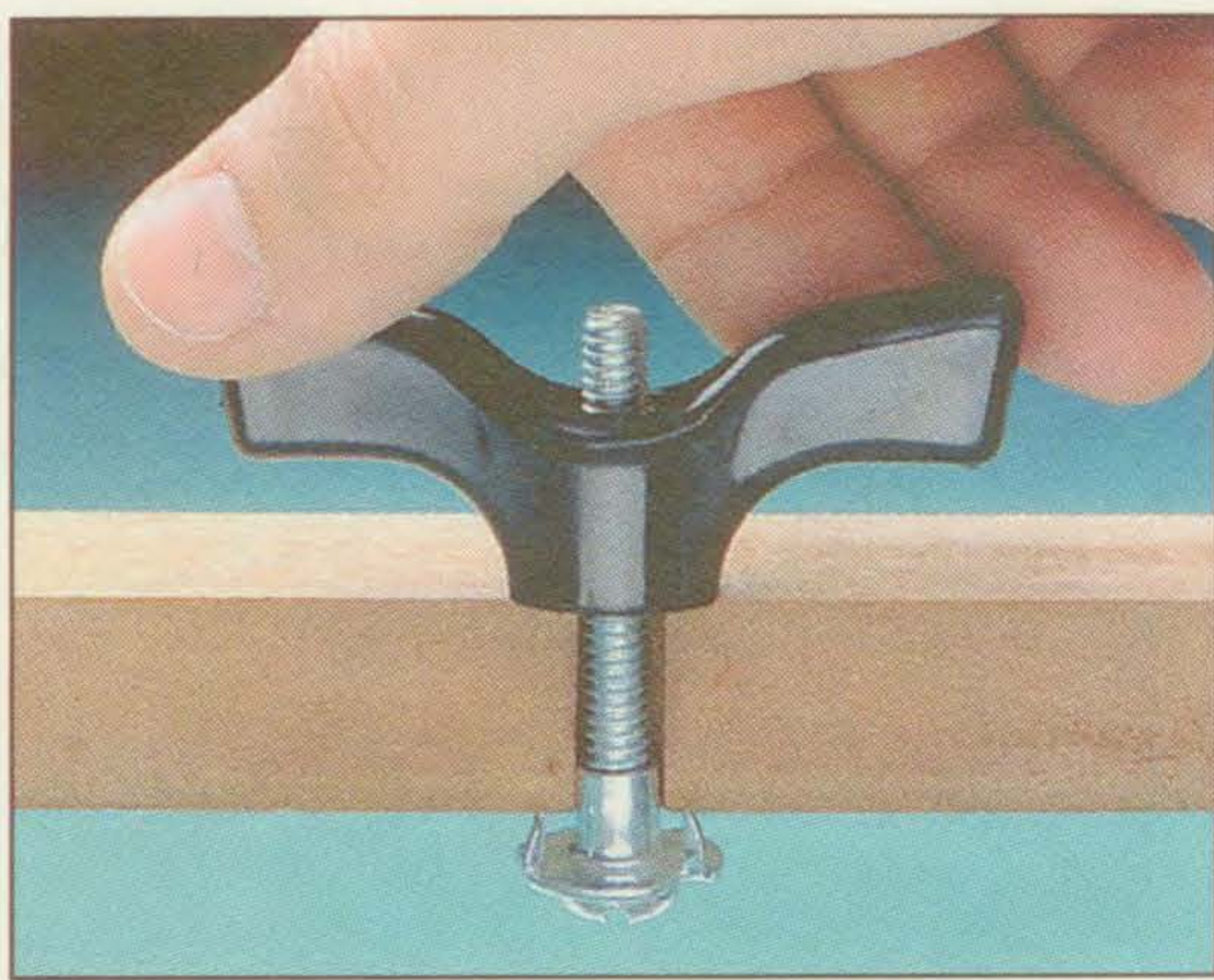
▲ **Perfect Fit.** Using this simple method for countersinking and filing a brass screw results in an almost invisible fit between the screw and the brass strip.

Installing a T-Nut

Normally, I use a hammer to tap a T-nut (with prongs) into a workpiece. But sometimes there just isn't enough room to swing a hammer. So I like to use a large plastic wing nut and a bolt for this installation instead.

Start by threading the bolt all the way into the T-nut. Then slip the bolt and the barrel of the T-nut into the pre-drilled hole in the workpiece.

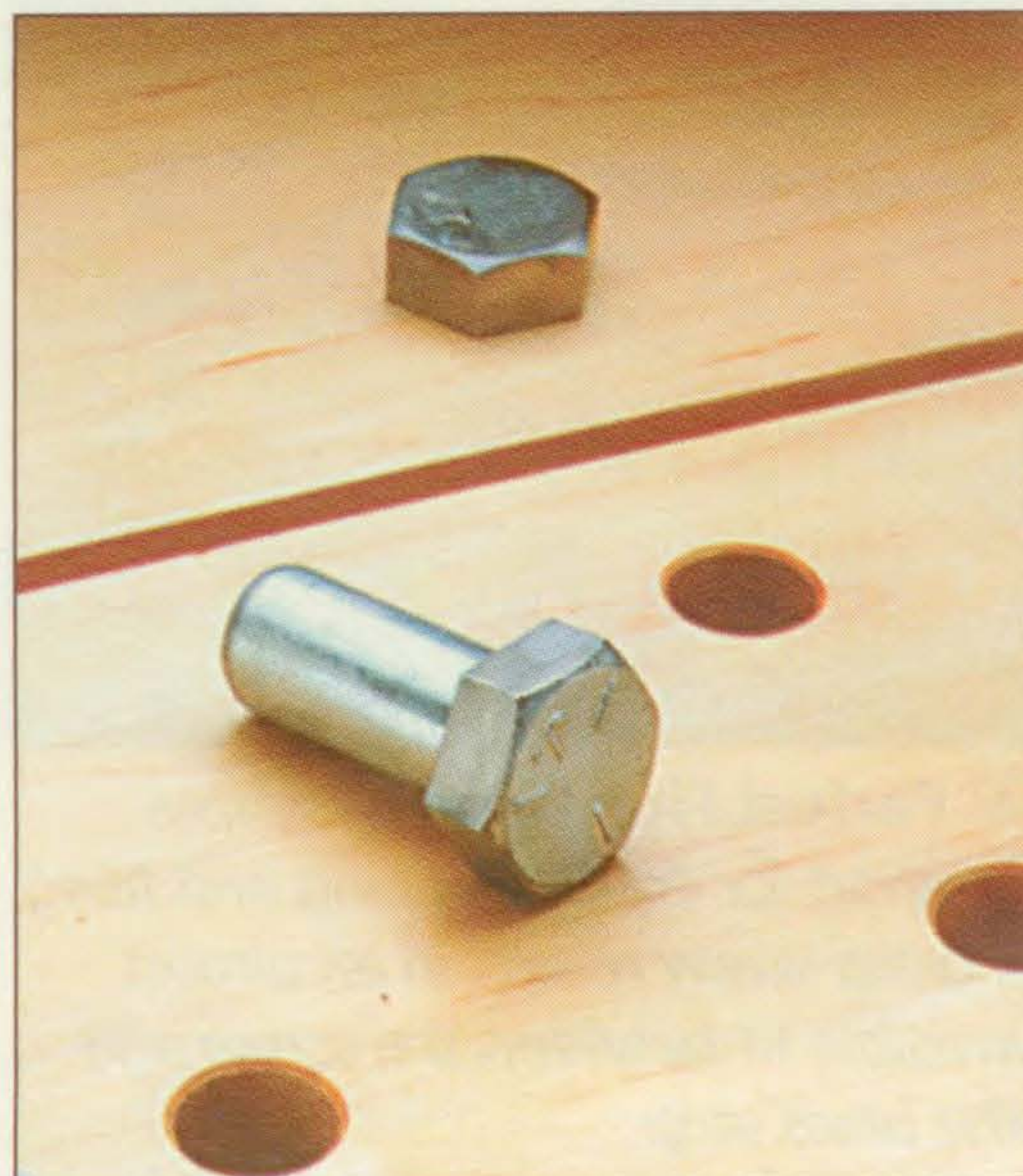
Now, to seat the T-nut, just thread the wing nut on the end of the bolt. Tightening the wing nut will tightly draw the T-nut prongs into the workpiece (see photo).



Bench Dogs

Bench dogs improve the versatility of any workbench. Early versions fit into square holes and were made out of wood. Or they can be made round so that they fit into round holes.

A quick and easy way to make a bench dog for round dog holes is by cutting the threads off a large bolt and then grinding the sides of the head at a slight downward angle.



Gluing Up a "Flat" Panel

Gluing up a bunch of narrow boards to make a wide panel of solid wood seems like such a simple thing. But there's a little more to it than first meets the eye.

The goal is to end up with a panel that looks like a single, wide piece of wood. But it also has to be perfectly flat (and stay that way). Reaching this goal is a two-step process — first, the boards are arranged to consider appearance and movement. Then the boards can be glued up.

Arrangement — The first step is to arrange your boards for uniformity. This means matching the color and grain pattern of adjacent boards (see photos below).

In addition to appearance, you'll also need to consider how the panel will move with changes in humidity.

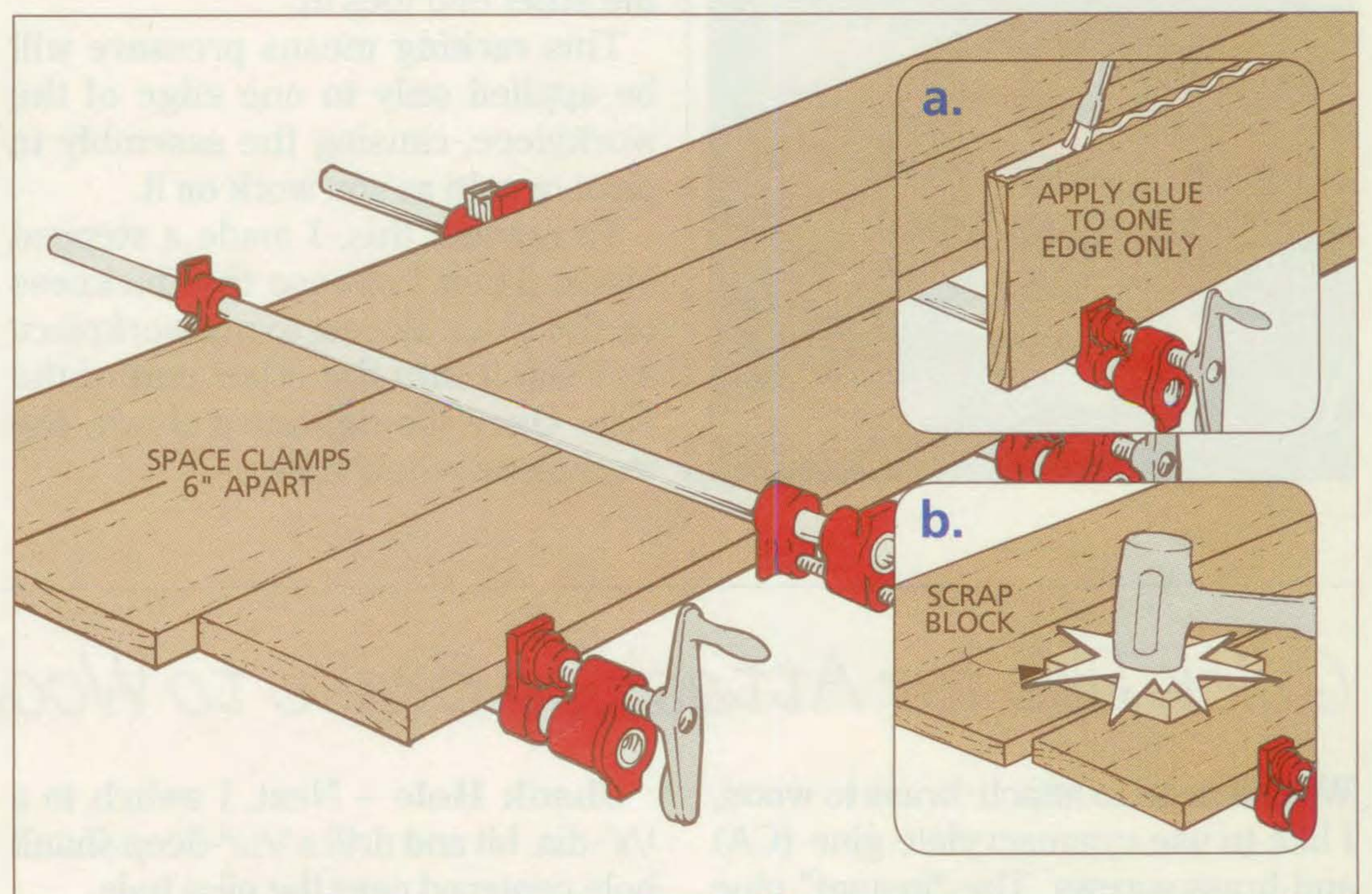
This depends on the growth rings on the end of each board. If you alternate the rings, each board moves in opposite directions. The end result is a panel that stays flat.

Glue Up — After you have the boards arranged, you still have to glue them up. Once you start, you need to work quickly to get the panel flat — and to keep it that way while the clamps are applied.

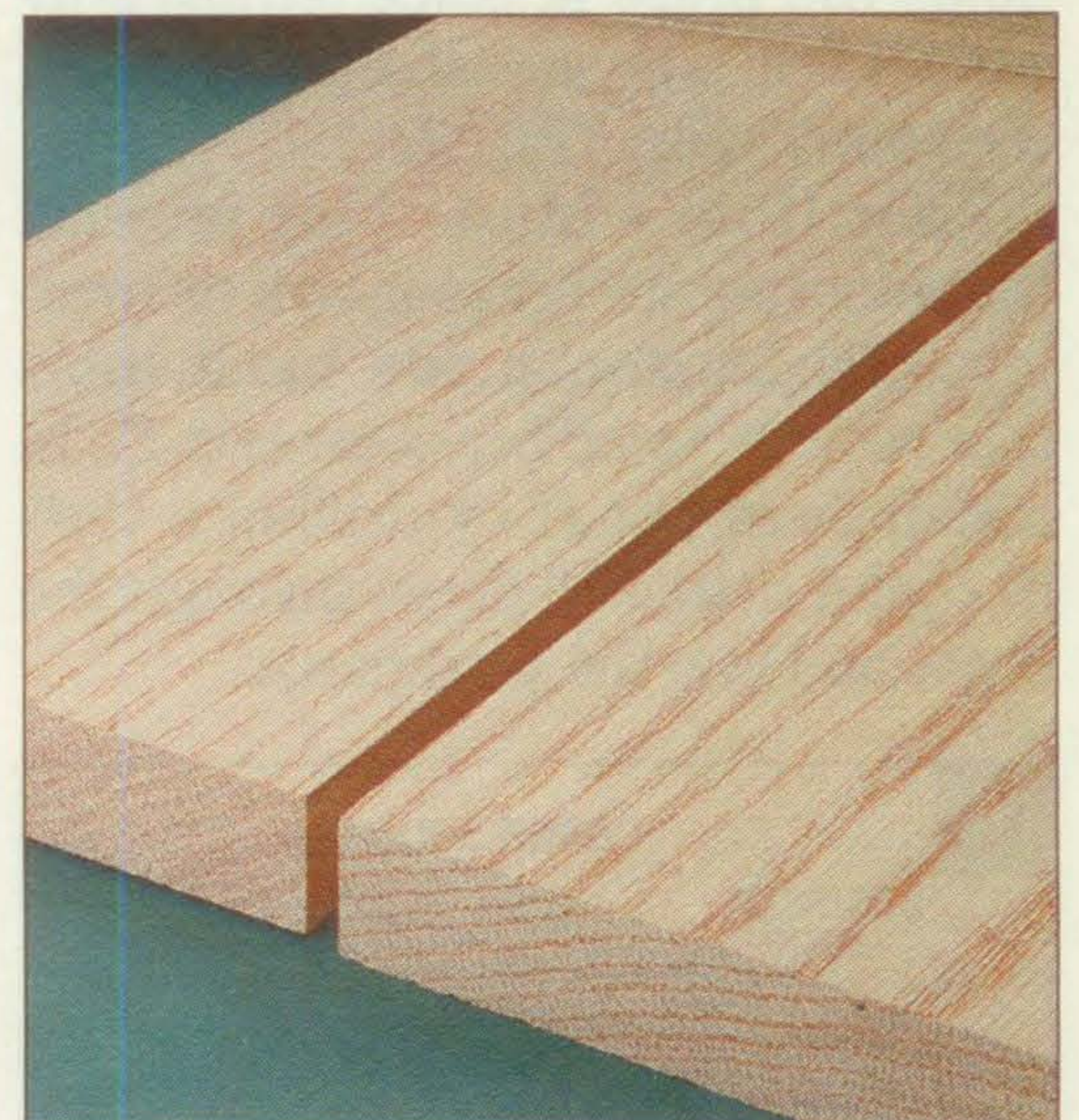
One trick that will save some assembly time is to apply glue to only one edge of each joint (detail 'a').

Then, to keep the panel from bowing as you tighten the clamps, alternate clamps above and below the panel every 6" (see drawing).

Finally, if the boards aren't exactly flush, whack them with a mallet and a block of wood (detail 'b').



▲ **Curved Grain.** With curved grain, arrange adjacent boards so curved grain patterns "merge."



▲ **Straight Grain.** Boards with side-by-side, straight-grain create an almost invisible joint.

Installing Wood Plugs

Occasionally on a project, I'll have exposed screw heads that need covering. That's when I use plugs. Wood plugs are usually available in three styles (*Fig. 1*). And the three most common diameters available are $\frac{1}{4}$ ", $\frac{3}{8}$ ", and $\frac{1}{2}$ ".

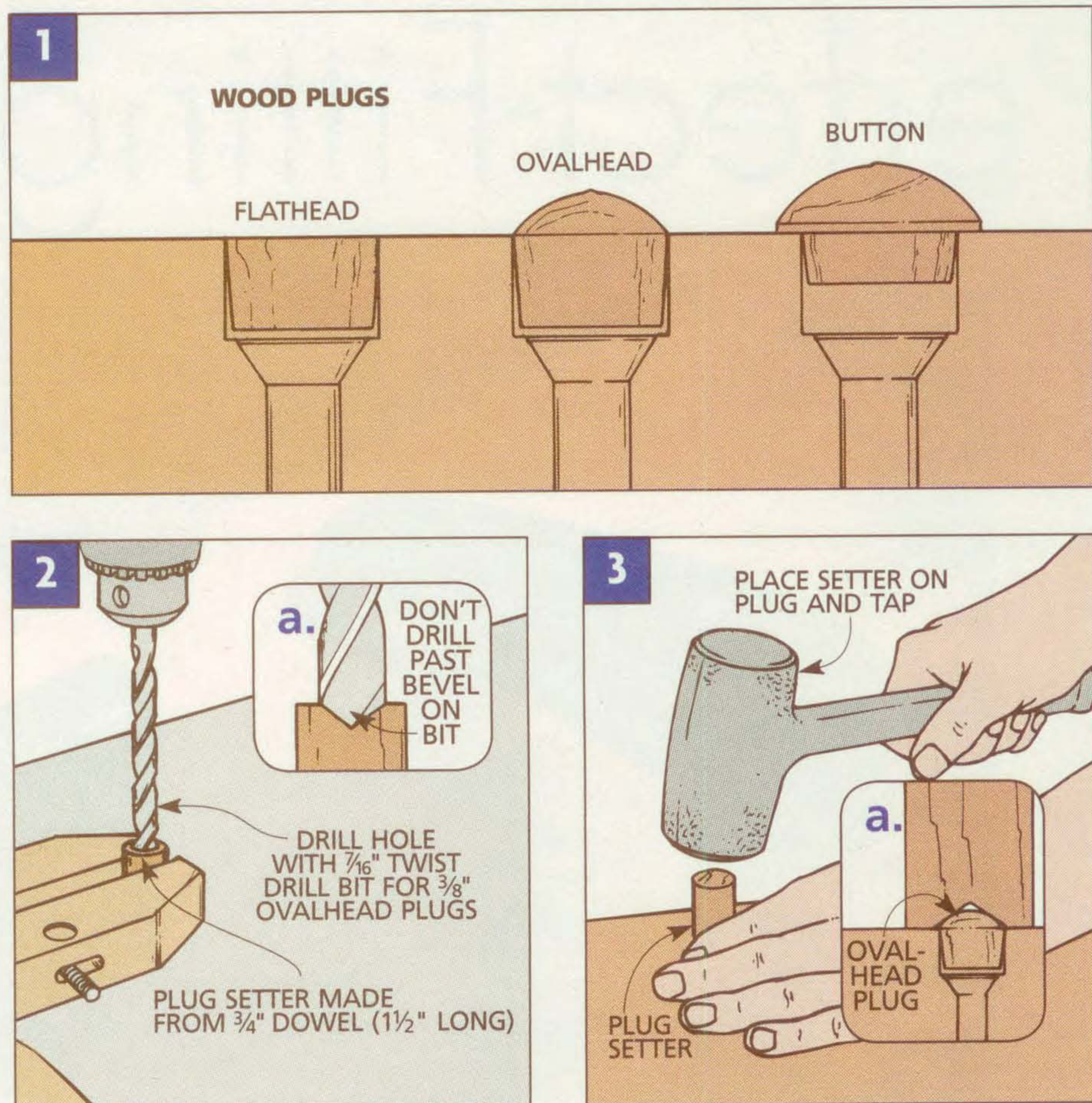
Installing Plugs – Each type of plug is unique in the way it's installed. Flathead and button plugs are simple to install. Ovalhead plugs, however, can be driven in too far, flattening the top.

With ovalhead plugs, you'll need a simple way to install them without flattening the tops. So I made a plug setter that matched the plug's rounded top (*Fig. 2*).

Construction – To make the plug setter, I first cut a $\frac{3}{4}$ " dowel, $1\frac{1}{2}$ " long. Then I drilled a shallow hole in one end of the dowel with a $\frac{7}{16}$ " twist drill bit (*Fig. 2*).

Set the Plugs – Once you've completed the plug setter, it's easy to use. First, position an ovalhead plug in a hole and place the setter over the plug. Then, tap the setter just until it bottoms out on the workpiece (*Fig. 3a*).

Note: Don't tap on the setter after it bottoms out or you could leave a doughnut-shaped dent in the work surface.



Thin Strip Push Block

Sometimes when ripping very narrow stock, I don't feel altogether comfortable using a push block that's designed mainly for wider stock. And it's nice having more than one option in the workshop. So I also built a push block that straddles my rip fence (refer to *Fig. 2*).

Stair-Step Notches – This version is made from two face pieces of $\frac{1}{4}$ " hardboard and a spacer. And for different thicknesses of stock, I cut stair-step notches on the front end of the hardboard face nearest the blade.

To make this push block, start by cutting a $\frac{3}{4}$ "-thick spacer to width to match the thickness of your rip fence.

Note: The width is critical because the push block should fit snugly over your rip fence, but not so tight that it binds when it's being used.

Cut the two hardboard face pieces 7" long and high enough to clear any adjustment bolts on the top of the rip

fence, plus $\frac{3}{4}$ " for the thickness of the spacer (*Fig. 1*).

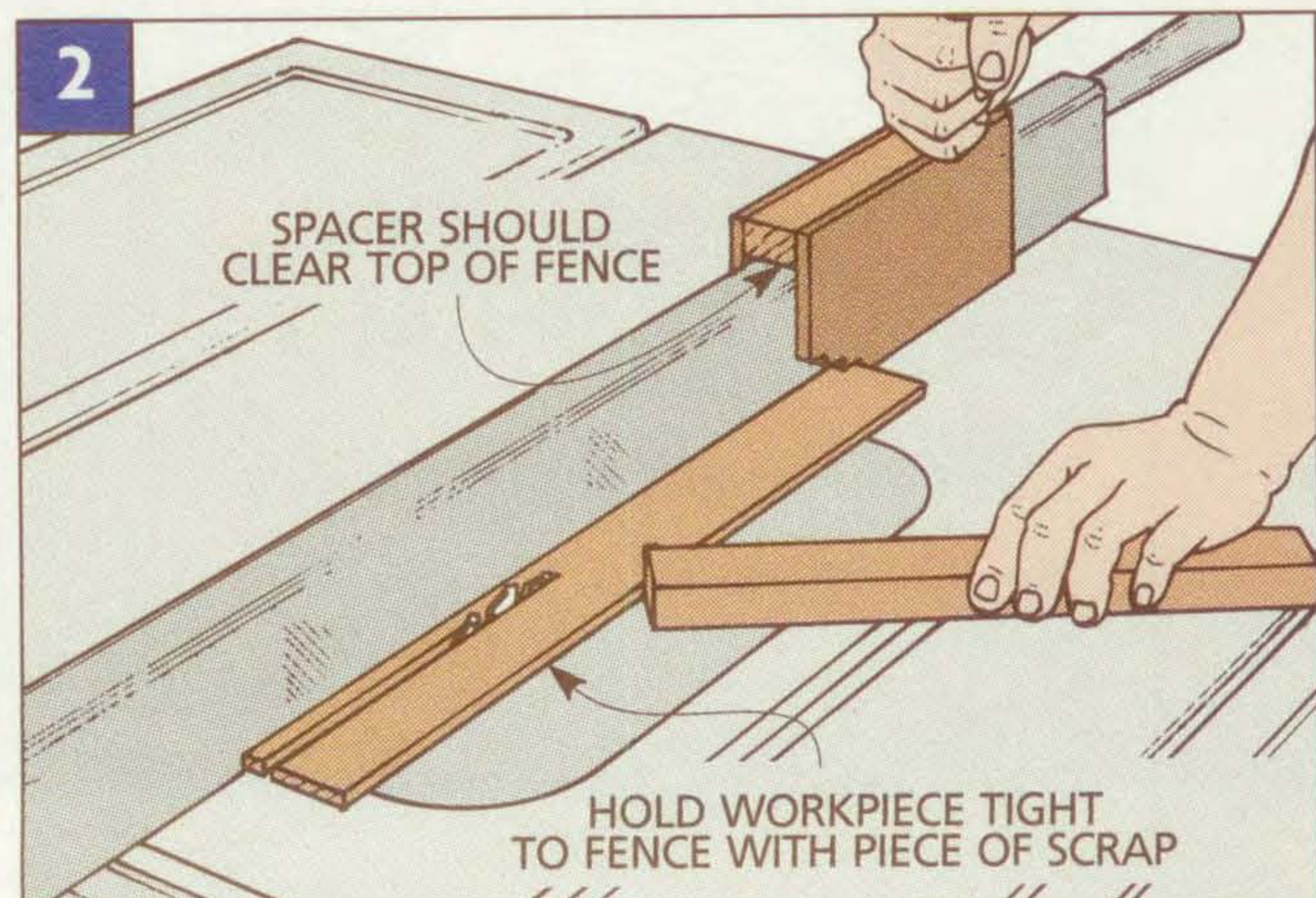
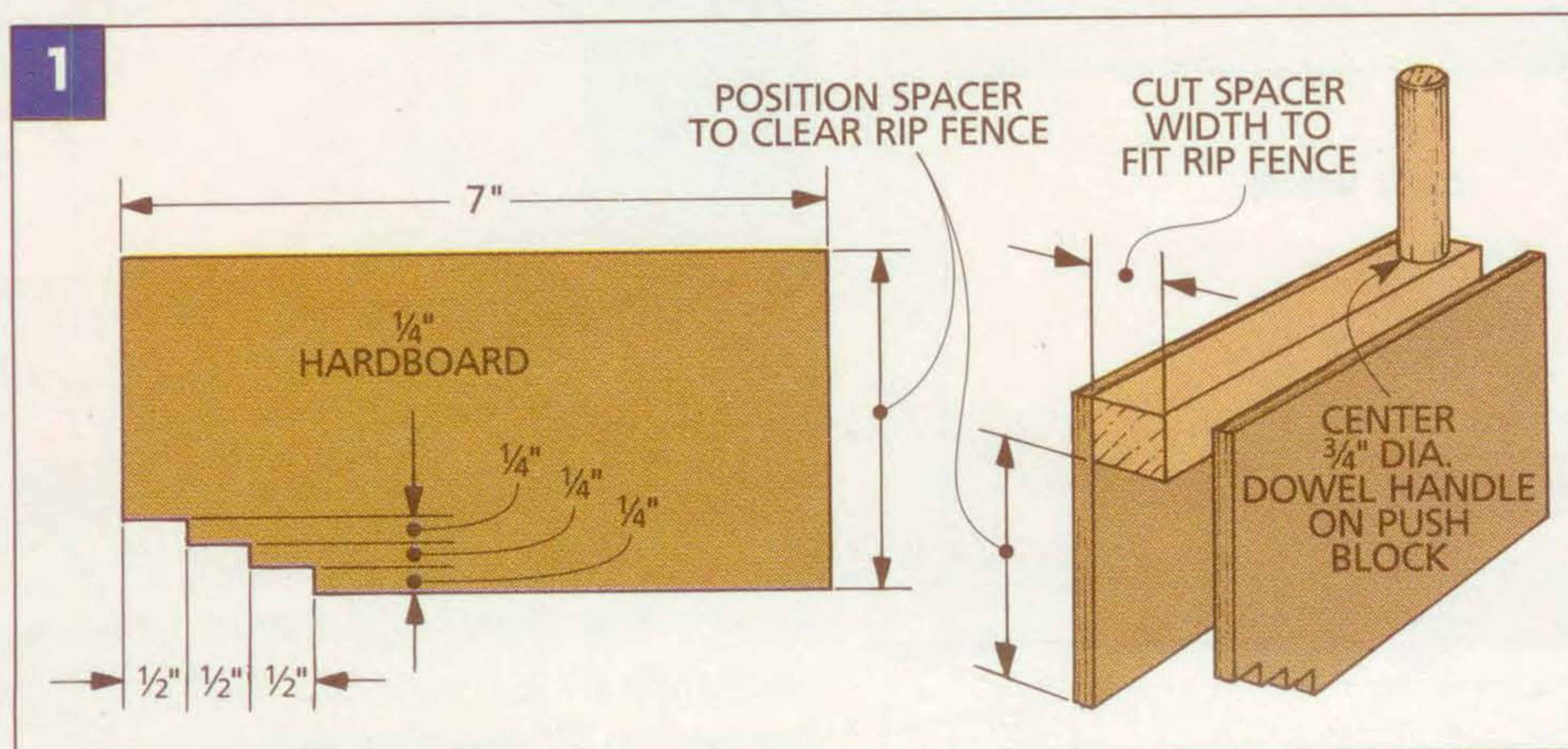
To cut the stepped cuts on the piece that faces the saw blade, lay out and cut a stair-stepped design. Each step is $\frac{1}{4}$ " high and $\frac{1}{2}$ " wide. (I cut mine using the band saw.)

Next, glue the face pieces to the spacer so their bottom edges ride on top of the saw table and the spacer clears the top of the rip fence.

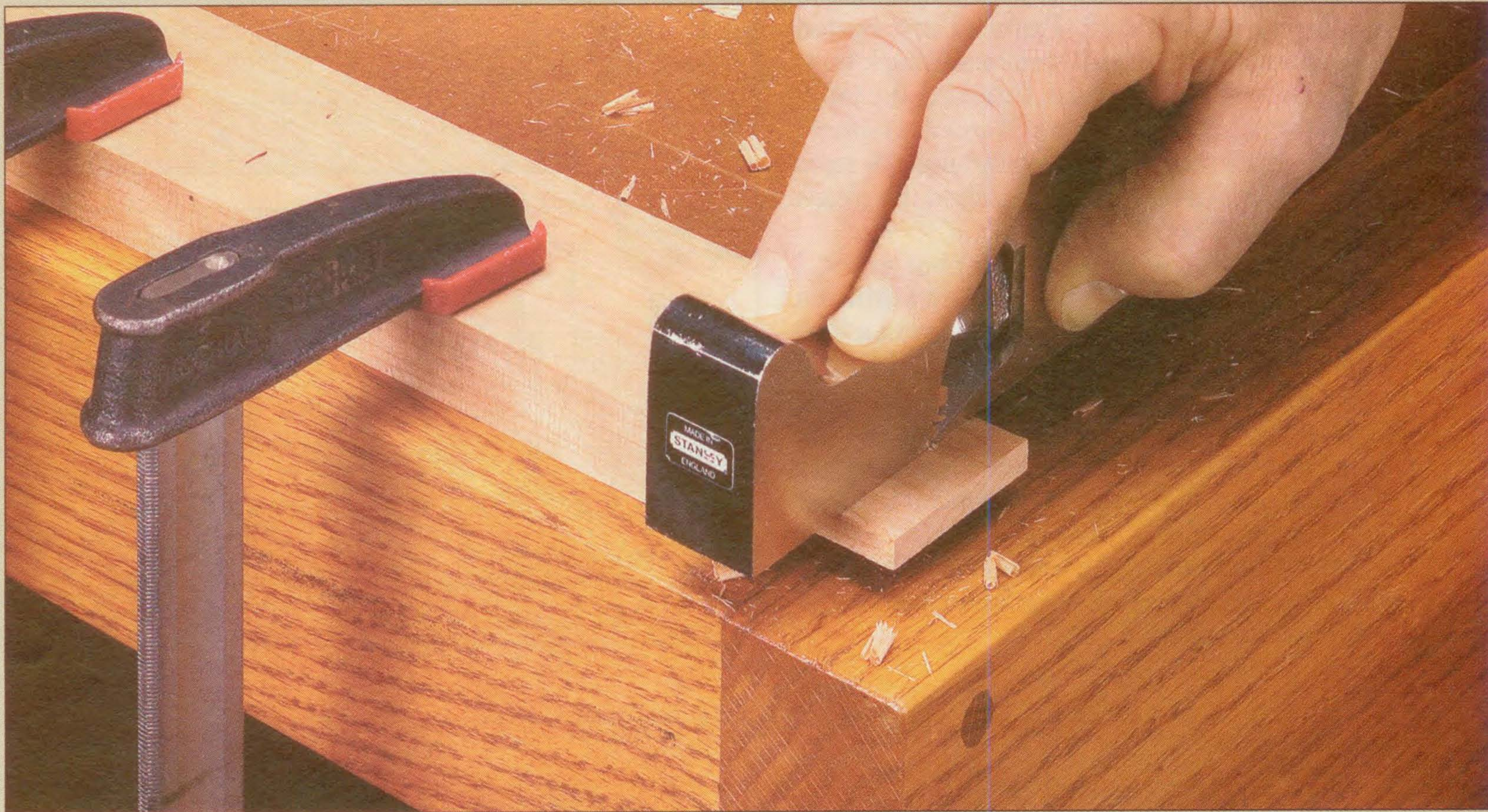
Handle – Then, to get a secure grip on the push block, I drilled a $\frac{3}{4}$ "-dia. hole and glued a $\frac{3}{4}$ "-dia. dowel near the back of the spacer.

Using the Push Block – To use this push block to rip narrow stock, first set it over the fence with the notch on the push block over the workpiece.

To help hold the stock tight against the fence, you can use a featherboard or just hold a piece of scrap against the piece while cutting (*Fig. 2*).



5 Steps For Perfect-Fitting Tenons



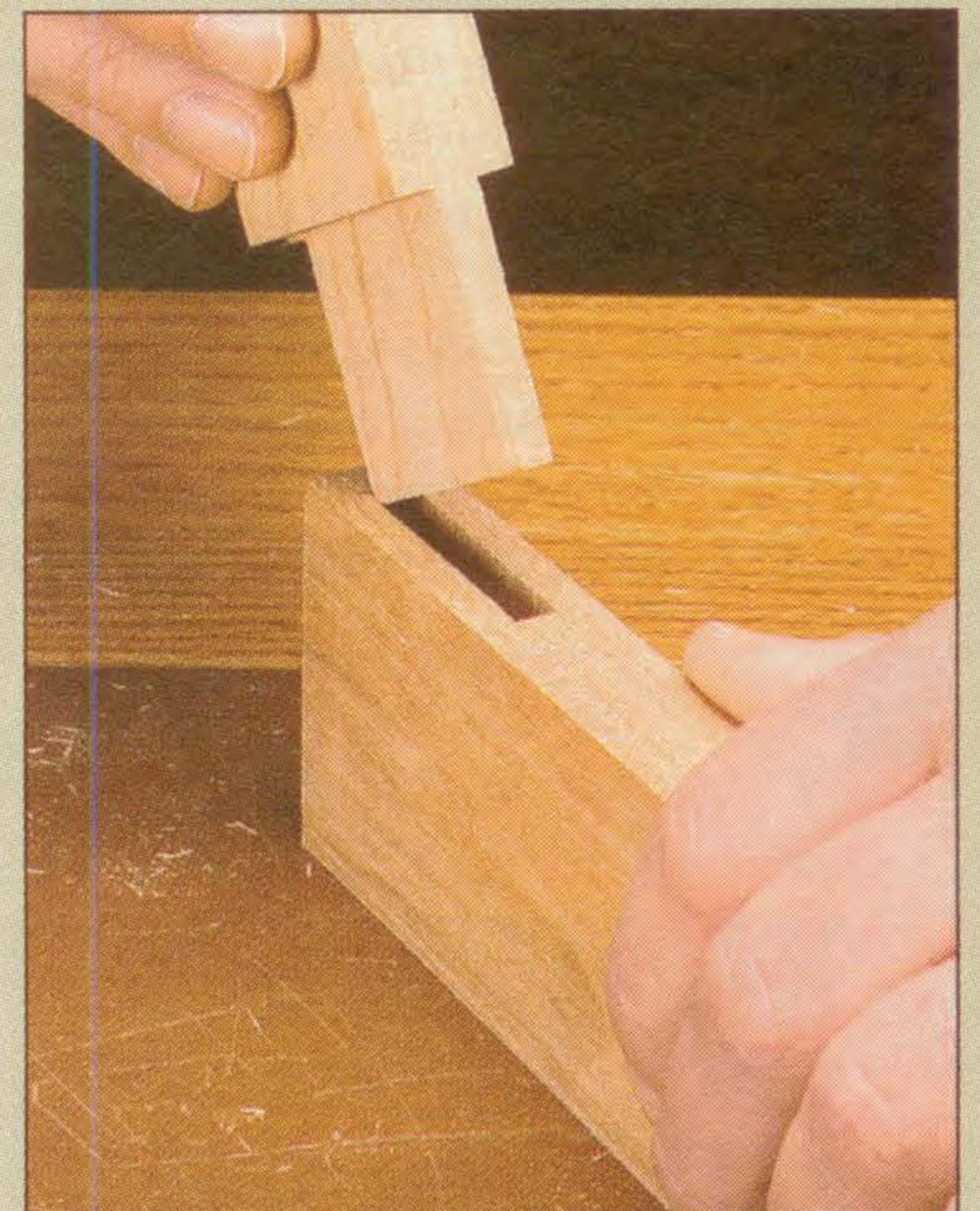
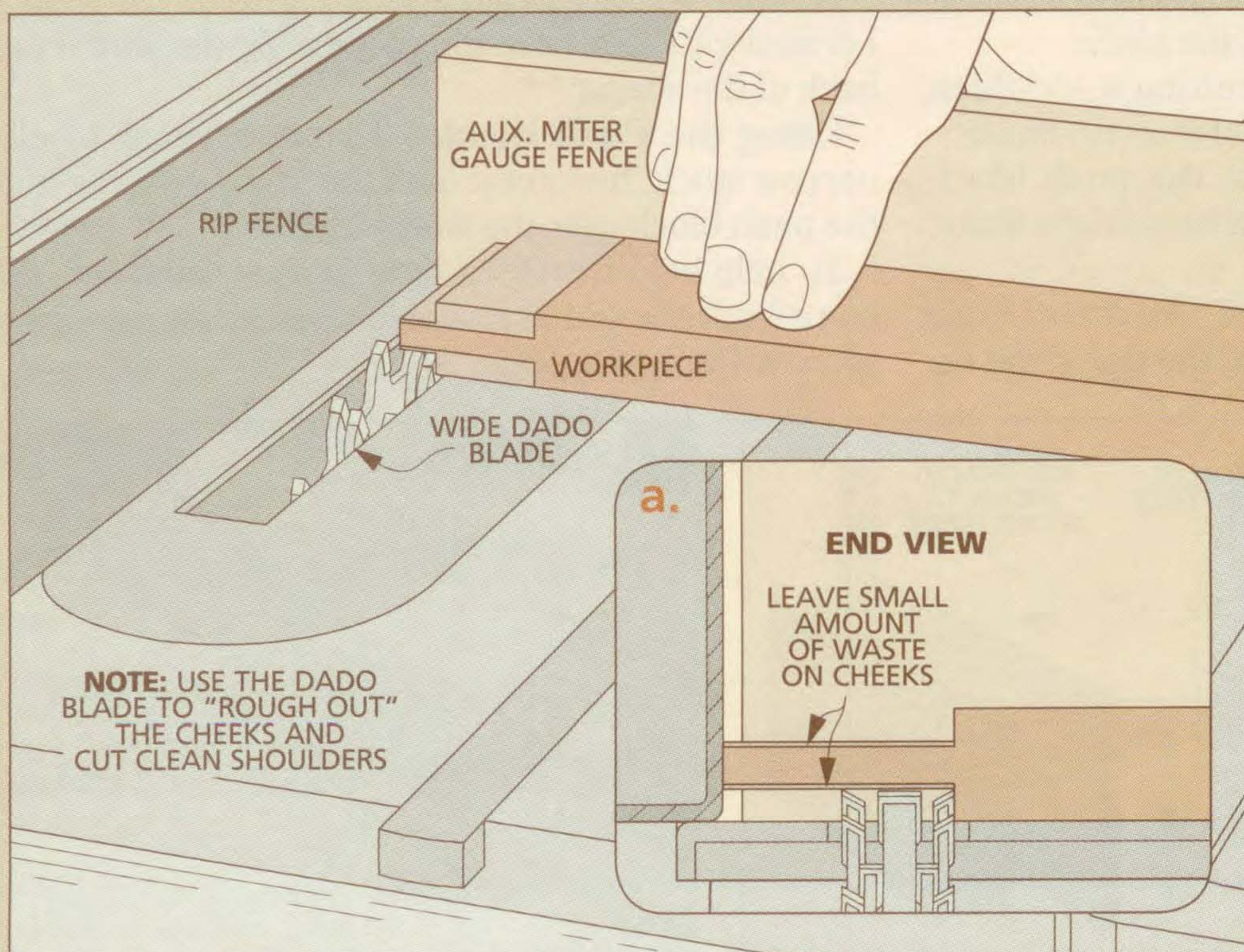
1 Cheeks & Shoulders

For many woodworkers, a perfect-fitting tenon starts with a dado blade on the table saw. With this method, you're going to establish the long shoulders and waste away most of the material on the cheeks.

As shown in the drawing below, a miter gauge with an auxiliary fence backs up the workpiece, preventing chipout, and the rip fence is used as a stop to define the final length of the tenon.

With the blade set slightly low,

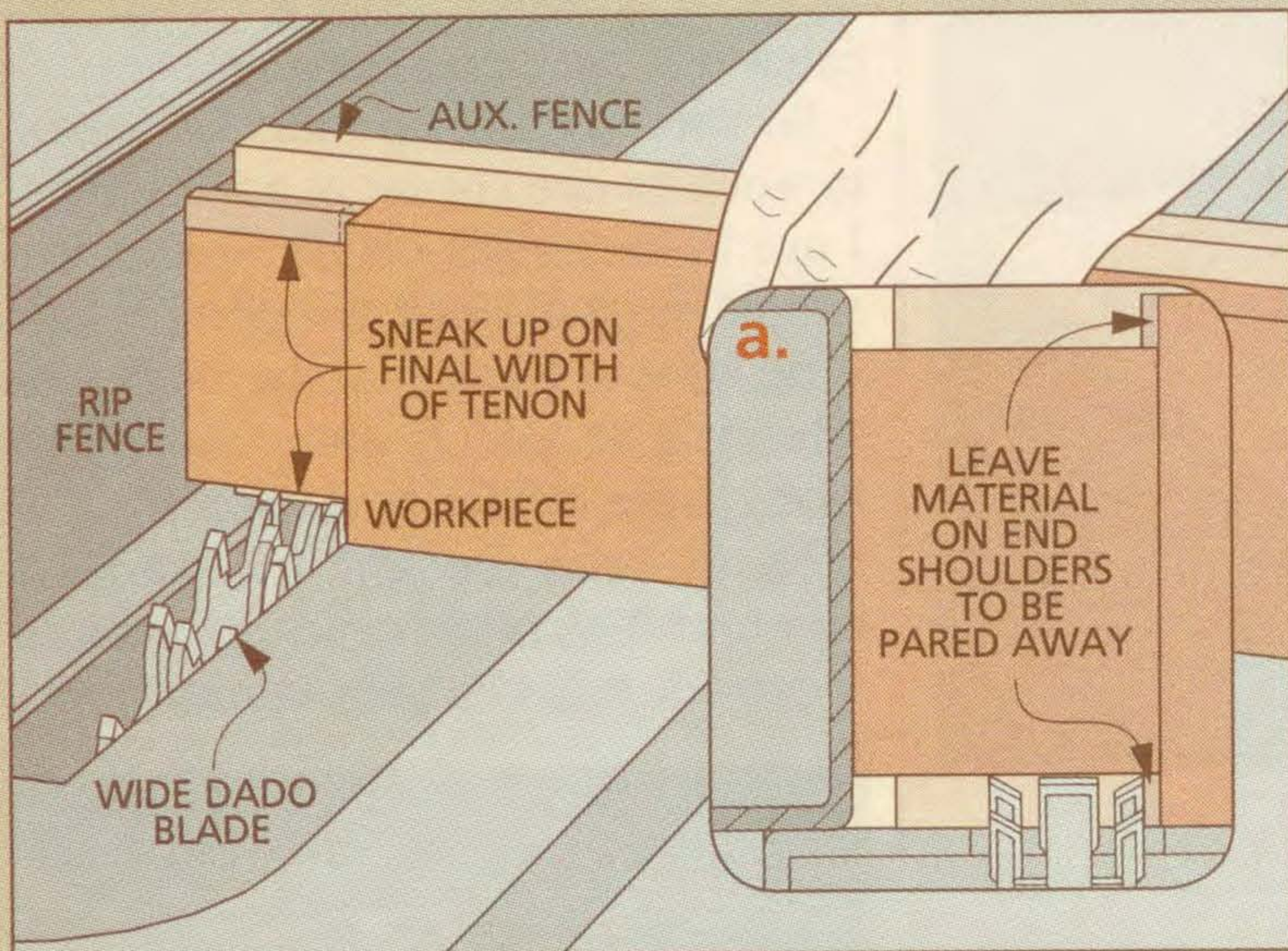
make your first cuts at the end of the tenon. Check the rough thickness and then work back toward the shoulder. The final pass along the shoulder should be very light. At this point, the tenon will be cut to length, but still just a hair thick.



▲ In the first step of cutting a tenon, the cheeks of the tenon are roughed to a thickness that just begins to fit the mortise.

2 The End Shoulders

Step two is where you'll cut the tenon to final width and establish the two end shoulders. The drawing below shows how to proceed.

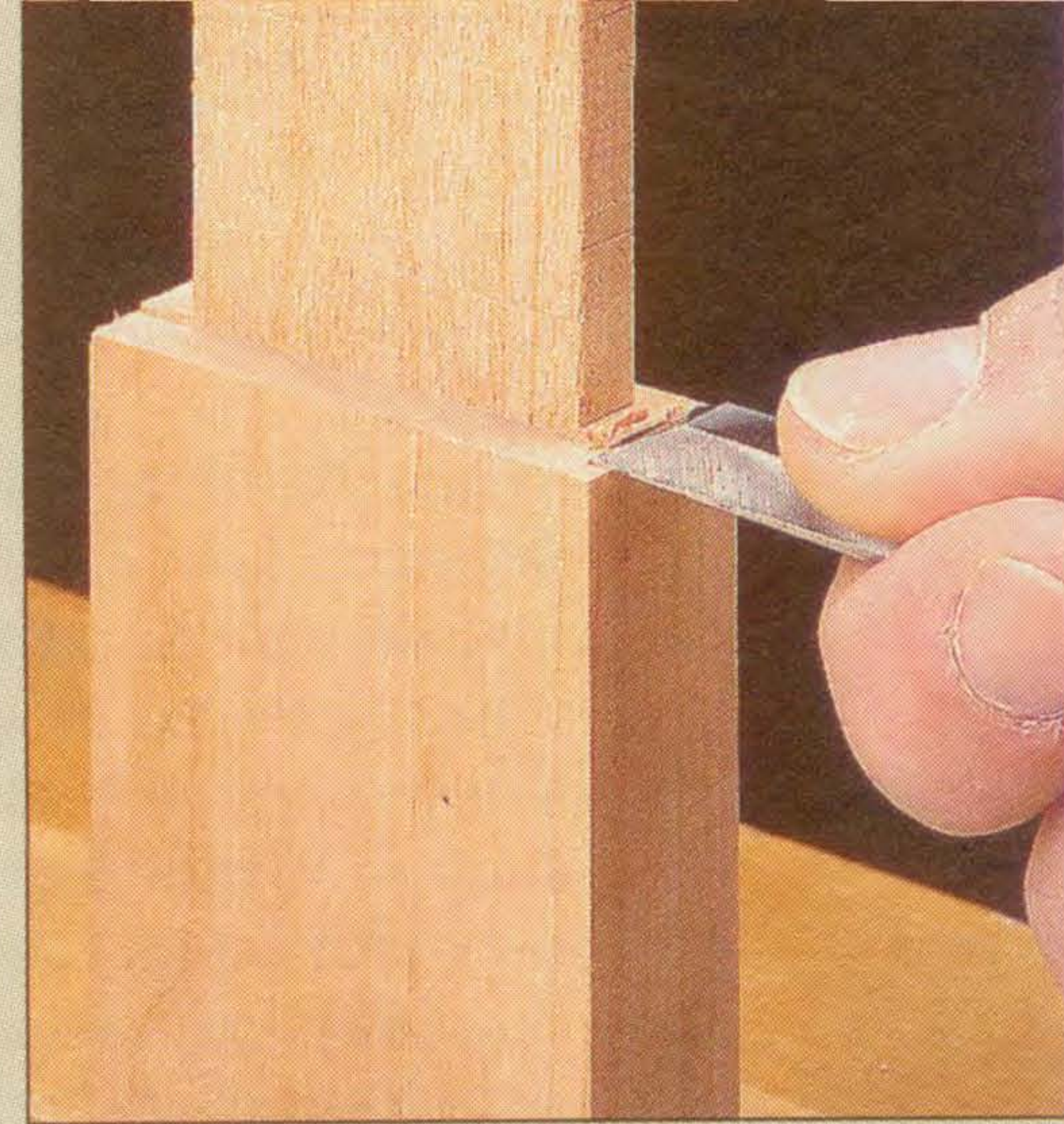


Use the same rip fence setup you used to cut the cheeks of the tenon. Begin by setting the dado blade slightly low so you can sneak up on the width of the tenon. Now with the workpiece on edge, start to waste away the material at both ends of the tenon. Check the progress as you go, gradually raising the blade.

But don't cut right up to the shoulders of the tenon. It's too likely that the blade will

leave score marks or possibly chip the long shoulders. As illustrated in detail 'a,' you want to leave a little material here to be carefully pared away later.

Once the width of the tenon is perfect, the work at the table saw is complete. The photo at right shows where to go from here. With the workpiece firmly clamped in the workbench vise you can pick up a sharp chisel to complete the work on the end shoulders. Several shallow slicing cuts will remove the remaining material easily and leave a clean, square shoulder.



▲ A sharp chisel will make a quick job of squaring the end shoulders. Shallow paring cuts will leave them clean.

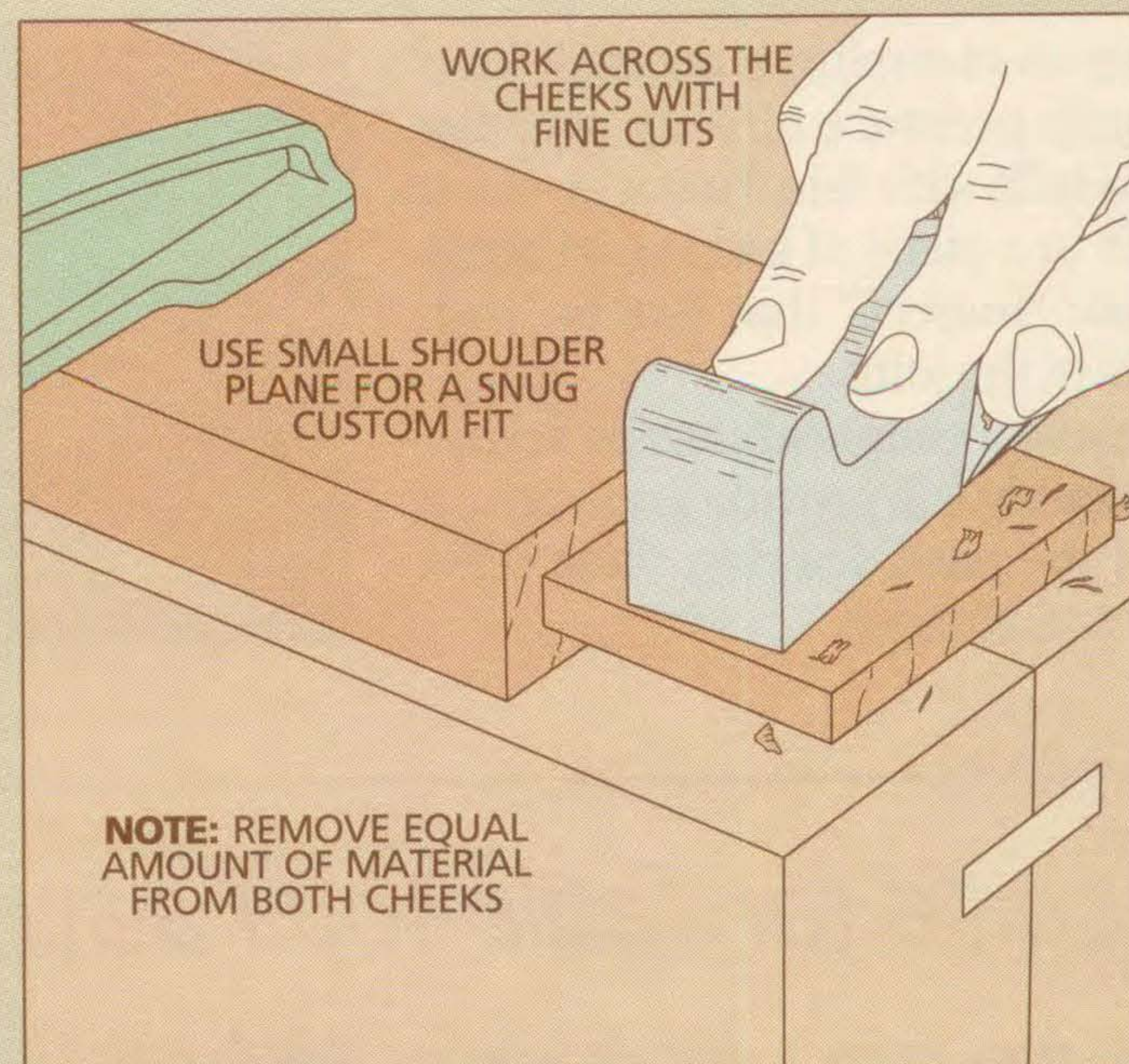
3 A Custom Fit

At this point the shoulders are cut around all four sides of the tenon. The width is perfect but it's still a little "fat" through the thickness. So now it's time to achieve a custom fit. To do this, you're going to carefully trim the cheeks of the tenon for a snug fit in its mortise. And for this job, my tool of choice is a small shoulder plane.

A shoulder plane gives you the handy combination of a fine cut with great control. You can work across the cheeks of the tenon without fear of tearout (right drawing). So maintaining a flat surface is easy.

Start at the end of the tenon and work back with light cuts, removing the same amount of material from both sides. To do this, take a couple of passes on one side and then switch faces.

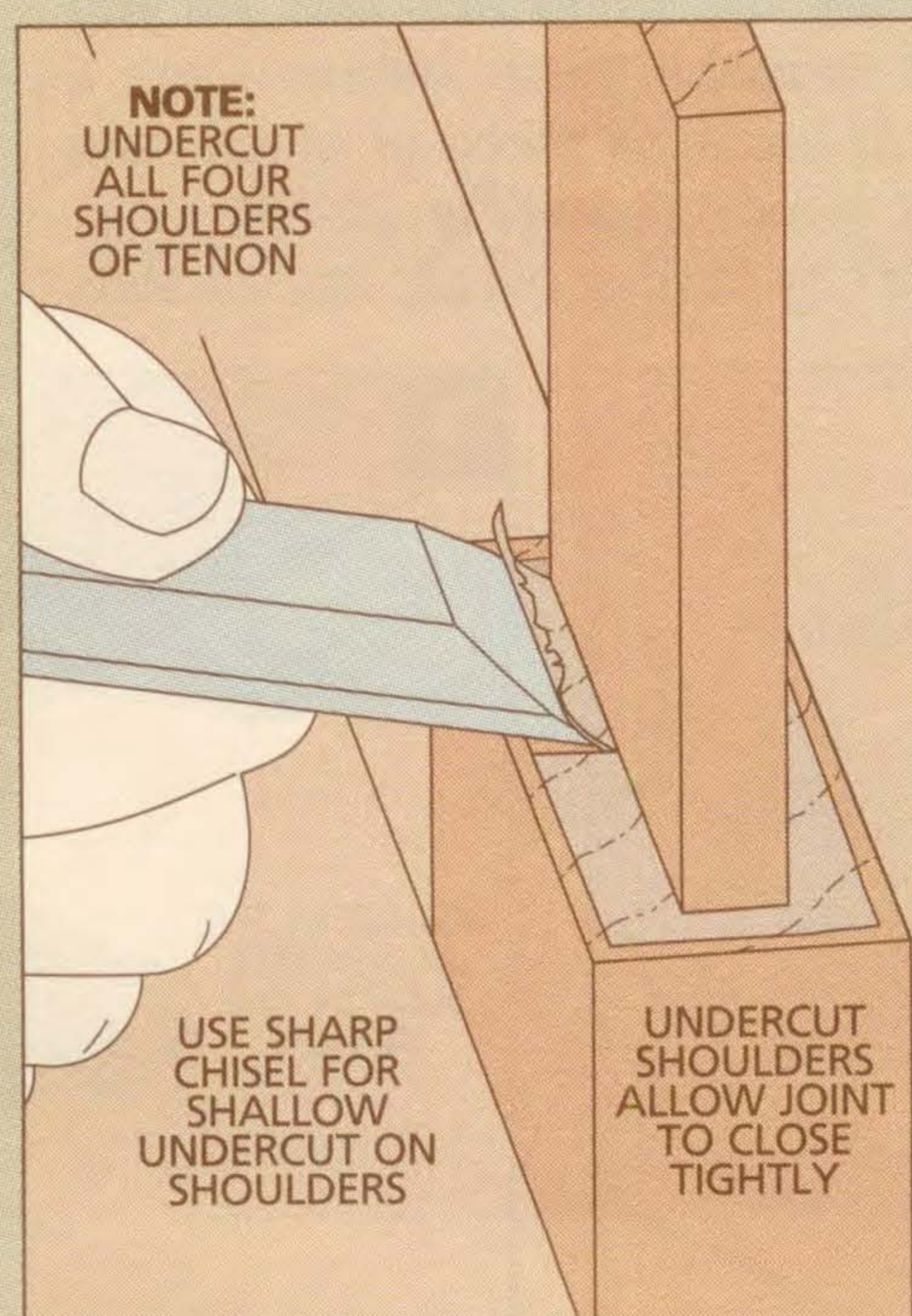
With just a little work, the tenon will begin to slide deeper into the mortise. If it takes more than firm pressure to seat the tenon, trim some more and test it again.



4 Undercut

Now your tenon is a perfect match with its mortise. But you also want the joint to look as good on the outside as it fits on the inside. So the next step involves a little fine tuning on the shoulders of the tenon.

You can quickly get the idea from the drawing at right. I use a sharp chisel to slightly undercut the shoulders of the tenon around all four sides. Start about $\frac{1}{16}$ " back from the face of the workpiece and use the same type of shallow paring cuts you used for the short shoulders of the tenon. You don't need to cut deeply. The small amount of relief you create will ensure that the joint closes tightly and looks seamless.



5 A Quick Chamfer

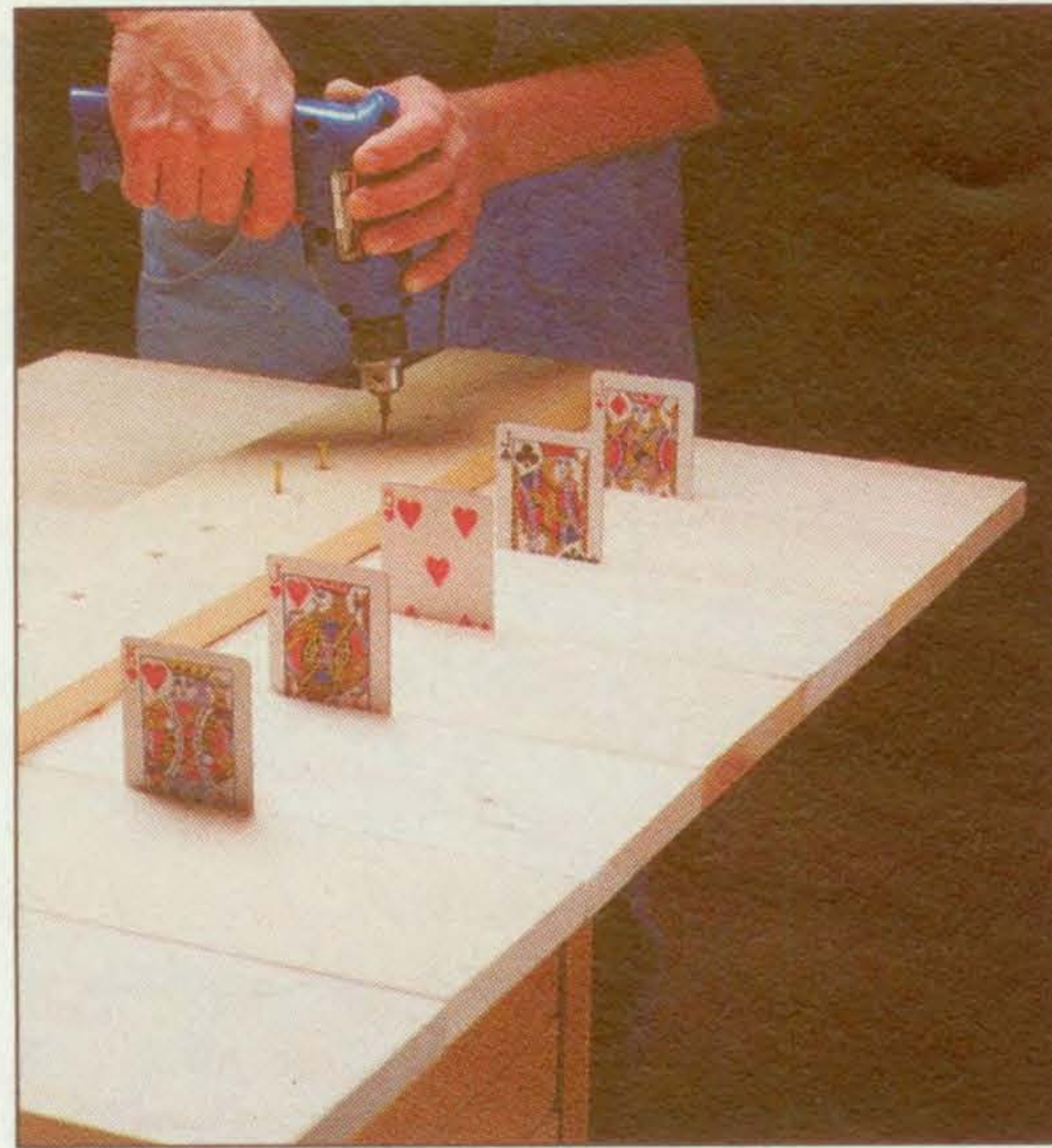
Now you have a mortise and tenon joint with a perfect look and fit. To make certain that this is still the case after the glue and the clamps are applied, plane a small chamfer onto the ends of the tenons. This allows it to slide in smoothly and provides a bit of relief space for glue.



Spacing Slats with Playing Cards

When building panels for country projects, instead of edge-gluing the boards together, the slats are sometimes screwed to a cleat. If you use this method to build a panel in a dry shop, a 5"-wide slat may swell across its width by as much as $\frac{3}{64}$ " as the humidity increases. So you need to attach the slats to the cleats with a gap between the slats.

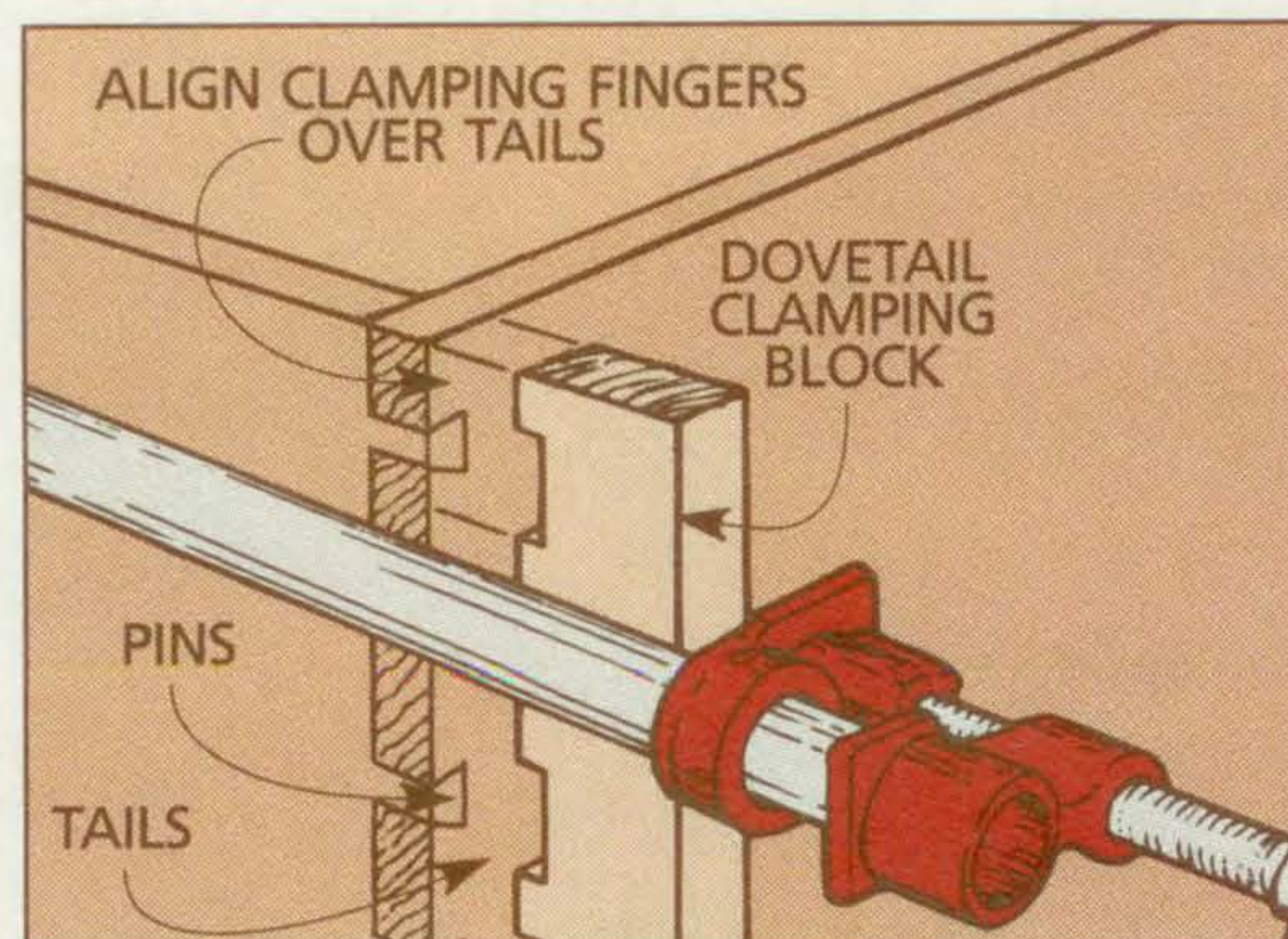
To space the slats evenly and consistently, I use playing cards as spacers. The thickness of three cards is just about the right amount of space.



Dovetail Clamping Block

The key to clamping a dovetail joint is to apply pressure directly over the tails. To help with this, I cut a series of notches in a piece of hardwood scrap to create "fingers" that line up with the tails of the joint.

Then just a couple of clamps across the assembly will provide pressure on each of the pins, drawing them tight to the mating piece.



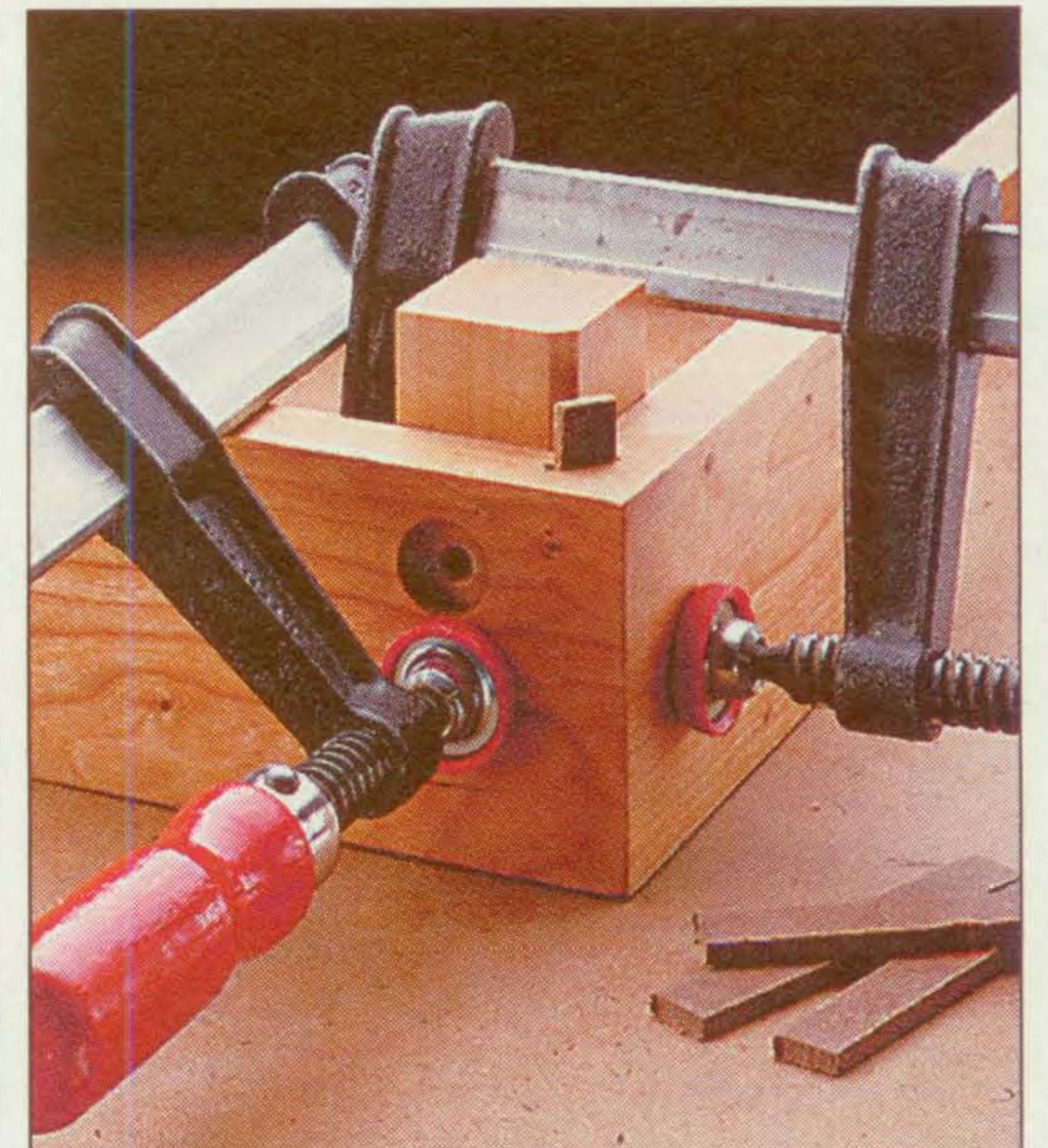
Squaring Miters

When gluing up all four corners of mitered projects, the slightest amount of extra pressure from a clamp can cause it to rack, creating gaps.

So when gluing up miters, it's best to work on one corner at a time. What I use to keep each corner square is a simple block of wood (see photo).

Be sure to square up the block and after you've added glue, clamp the block to the inside of the corner.

Note: I also thought it was a good idea to chamfer the corner of the block to provide relief for glue squeeze-out.



Biscuits for Table Top Fasteners

Anyone who owns a biscuit joiner knows how handy biscuits can be. Not only do they help to strengthen a joint, but they're also great for helping to line up a panel (and keep it aligned) during glue up.

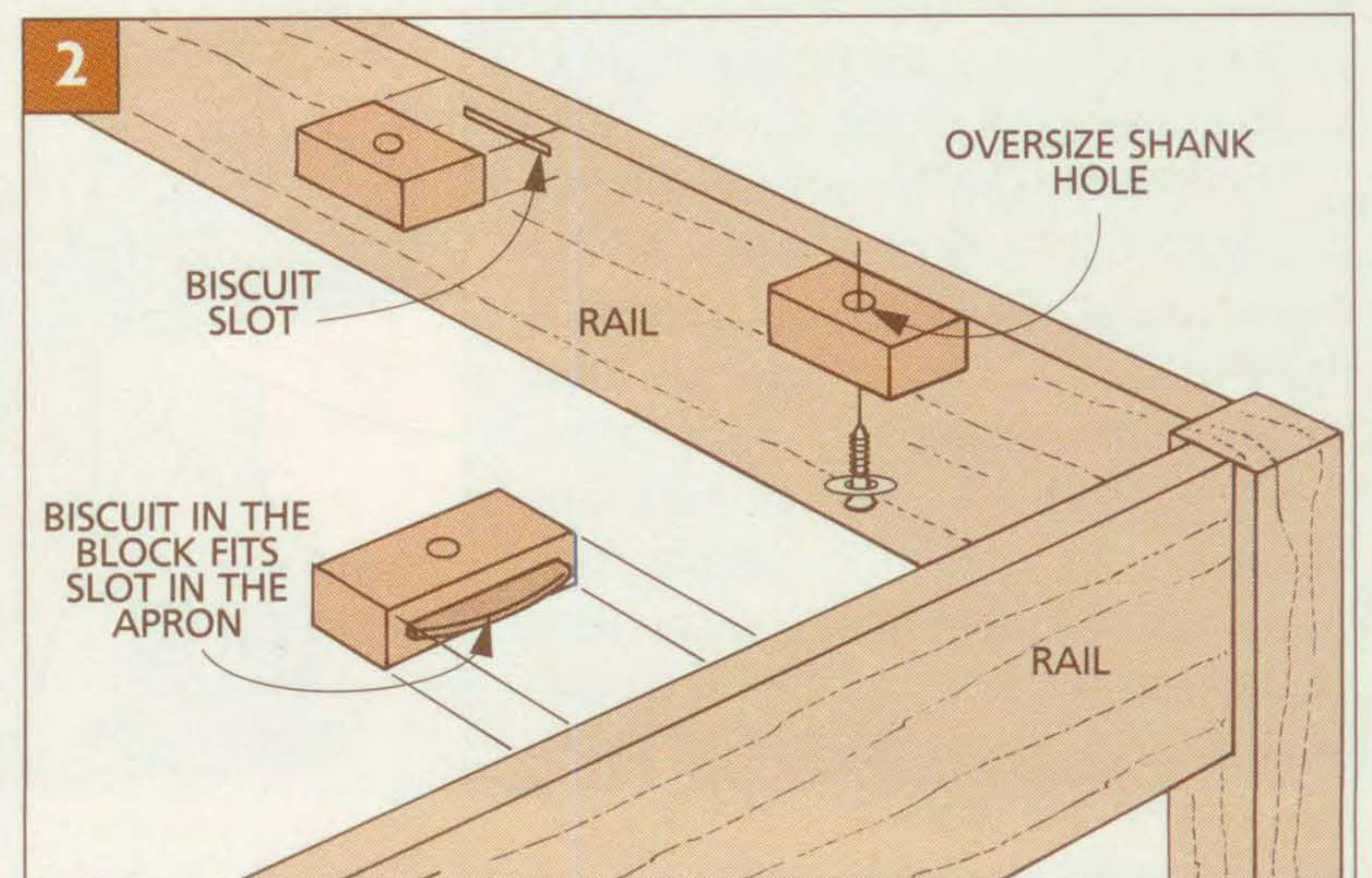
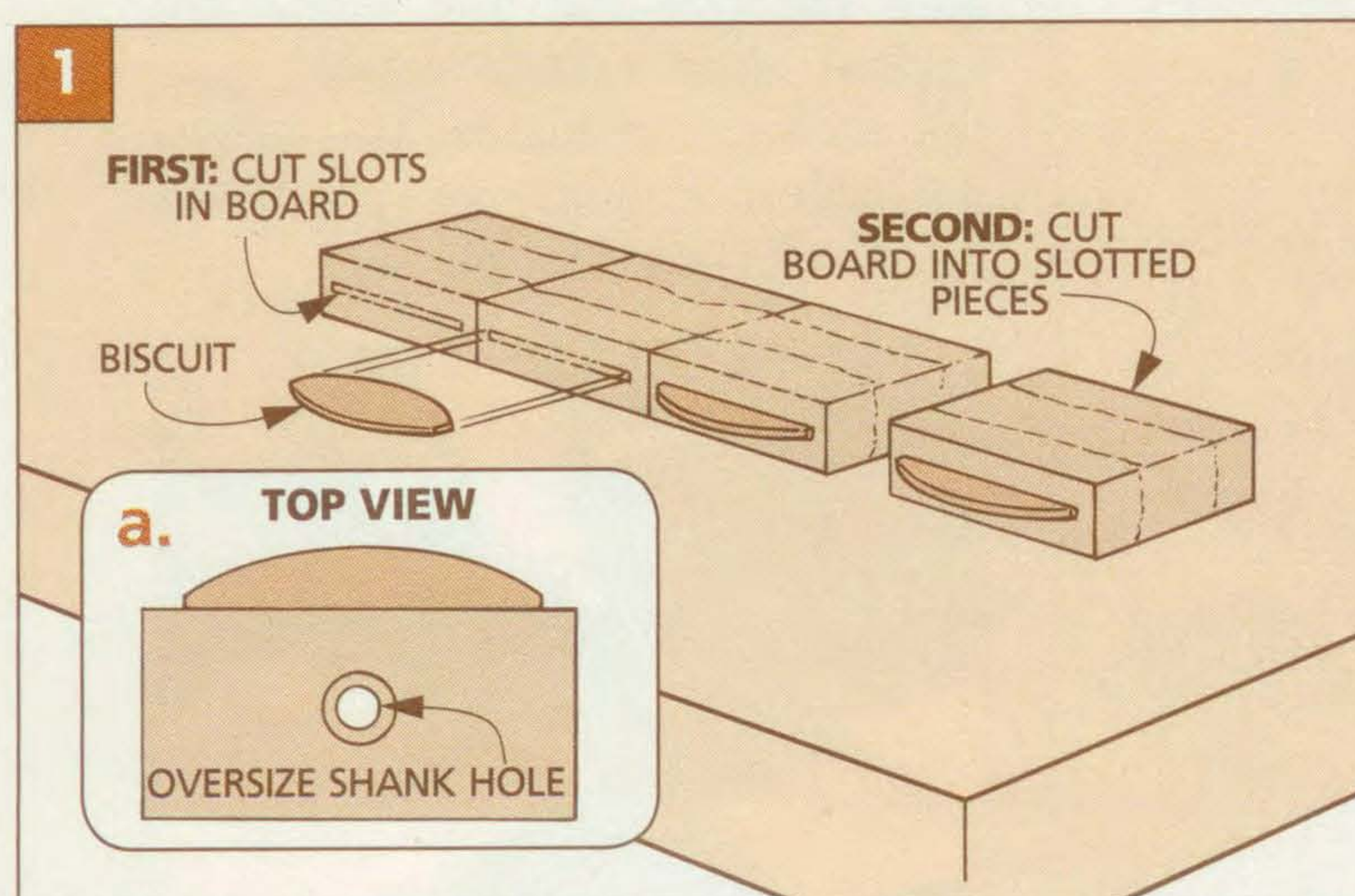
Another Use – Recently I've discovered there's another use for

wooden biscuits. They can also be used to make fasteners that hold a top securely in place, while still allowing the wood to move. All you need to make these fasteners are a biscuit joiner, a piece of stock, and some woodscrews (Fig. 1).

Start by cutting evenly spaced slots

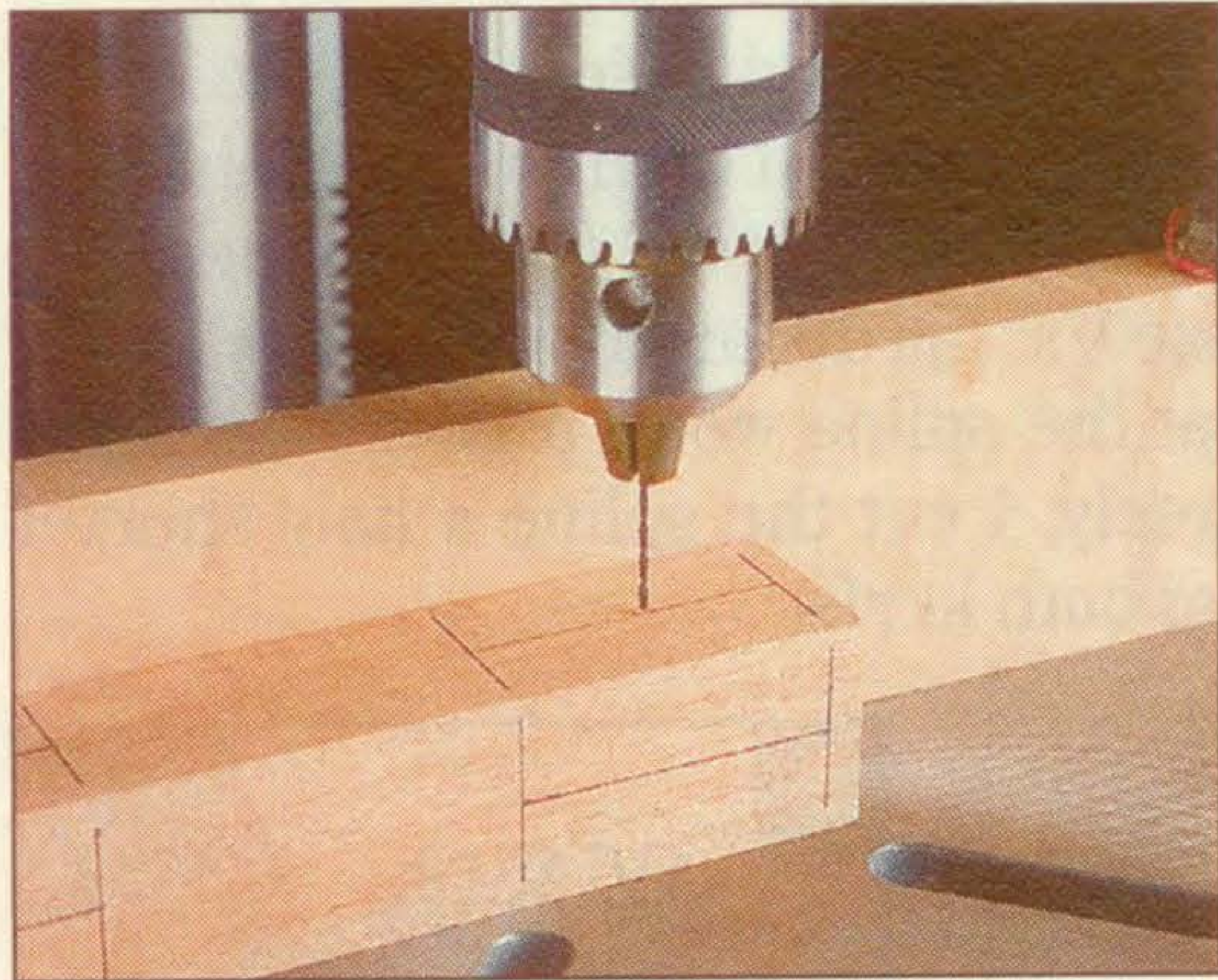
in a board. Next, cut the board into small blocks. Finally, drill an oversize shank hole in each of the blocks and glue a biscuit in the slot.

Now cut a series of slots in the aprons or rails of your project (Fig. 2). The biscuits in the blocks fit in these slots when screwed to the top.



Center a Mortise

To center a drill bit on a thickness of stock, set the fence so a small bit touches the centerline. To re-check, flip stock end for end. Then switch to your mortising bit.

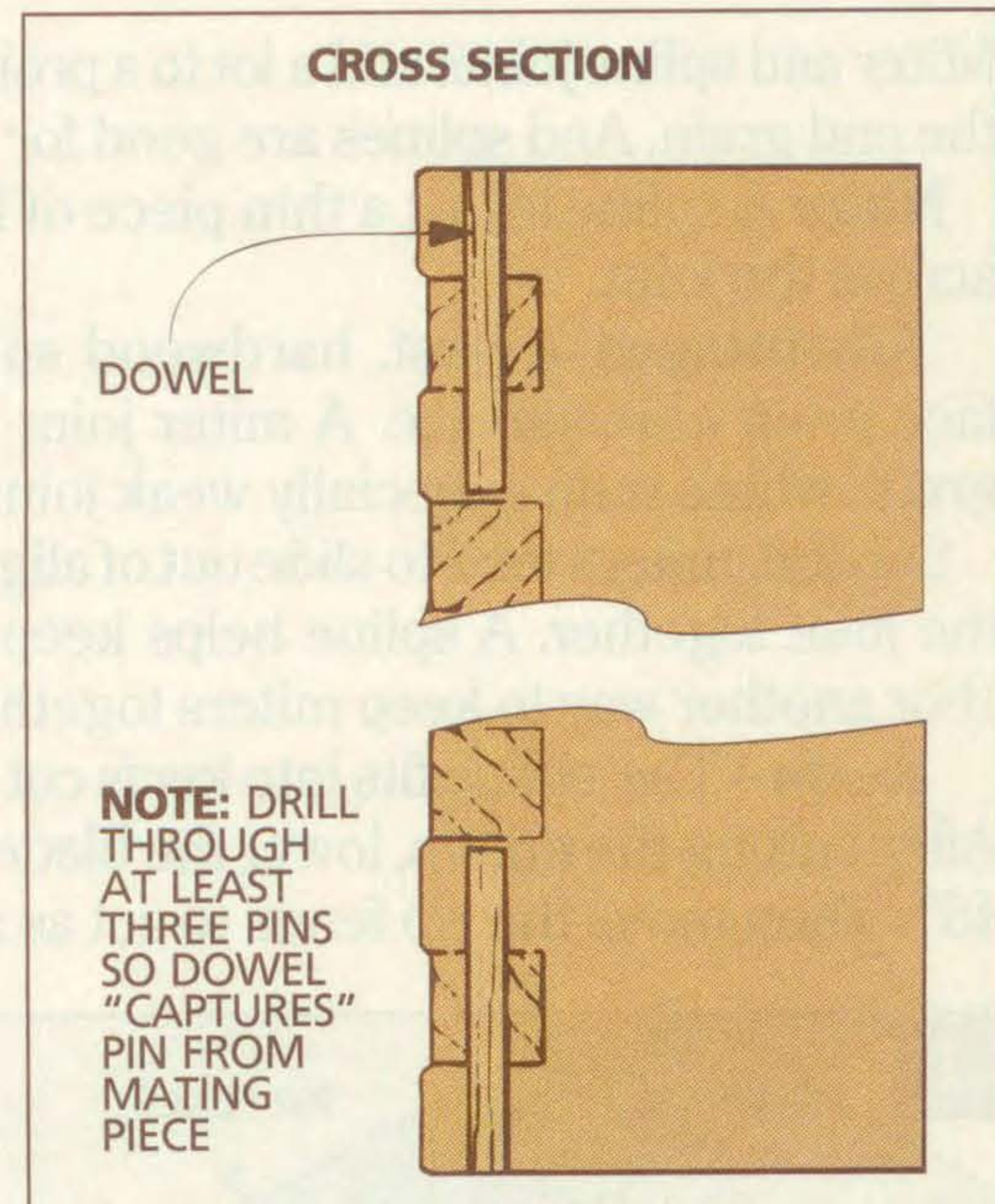


Pinning Box Joints for Strength

Instead of just gluing my box joints, there are times I'll also secure them with a dowel pin through each corner. It adds to the strength and can save a lot of time on large projects because you don't have to use as much glue.

To do this, simply drill a hole from the top and bottom at all four corners and insert a length of dowel. You don't need to drill all the way through the joint, just deep enough to allow each dowel to capture a pin from the mating side (*see drawing*).

Cut each dowel a little longer than the depth of the hole. Once the dowels are tapped in, trim them with a chisel, and sand them flush.

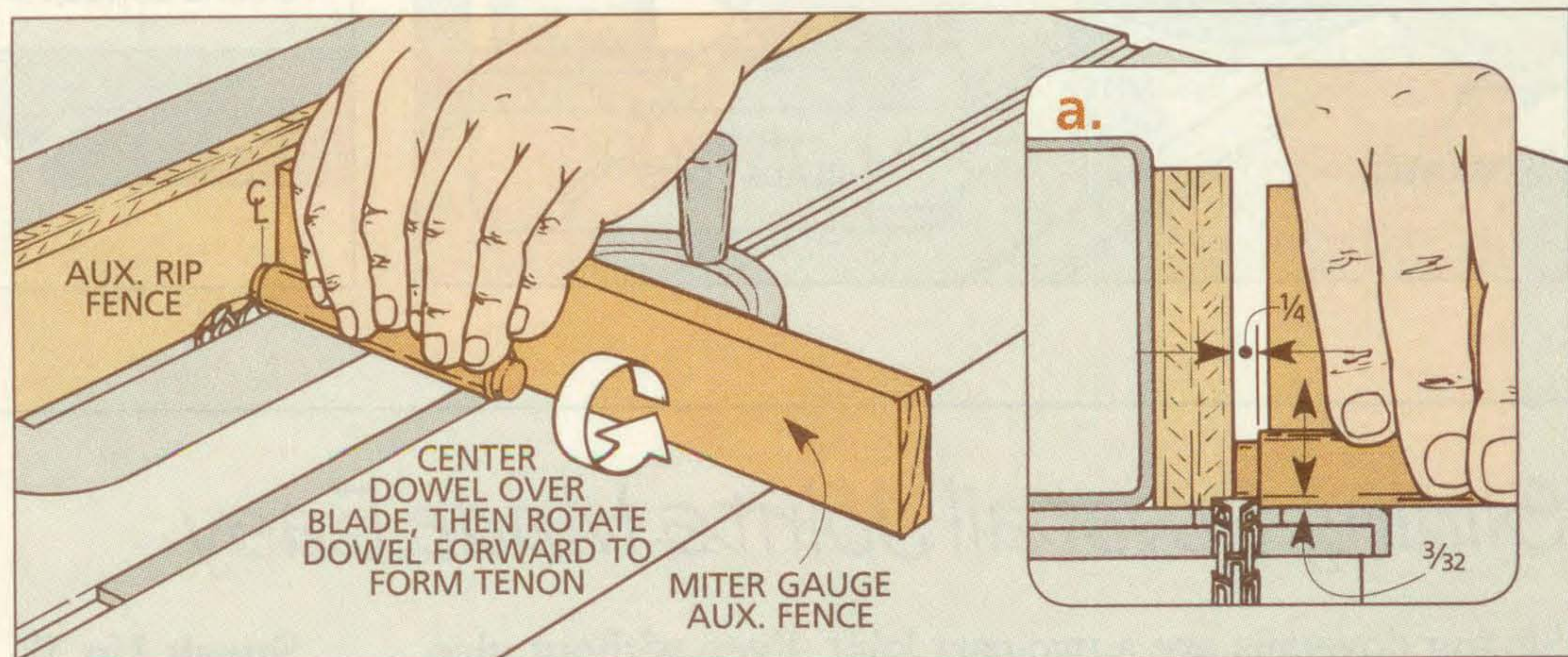


Round Tenons with a Table Saw

The easiest way to cut tenons on the ends of dowels is to use a table saw and dado blade. An auxiliary fence on both the miter gauge and rip fence helps.

The diameter of the tenon is determined by the height of the dado blade. Set the rip fence for the length of the tenon (*detail 'a'*).

To make the cut, hold the miter gauge in place with the dowel against the auxiliary fence as you rotate it forward (*see drawing*).



Tips for Aligning Half Laps

If you've ever tried to make your own lattice for a project, you know that the hardest part about them is getting the half laps to align. The secret to making lattice screens align is to cut all the notches at once in a wide blank, then rip the individual slats from the blank.

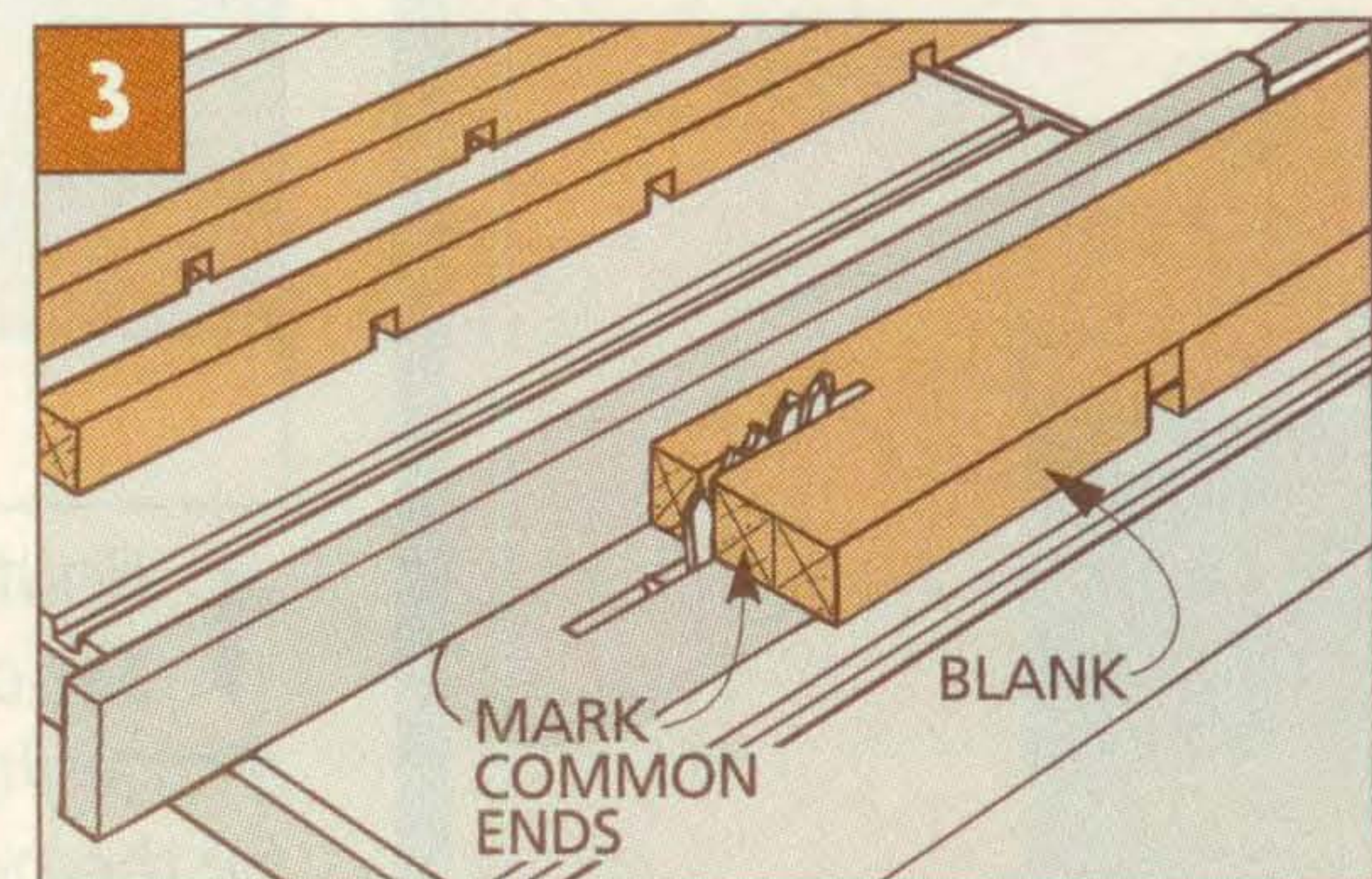
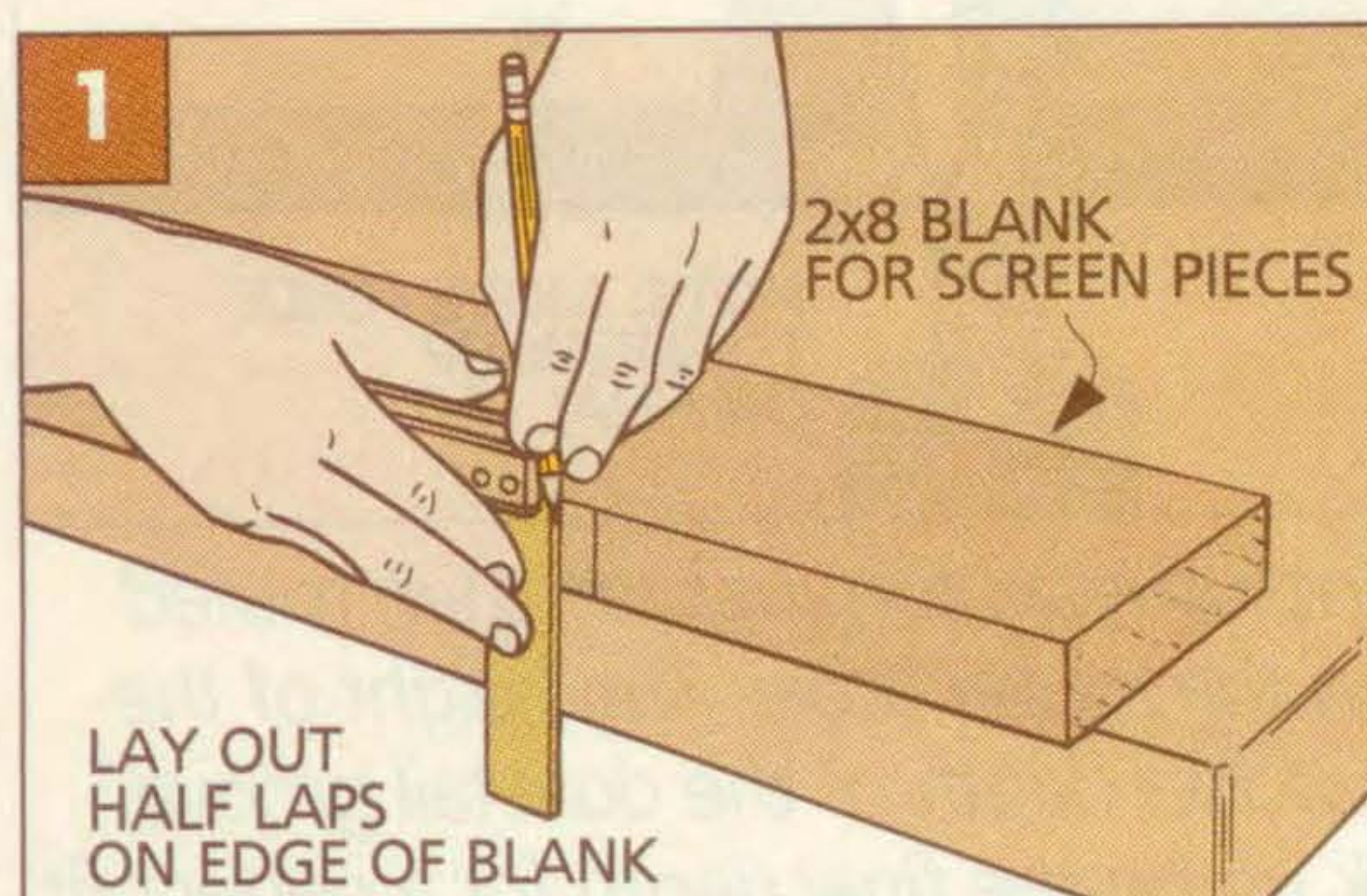
Start by cutting your 2x8 blank to final length and then lay out the positions of the notches along one edge (*Fig. 1*).

Note: If you're laying out a lot of lattice screens, you may want to check the "Secrets of the Story Stick" tip on page 6.

Next, cut a series of dados across the blank. Fasten an auxiliary fence to your miter gauge to help support the piece and to prevent tearout on the back edge (*Fig. 2*).

Once all the dados are cut, set the rip fence and rip the pieces to final width. Make sure you mark one end of the blank so that you can orient the strips the same way when you assemble the screens (*Fig. 3*).

This same procedure can be used when cutting the frame pieces that surround the screens.



Super-Strong Splined Miter Joints

Miter and spline joints add a lot to a project. The miter hides the end grain. And splines are good for a couple of reasons.

Note: A spline is just a thin piece of hardwood that runs across the joint.

Advantages – First, hardwood splines provide more face grain glue surface. A miter joint is end grain to end grain, which is an especially weak joint.

Second, miters tend to slide out of alignment as you clamp the joint together. A spline helps keep the pieces aligned. (For another way to keep miters together, see page 25.)

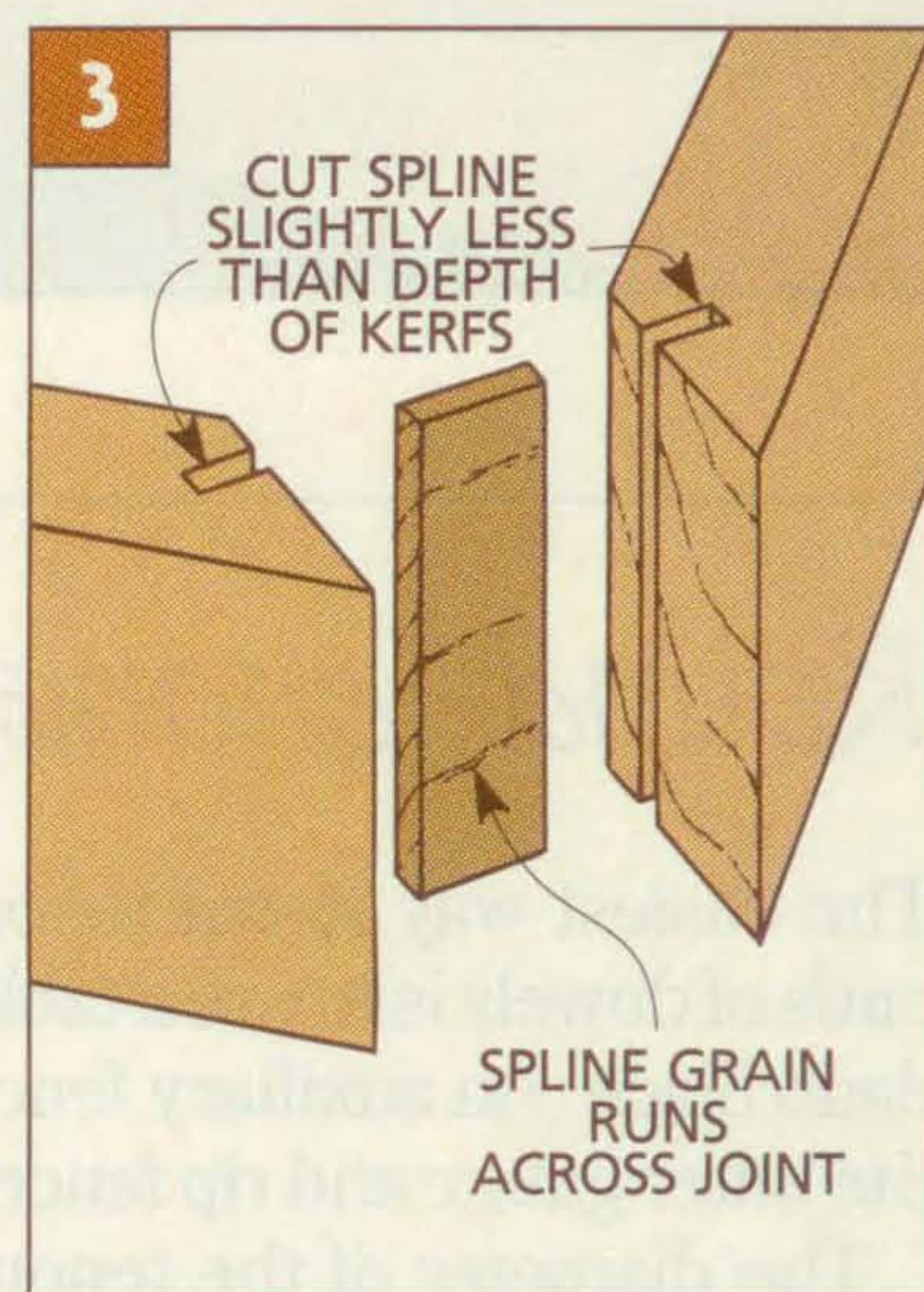
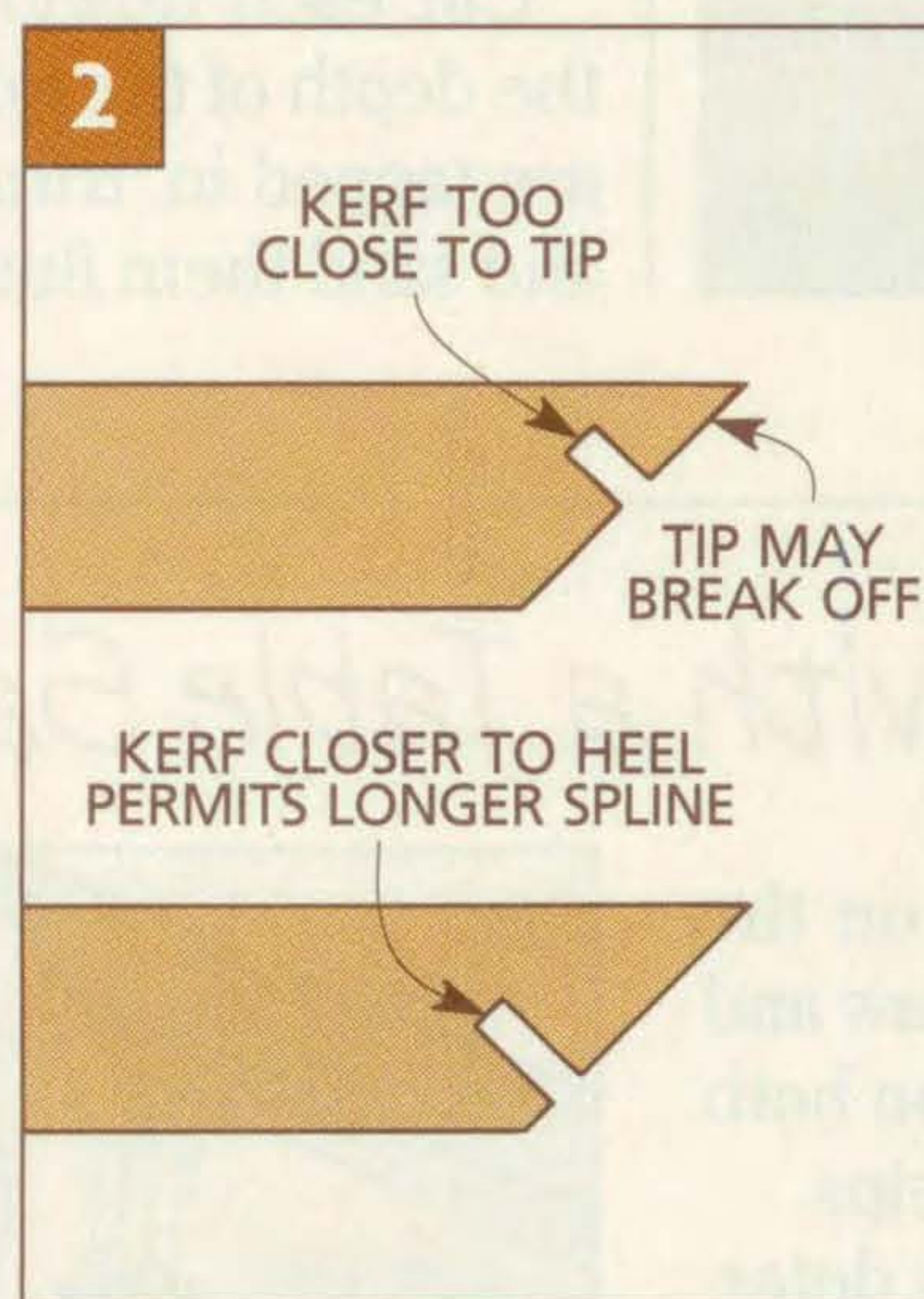
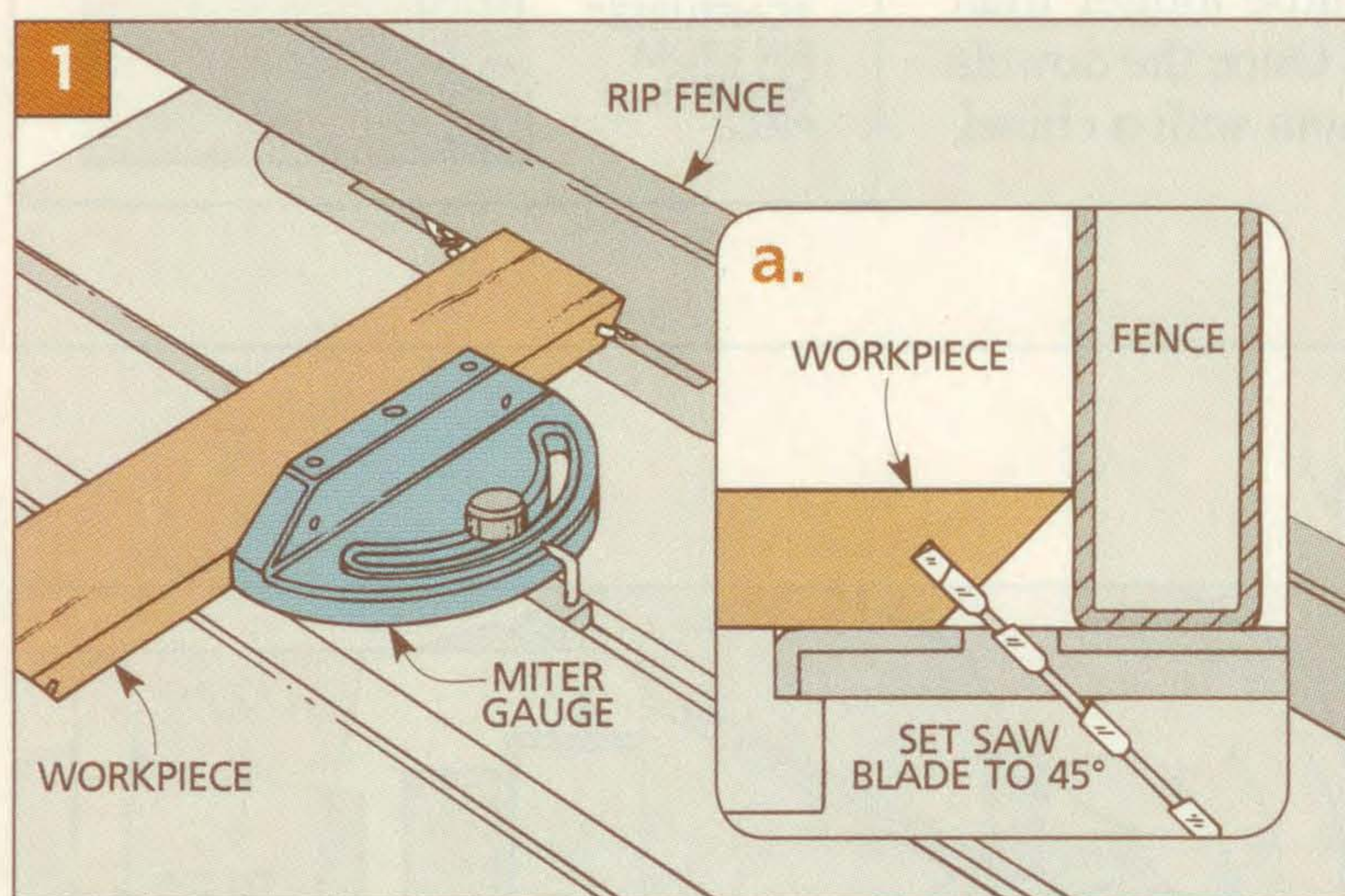
Kerfs – The spline fits into kerfs cut in both workpieces. After cutting the miters, lower the blade, but keep it tilted to 45°. Then move the rip fence to act as a stop (Fig. 1).

The position of the rip fence will determine the location of the kerf (Fig. 1a). I prefer to offset the kerf toward the heel rather than the point of the miter (Fig. 2).

With the spline near the heel, the tip isn't as likely to crack off if the joint is stressed. By positioning it there, you can also insert a longer spline to provide more glue surface.

Spline – Now cut the hardwood splines to fit the kerfs. These splines are exposed, so I cut them so the grain runs perpendicular to the joint line (Fig. 3). (If the spline is not exposed you could use 1/8" hardboard instead.)

Also, to ensure that the spline won't prevent the miter from closing completely, I cut the spline a hair shorter than the total depth of both kerfs.



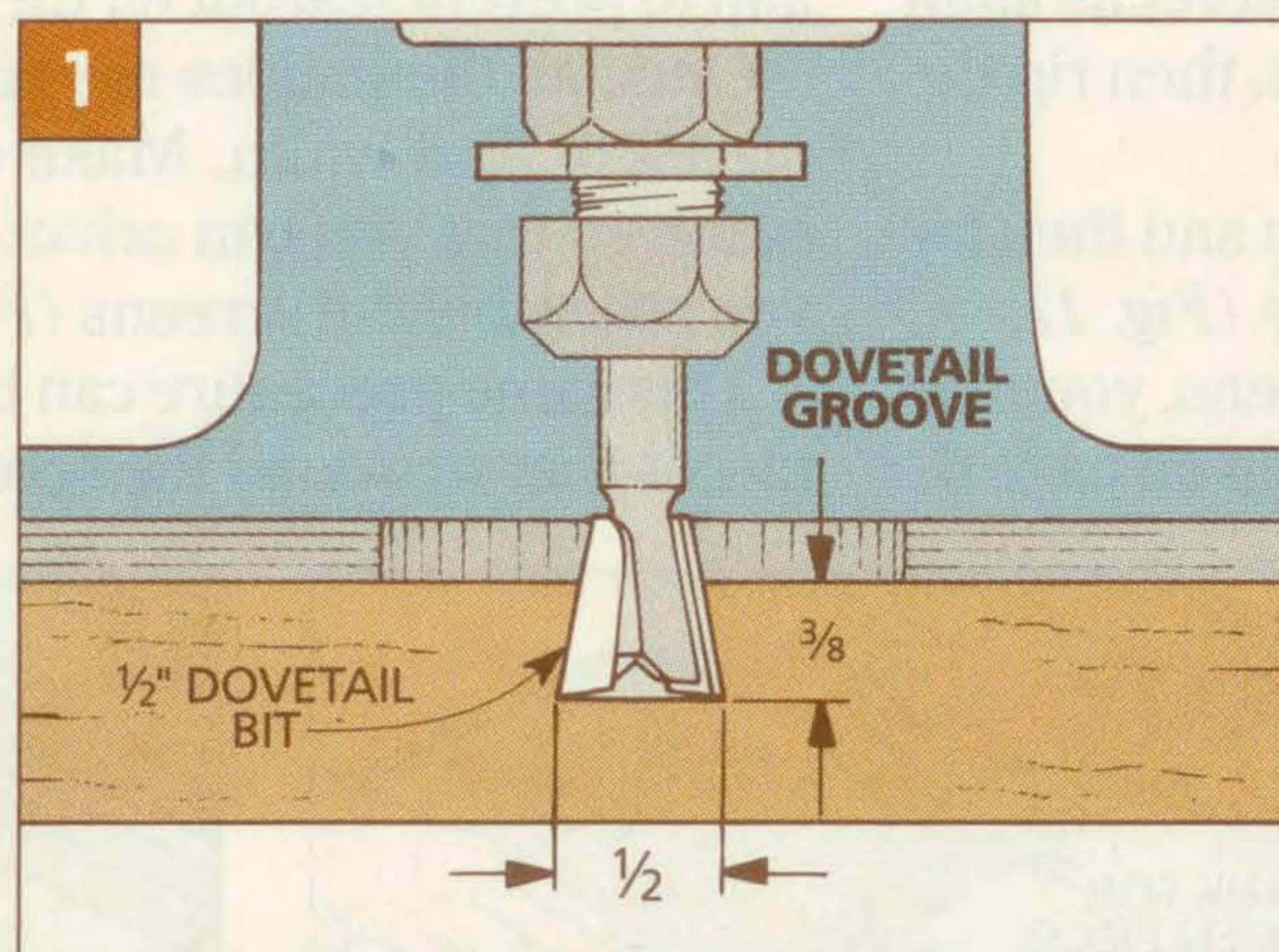
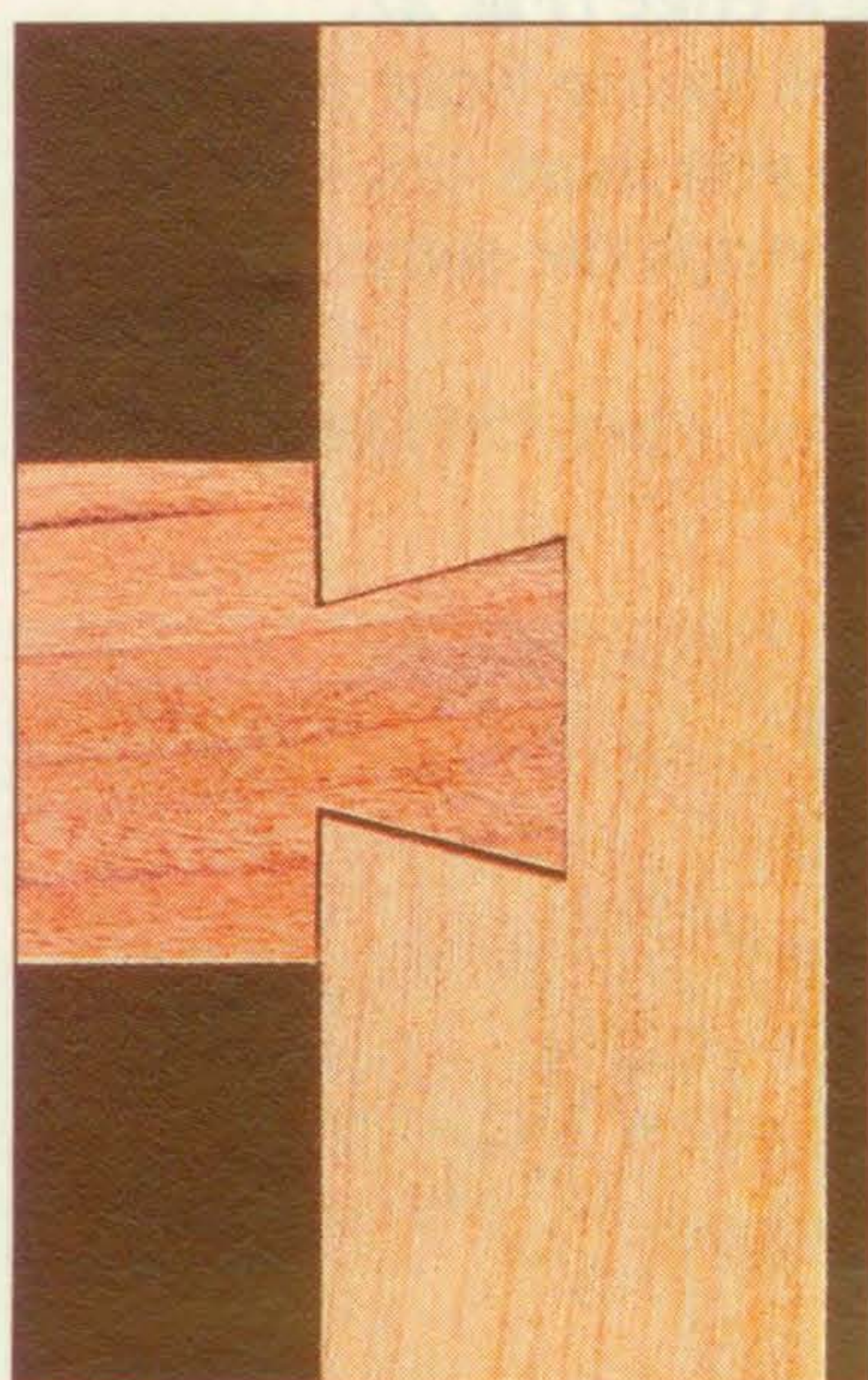
Sliding Dovetail Joints Made Easy

Sliding dovetails are a two-part joint. Even without glue, the angled sides of the tongue fit the angled walls of the groove exactly. It's an extremely strong way to join two perpendicular pieces of wood. And they allow panels to float independently of the frames during seasonal changes in humidity.

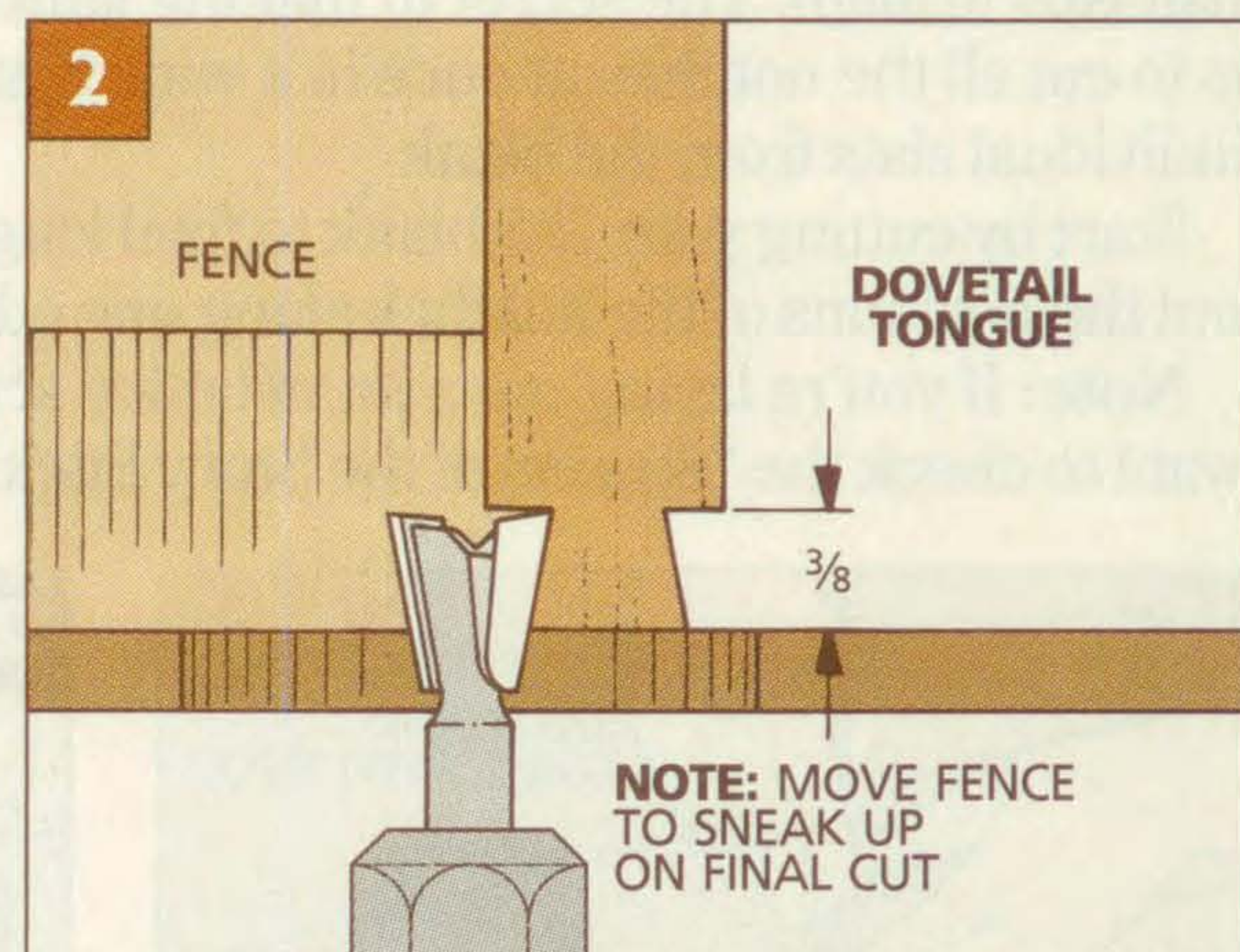
Be Precise – Routing both parts of the joint requires precision — a tight fit holds the project together. But the joint shouldn't be so tight the parts are hard to assemble.

Sneak Up To a Tight Fit – The secret to the best fitting sliding dovetail is in sneaking up on the final cut until the tongue piece just fits the grooved piece. To help make it easier to rout, I built a tall fence to hold the tall pieces on edge while routing.

Grooves and Tongues – First, rout the grooves with a hand-held router, running it against a straightedge (Step 1). Then rout the tongues on the router table, sneaking up on a perfect fit (Step 2).



1 Rout dovetails with a hand-held router. Set depth of cut, then run router against a straightedge. Using a straight bit followed by the dovetail bit makes this job easier.



2 The dovetail tongues are then routed on the router table. The height of the bit matches depth of the dovetail groove. Sneak up on the final depth for a perfect fit.

3-Step Mortise & Tenon Joints

There are lots of jigs and machines on the market that make cutting mortises and tenons easier. And if you have a lot of joinery to cut, they're worth the investment. But for small projects a mortise and tenon joint can easily be cut using just two power tools, a chisel, and a file.

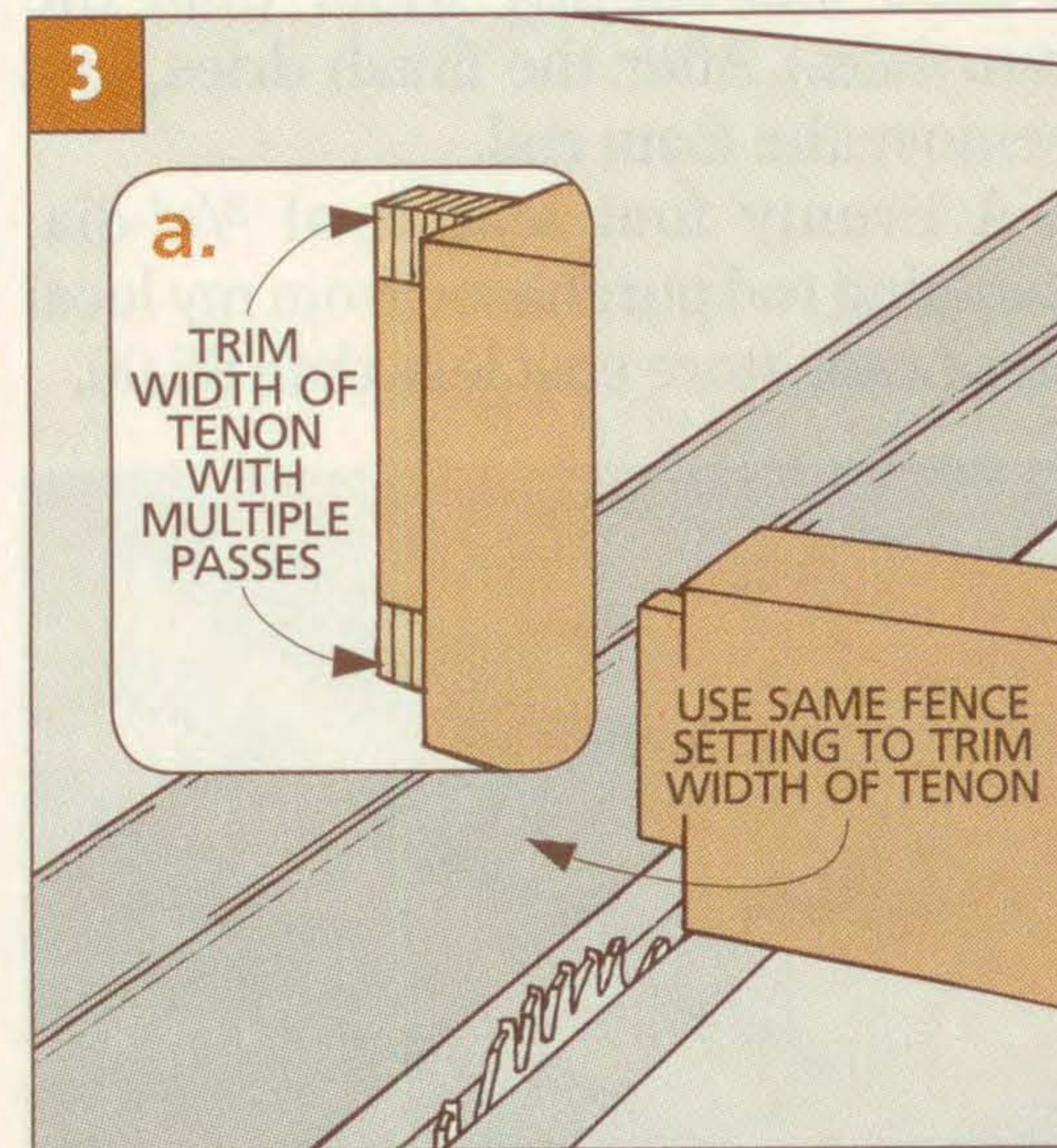
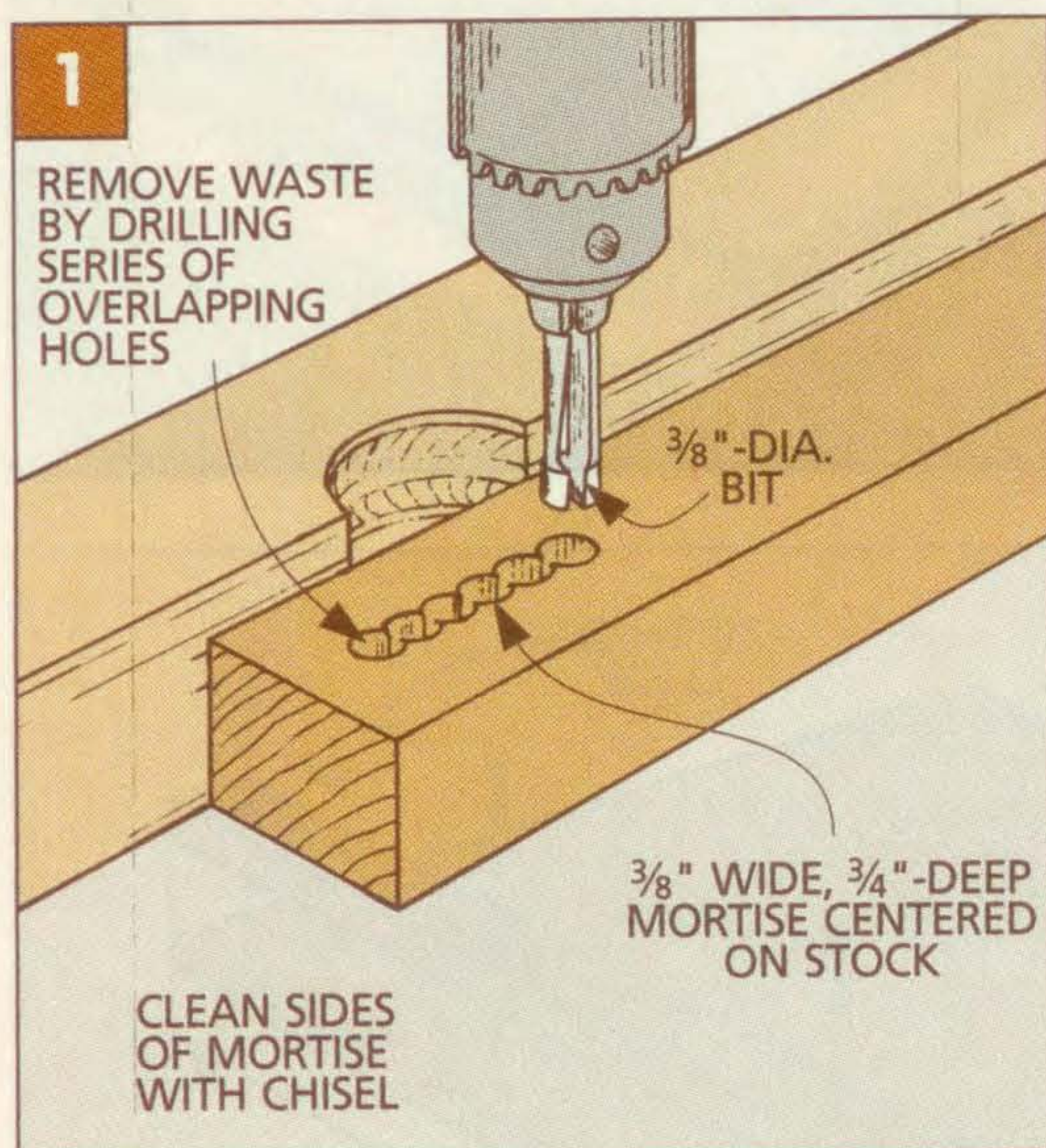
All this involves is boring a series of centered holes on the width of your stock (*Fig. 1*). You want them to be slightly deeper than the final length of the tenons. Then you simply clean up the cheeks of the mortise with a chisel, leaving the ends in the half-round shape.

After the mortises are cut, you can make the tenons on

all the adjoining pieces. To cut them, set the fence of the table saw to the desired length for the tenons, making sure to measure from the outside of the blade (*Figs. 2 and 2a*).

The trick is to use a piece of scrap the same thickness as the workpiece to set the height of the blade. Make passes over both faces of the scrap, and gradually raise the blade until the thickness of the tenon fits snugly in the mortise.

Follow the same procedure to cut the shoulders of the tenon (*Figs. 3 and 3a*), carefully paring away the shoulders until it fits the mortise length. Then I use a file to round over the corners to fit the rounded ends of the mortises.



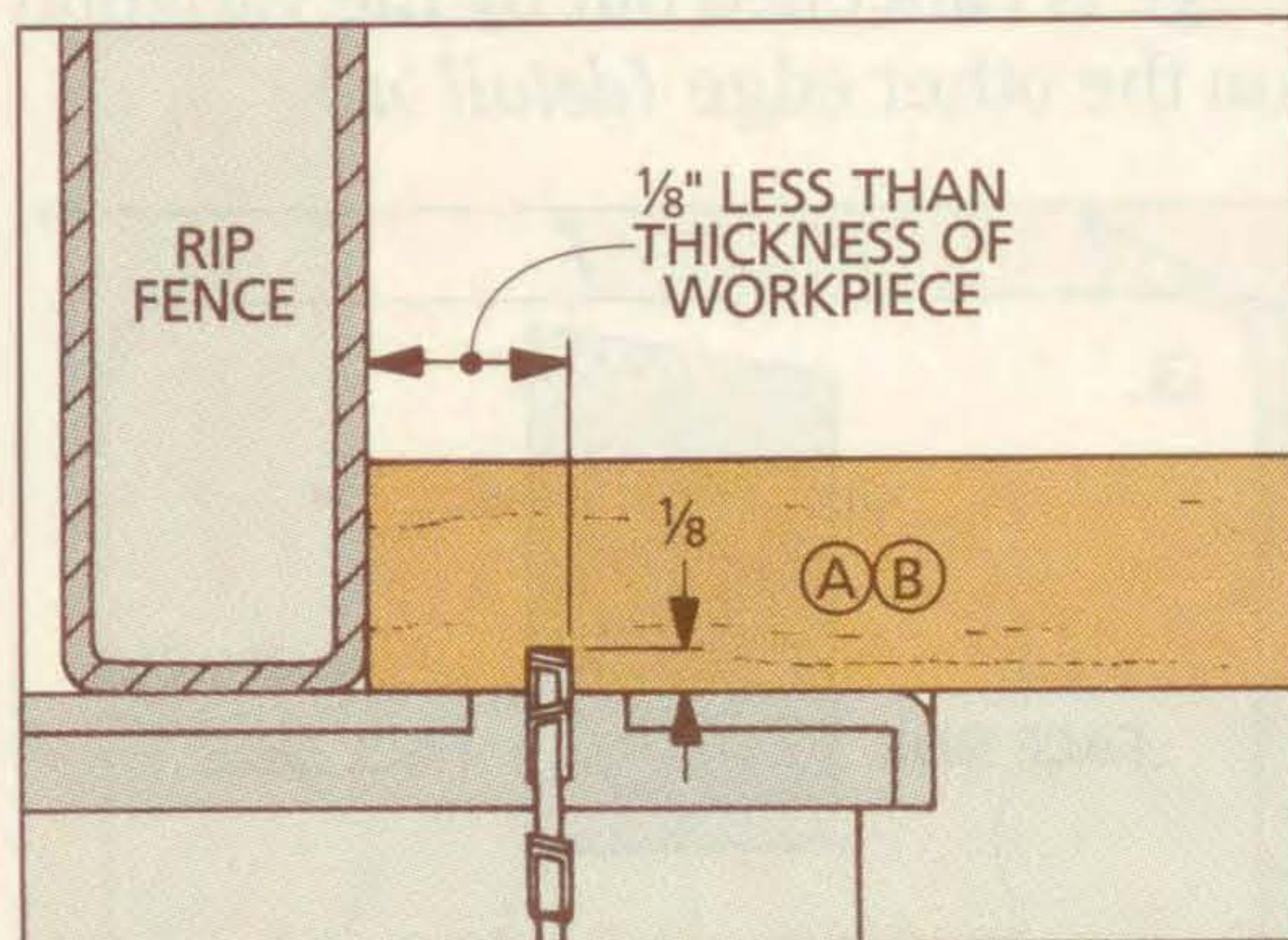
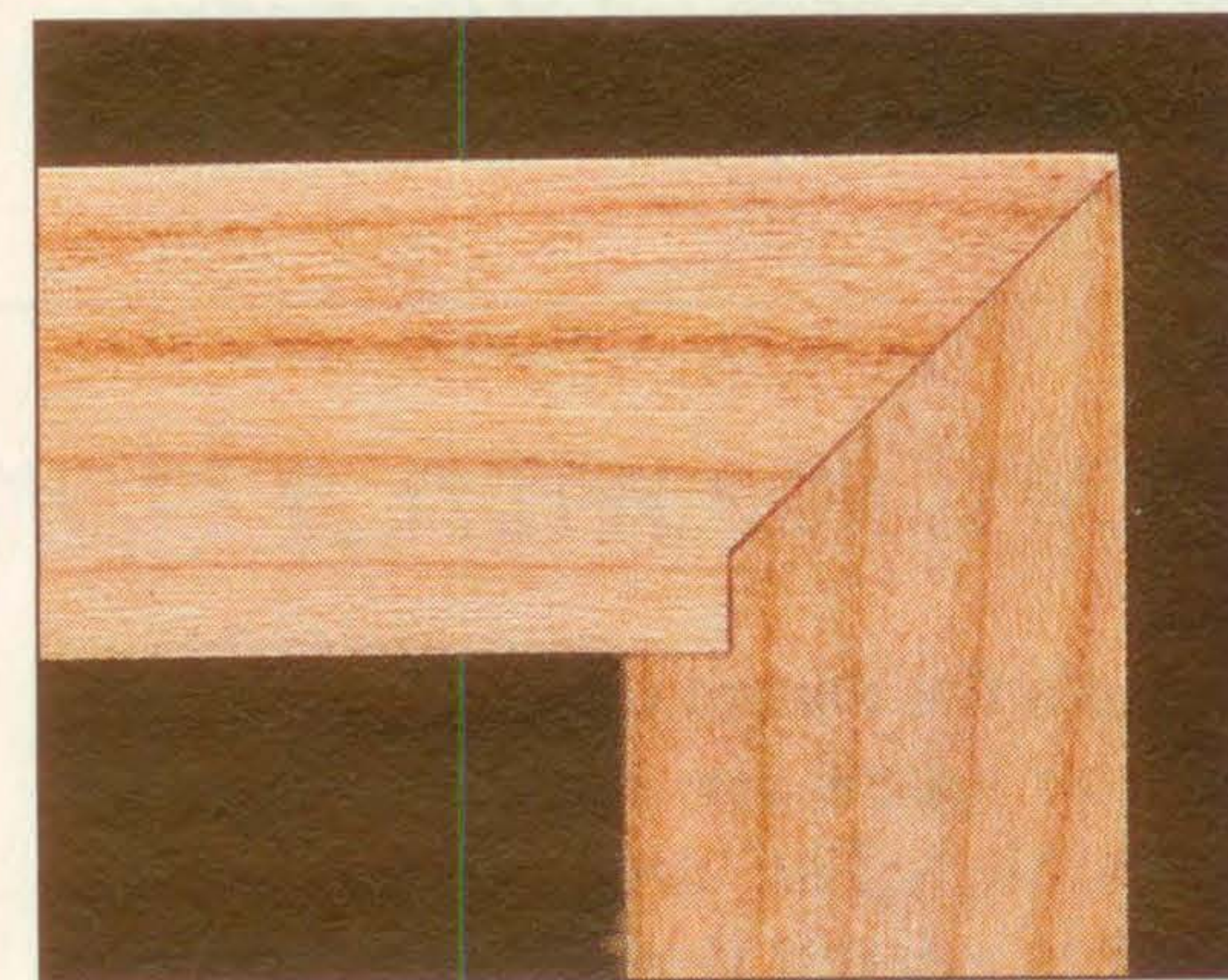
Stop Miter Joints from Slipping Apart

Miters are commonly used to hide the end grain on two pieces that are being joined. It's a joint that works well for picture frames and small boxes that won't get a lot of handling.

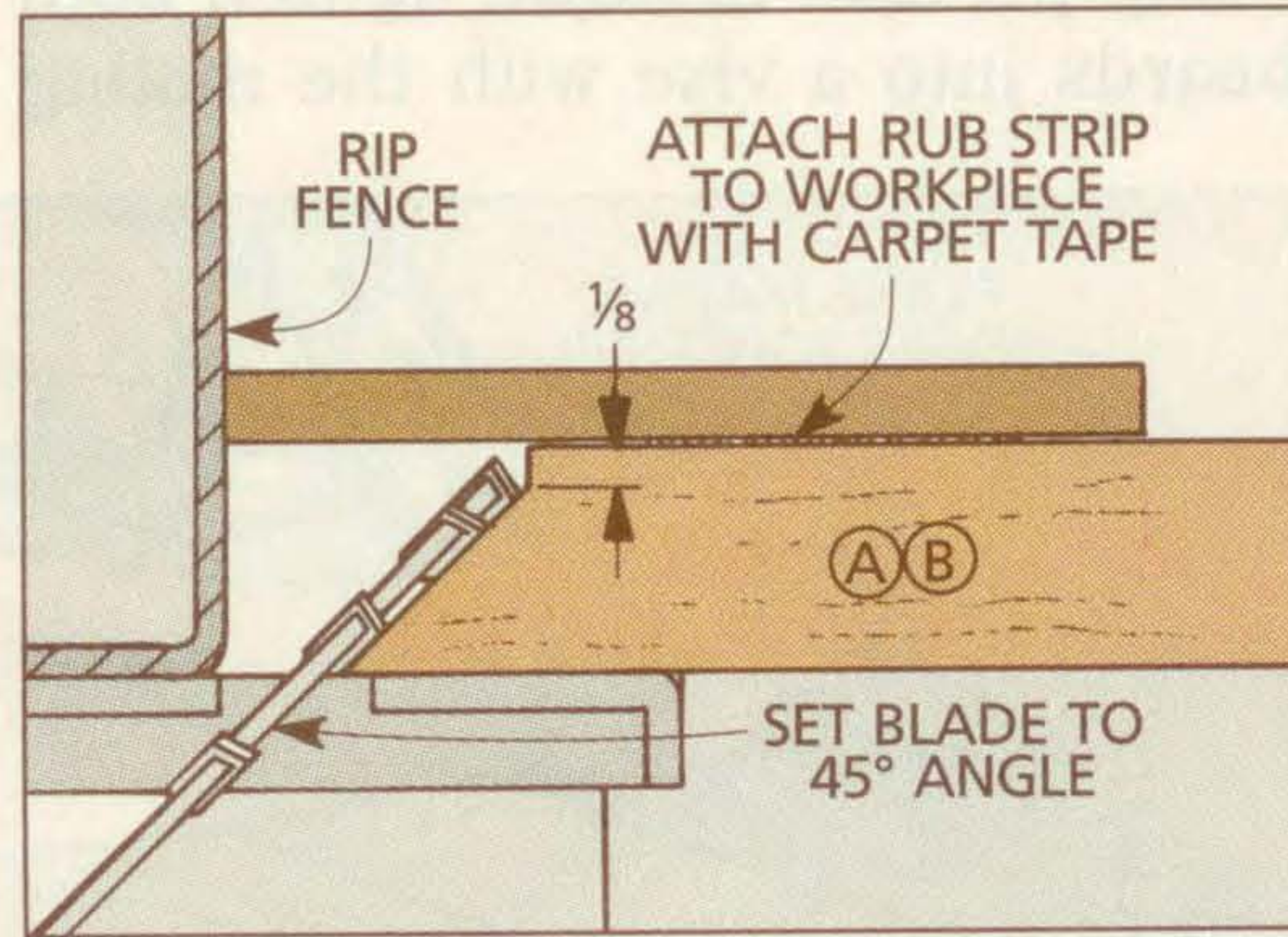
But by itself, a miter joint isn't that strong. So for larger projects, I often use a variation of a miter joint — a rabbeted miter — to join the four workpieces. (For another solution to this problem, see page 22.)

First, use the table saw to cut a shallow kerf across the inside face of all the pieces (parts A and B) (*Step 1*). Then the miter is cut with the blade aligned with the kerf (*Step 2*). (A hardboard rub strip helps to align the blade to the top of the kerf.)

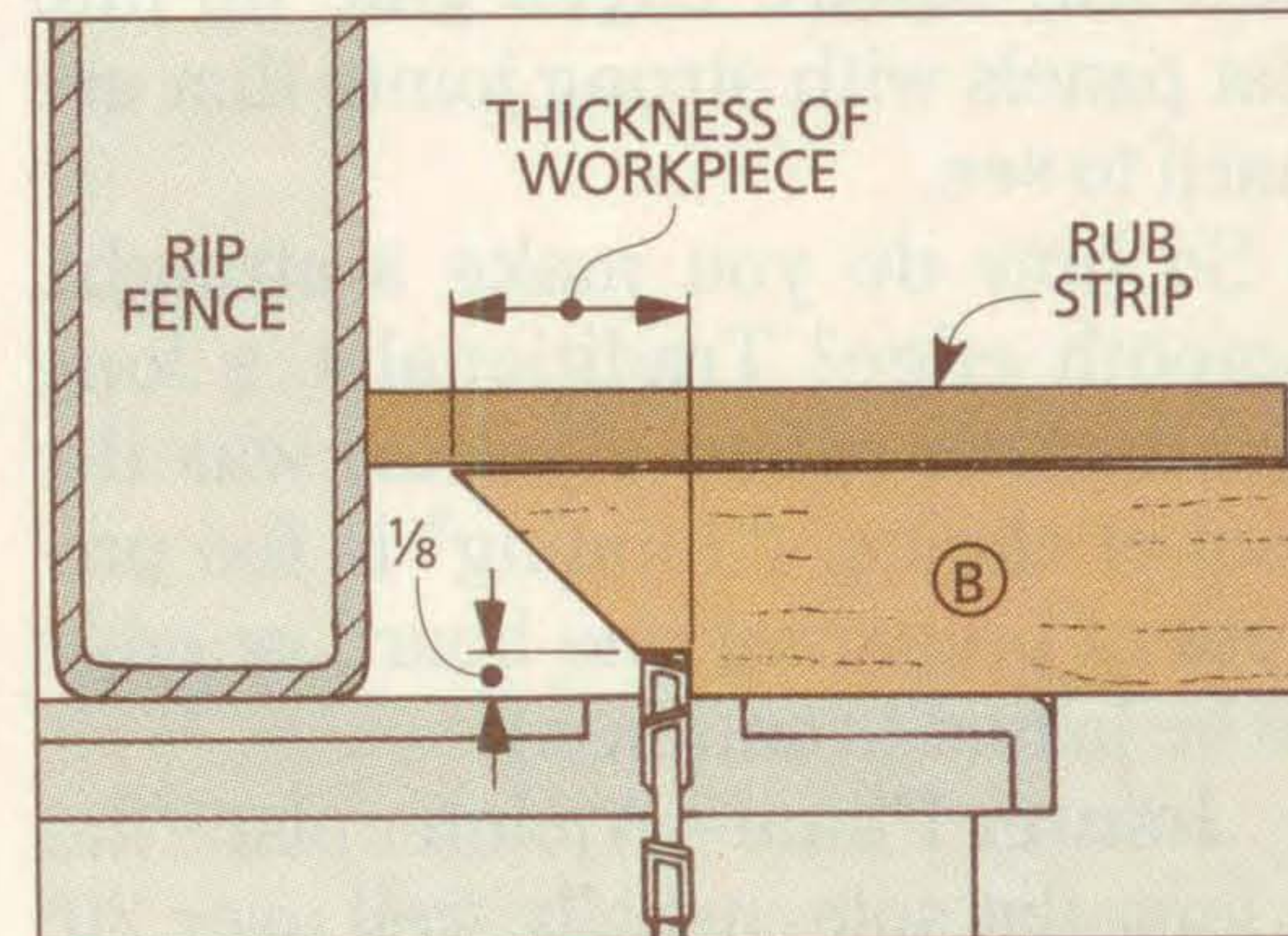
Lastly, a shallow rabbet ($\frac{1}{8}$ ") is cut on both ends of the two opposing pieces (parts B) (*Step 3*). Again, the rub strip helps line up the cut.



1 The rabbeted miter joint starts out the same on all four workpieces. First, cut a $\frac{1}{8}$ "-deep kerf with a regular saw blade across the inside face of each piece.



2 Now, cut the miter. Be sure the blade is aligned to the kerf. To help, stick a piece of hardboard to the workpiece. Then adjust the fence and sneak up on the cut.



3 Finally, the last cut is a rabbet on the two opposing piece. Again use a hardboard rub strip, but this time to help position the blade in relation to the long point of miter.

Plugging Mortises

Recently I was working on a project that had a series of slats that fit in mortises. Because of the way the project was designed, it was easier to apply the finish before assembling all the pieces. The trick was keeping the finish out of the mortises — I wanted good glue joints later on.

To do this, I plugged each mortise temporarily with foam caulking rod (see photo). (The caulking rod that I used was slightly wider than the mortises.) After the finish dries, just remove the foam rod.

A twenty foot length of $\frac{3}{8}$ "-dia. caulking rod purchased from my local hardware store cost less than \$5.00.



▲ **Plug the Mortise.** A short strip of foam caulking rod does a great job of keeping finish out of the mortise before glue up.

Frame and Panel Glue-up Jig

Gluing up a frame and panel door so it ends up perfectly square can be difficult. The pieces always seem to slip out of square during glue-up.

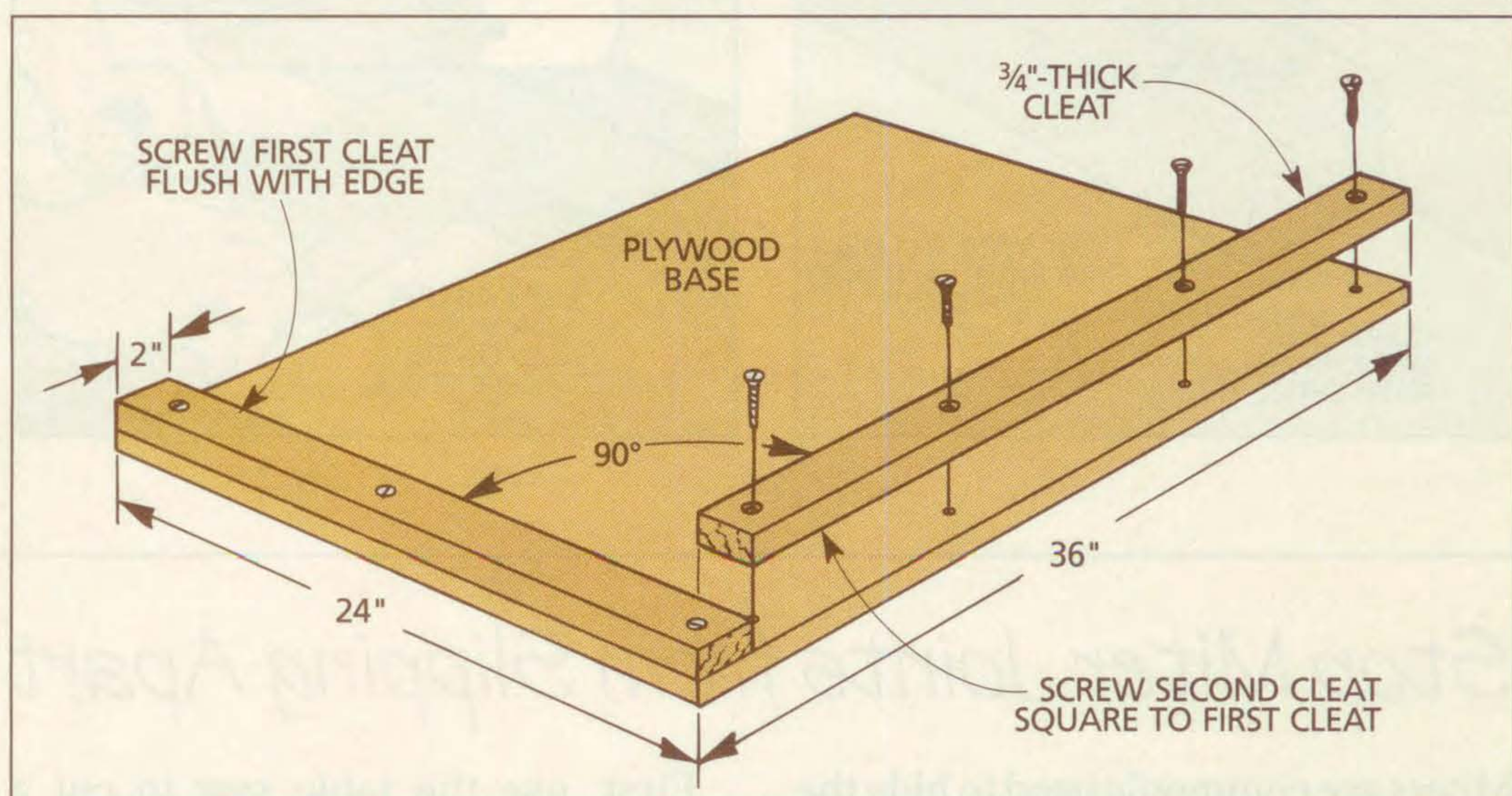
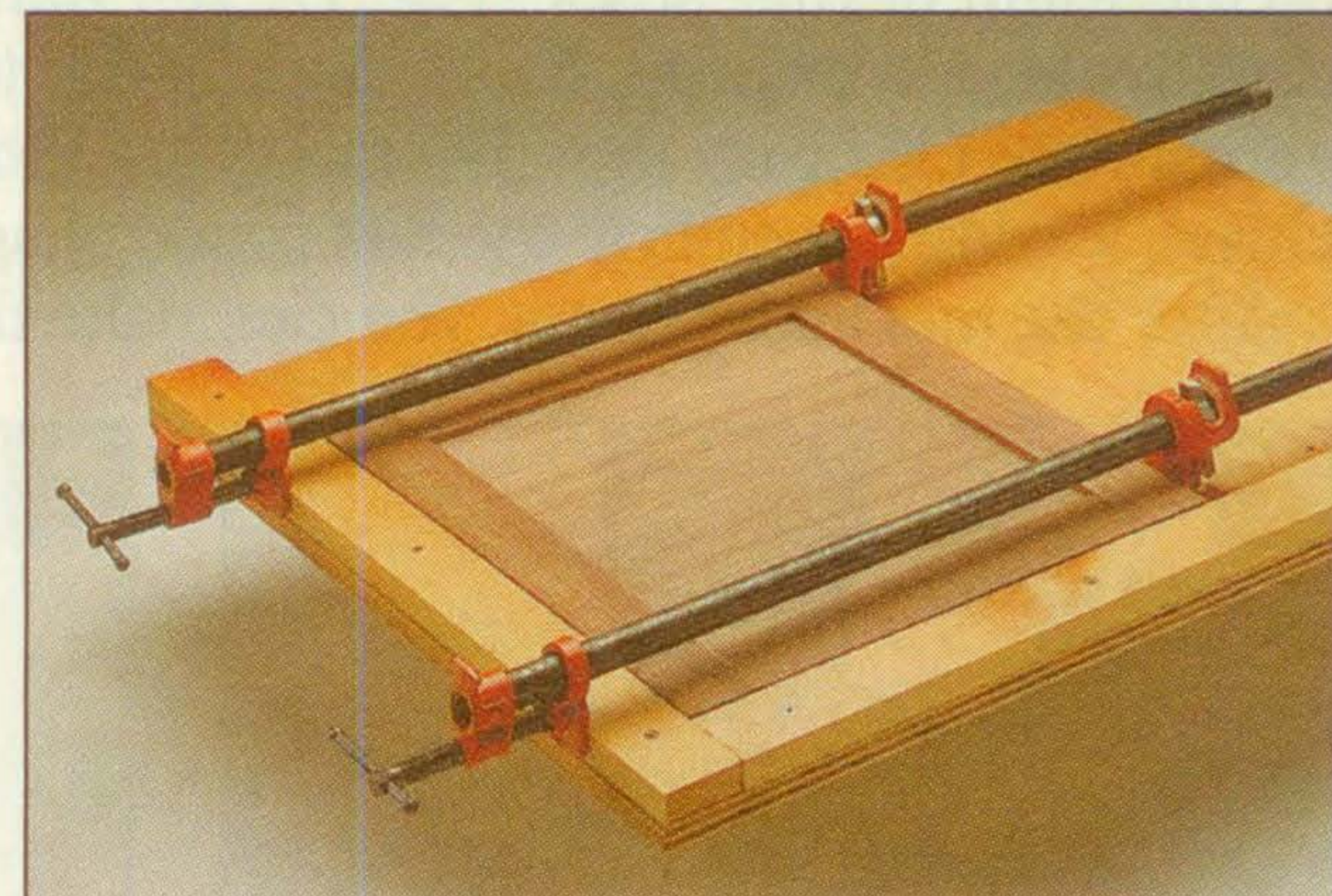
To get around this, I built a jig that provides an accurate reference when gluing up panels (see photo).

Build the Jig — The jig consists of a plywood base and two cleats (see drawing). To provide an accurate reference, it's important that the cleats are screwed to the base so they're 90° to each other.

To use the jig, start by placing each clamp directly over (and parallel to) the rails of the frame. Then, adjust the

pressure and position of the clamps until the frame sits square in the jig.

Note: To prevent any glue squeeze-out from sticking to the jig, I brushed on several coats of polyurethane finish to the base and cleats.



Jointing with a Hand Plane

What's the secret to gluing up panels so the joints are strong and nearly invisible? The answer lies in the boards edges. Boards with straight, smooth, square edges glue up into flat panels with strong joints that are hard to see.

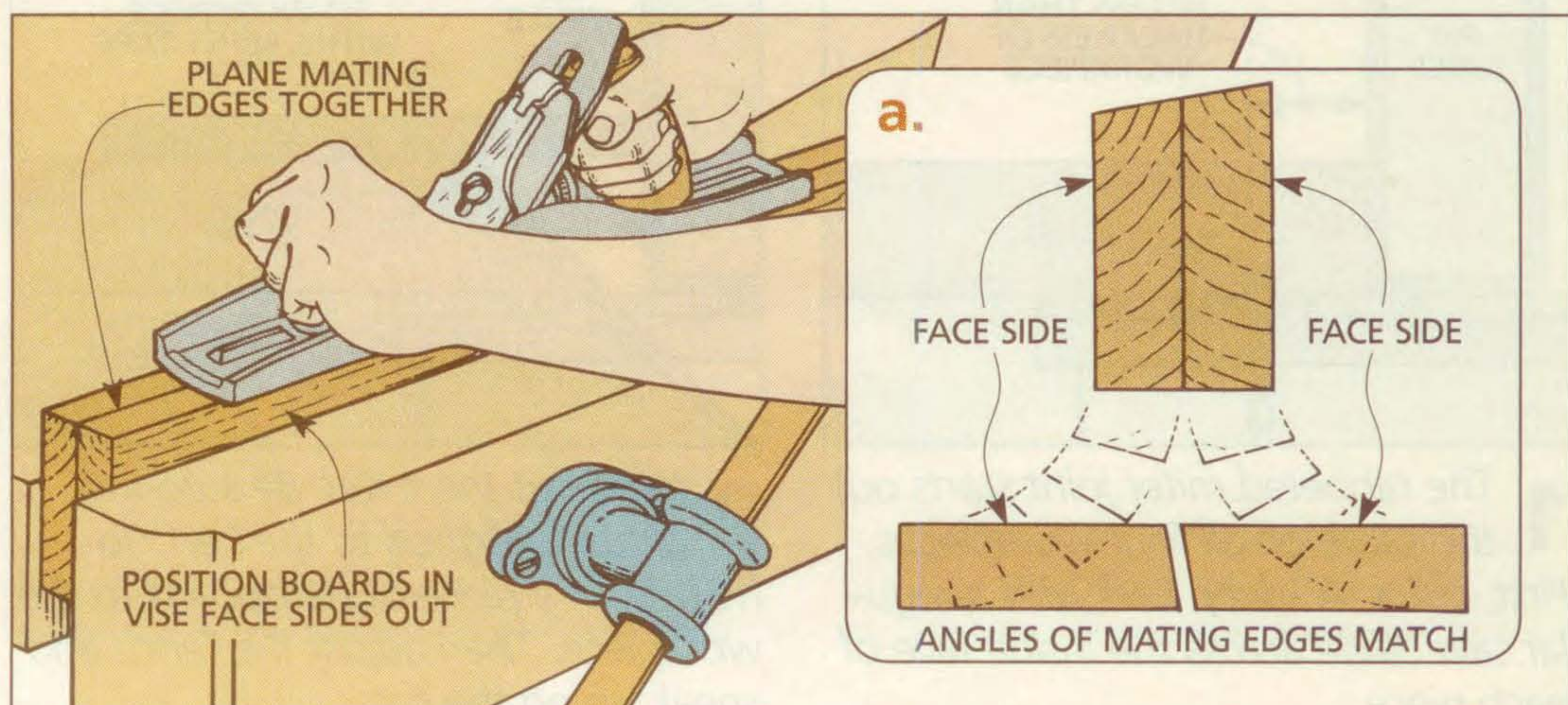
So how do you make a straight, smooth edge? Traditionally, a long hand plane called a jointer was the tool of choice. ("Jointing" is the process of preparing one board or edge to be joined to another.)

Jointer Plane — A jointer plane has a long flat sole, usually well over 20" long. So as it's passed over a wavy edge the plane iron (blade) only cuts off the high spots. (A shorter plane will ride along the wavy edge and won't provide a flat surface.)

One of the biggest challenges with hand planing is getting a perfect 90° angle between the edge and the face. One solution is to not worry about being perfect. Instead, tighten both boards into a vise with the mating

edges up and the face sides of the boards out (see the drawing below).

Now plane both boards at the same time. Any variation from 90° on one edge is cancelled out by the variation on the other edge (detail 'a').



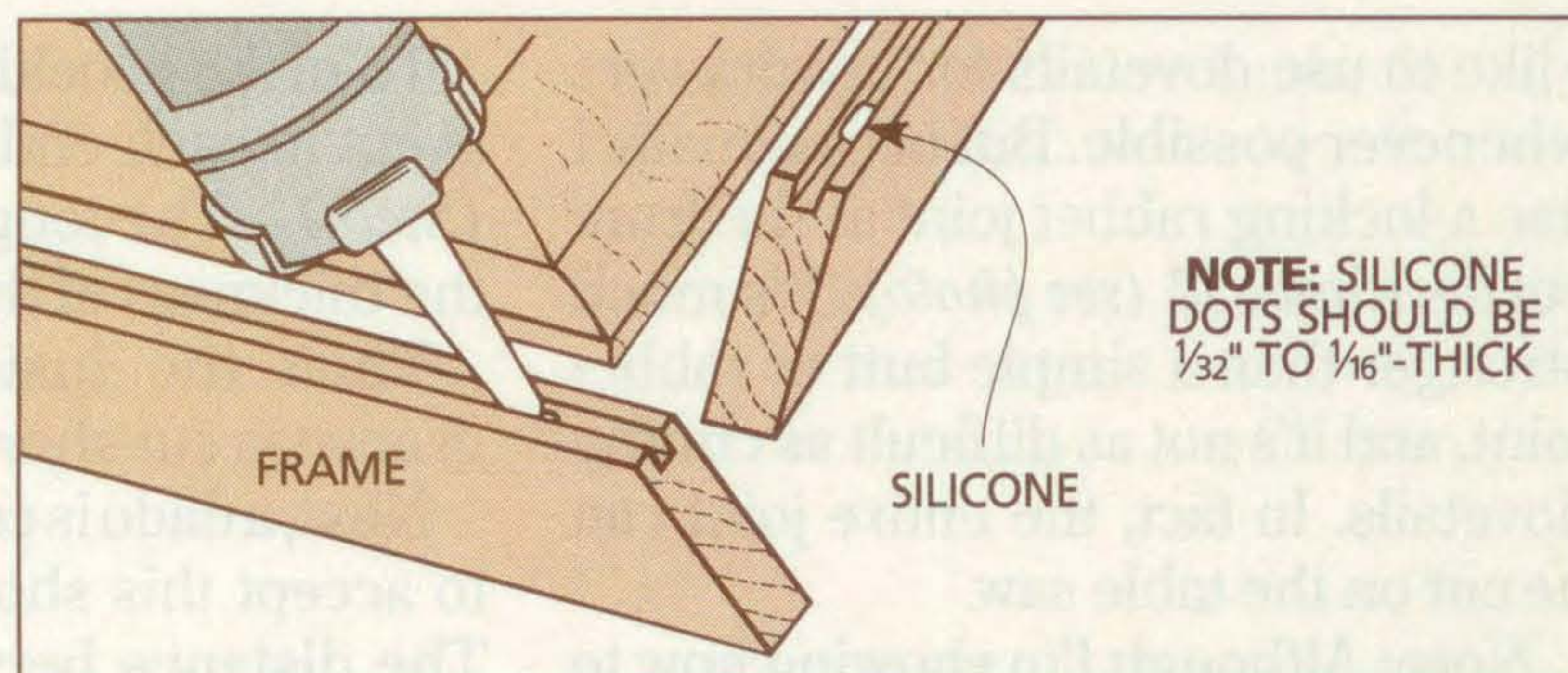
Stop That Panel From Rattlin'

In the past, I've had trouble with raised-panel doors during dry seasons. The panels (which fit fine when it was humid) contract in the frames, causing them to rattle around.

To prevent this, I now put small dots of silicone near

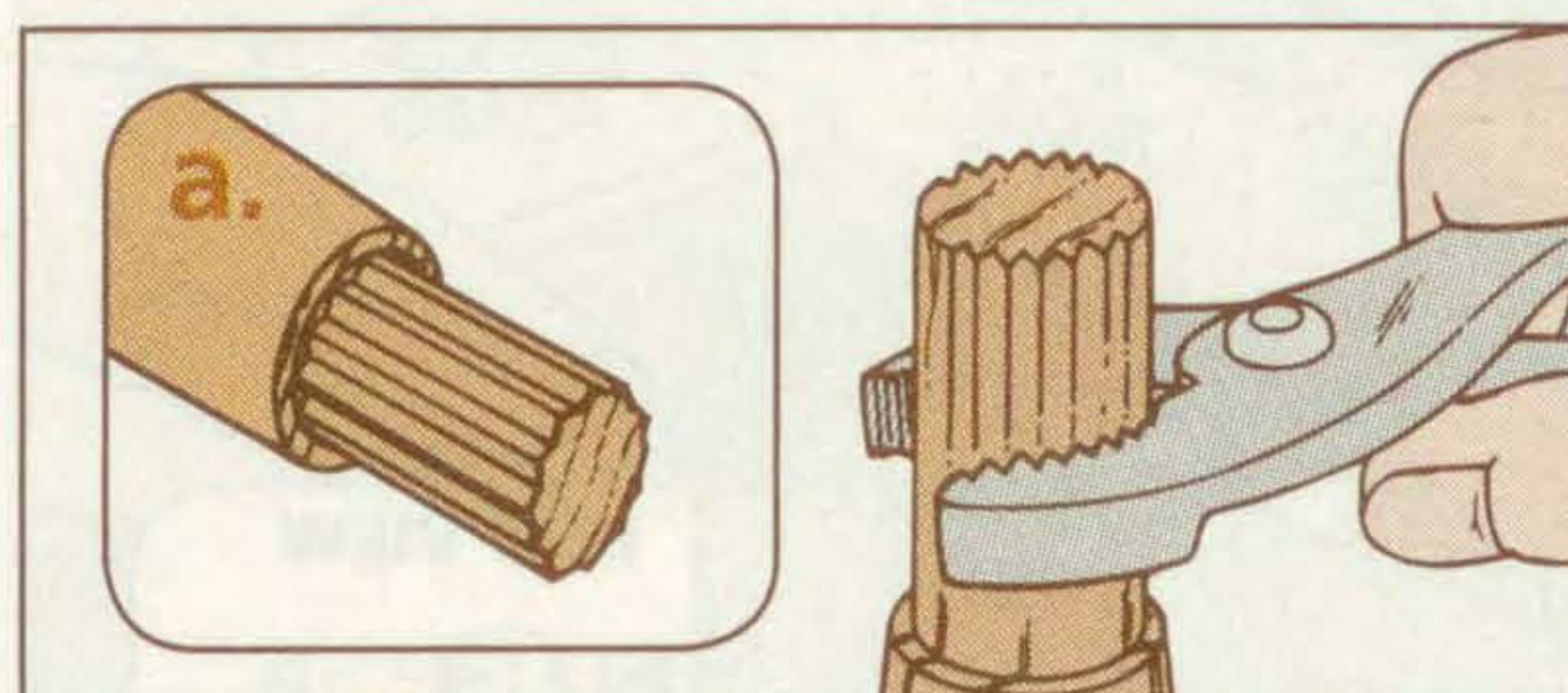
the corners of the frame before assembling the door (see drawing).

Let the silicone harden overnight. Then install the panel as normal. The silicone acts as a shock absorber, cushioning the panel inside the frame.



Fluting Round Tenons

When a dowel fits tight in a hole, it usually scrapes off the glue as it's driven home — unless the end of the dowel (the tenon) is fluted. I make flutes for the bench's dowels using an ordinary set of pliers (see drawing).



Shop Tip

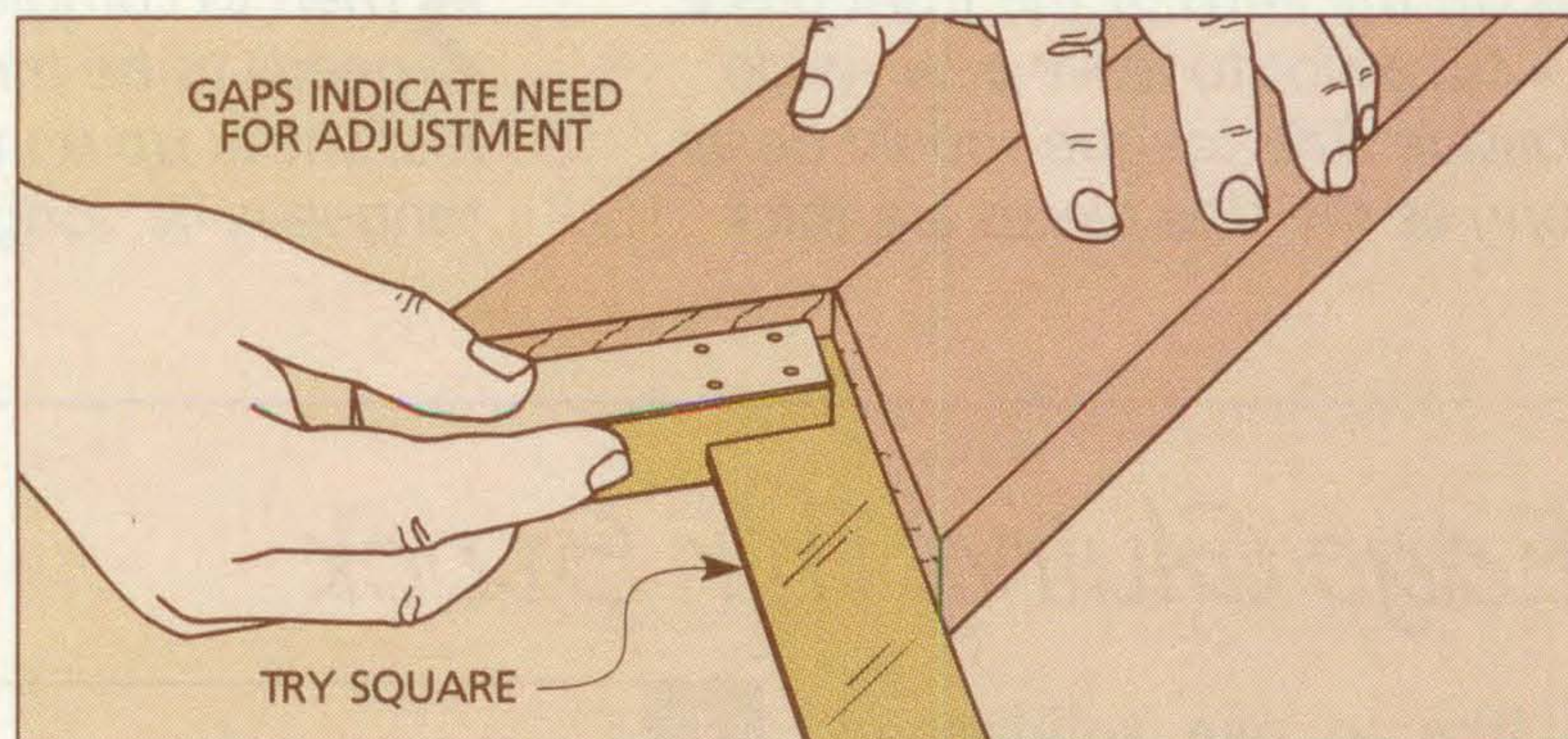
Dowel Centers —

Occasionally, my dowel centers fall out. To prevent this, place a piece of tape across the dowel center. The points will still go through the tape and make their mark.

Checking Miters

The normal way to check a mitered corner for square is to butt the miters together and place a try square on the outside of the corner. I don't. Mainly because I find it difficult to hold the square with one hand while keeping the mitered workpieces tight in the other.

For me, it's easiest to hold the pieces together edge-to-edge and place the square in the mitered corner (see drawing). This also allows me to place the mitered pieces over the edge of my bench so I can get a more accurate reading when checking thinner stock.



Undercut for Tight-Fitting Shoulders

There's an easy way to make mortise and tenons fit together without gaps at the shoulders — undercut them.

"Undercutting" simply means paring away the end grain $\frac{1}{64}$ " deep along the tenon's shoulders.

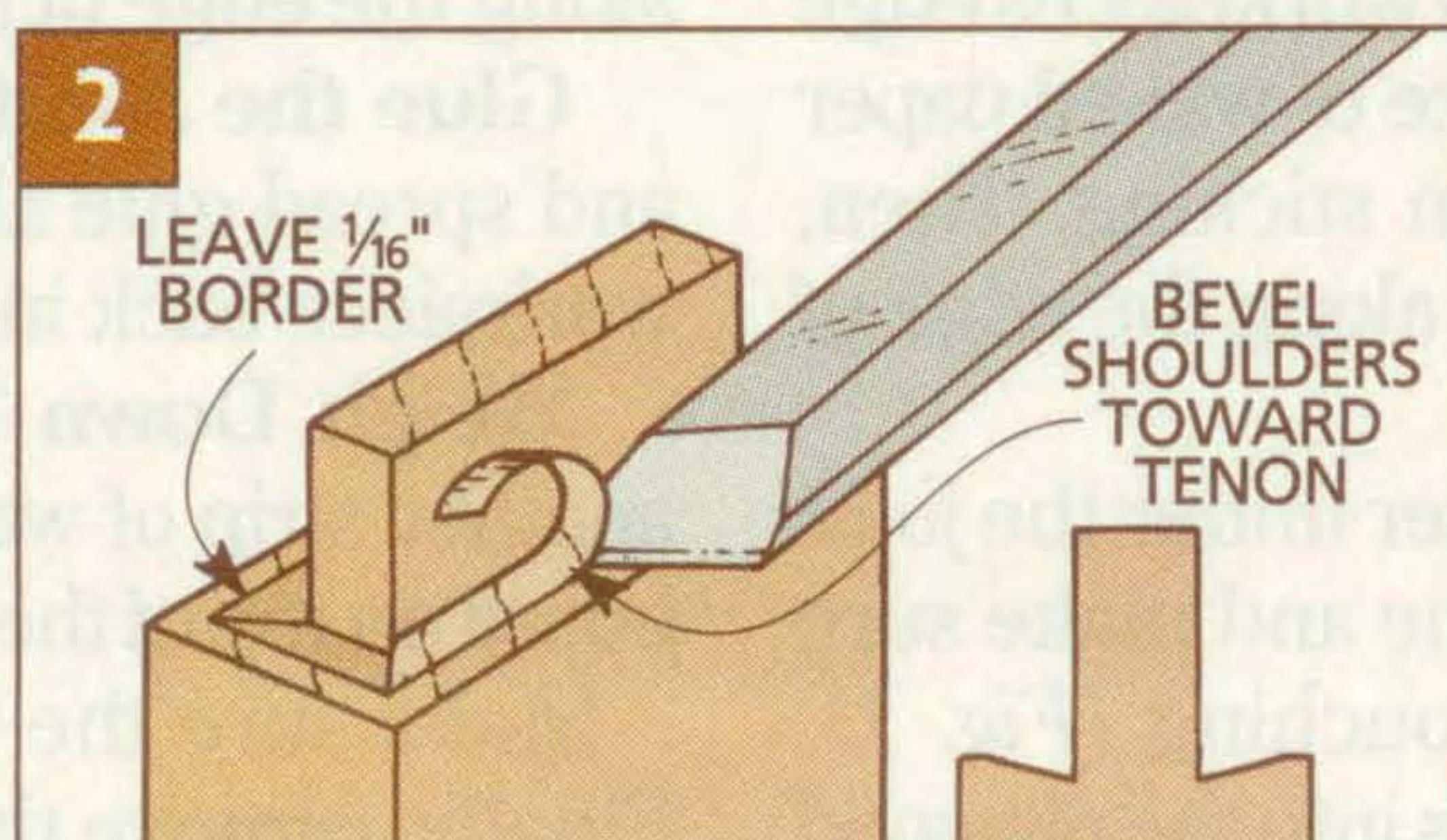
The trick is to undercut the area next to the tenon cheek, leaving at

least $\frac{1}{16}$ " untouched along the outside edge of the shoulder. If you cut all the way to the edge, you'll leave a gap in the joint.

Start by lightly pushing a chisel straight into the corner (Fig. 1). Do this all the way around the tenon. Then to remove the waste, angle

the chisel in toward the cheek of the tenon (Fig. 2).

Also, to prevent the square ends of the tenon from pushing all the glue to the bottom of the mortise, lightly chamfer the ends (Fig. 3). This chamfer can be cut with a chisel or block plane.



Locking Rabbet Drawer Joints

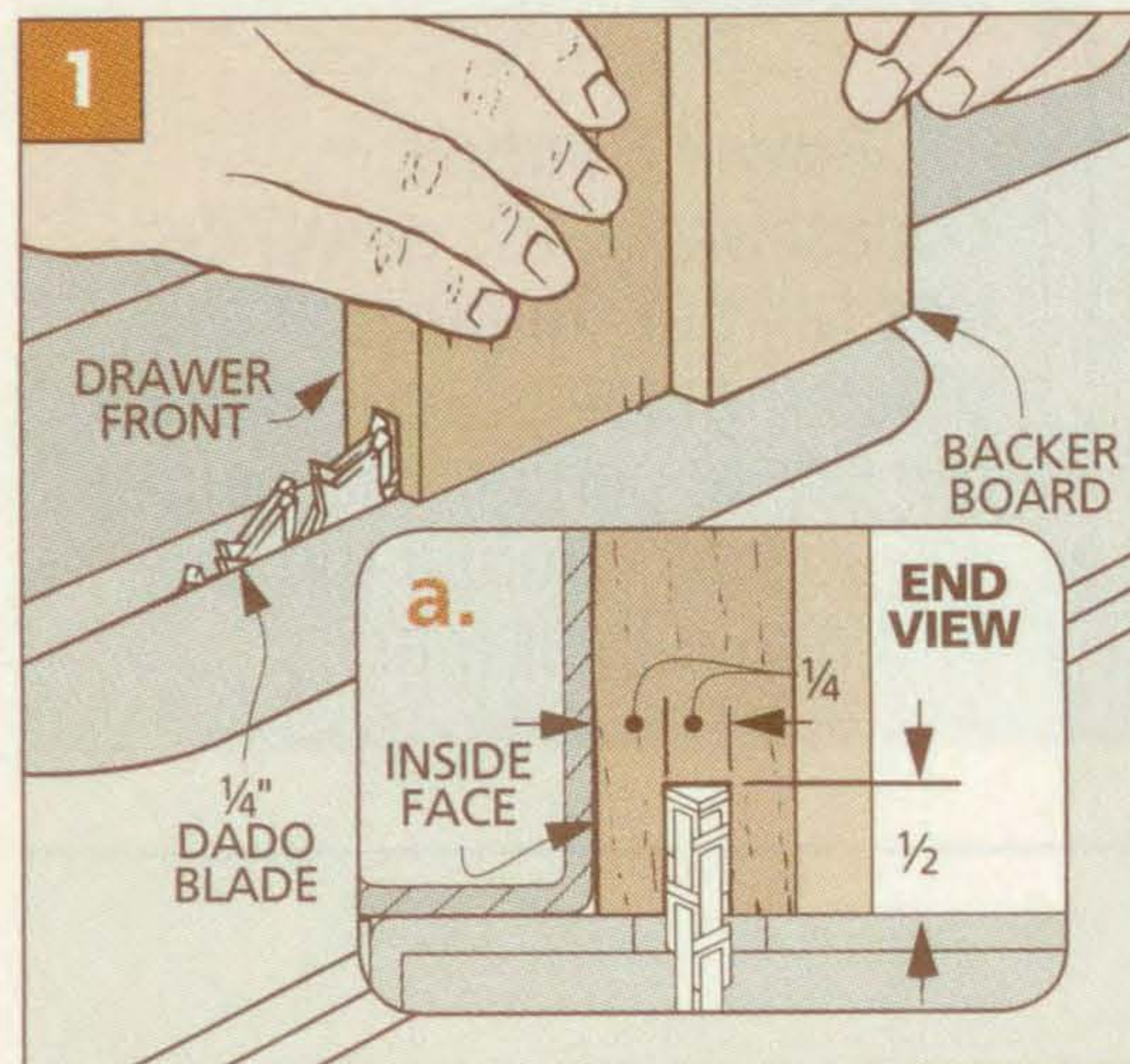
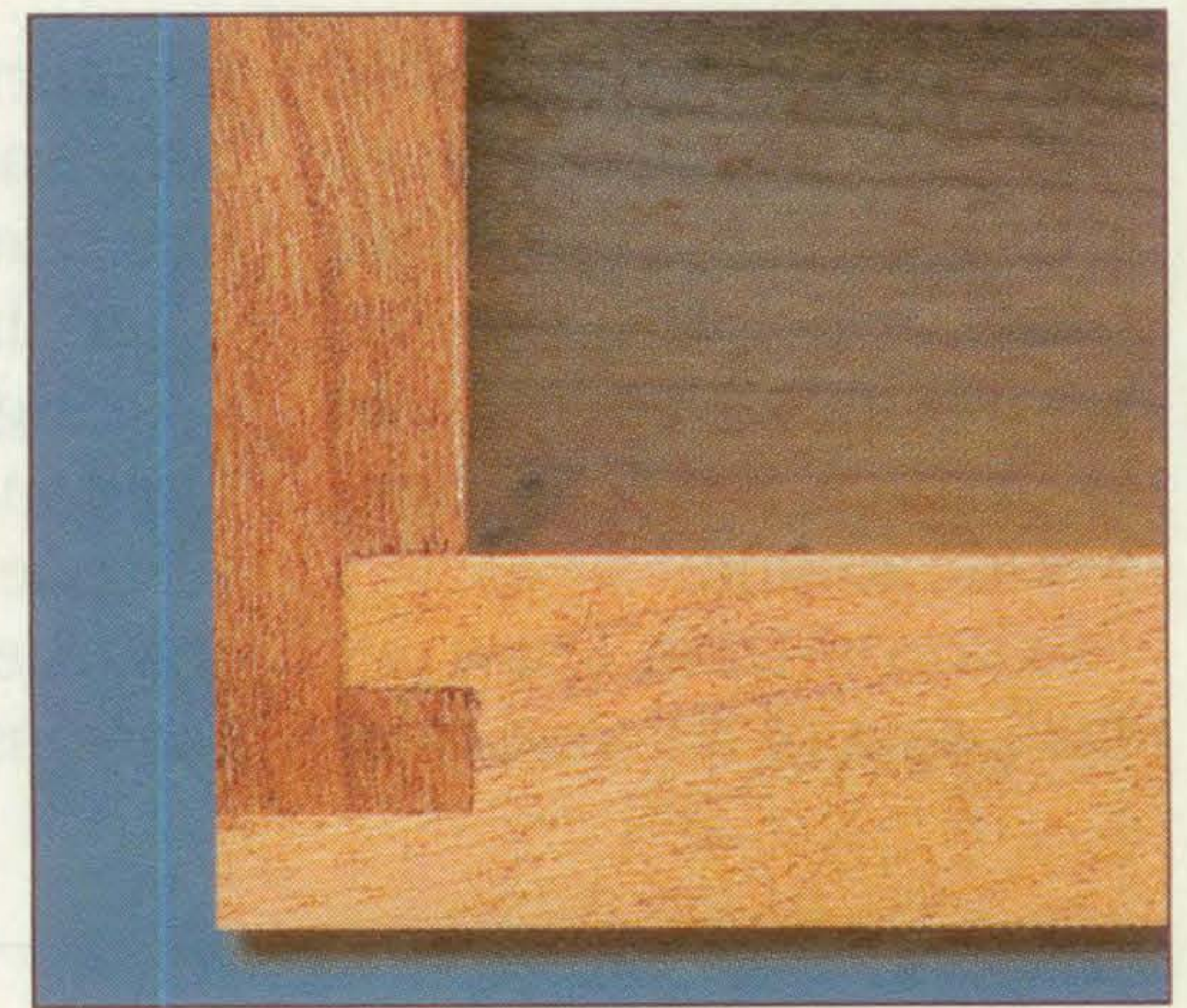
I like to use dovetails for my drawers whenever possible. But occasionally I use a locking rabbet joint at the front corners instead (see photo). It's much stronger than a simple butt or rabbet joint, and it's not as difficult as cutting dovetails. In fact, the entire joint can be cut on the table saw.

Note: Although I'm showing how to cut the joint on the table saw, the same procedure can be used to cut the joint with a straight bit in the router table.

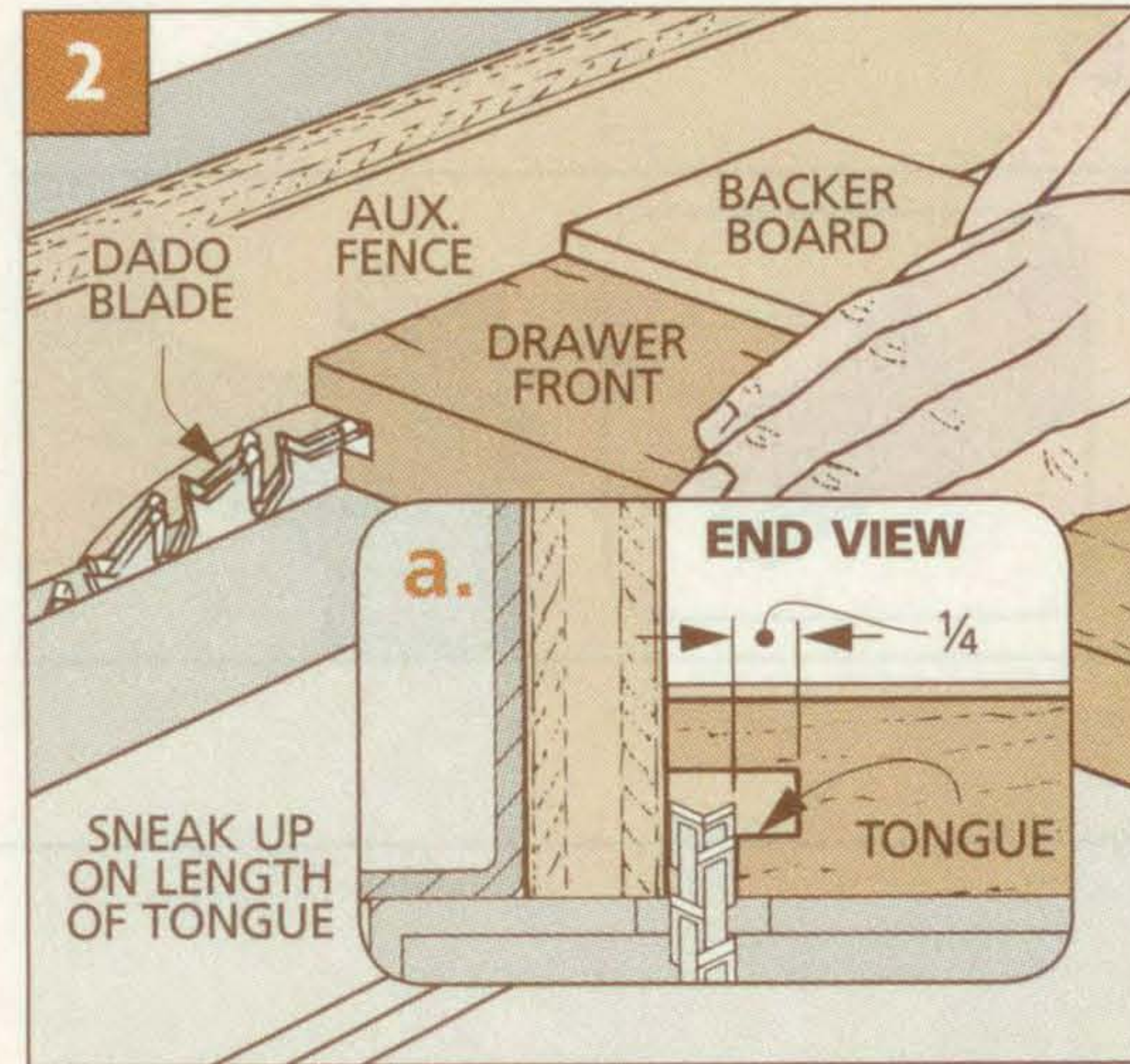
To make a locking rabbet, a groove is cut in each end of the drawer front (Step 1). The tongue's depth matches the thickness of the side pieces.

Then the inside tongue of the groove is cut shorter (Step 2).

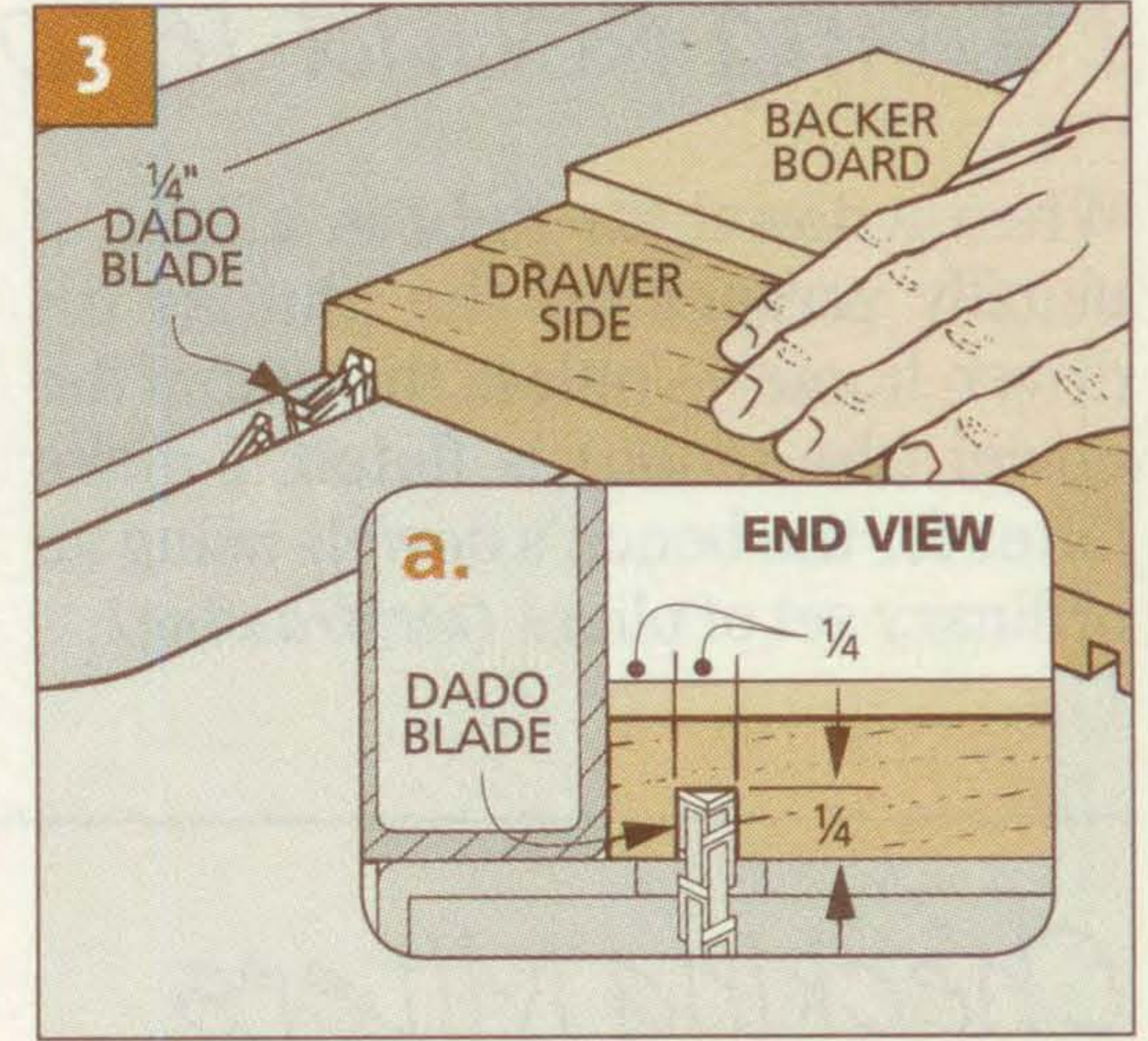
Next, a dado is cut on each side piece to accept this short tongue (Step 3). The distance between the dado and the end of the workpiece should equal the width of the dado in the drawer front (see photo).



1 On the ends of the front piece, cut a slot to leave a 1/4"-wide tongue. The tongue should be as long as the side pieces are thick.



2 Then to complete the tongue, it needs to be trimmed to length. Just sneak up on the cut until the tongue is 1/4" long.



3 Finally, to hold the tongue on the front, cut a 1/4" x 1/4" dado on each side piece. (Be sure to check the setup with a test piece first.)

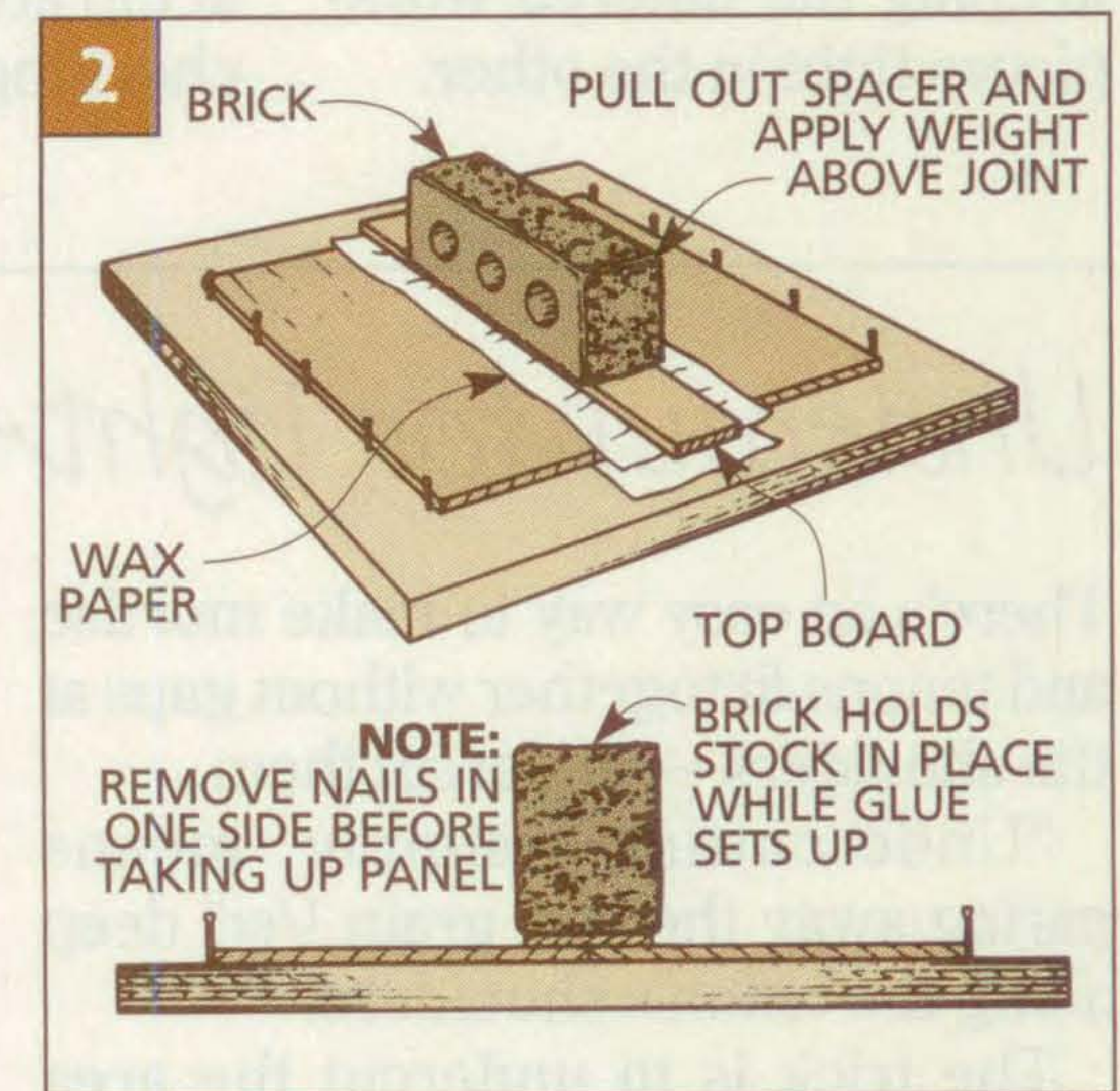
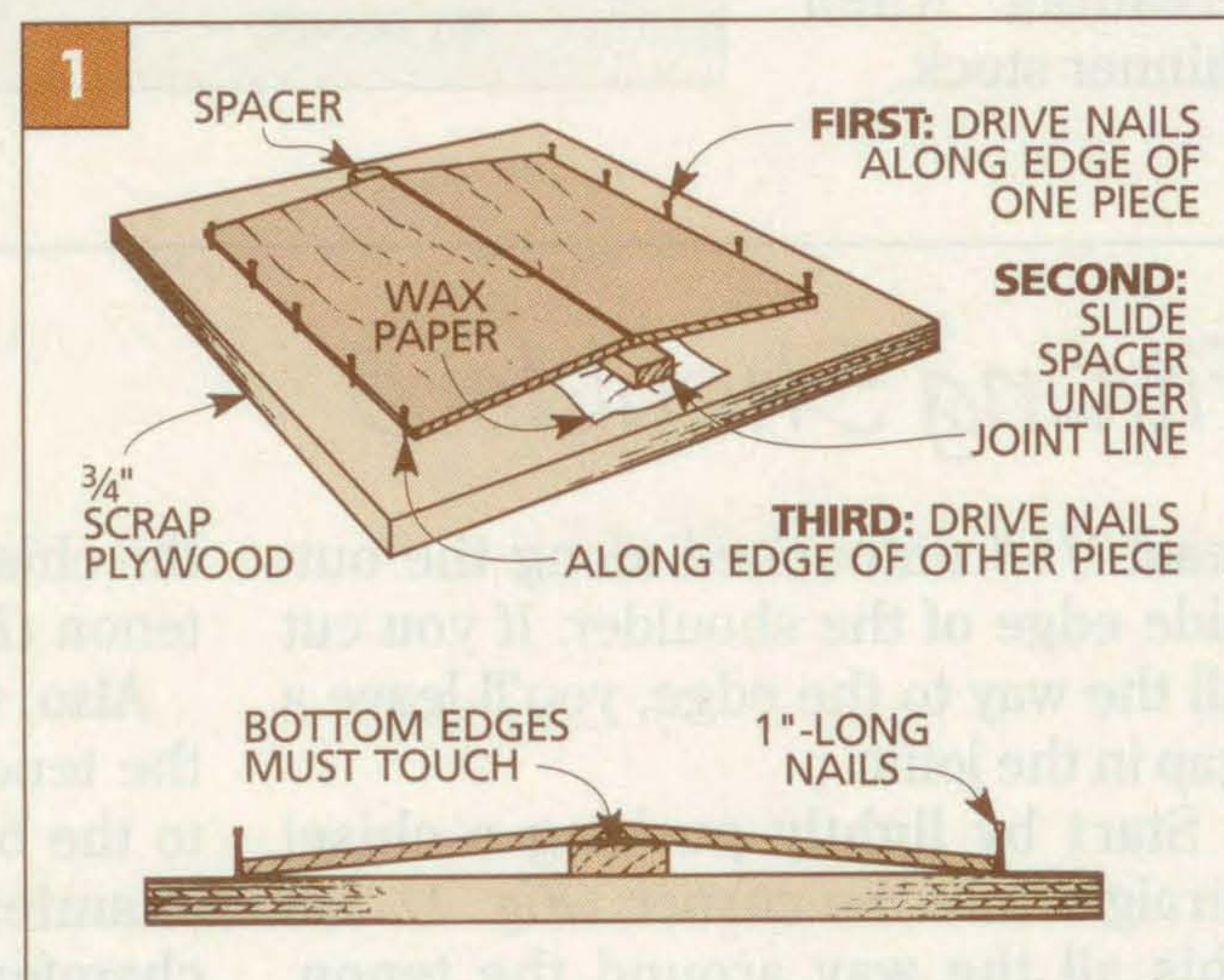
Edge Gluing Thin Stock

I like to use solid-wood bottom panels for boxes and small chests, which means I often have to glue the panels up. When edge gluing thin pieces, I use a special technique.

Prepare Stock – For the first step, I start by jointing the two edges so they fit together without gaps. You can use a jointer for this step, but if you don't own one, a block plane will also do the job.

Work on Plywood – Now, place the two workpieces edge to edge on a piece of plywood. Place a piece of waxed paper under the joint line to prevent them from sticking. Then, drive several finish nails into the plywood, along the edge of one of the pieces.

Joint Line Spacer – Next, slide a spacer under the joint line. The trick is to center it on the joint line and make sure the bottom edges of the two pieces are touching (Fig. 1). With both pieces in place, drive several nails into the plywood



along the edge of the other piece (Fig. 1).

Glue the Joint – Now, carefully tilt one of the panels up and spread glue along the inside edge. Then gently set the workpiece back in place.

Weigh Down Top – Next, slide the spacer out and lay another strip of wax paper on top of the joint line. Now lay a board on top of the wax paper and stack a brick on the board.

Make sure the two pieces are flat, and let the glue dry. Finally, remove the nails before taking the panel up.

Simple Jig for Compound Miters

The traditional method for making compound miters is on the table saw with the miter gauge angled and the blade tilted. This procedure can be tricky and involves referring to a chart for the correct angles to set the miter gauge and the blade.

But if the workpiece can be held at the angle it will be installed on the project, the table saw blade can stay at 90°, and only the miter gauge needs to be angled. I was able to use this simpler technique for a recent project. Now I use it all the time.

Auxiliary Fence – To make the cut, begin by fastening an auxiliary fence to the miter gauge. The fence has to be tall enough to support the molding when it's held at the desired angle.

Since the bottom edge of the molding I used was cut at 45°, there was a flat surface that could rest on the surface of the table saw. The top

edge was then supported by the auxiliary fence (*Fig. 1*).

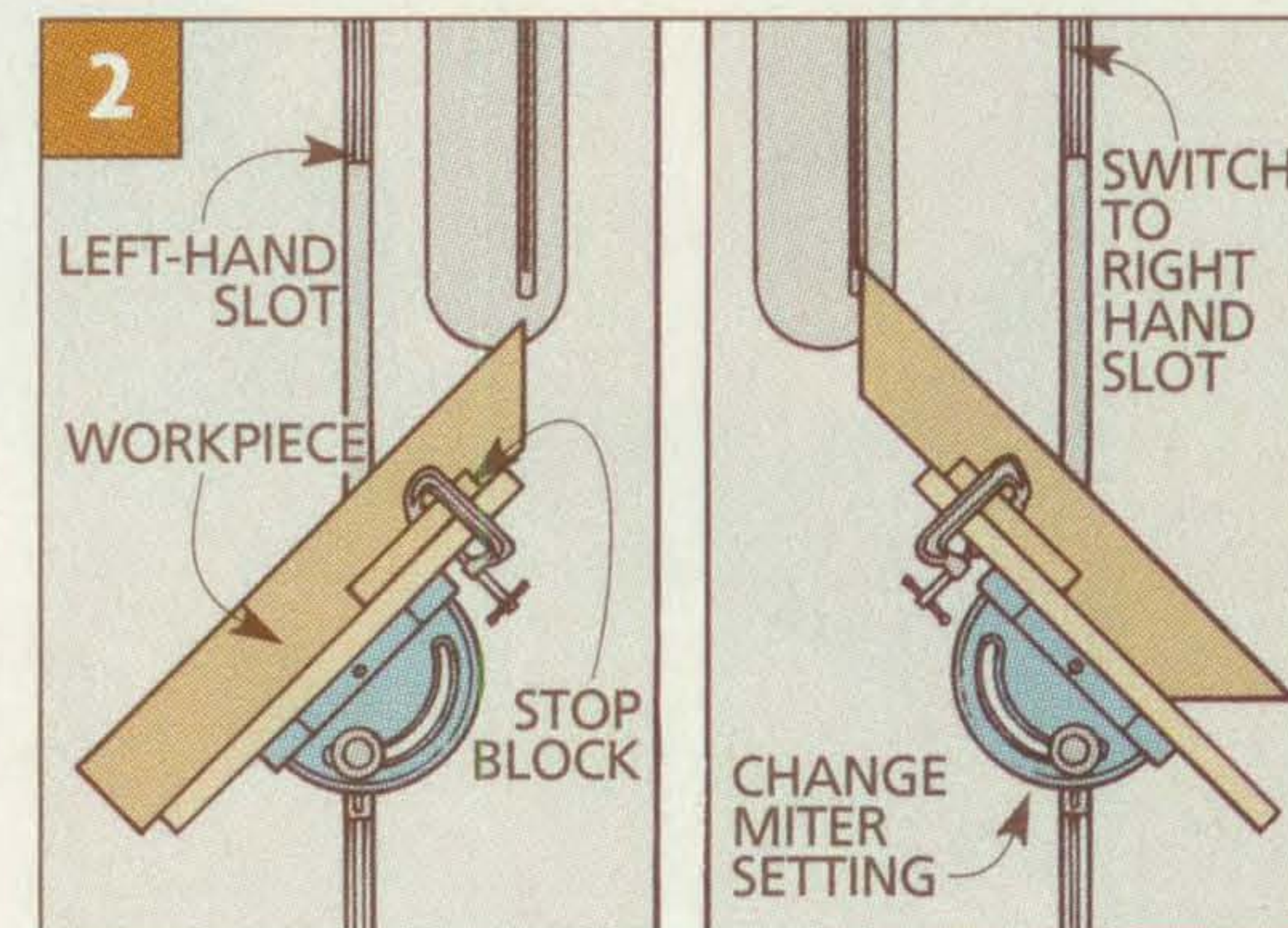
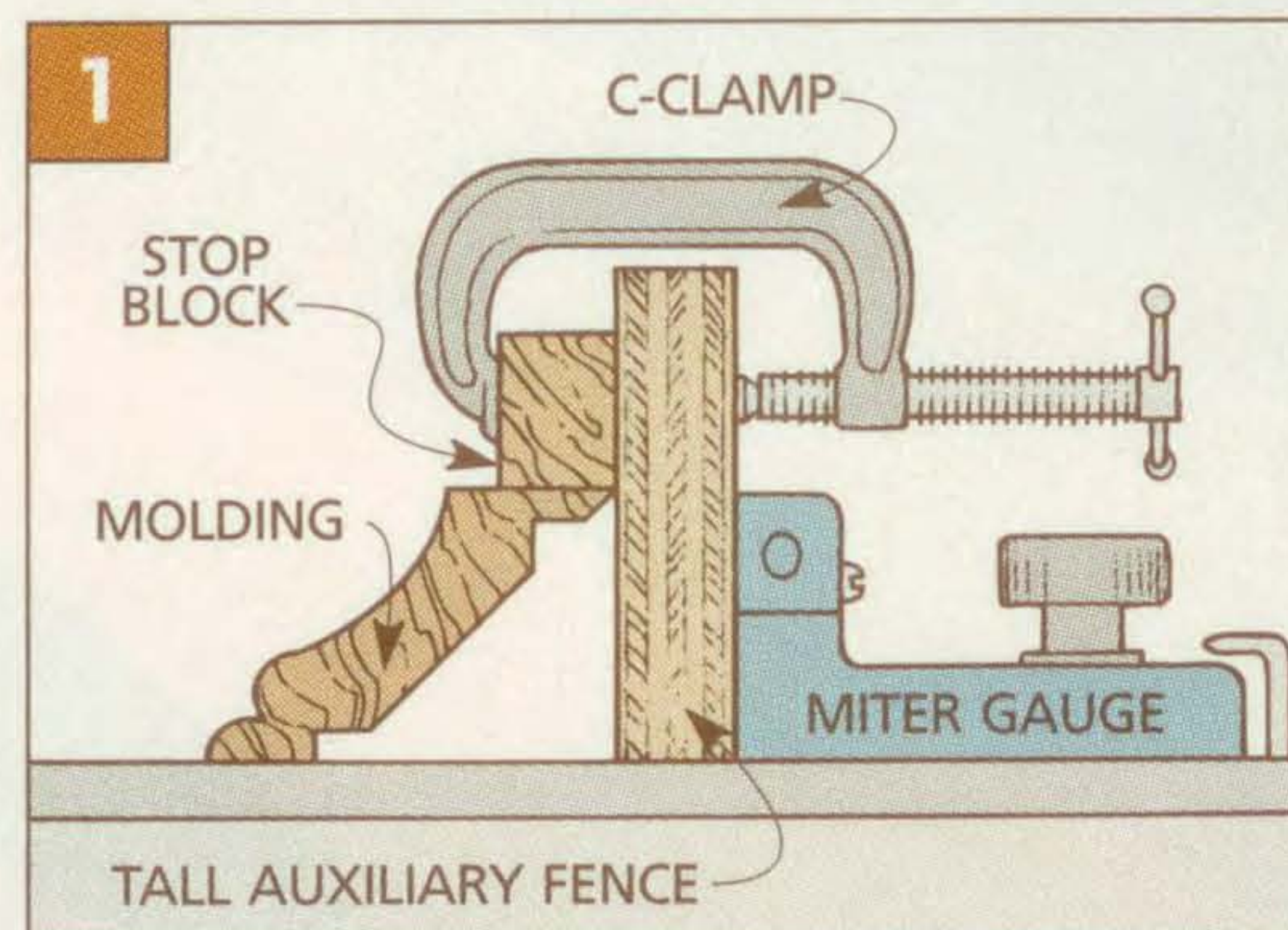
To prevent the molding piece from sliding up during the cut, clamp a small stop block to the auxiliary fence so it rests on the top edge of the molding.

Making the Cut – To cut the molding to length, begin by rotating the miter gauge to 45° and place it in the *left* slot of the table saw. Tip the workpiece to the correct incline (with both edges flat) and bring it up tight

under the stop block and against the auxiliary fence. Then push the workpiece through the blade (*Fig. 2*).

To miter the other end of the workpiece, move the miter gauge to the *right* slot and swing the head of the gauge to the opposite 45° setting.

If the molding can be cut by holding it against an auxiliary fence this way, the cut is likely to be much more accurate than the old-fashioned compound miter procedure.



Check for Square

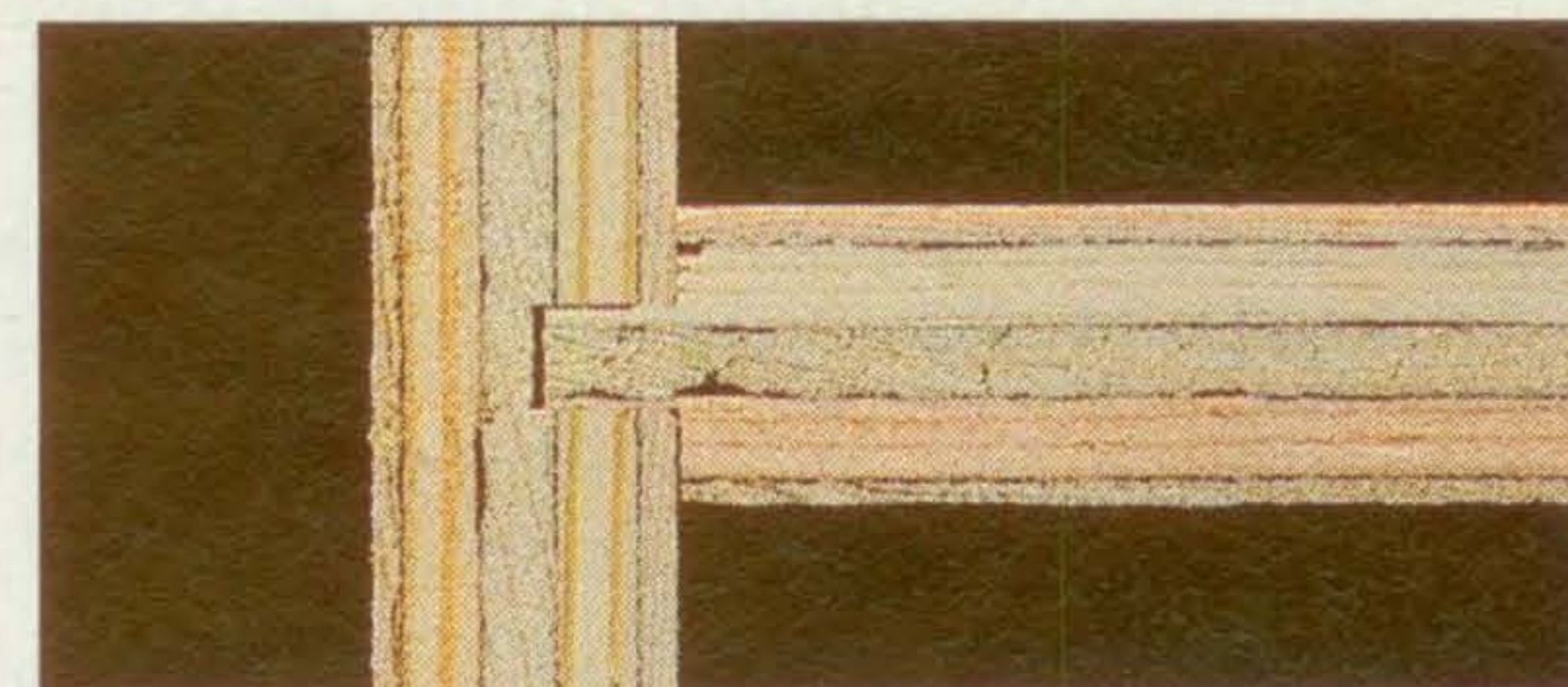
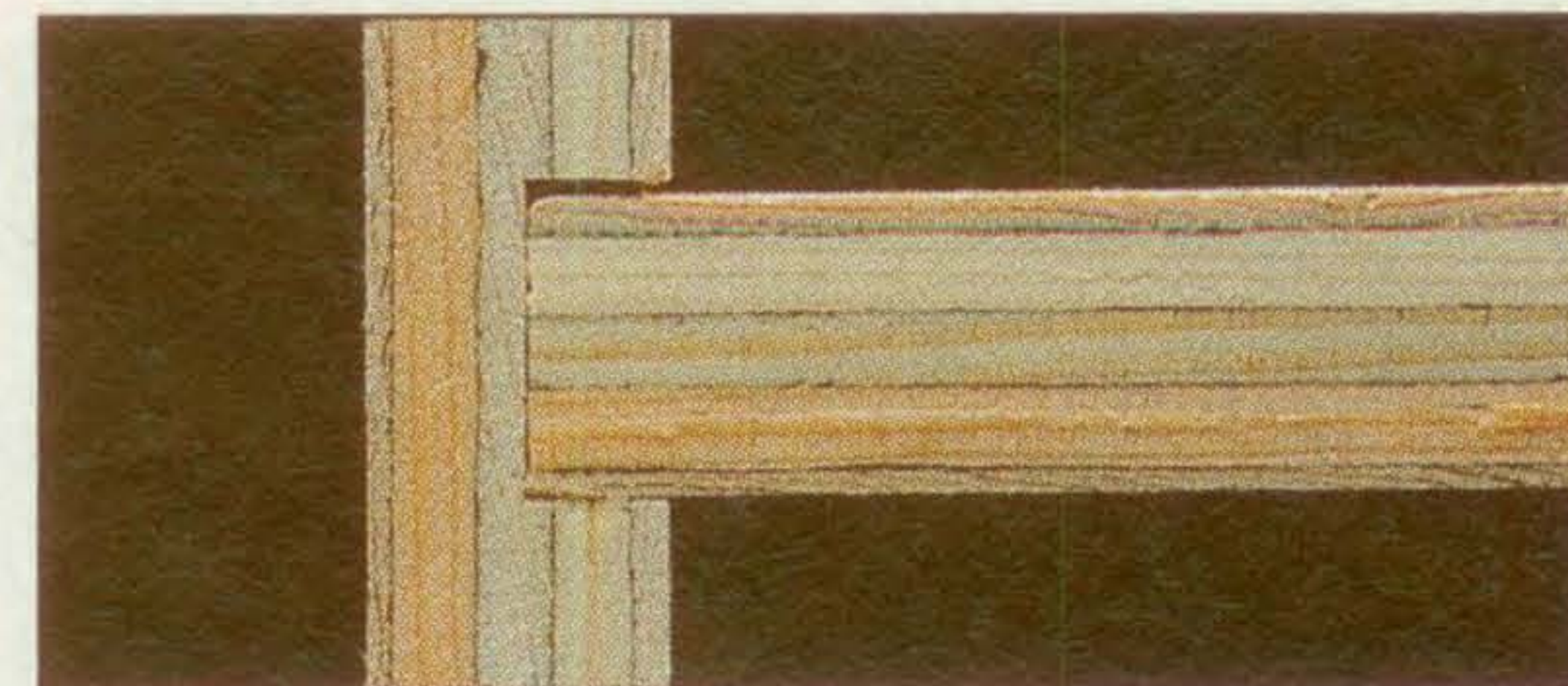
A small piece of plywood acts as a substitute where a try square won't fit. Cut the plywood at exactly 90° and trim a corner for clearance.



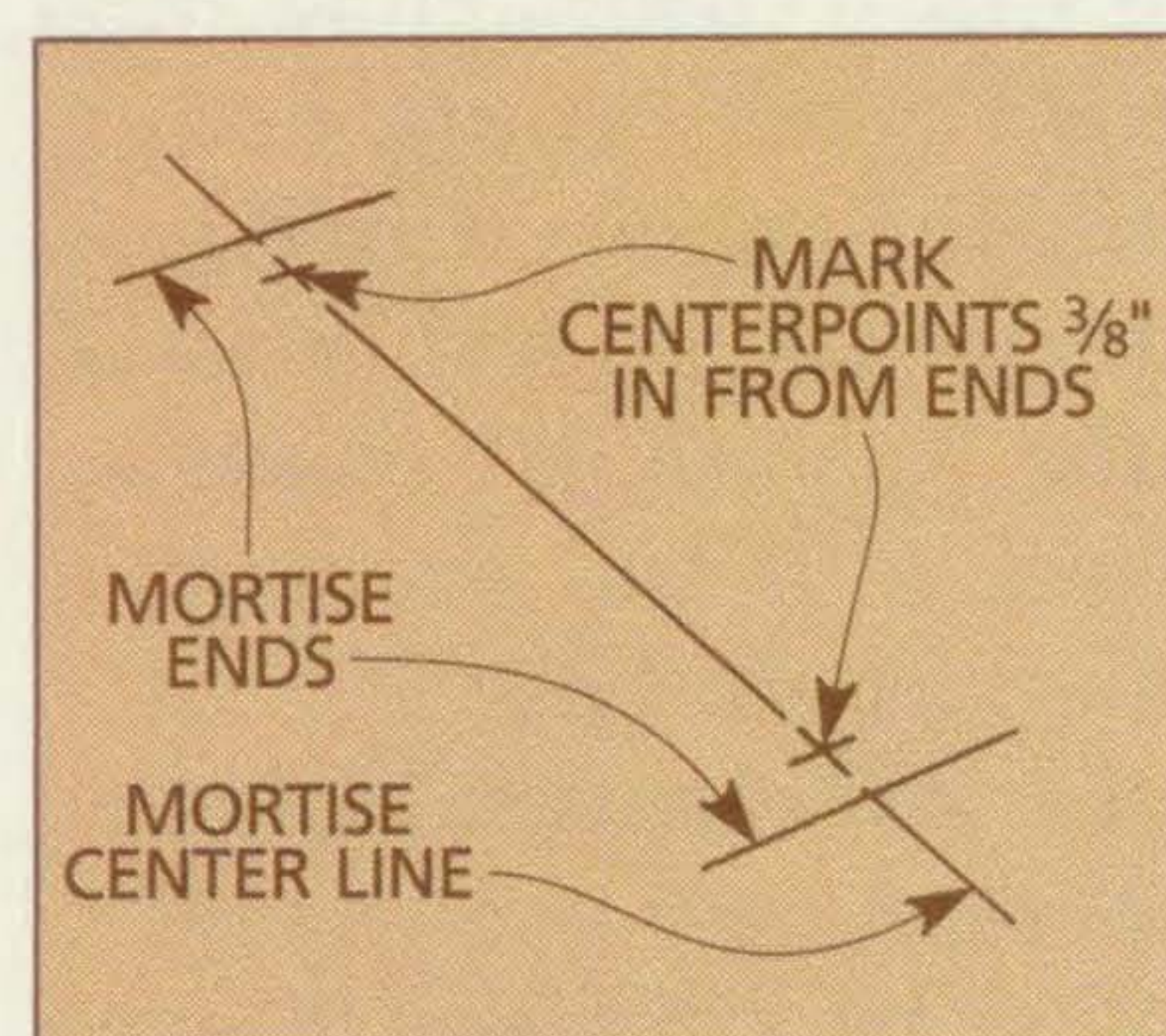
Better Looking Tongue & Dado Joint

There are several ways to join a shelf to the side of a cabinet. A full-width dado (*see upper photo at right*) normally works fine, but if the shelf doesn't fit the dado exactly, there will be a visible gap.

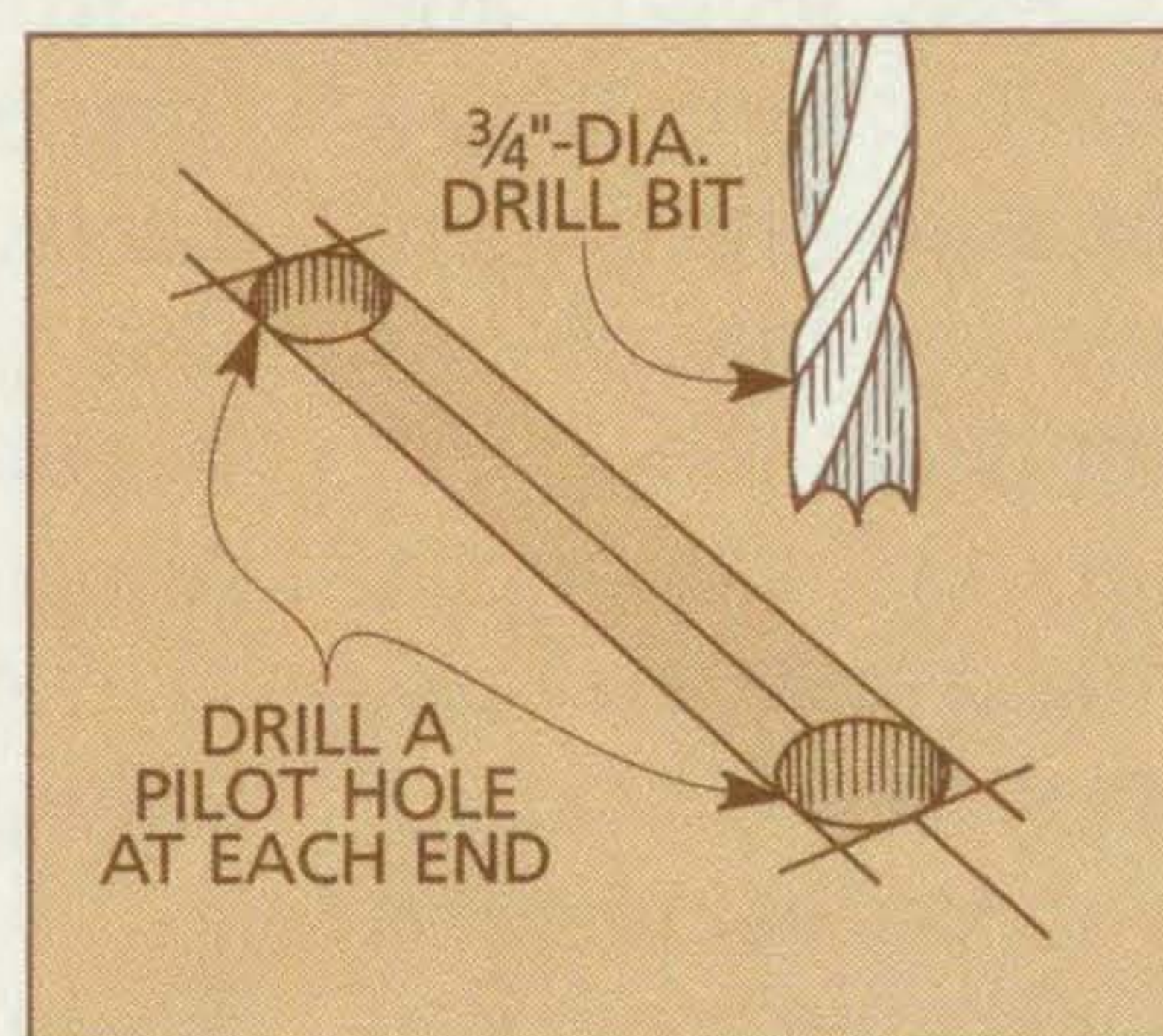
Tongue and Dado – The tongue and dado joint (*lower photo*) looks better because it hides any gap above the tongue of the shelf. Another benefit is that it also covers up any splintering along the edges of the dado. You can also center or off-set the tongue.



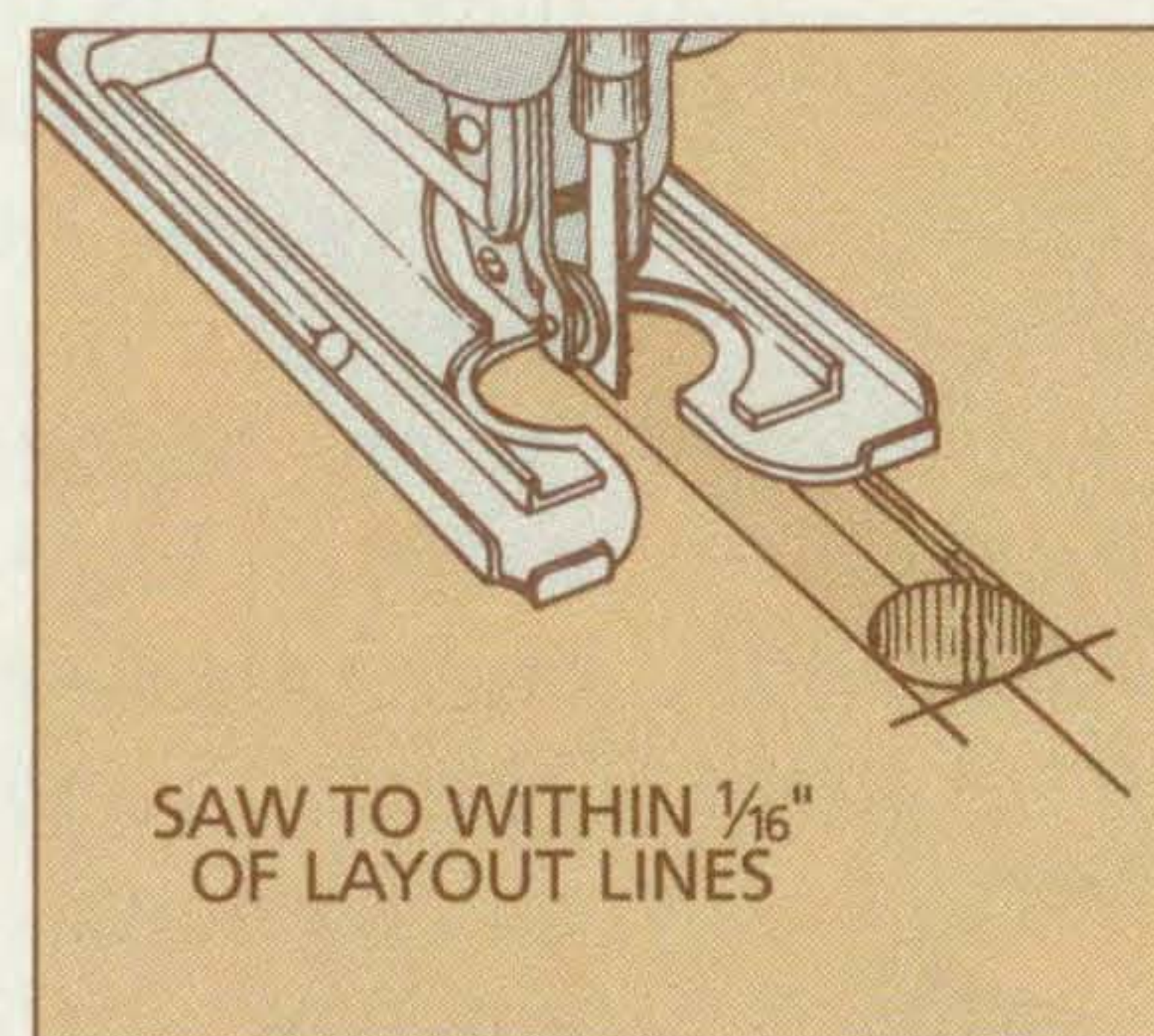
Make Through Mortises with a Jig Saw



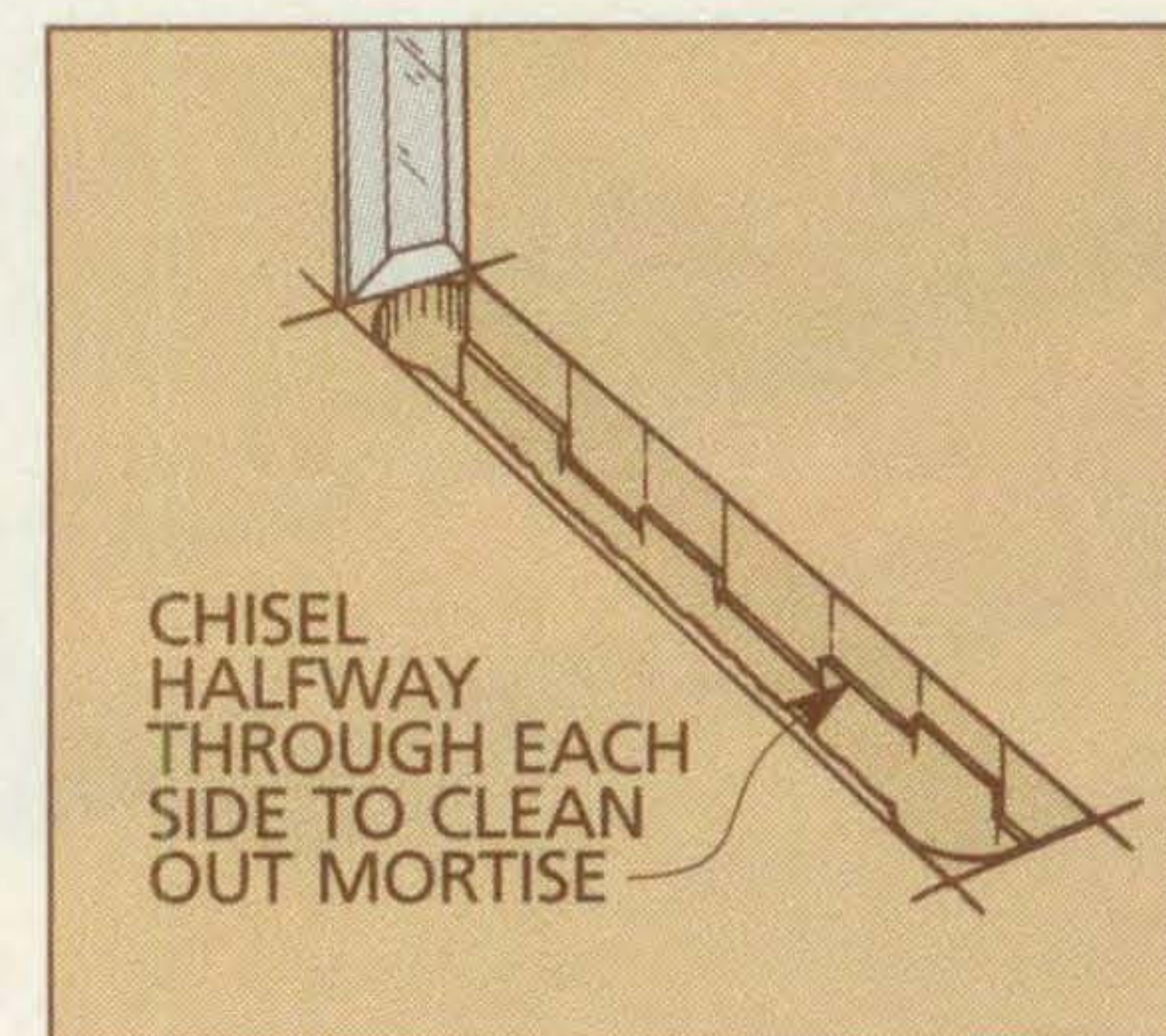
1 Lay out the mortise centerline, ends, and pilot holes $\frac{3}{8}$ " from each end.



2 Drill a $\frac{3}{4}$ " hole at each end. Use these holes to lay out edge of mortise.

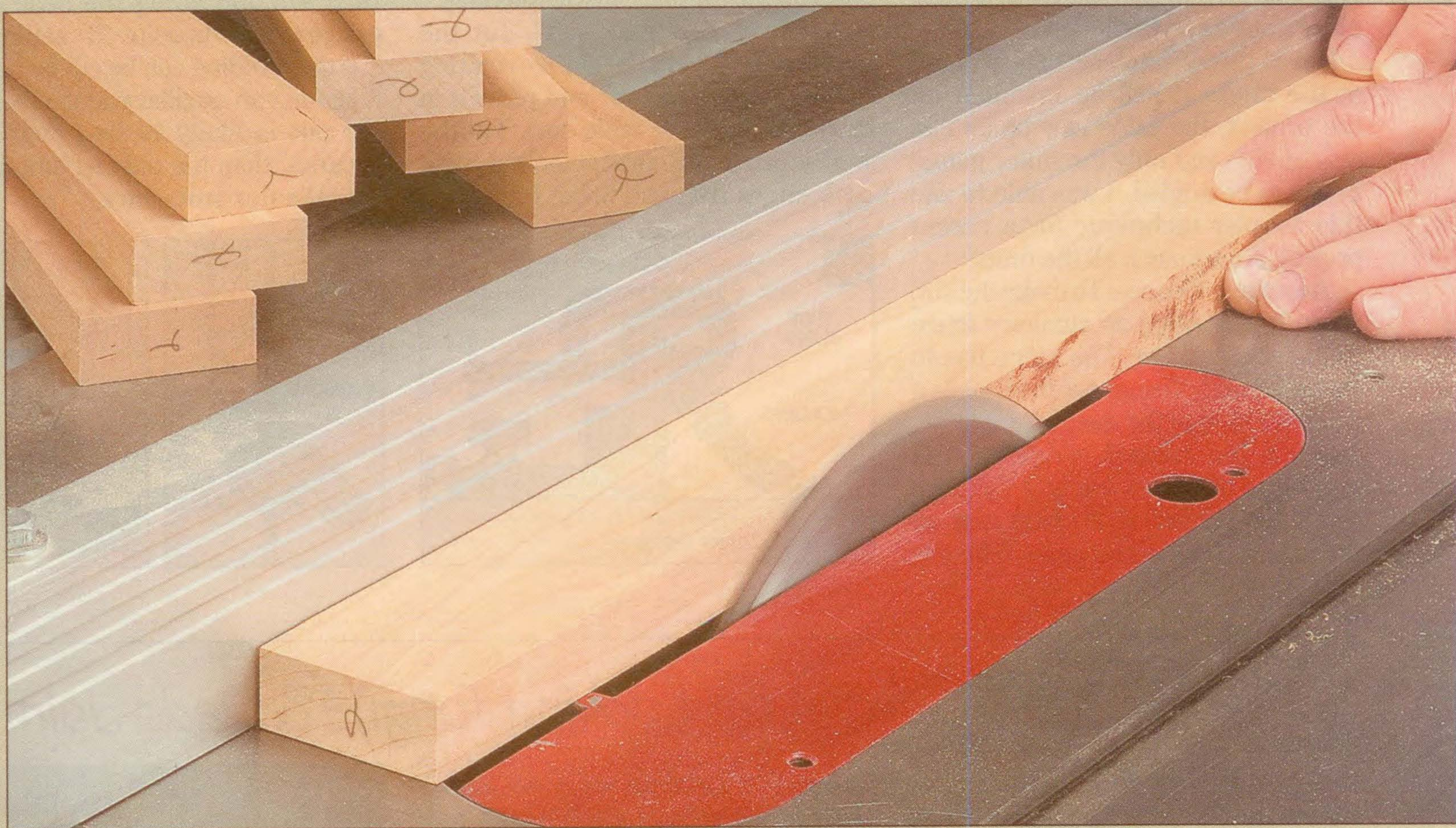


3 Remove waste using a jig saw. Cut to within $\frac{1}{16}$ " of all layout lines.



4 Chisel up to layout lines. To help prevent chipout, work from both faces.

Cutting Perfect Pieces On Your Table Saw



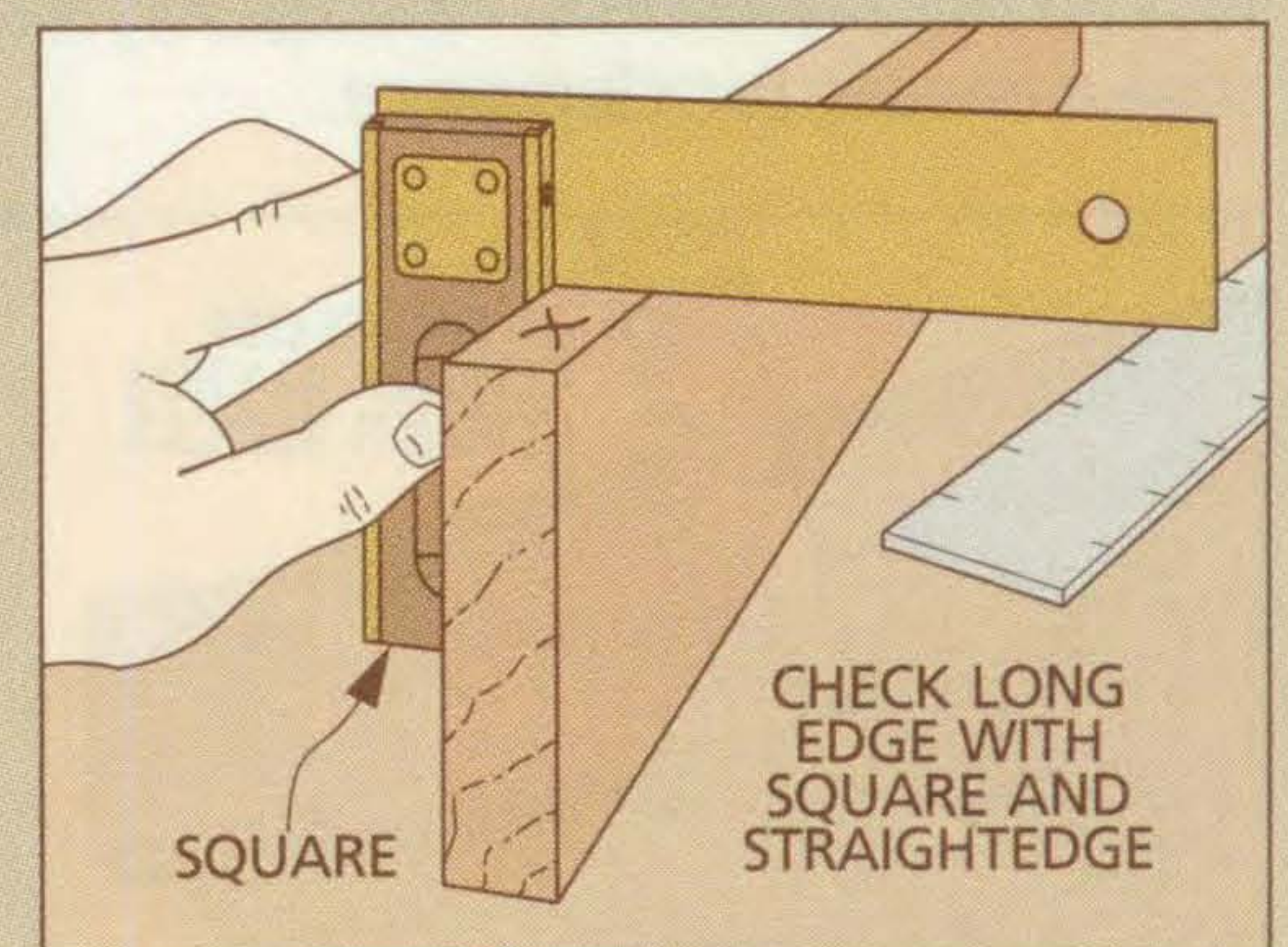
Start by cutting the workpiece to size. Sounds easy, doesn't it? But a lot of woodworkers will admit to having goofed at this supposedly simple task a few times. A piece of stock ends up too short, not straight, or out of square. Sometimes this isn't a big deal, but other times it comes back to bite you.

So now I have a simple routine that I follow when cutting stock to size on the table saw.

Size As You Go – Usually, when building a project, you're working on one assembly or step at a time. For example, doors, drawers, or case parts. So this is how I like to approach cutting parts to size. Just size the pieces that you need for the job at hand. It's easier to keep things straight and you can make minor "size" adjustments as you work through a project.

Cut List – Before you start cutting, you need a goal. And for me, this is a cut list. I jot down a list of the parts that I need to cut and their dimensions (thickness, length, and width). Even when I'm only cutting a part or two, I write down the dimensions. It's too easy to remember a "wrong" measurement.

If you have a lot of pieces to cut, check them off the list as you go. Then all you'll need to do is take a quick glance at your cut list to tell if you have all the parts you need. You don't want to get halfway through the job and realize that you're short one door rail or drawer side.



Reference Edge. To get started right, you need one straight and square edge to work from.

Rough Cut – Once I know what size pieces I need, I rough-cut the parts from the stock at hand. At this point, all you're trying to do is get in the ballpark. It's easier for me to work with and accurately size smaller pieces. I just try not to skimp here. For example, if I need a 2" by 24" stile, I try to give myself about a 2 1/8" by 25" piece to work with. But the rough dimensions you use will depend on the stock you're working with.

Workpiece cut to final size

Workpiece rough-cut from stock

Starting point (hardwood stock from lumberyard)

One Straight, Square Edge – With the rough-sized pieces in hand, the next goal is to give each piece one straight and square edge. This edge will guide your first rip cut. A straightline rip jig on the table saw, a handplane or a pass over the jointer will do the job. Before moving on, make a quick check with a straightedge and square and then mark the straightened edge (box below left).

The Four Steps

Now you're ready for the four dimensioning cuts that you see illustrated in the drawings at right.

Two Parallel Sides – The first step is to rip the workpiece close to its final width (Step One). I never try to hit the final dimension right on the money. The purpose is just to make sure that both long edges are straight and parallel. An extra $\frac{1}{32}$ " or $\frac{1}{16}$ " in width is plenty. This leaves enough material to allow you to come back later and clean up this face — eliminating saw marks, burn marks, or tearout from crosscutting. And with straight, parallel edges to work from, you'll have a much easier time getting square ends when you crosscut to length.

One Square End – Once you have two straight edges, begin cutting the piece to length by making a clean, square crosscut on one end. But don't get carried away, this is usually just a light trim cut. Be sure to leave yourself enough length for the final cut.

The ends of the workpieces are often where the joinery takes place. And the key to accurate crosscuts is control of the workpiece. For this I rely on a miter gauge with a long auxiliary fence (Step Two). This gives you a solid backing for the workpiece that allows a controlled feed and limits tearout. A smooth, steady feed produces the best crosscuts. Too slow and the wood burns — too fast and you'll end up with a ragged or inaccurate cut.

If I've got a stack of parts to cut to length, I'll square one end of all the pieces before cutting any to final length. A mark on the squared end will help keep things straight (see main photo).

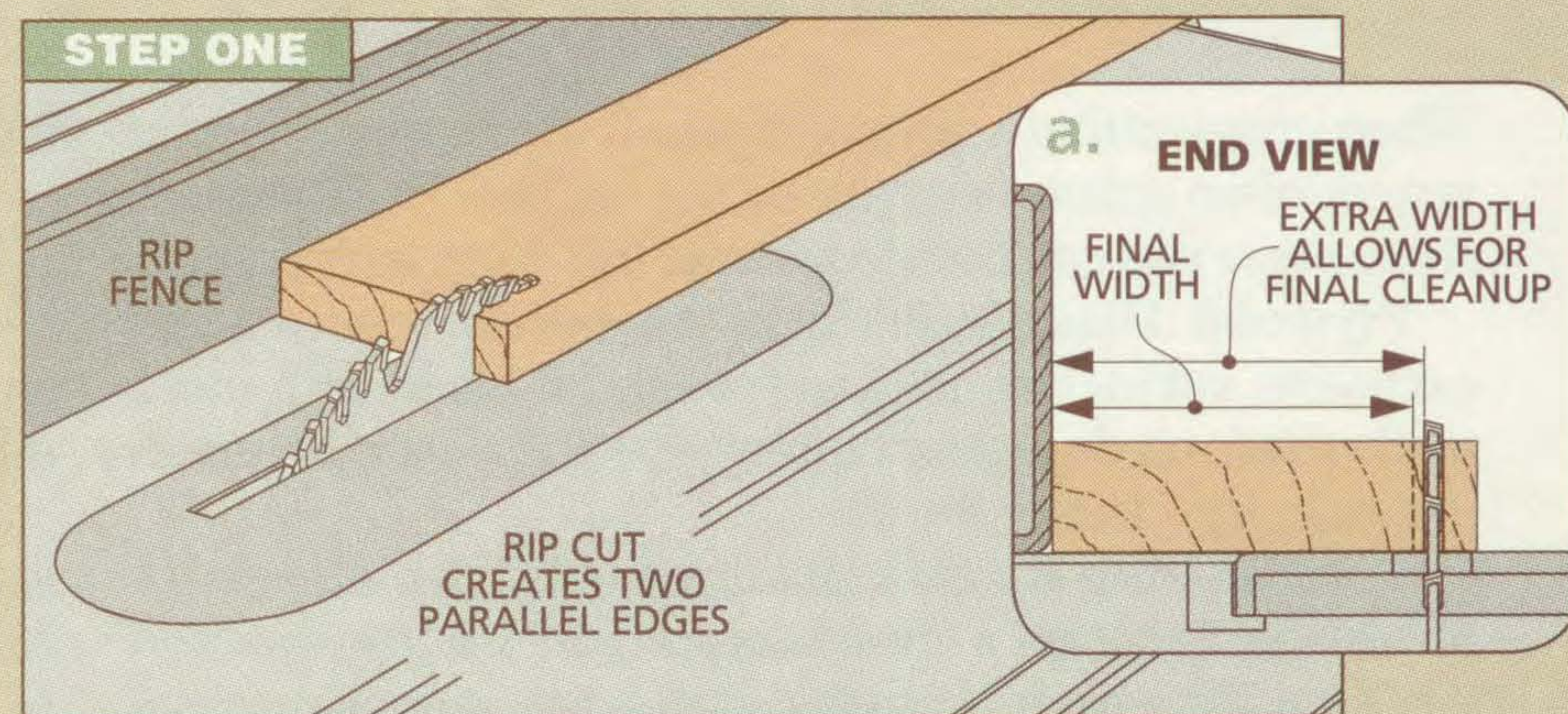
Cut To Length – Now you can make the final crosscut to length. And more often than not, you're going to want to cut several pieces to identical lengths. Door rails and stiles, and face frame parts are a good example.

So rather than measure and cut each piece and hope for the best, I set up to cut "multiples." This involves measuring and marking one piece and then using this piece to set up the saw for cutting the remaining identical pieces to length. A stop block on the miter gauge can be adjusted as you sneak up on the length of the measured piece, as shown in Step Three. The length of the pieces that follow will be exactly the same.

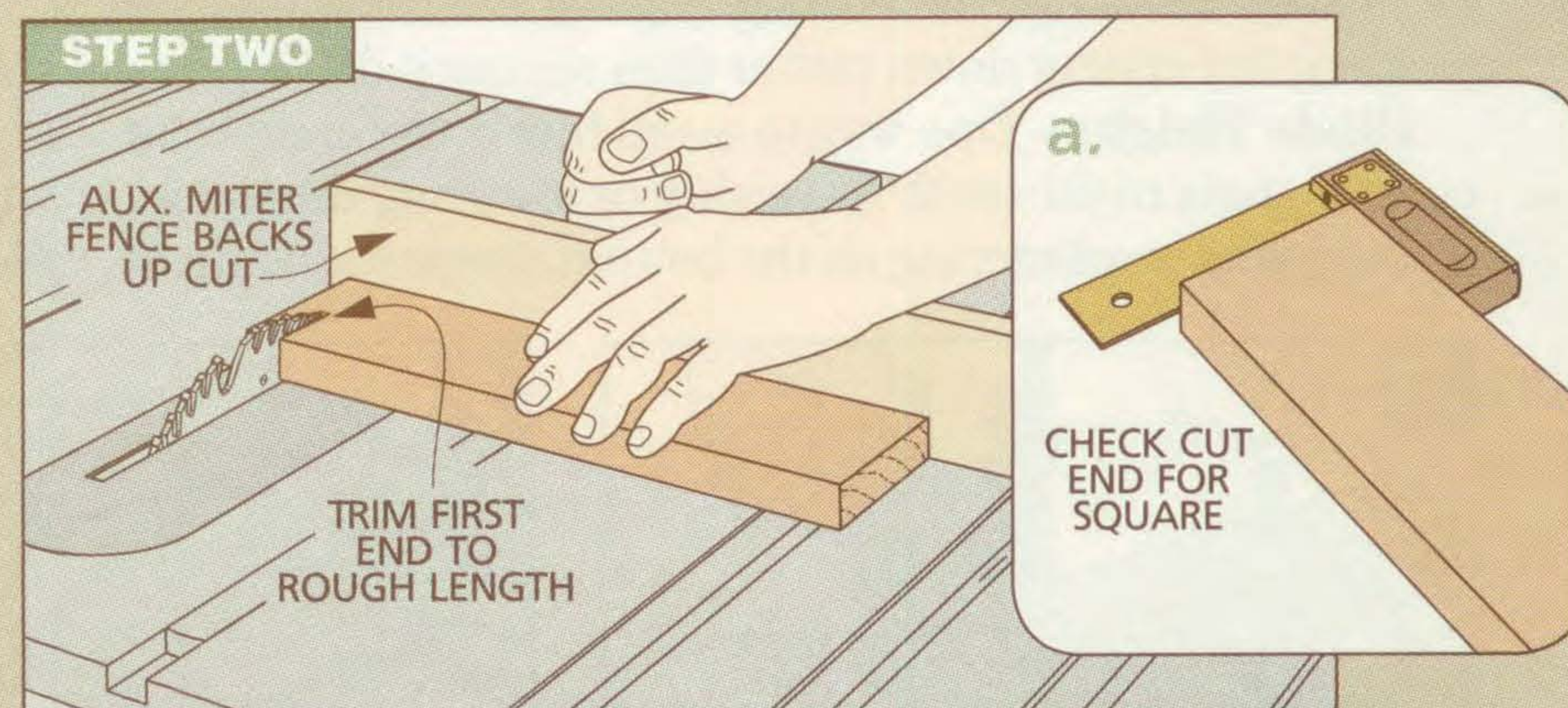
The Final Edge – At this point your workpiece is cut to length and has one clean, square edge. But it's still a little overwidth. A light rip cut removes the extra width and cleans the final edge, as you can see in Step Four and the main photo.

That's all there is to it. At this point, the workpieces are square and true to size. But the best thing is that you can move on with one less thing to worry about.

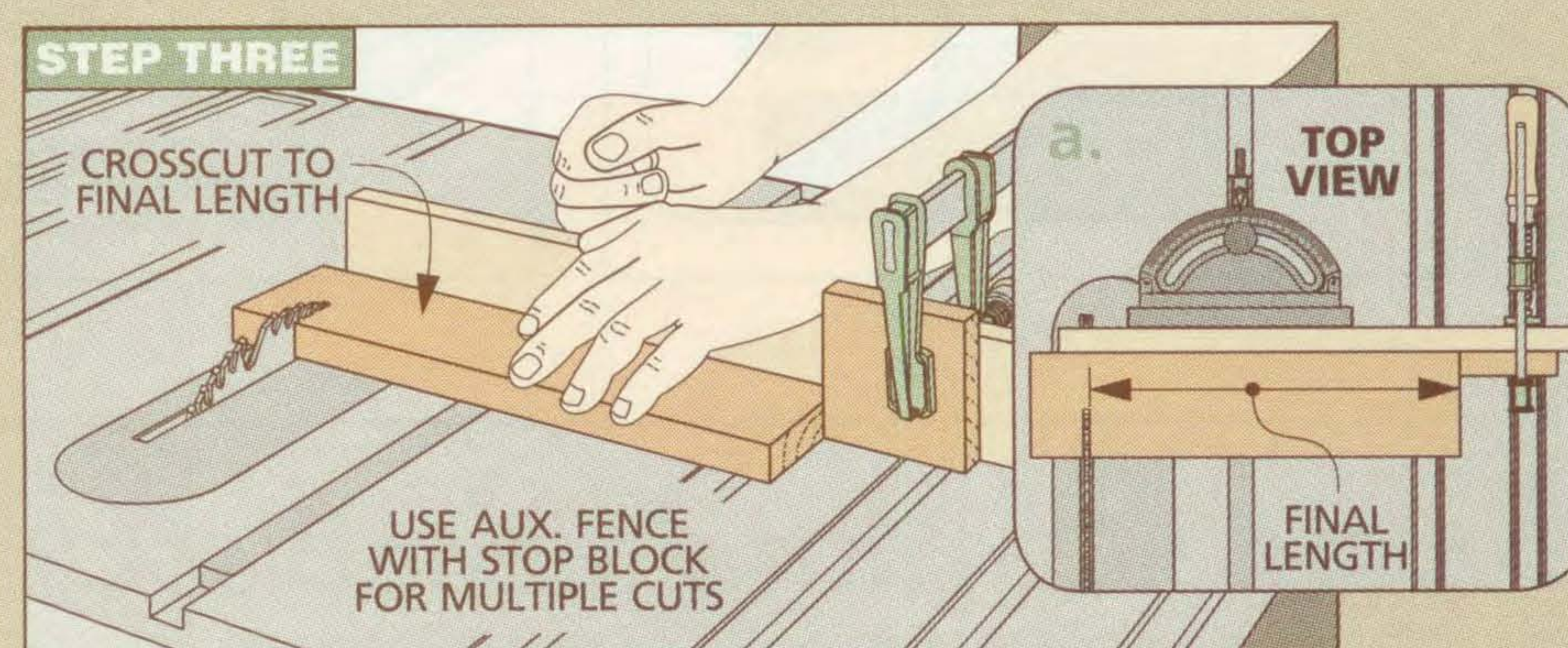
4 Steps for Perfect Pieces



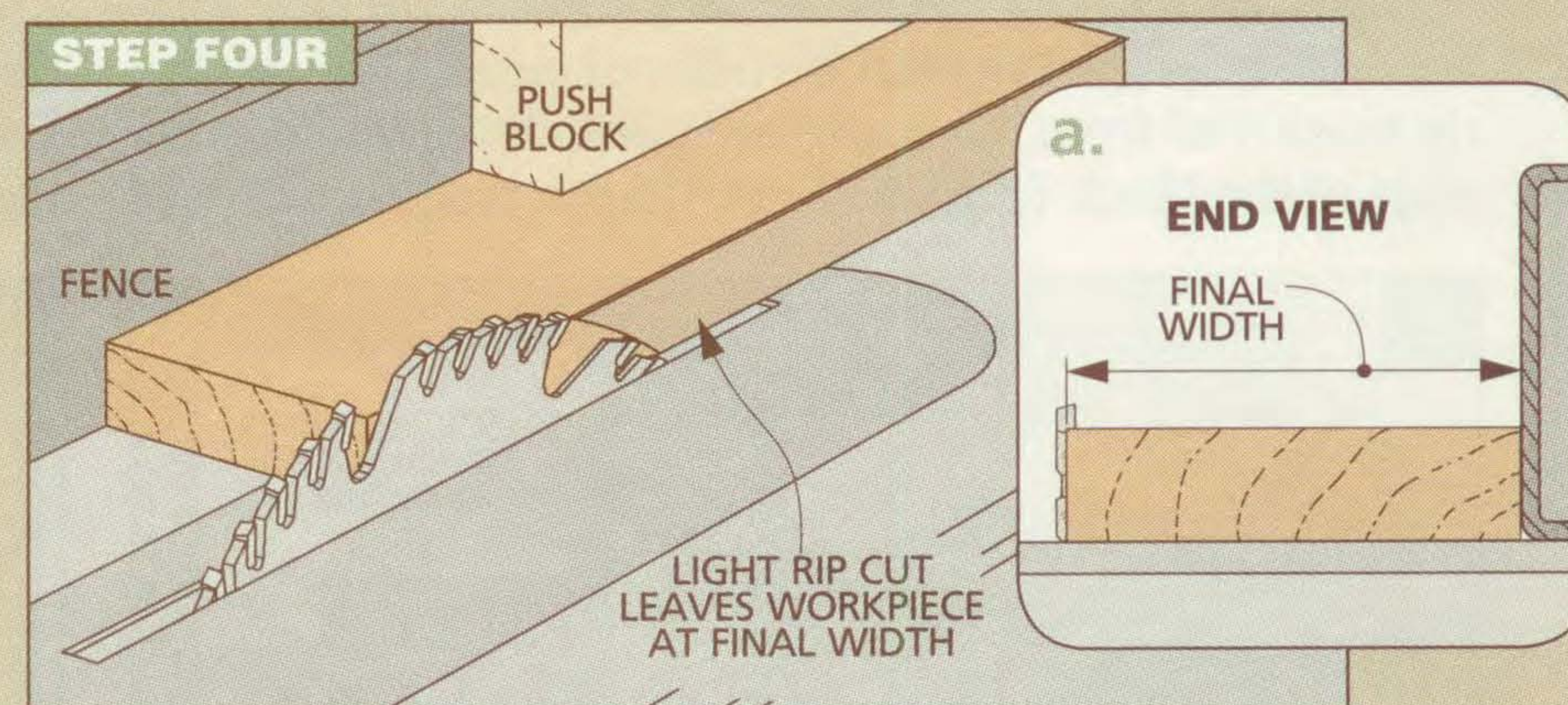
Rip Close to Final Width. With the straight, square edge against the fence, rip the workpiece close to its final width. The extra width allows you to clean up this face with the final cut.



Square One End. Once you have two straight and parallel edges, you can begin crosscutting the workpiece to length. Start with a square, trim cut across one end of the piece.



Final Length. A second crosscut on the opposite end gives you the final length. An auxiliary miter gauge fence with a stop block clamped to it makes multiple cuts quick and accurate.



Clean Rip. With the piece cut to length, a light rip pass on the face you cut in step one, gives you the final dimension. Any saw marks, burn marks, or tearout will be removed.

Getting Clean Cuts In Plywood

When crosscutting a plywood panel, the bottom layer of veneer often splinters out along the cut line. But there are some steps you can take to prevent this from happening.

Plywood Blade – Perhaps the easiest way to avoid excessive splintering is to use a special blade with more teeth, that's made just for cutting plywood. The more teeth per inch, the cleaner the cut.

Combination Blade – But if you only have a combination blade, there are a few tricks you can use to get a clean cut. First, if the blade is crusted with sawdust or pitch, clean it thoroughly. Sometimes, however, even a clean combination blade will splinter the veneer.

There are two reasons for this. First, a combination blade has fewer teeth than a plywood blade, so it won't cut as cleanly. Secondly, the cutting edge of the teeth may be pushing the veneer down rather than slicing it off.

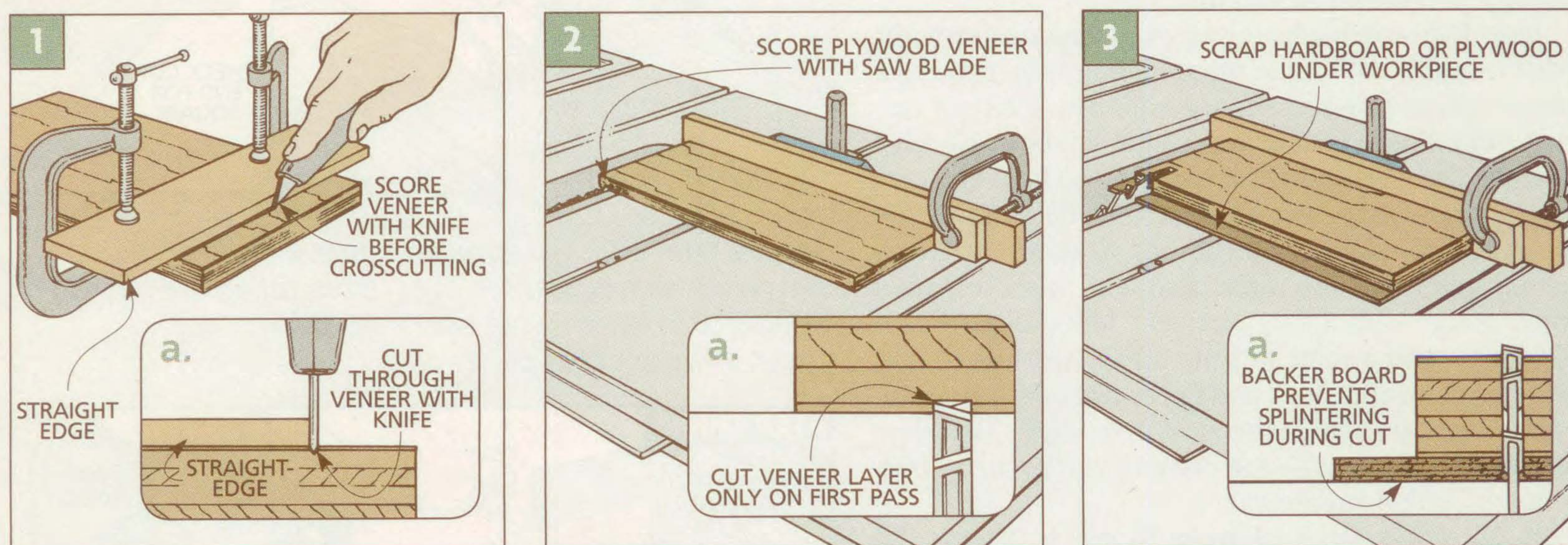
Blade Height – One way to avoid this is to change the cutting angle of the teeth by raising or lowering the blade. If your panel is splintering on the bottom, lower the blade. If

it's splintering on the top of the plywood, raise the blade.

Scoring Cut – The most common way to get a clean cut is to score the panel along the cut line before making the cut (Fig. 1). To do this, cut through the veneer layer with a sharp utility knife. While this method works, it's sometimes difficult to line up the saw blade with the scored line.

Scoring On the Saw – An easier way to score the panel is to use the saw blade itself. The trick is to make the cut in two passes. On the first pass, set the blade just high enough to cut through the veneer (Fig. 2a). Then raise the blade and finish the cut on the second pass. To help ensure the workpiece stays aligned with the blade during both cuts, you can clamp an extension fence with a stop block to your miter gauge (Fig. 2).

Backer Board – Another way to keep the veneer from splintering is to use a backer board (Fig. 3). This is a piece of plywood or hardboard that's placed below the workpiece when making the cut. This way the veneer layer is supported and can be cut cleanly.



Safe Cuts With a Miter Block

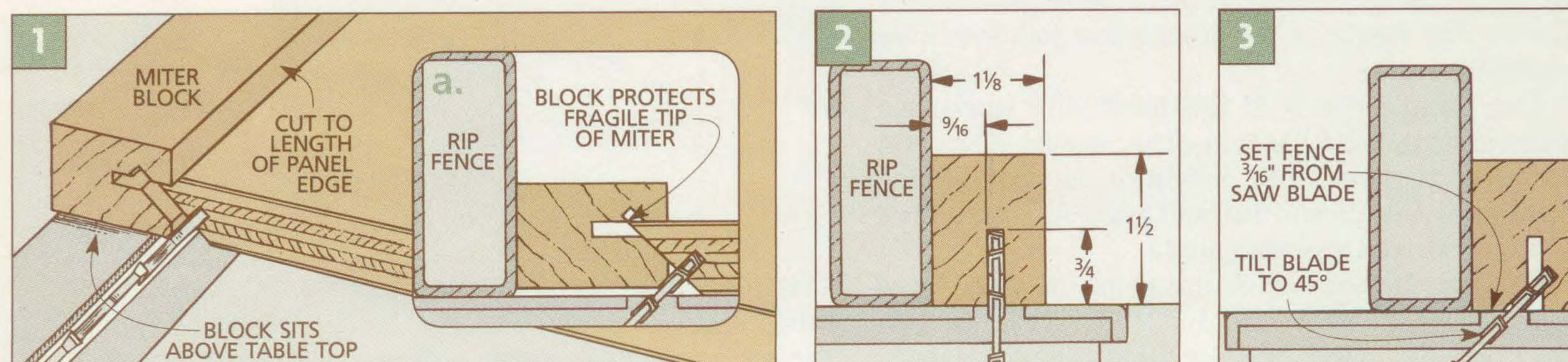
To protect the mitered edges of a workpiece when cutting slots for splines, I use a scrap block with an angled slot in it (Fig. 1). The mitered edge fits in the slot so the wood fibers won't get crushed.

Miter Block – To make the block, rip a 2x4 to 1 1/8" wide and cut it to length to match the mitered piece. Then, set the rip fence 9/16" from the blade and cut a slot on the narrow edge of the block (Fig. 2). Next, tilt the blade to 45° and

reset the rip fence (Fig. 3). Run the block across the blade with the same face against the fence.

To cut the spline kerf in a mitered workpiece, fit the sharp edge of the mitered panel into the slot (Fig. 1). Then, put the block against the fence and set the blade to the right height (Fig. 1a).

Finally, cut the kerf in the workpiece with the block riding along the fence.



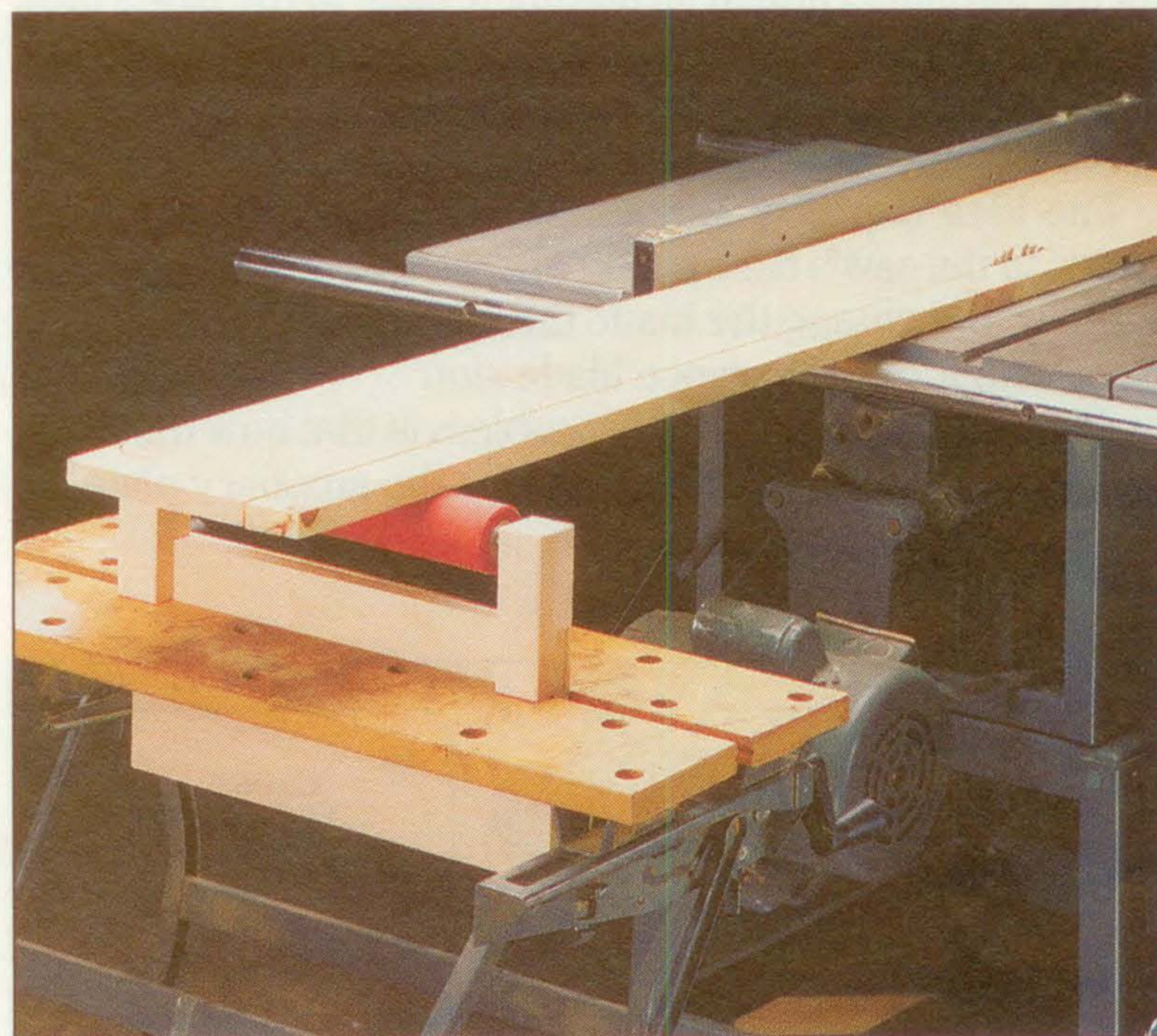
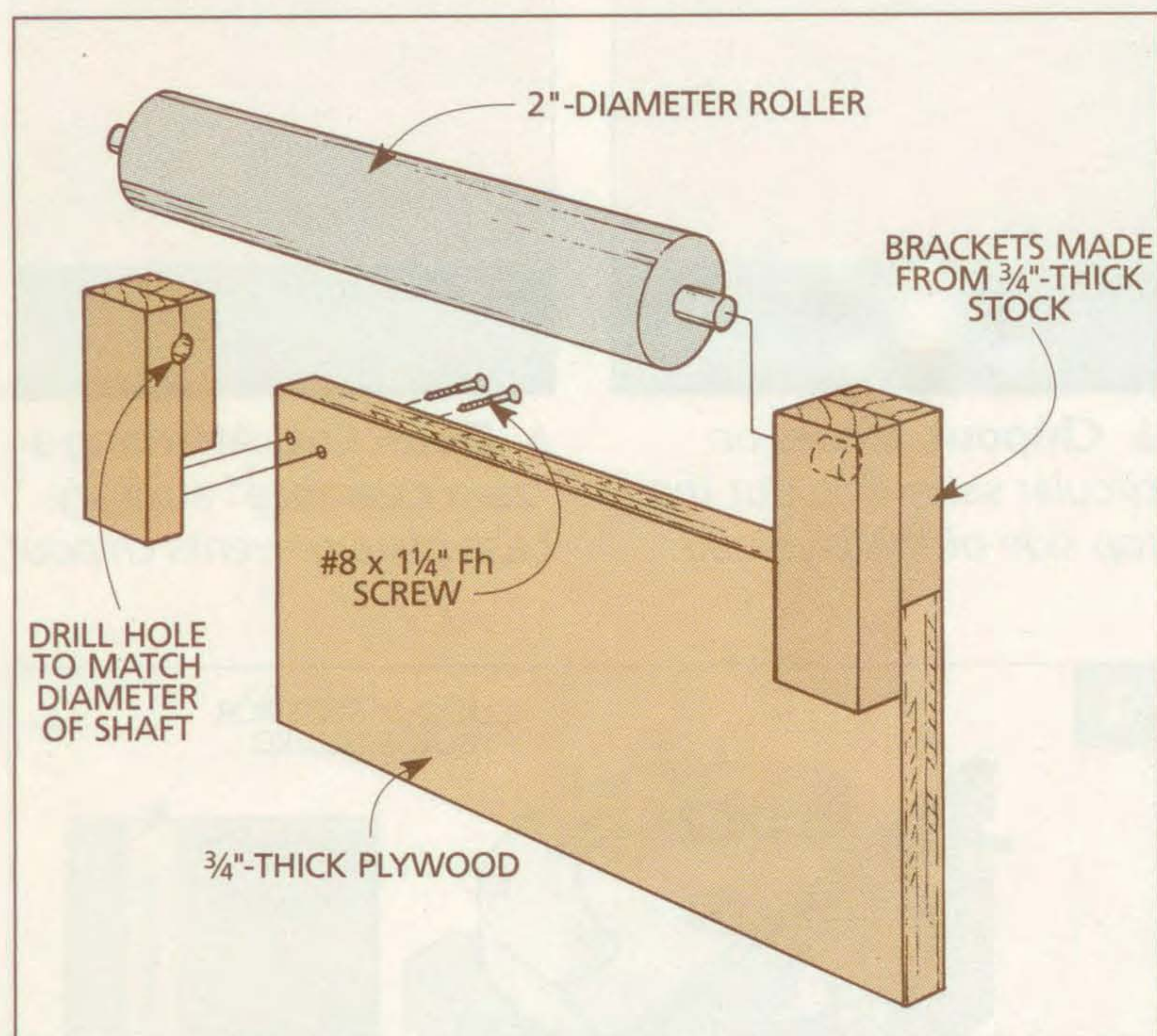
Shop-Made Outfeed Support Roller

This shop-made outfeed support roller can be secured in the jaws of a portable workbench (see photo) or clamped to a sawhorse. And when it's not being used, it can easily be stored in the table saw stand.

Make the Roller – The support is simply a roller attached to a piece of plywood by a pair of 1½"-thick wood brackets (see drawing). I made the brackets

from two pieces of ¾"-thick stock. The longer half of each bracket extends down the face of the plywood and serves as a stop to set the height of the support (see photo).

I used the roller from an old copy machine. But a typewriter roller would also work. Another option is to make your own roller using a piece of PVC pipe with filler pieces in the ends and a length of dowel.



Don't Get Pinched When Cutting a Box In Two

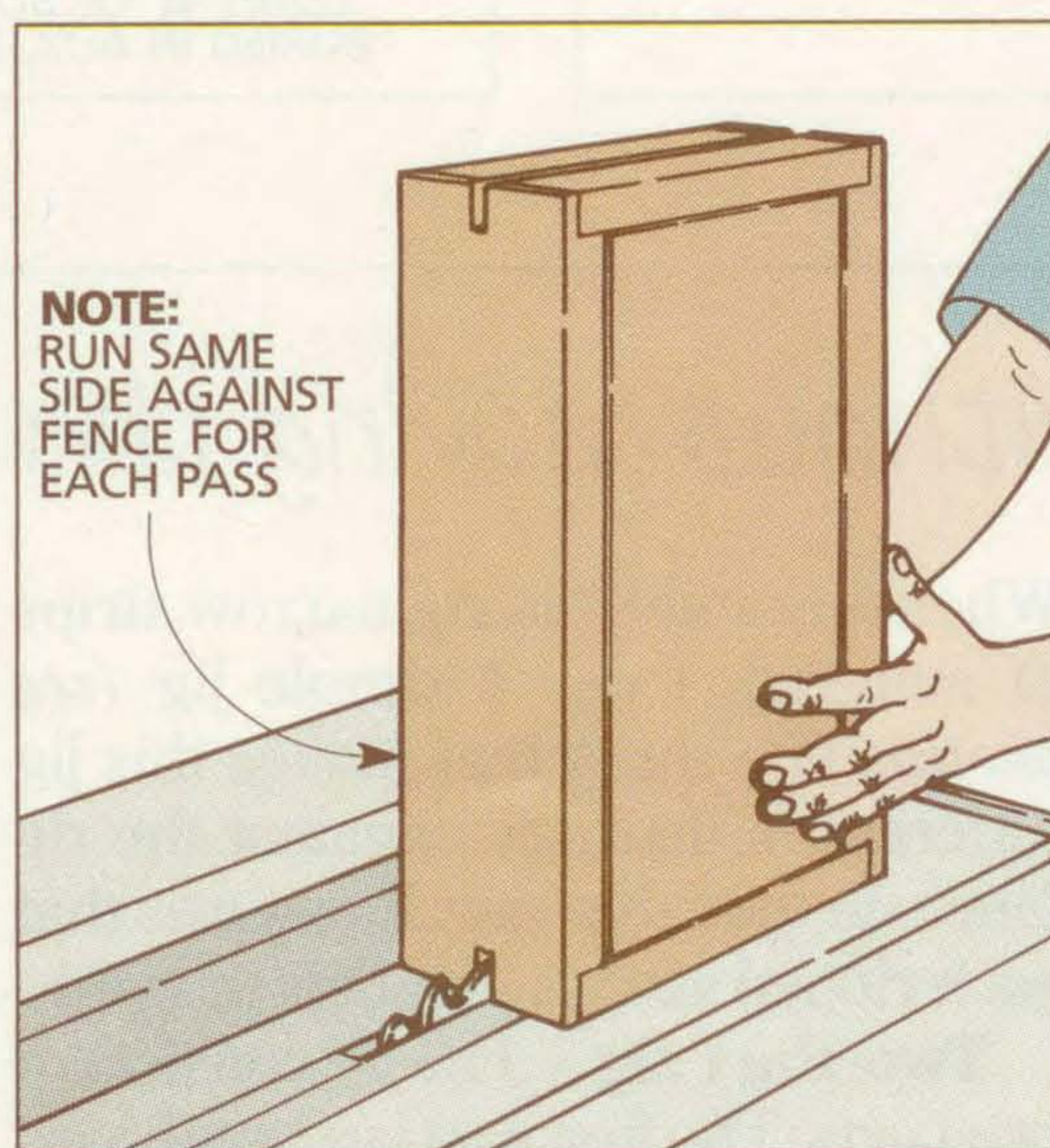
Like a lot of woodworking tasks, cutting a box into two parts looks more complicated than it is. But with the right technique, it can easily be done with just a table saw. All it takes is a good rip blade, the right cutting sequence and a simple trick.

Cut Opposite Sides – First, cut two opposite sides (or ends) of the box (Step 1). Make sure the blade is raised high enough to cut through the thickness of the workpiece and be sure to run the same side of the box against the fence during each pass.

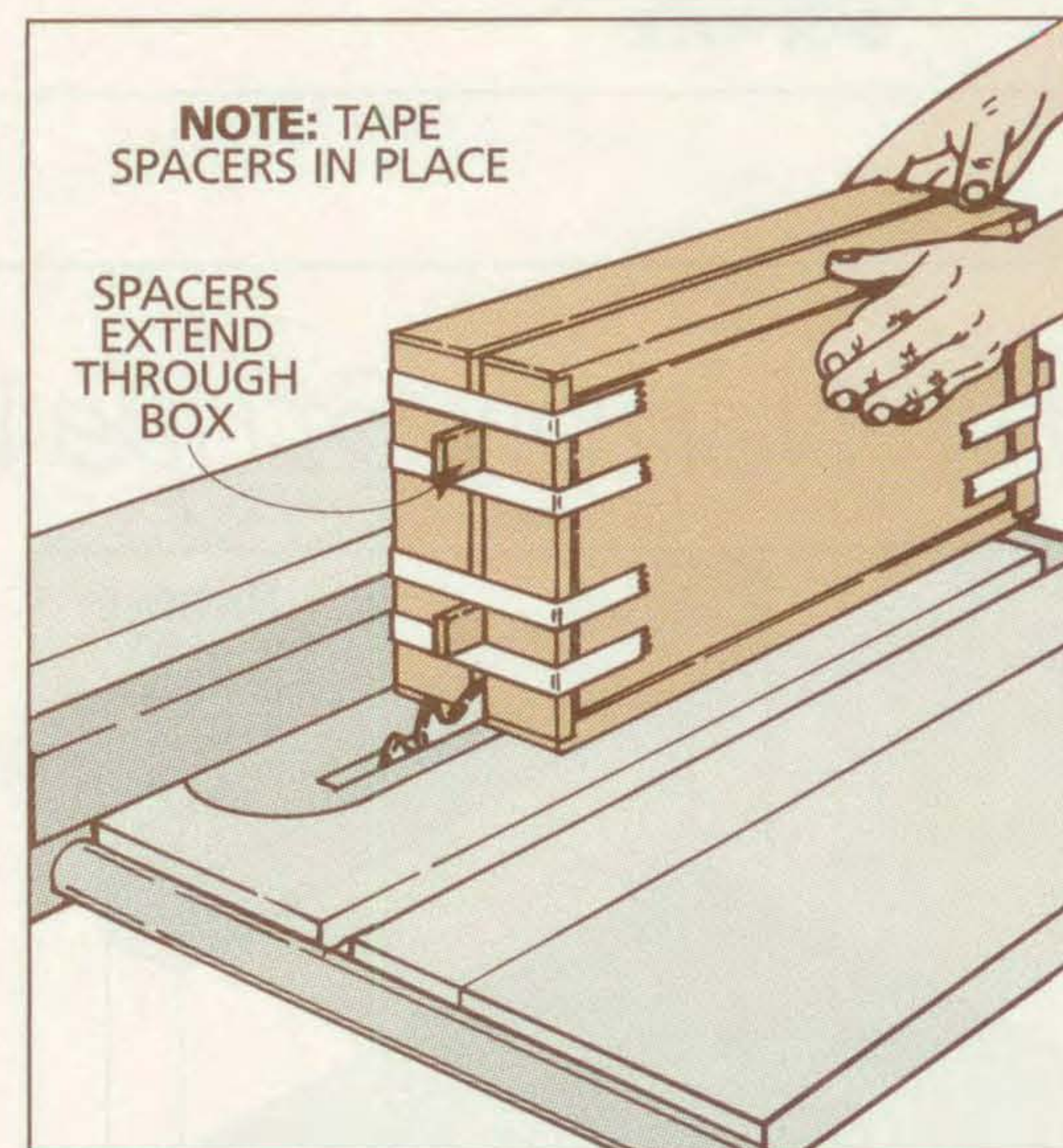
Problems – Now is where you'll have a problem. When you cut the next two sides, the saw kerfs can pinch the blade and cause kickback. A dangerous situation.

Keep Kerfs Open – To prevent the kerfs from closing, slip a pair of spacers through the box and tape the spacers in place (Step 2).

After you've made the final two cuts, simply remove the tape and separate the two halves.



1 To cut a box into two halves, the first thing to adjust is the height of the table saw blade. You want it to just cut through the thickness of the box sides. After the blade is set, make a pass on opposite sides (or ends) of the box. Just be sure to run the same side against the fence for each pass. This way, if the cuts end up a little off-center, they will still be aligned with each other. When that's complete, go on to the next step.



2 Once the initial cuts have been made, you need to take the proper precautions to avoid a kickback accident. To do this, you want to prevent the saw kerfs from closing up and pinching the blade. Start by cutting a pair of spacers from 1/8" hardboard and slip them through the kerfs you cut in the box. I use strips of masking tape to hold the spacers in place (you don't want them falling into the blade during a cut).

Cut Plywood Without Chipout Using a Circular Saw

When working on a project with a lot of large pieces of plywood, I like to start by cutting them down to a more manageable size from a 4x8 sheet with my circular saw.

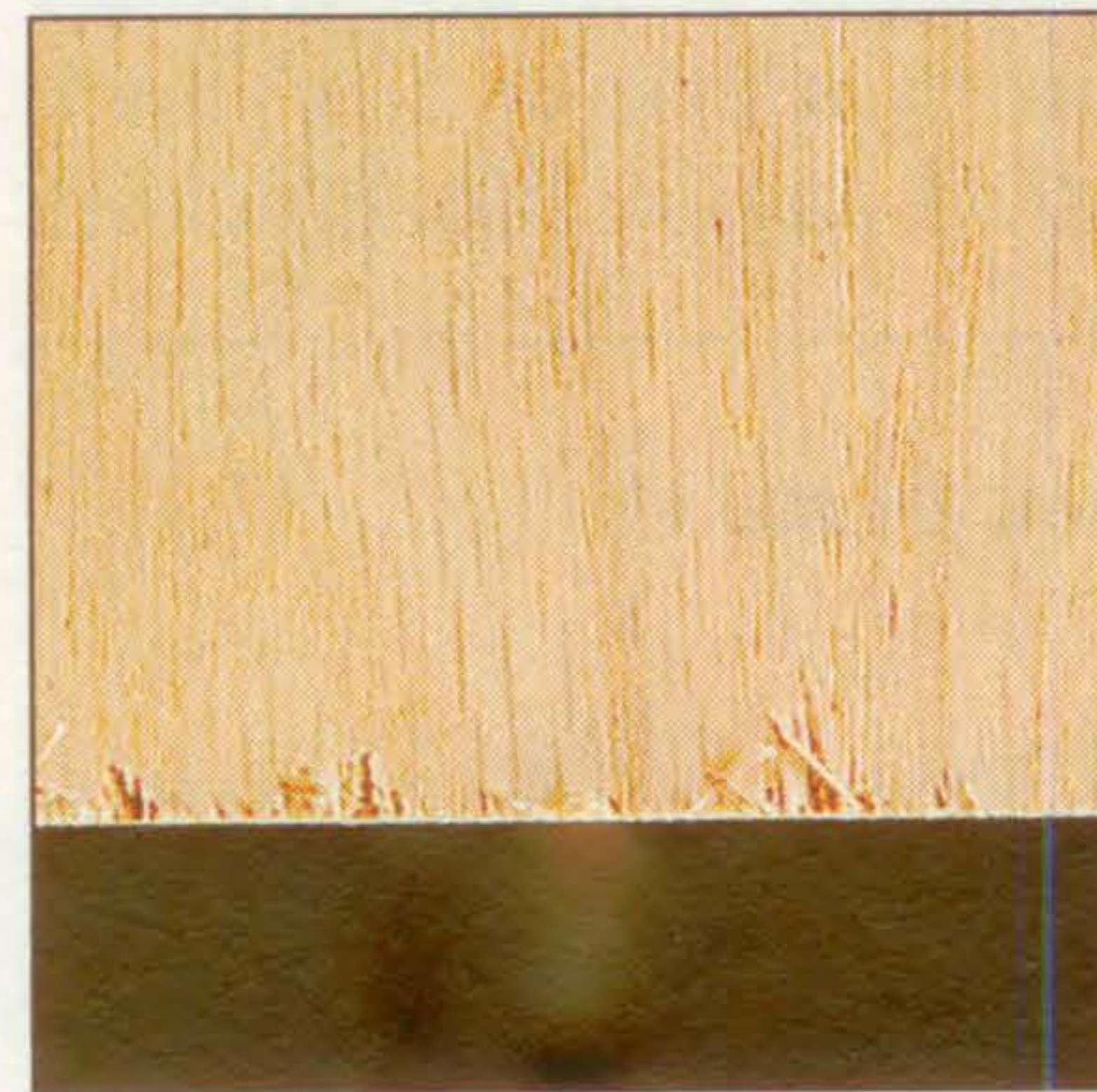
Normally, I always face the good surface of the plywood down since the blade causes chipout on the top ("up") side. But sometimes I want a clean cut on both sides.

Zero-Clearance Auxiliary Plate – To prevent chipout on the top side, I attach an auxiliary plate to the saw's base plate (Fig. 1). The plate has a "zero clearance" blade slot cut in it. This backs up the wood fibers along the cut line and prevents chipout (see photos at right).

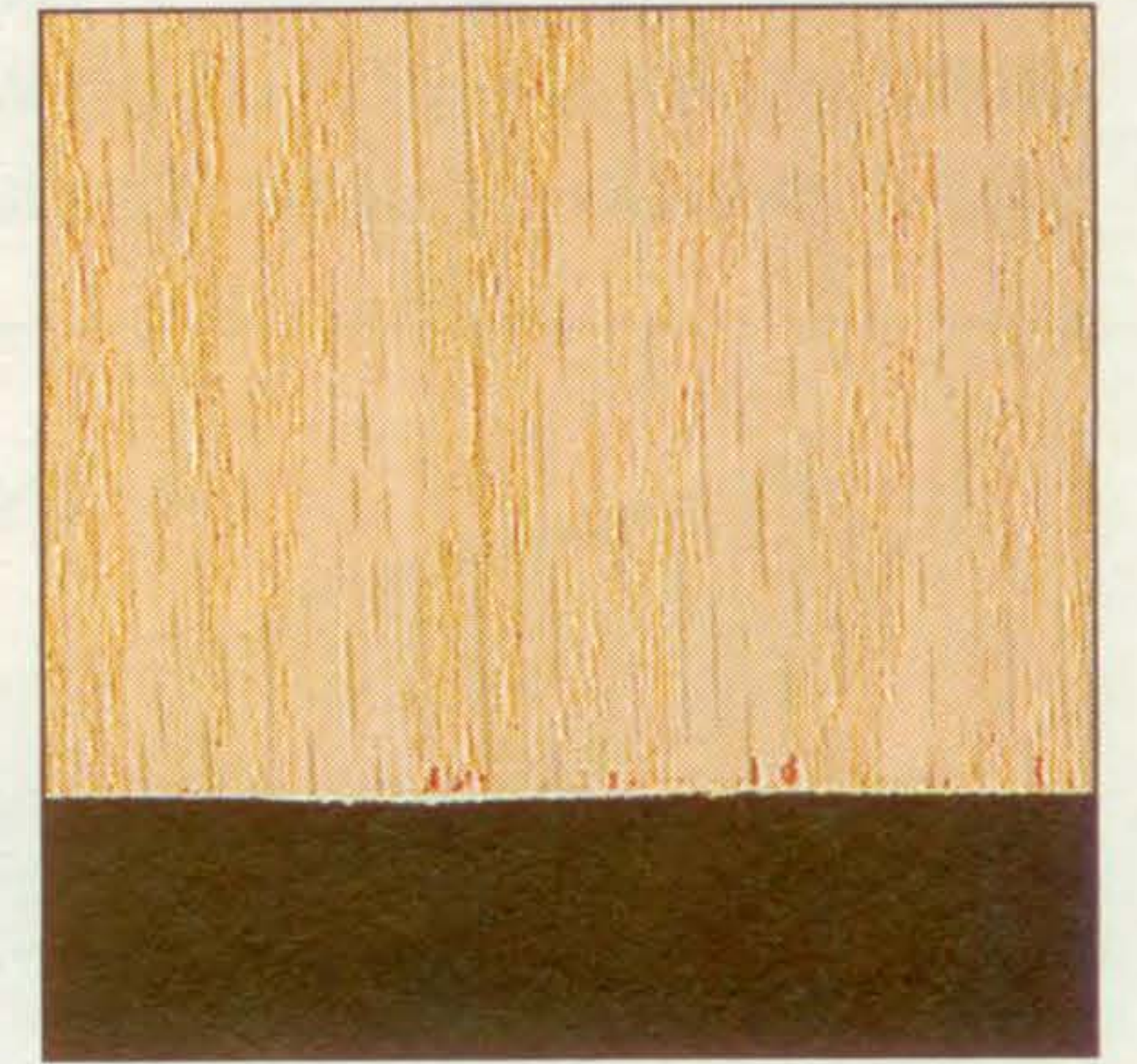
The idea is pretty simple. Screw a piece of 1/4" hardboard to the saw's base plate (Fig. 1). Then, carefully start the saw and plunge the blade through it. Now you've got a plate with a zero clearance blade slot.

Blade Guard – The only problem is that now the blade guard won't work. It's held back by the auxiliary plate, so the blade is left exposed.

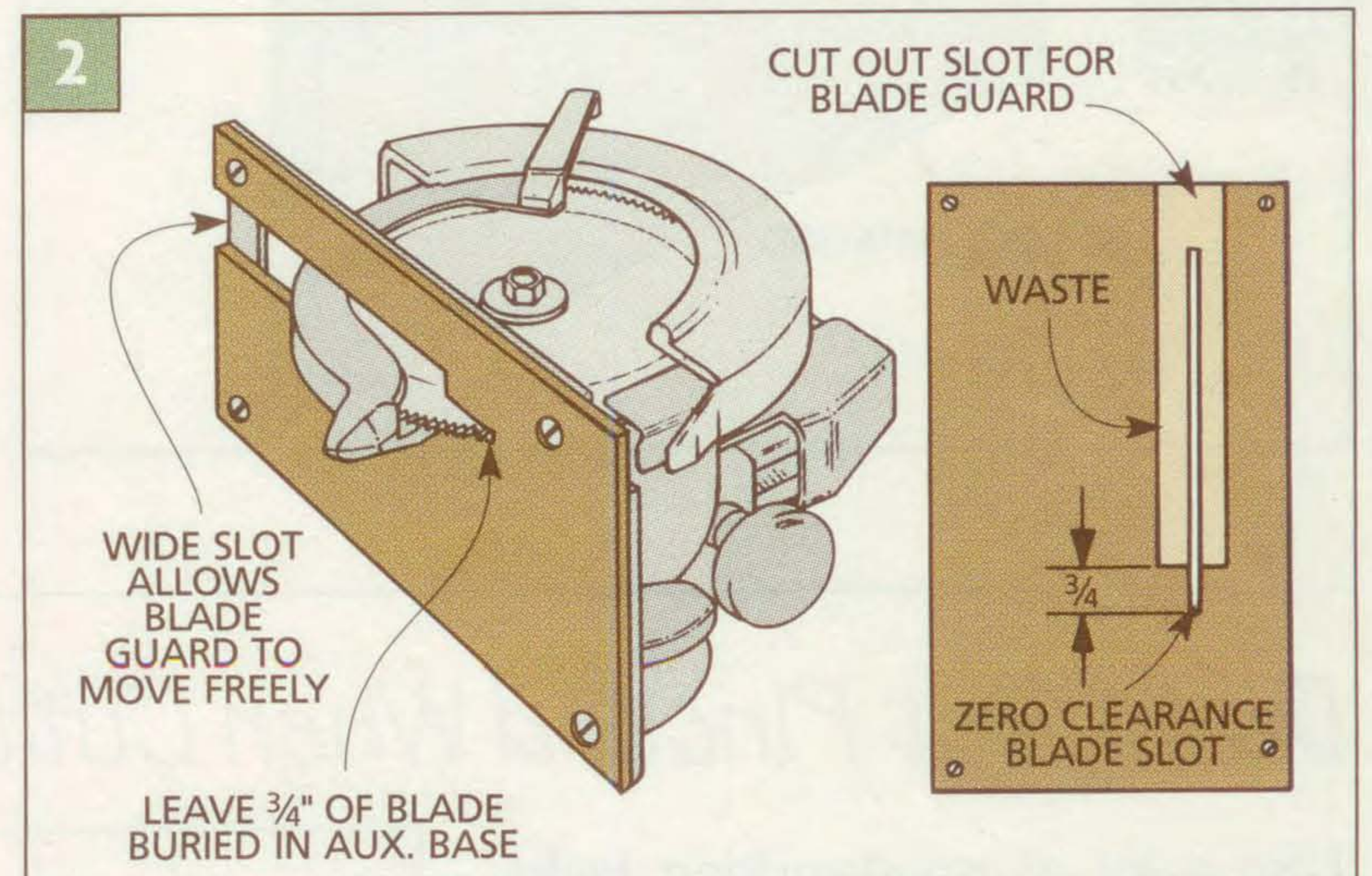
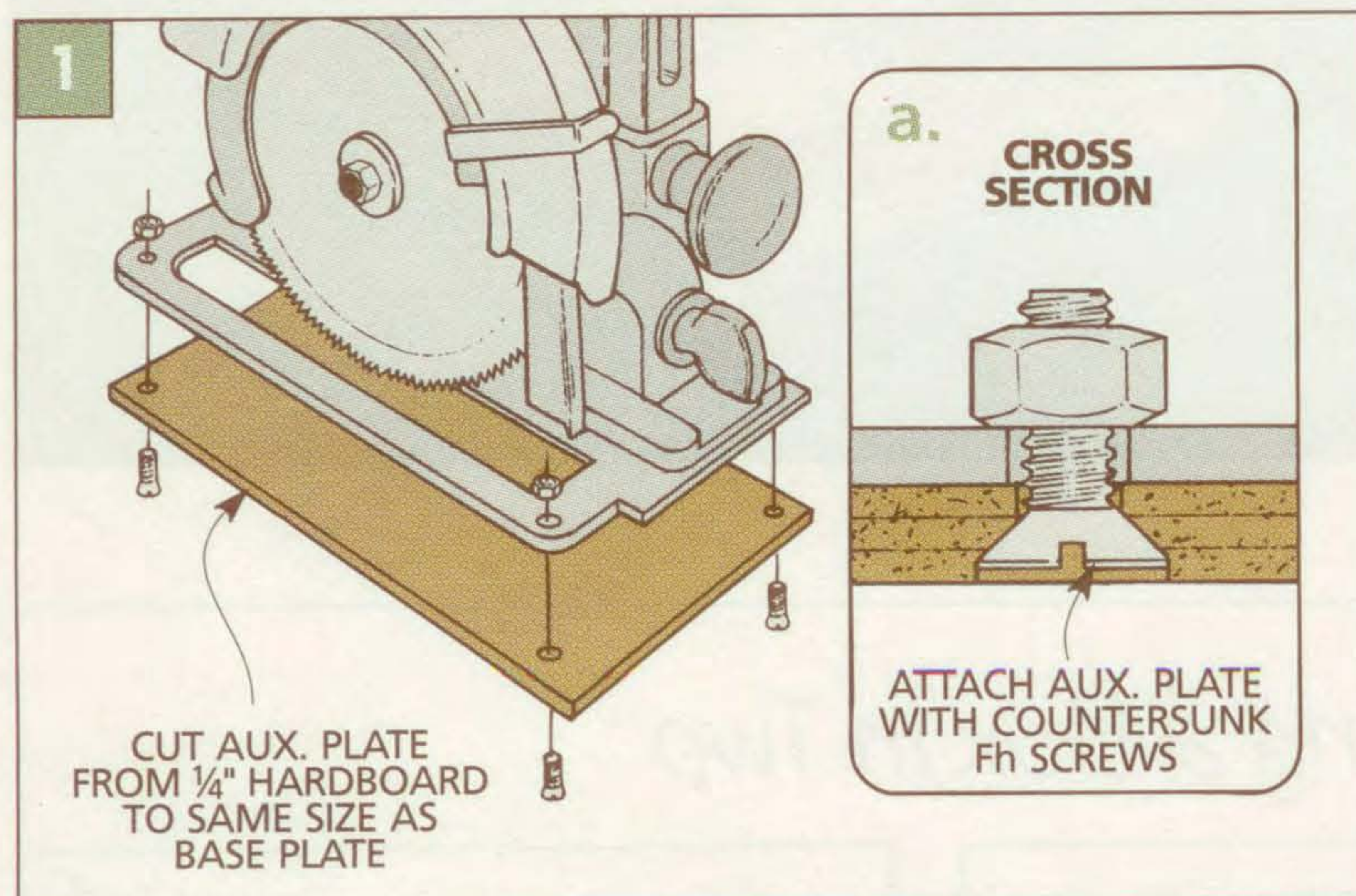
To solve this problem, cut a wide second slot centered on the first one (Fig. 2). Cut it wide enough to allow the guard to move freely, but stop it 3/4" back from the forward end of the blade slot (Detail in Fig. 2).



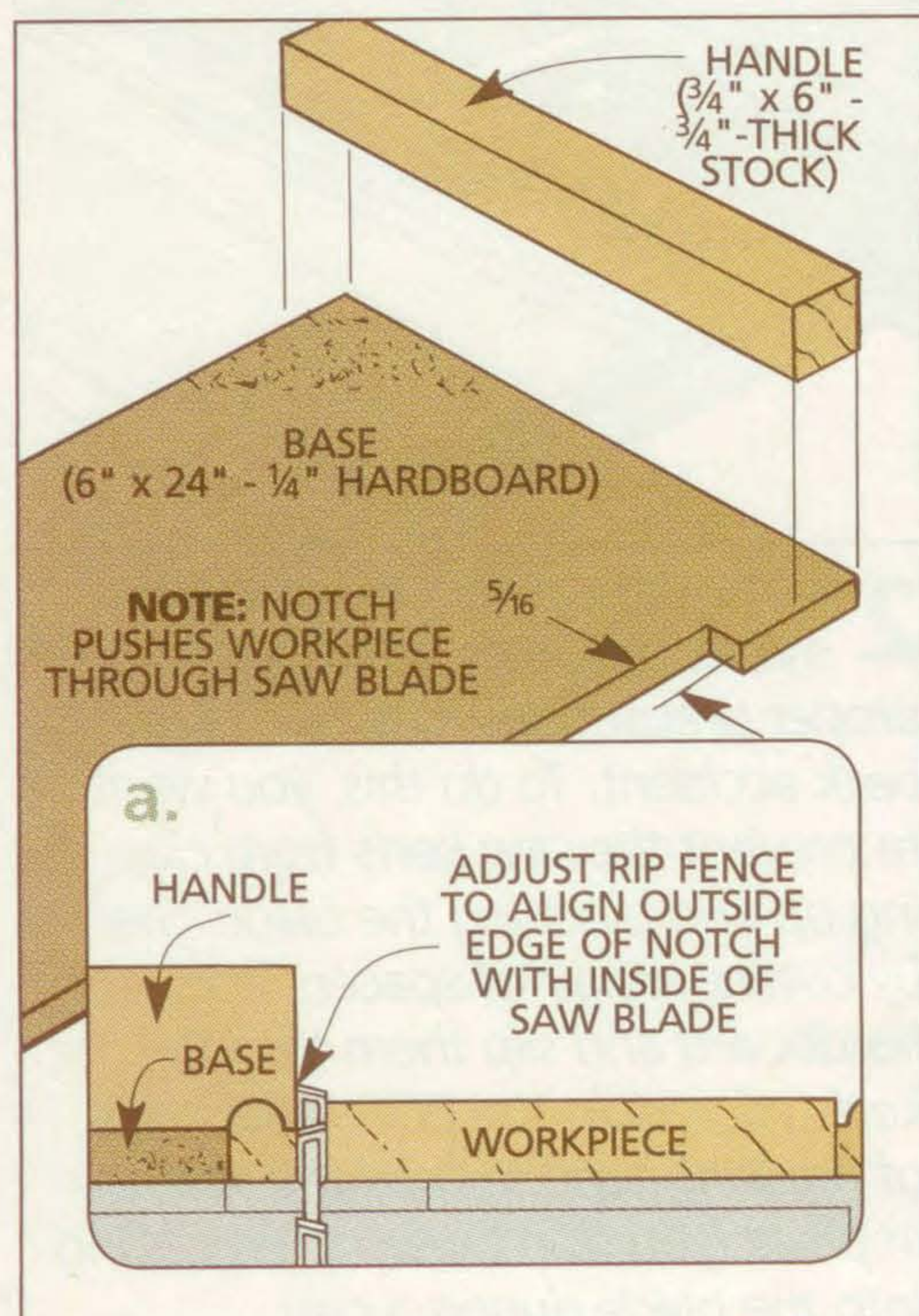
▲ **Chipout.** Blades on circular saws chip out the top side of the plywood.



▲ **Clean Cut.** Attaching a "zero clearance" auxiliary base plate prevents chipout.



Rip Narrow Strips Without Moving the Rip Fence



Whenever I need to rip narrow strips of material, I use a simple jig (see photo). The thing that makes this jig different is that it rides against the rip fence on the table saw. It ensures that each ripped strip is identical in width.

Two-Part Jig – The jig consists of two parts. The first part is a hardboard base that has a notch sized to match the width of the strip (see drawing). The second part is a wood handle that gets glued to the base.

Make Your Cuts – To set up the jig, start by positioning the rip fence so the outside edge of the notch aligns with the inside edge of the table saw blade (see detail 'a' at left). After fitting the workpiece in the notch, push the jig past the saw blade to rip the first narrow strip from the blank.

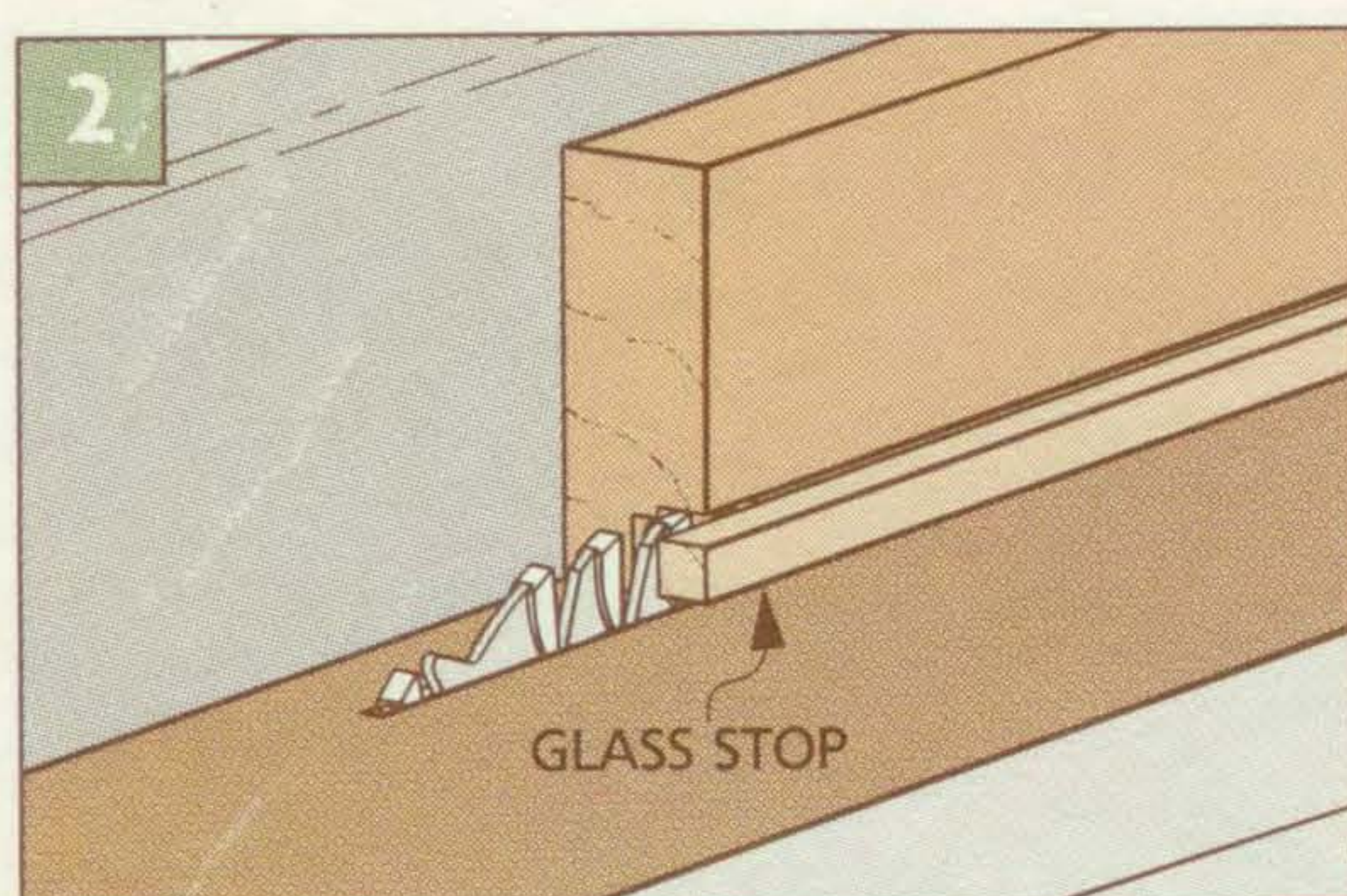
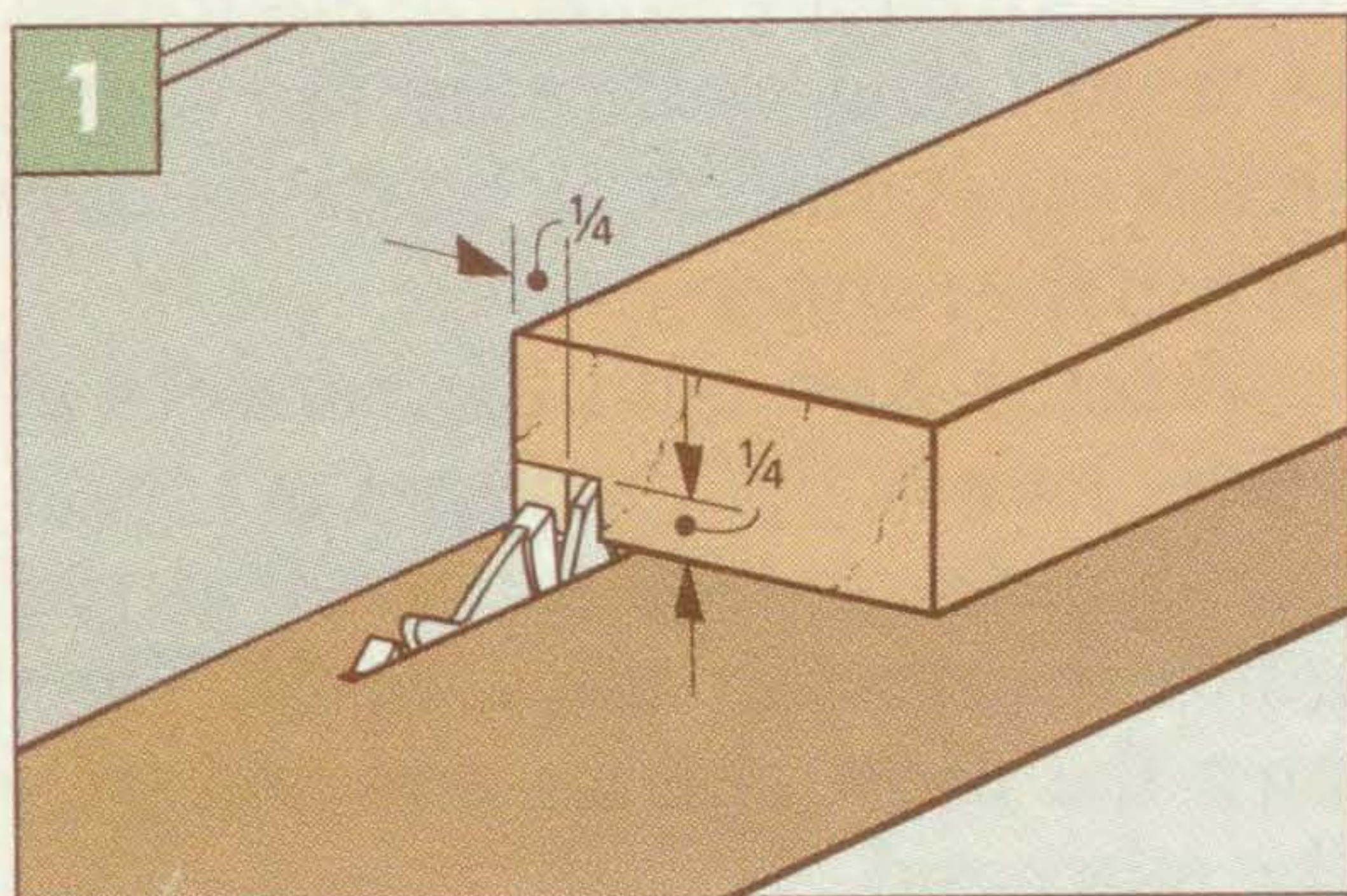


To rip a strip from the opposite edge, don't reposition the rip fence. Just rotate the workpiece and repeat the process.

Note: It's best to use a workpiece that's at least 3" wide so your hands stay well away from the blade.

Cut Glass Stop

Glass stop can be cut from a larger blank with just two passes on the table saw (Figs. 1 and 2). A zero-clearance insert around the blade will prevent the stop from falling into the saw.



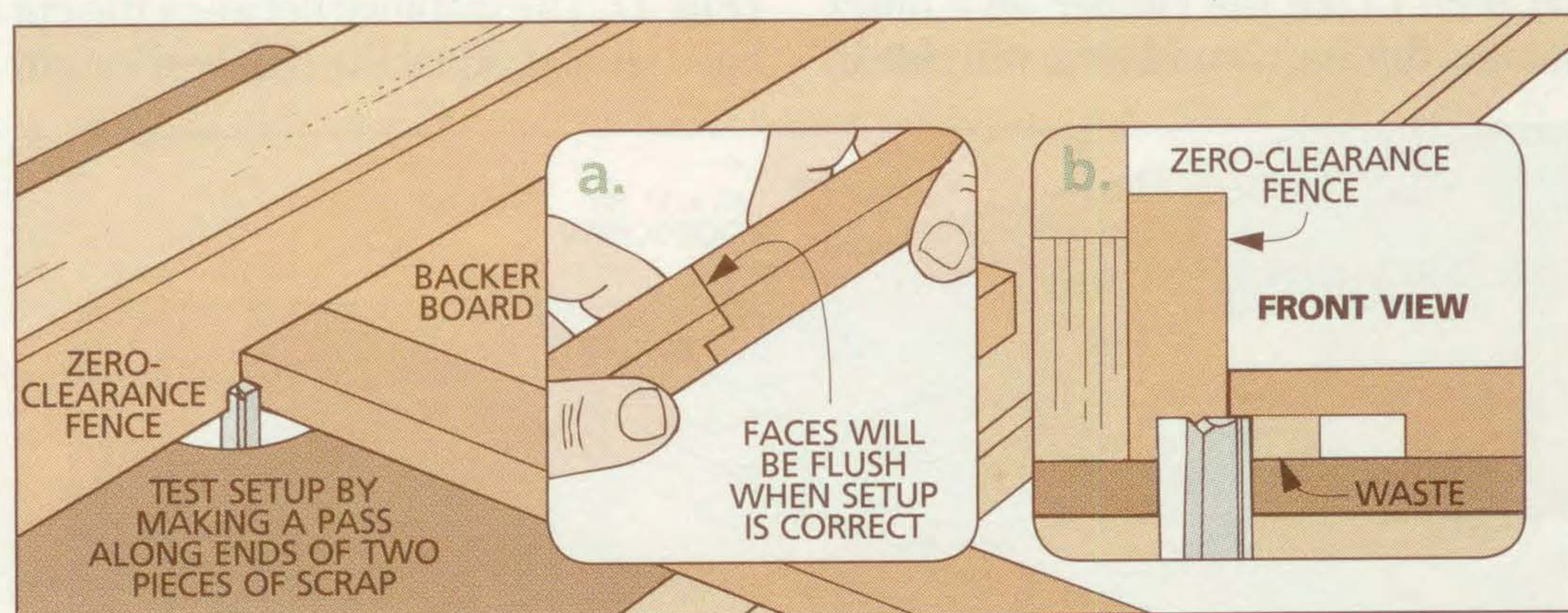
Cutting Perfect Half Laps

When cutting half laps on small workpieces, I like to use a straight bit in the router table and a zero-clearance fence to get a smoother surface.

Setup – I check my setup by first cutting a test joint on some scrap the same thickness as a workpiece from the project. For 1/2"-thick pieces, raise the bit 1/4" above the table. Then make a pass on one end of each scrap (see drawing). Check the setup by fitting the pieces together (detail 'a'). If the faces are perfectly flush, the bit is at the right height.

Cutting Joint – Using a 1/2" straight bit, I took three passes to cut the 1" width of these joints. The first pass defined the shoulder of the joint. The second pass is a light cut with the end of the workpiece pressed against the router table fence and a small part of the bit exposed (detail 'b'). This cut helps prevent chipout as you clean up the remaining waste on the third pass.

Consistent Depth – As you make each pass, press down firmly on the workpiece so the cuts are all the same depth.

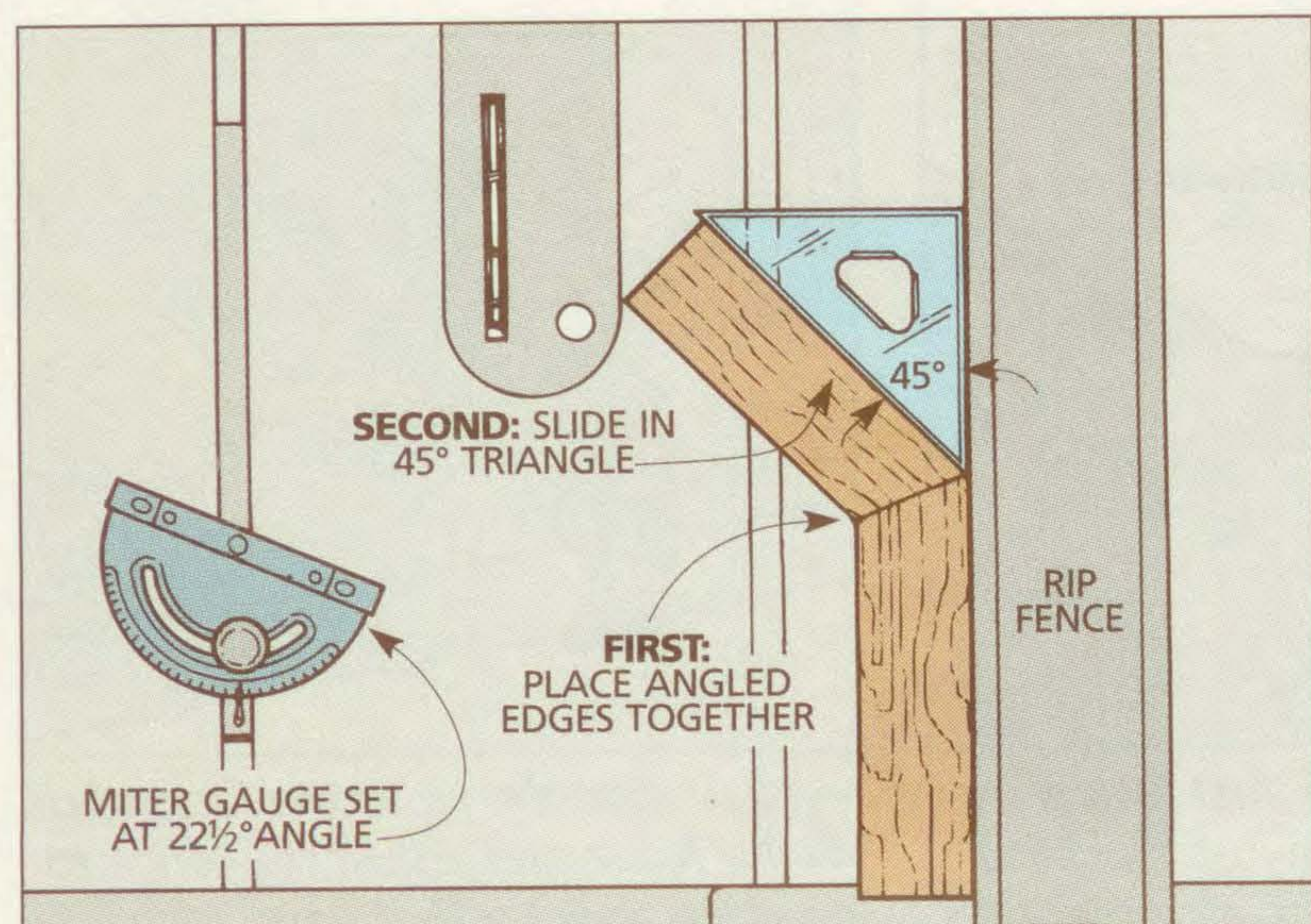


Setup for 22 1/2° Miters

Setting a miter gauge to exactly 22 1/2° can be difficult. But here's a trick to make this job easier.

Gauge Markings – Set your gauge to 22 1/2° as indicated by the markings on the head of the gauge. Then make a test cut through a piece of scrap.

Check the Angle – To check the accuracy of the setup, place the long side of one piece against the rip fence. Next, place the mitered end of the second piece against the mitered end of the first (see drawing). Check the angle between the second piece and the rip fence with a plastic triangle (available at office supply and art stores). An accurate cut creates a 45° angle.

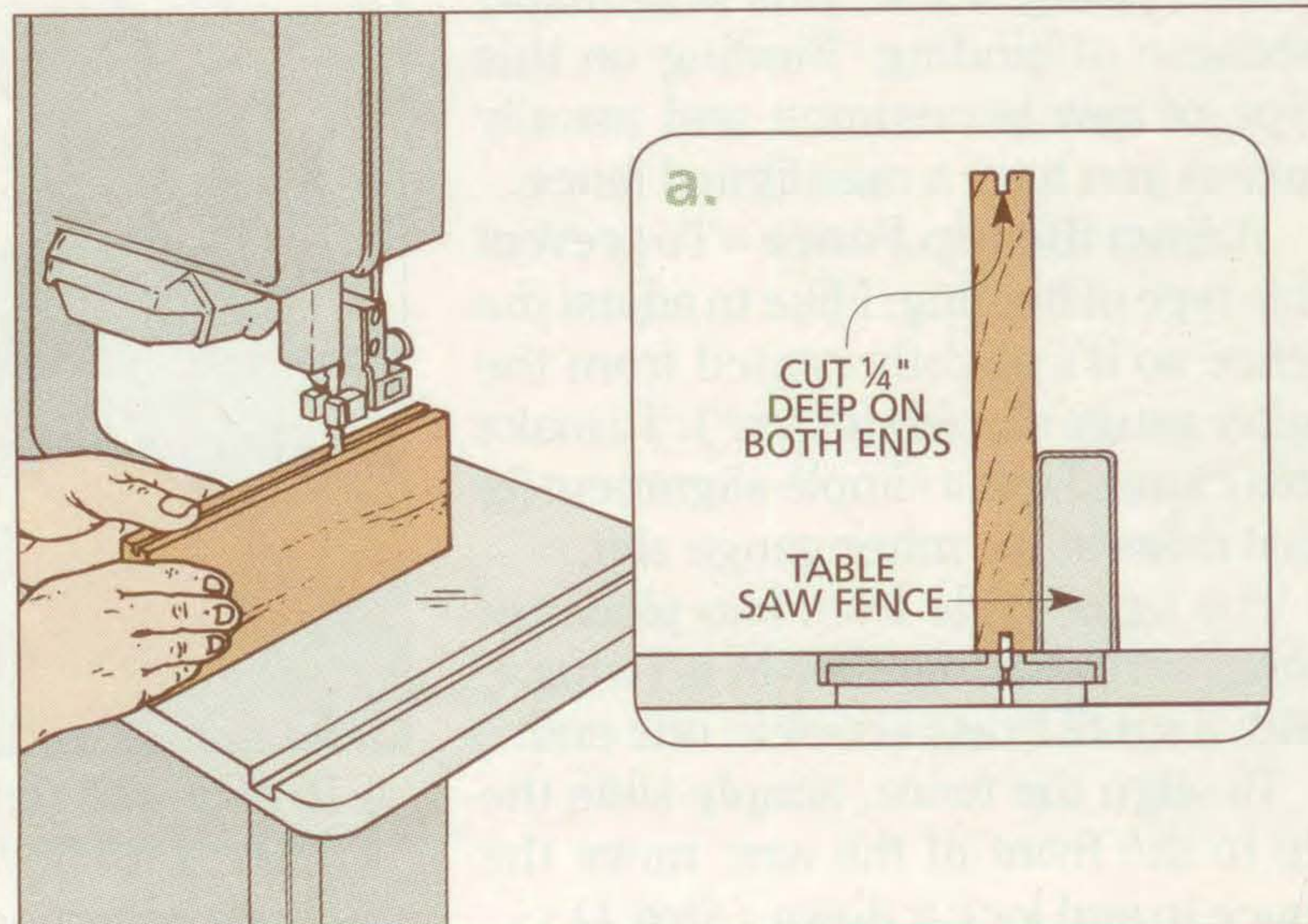


Two-Step Resawing

Although there are lots of way to do it, I like to use both a table saw and band saw for resawing narrow boards from thick stock. This method is most useful with boards that are too wide to cut all the way through on the table saw.

Start by using the table saw to score the two edges of the board with cuts that are about 1/4" deep (see detail 'a'). Then, to finish resawing the board, switch to the band saw (see drawing). The scored cut lines on each edge of the board act as "guides" to keep the band saw blade on track.

This method works well because it usually results in boards of uniform thickness (which means there will be less final planing needed).



Crosscutting Large Panels

Whenever I've needed to trim the ends of a long, wide, glued-up panel, I've used either a circular saw or a hand-held router. But recently, I came up with a different method using my table saw. It takes less time than using a router. And by using my good crosscut blade, I get a clean, square cut with no chipout — much better results than the circular saw.

Temporary Runner — What makes this all work is a temporary runner screwed to the bottom face of the top panel. (That way the screw holes won't be seen.) Like the runner on a miter gauge, this hardwood strip will ride in

the slot on the table saw and guide the long panel so the cut will be clean and square (*Fig. 2*).

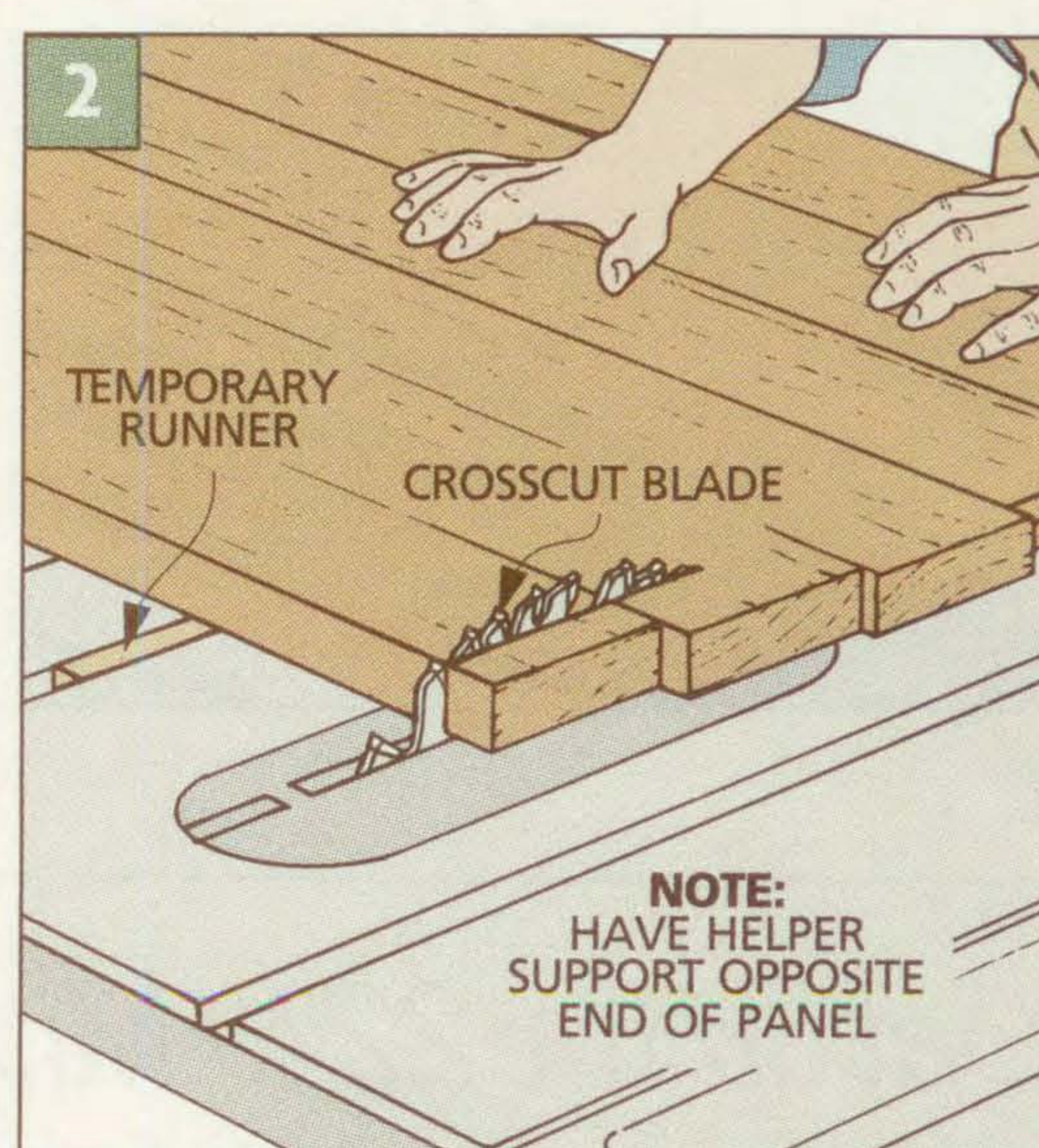
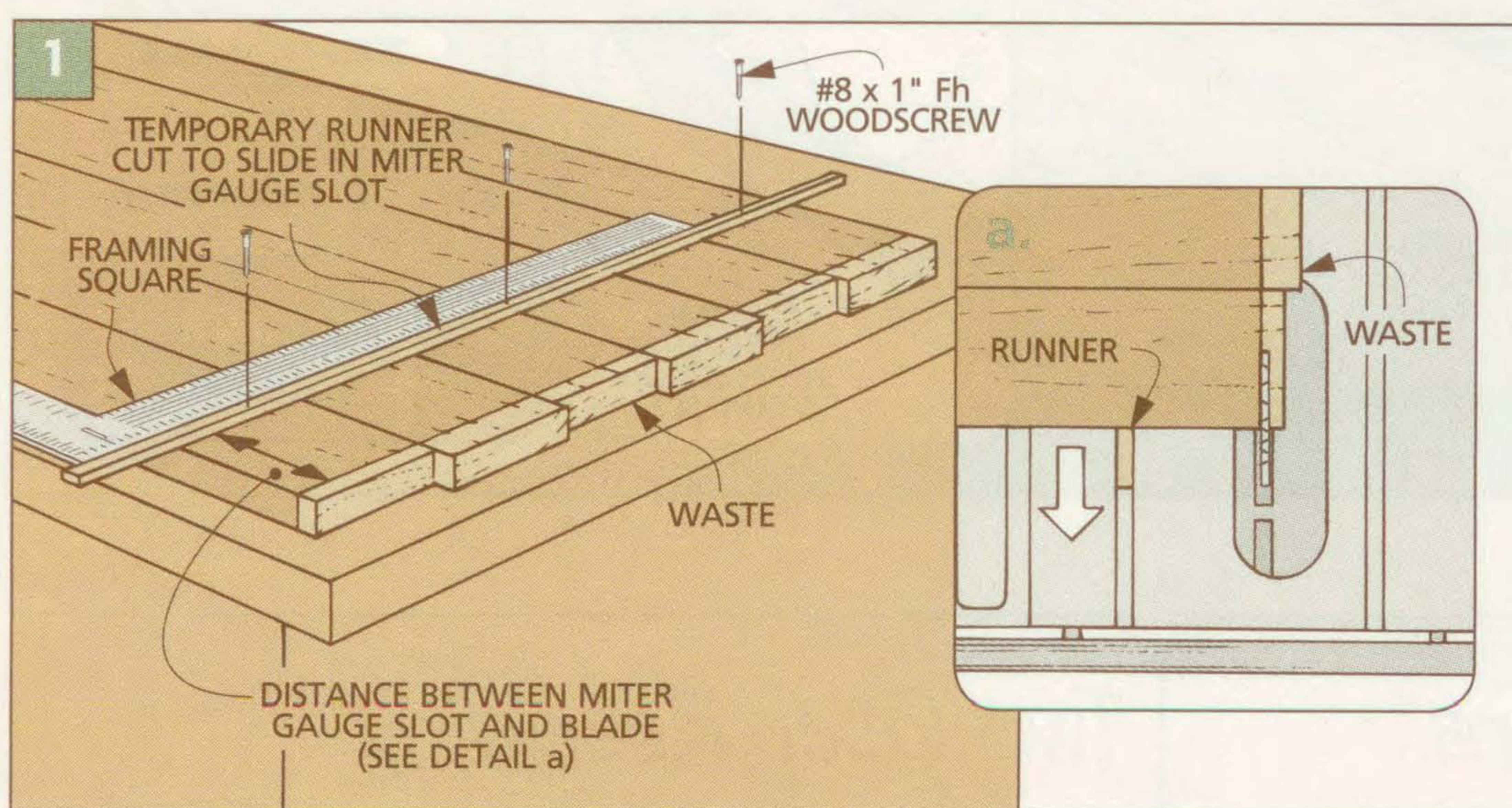
To do this, start by making a couple of long runners to fit in your table saw slot. (I made mine out of a $\frac{3}{8}$ " x $\frac{3}{4}$ " strip of solid wood.) Size the runners carefully — you want a snug fit, but not so tight that it will bind. And the runners should be longer than the panel is wide (*Fig. 1*).

Layout the Lines — Next, I laid out two lines on each end of the panel: a cut line and a line for the runner (*Fig. 1*). The distance between the cut lines should equal the finished length

of the panel. And the line for each runner should be located the same distance from the cut line as the saw blade is from the miter gauge slot.

With the layout lines drawn, the runners can be screwed to the panel. (I used a framing square to align each of them.) And make sure the screw heads are countersunk below the surface of the runners.

Trim — Now with the runners in place, simply flip the panel over and get someone to help support it as you guide it over the saw (*Fig 2*). Then turn the piece end for end and trim the other end.



Simple Jig for Dead-On Rip Fence Alignment

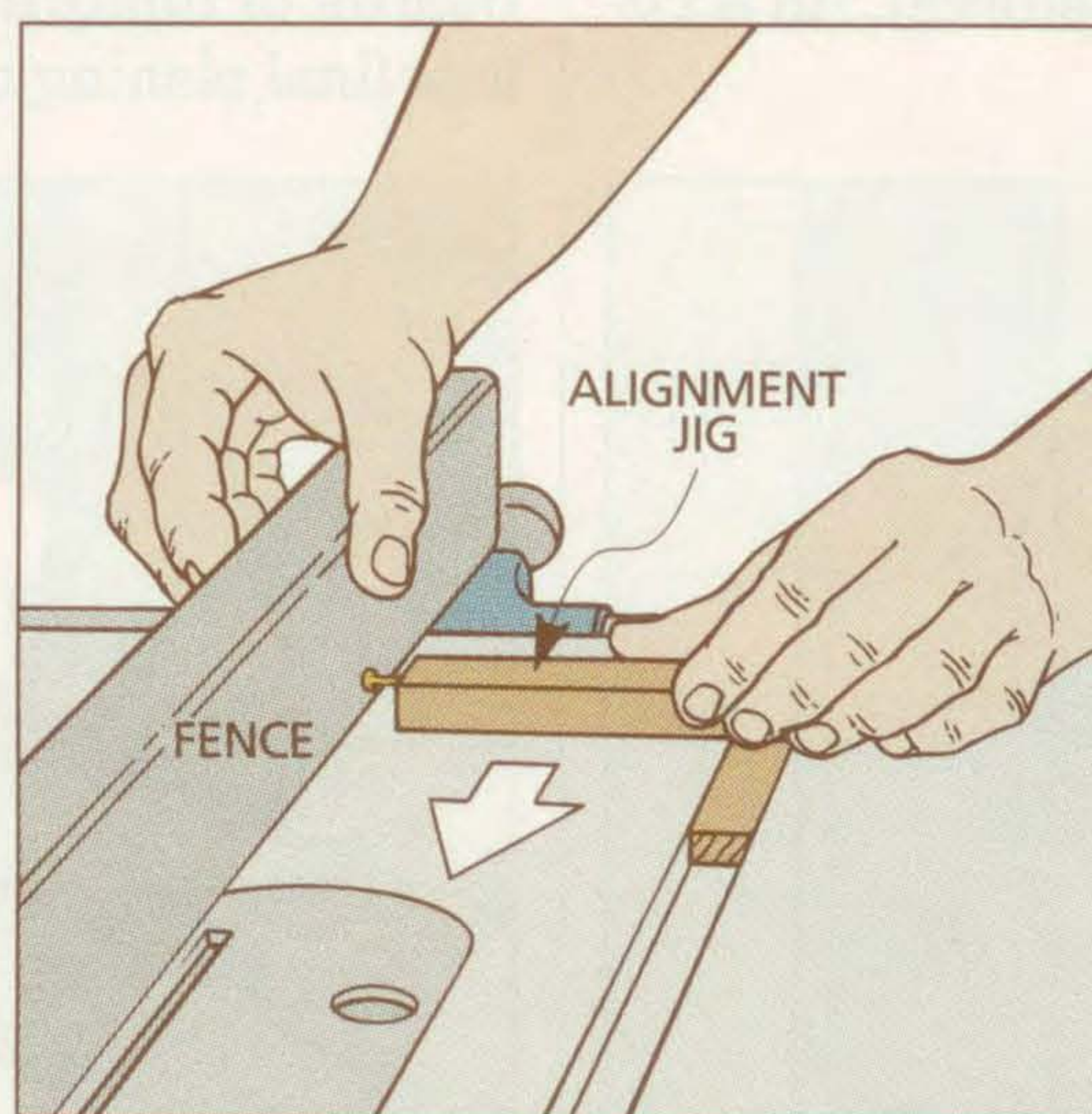
A lot of older contractor's-style table saws have a fence that rests on two rails, one at the front and one at the back of the saw's table. If you have this kind of saw, you've probably noticed that you often get burn marks when ripping stock. This is probably because of binding. Binding on this type of saw is common and usually means you have a misaligned fence.

Adjust the Rip Fence — To prevent this type of binding, I like to adjust the fence so it's slightly canted from the miter gauge slot (about $\frac{1}{32}$ "). To make this easier, I use a simple alignment jig that rides in the miter gauge slot.

The jig is made from two pieces of scrap screwed together in a T-shape, with a small brass screw in one end.

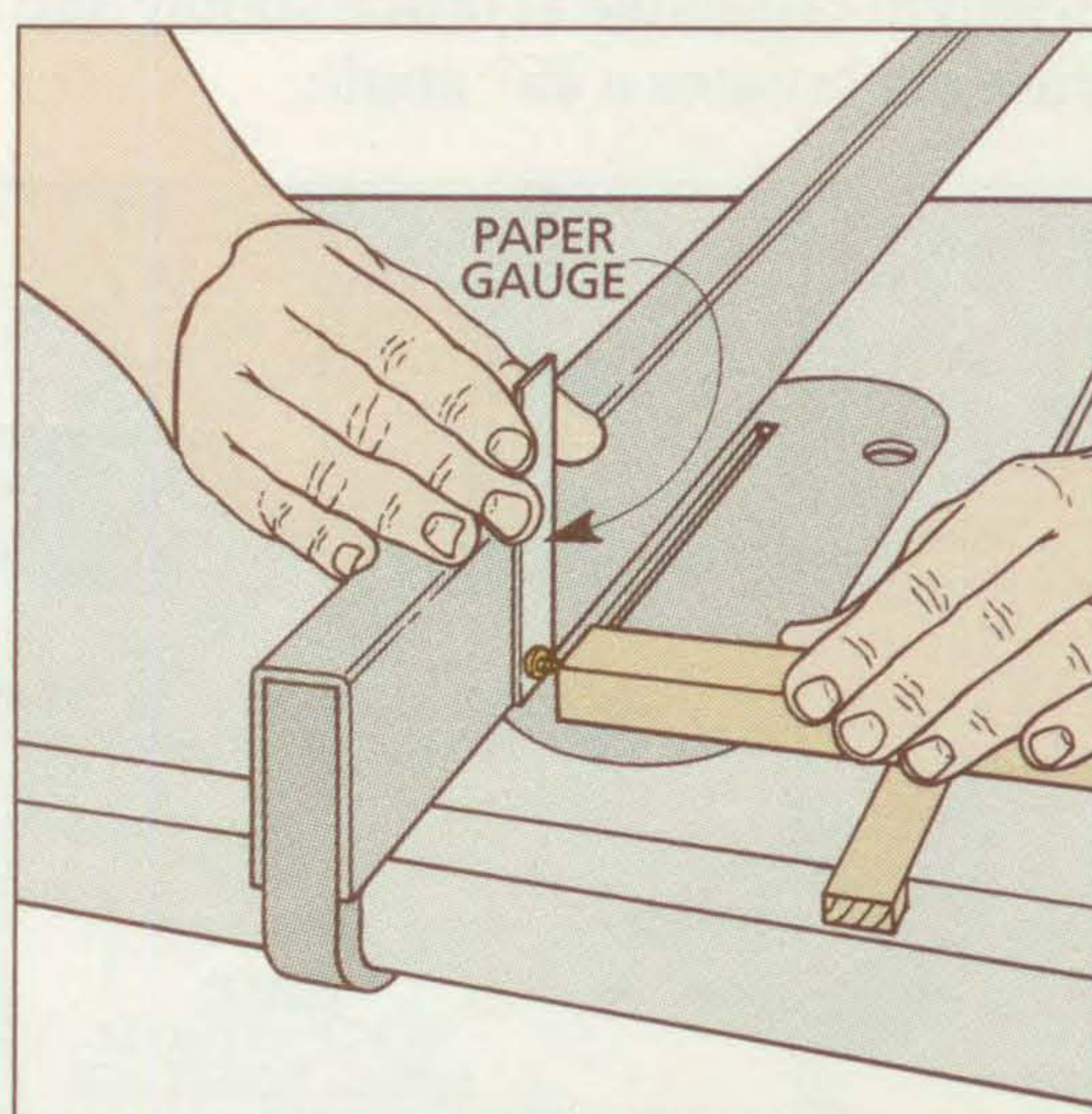
To align the fence, simply slide the jig to the front of the saw, move the fence in and lock it down (*Step 1*).

Paper Spacer — Now slide the jig to the far end and use a spacer to allow for a $\frac{1}{32}$ " gap (*Step 2*). (A few sheets of notebook paper works well.)



1 To align the fence, first lock it down with its face just touching the brass screw on the alignment jig.

Setting the fence with a gap still allows for straight cuts, but it greatly reduces the chance of binding between the blade and the fence.



2 Now slide the jig to the far end of the fence and adjust the fence to produce about a $\frac{1}{32}$ " gap.

A Tall Featherboard for Tall Workpieces

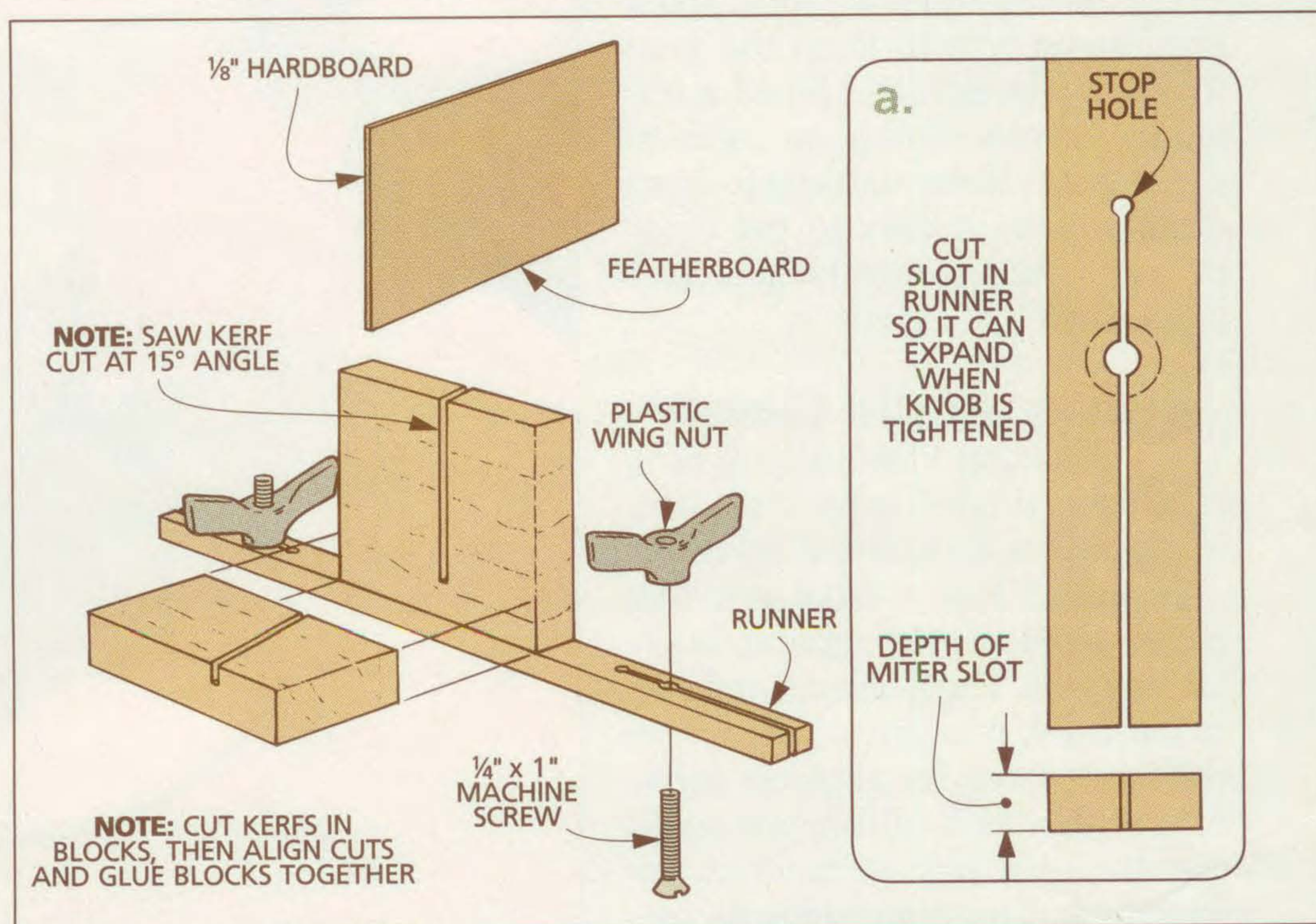
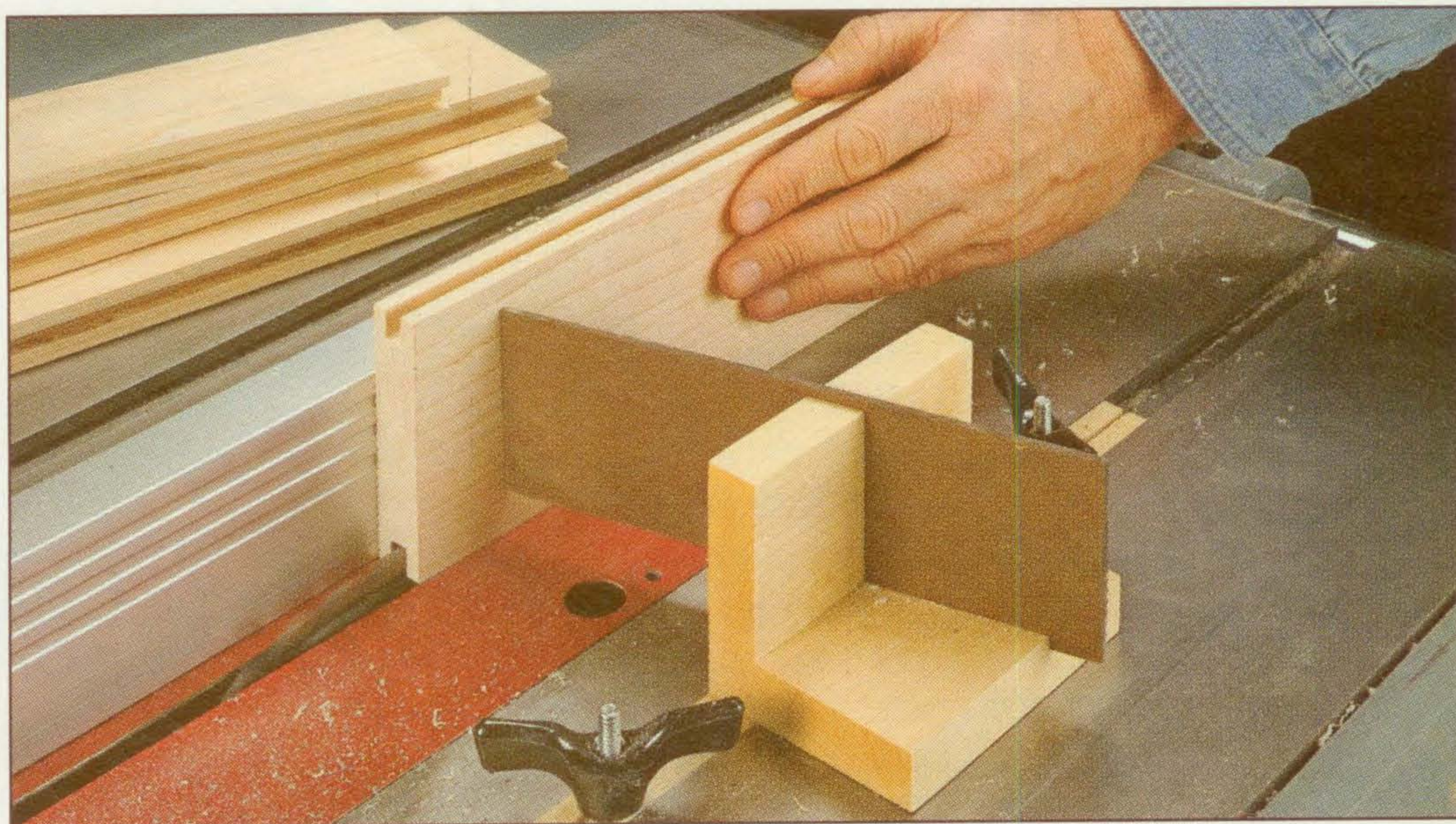
When making frame and panel sides for a case, I like to use a tongue and groove to hold the panel in place. There are a lot of ways to this. You could use a router table and a straight bit, but I use a table saw when cutting grooves in the edge of a workpiece.

Tall Featherboard – But there's just one problem. If the workpiece is extra wide it's hard to keep it flat against the rip fence. You can use a featherboard, but most of them are designed to hold a piece that's laid face down on the saw table. So to keep tall pieces flat against the fence and stable during the cut, I made a "tall" featherboard that applies pressure to the full face of the board.

Different Design – My design is a little unusual and doesn't look like a traditional featherboard. That's because I use a piece of hardboard that acts like a spring to apply the pressure (see drawing at right).

This piece of hardboard fits snug in an angled saw kerf that I cut in a L-shaped block. Yet it's easy to adjust for different stock sizes.

Expandable Runner – The block is attached to a runner that fits in the miter gauge slot of the table saw. Instead of using clamps to hold the featherboard in position, the runner expands when a pair of wing nuts are tightened (see detail 'a'). This wedges the runner in the slot so the featherboard won't move.



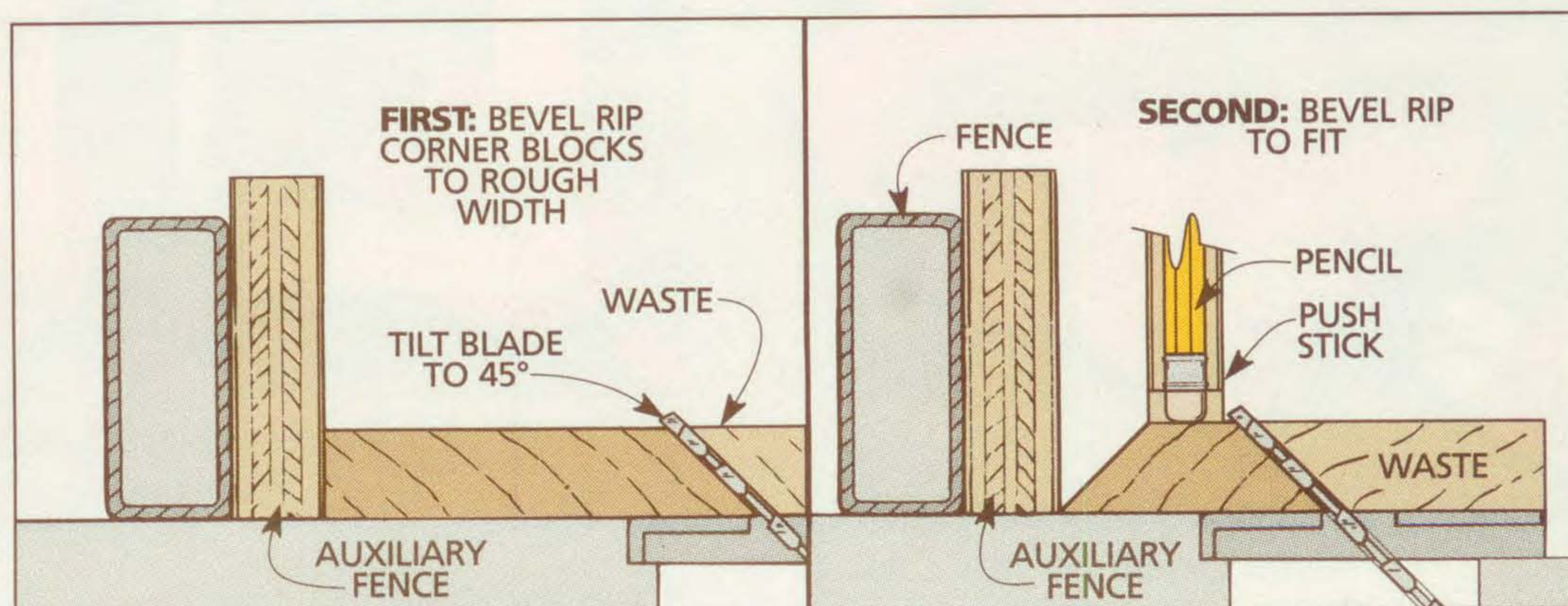
Safe Bevel Ripping on Right-Tilt Table Saws

Bevel ripping both edges of a narrow workpiece using the table saw is a delicate operation. In order to make this procedure safer, I like to use a narrow, shop-made push stick, and the eraser end of a pencil as a hold-down.

The procedure that I used to make the corner blocks

for a small table was to start by ripping a 45° bevel along one edge of each block (see left drawing). Then I ripped another bevel on the opposite edge (see right drawing).

I carefully sneak up on the final width until the triangular block just fits in the back corner of each leg.



Must-Have

Corner Clamps

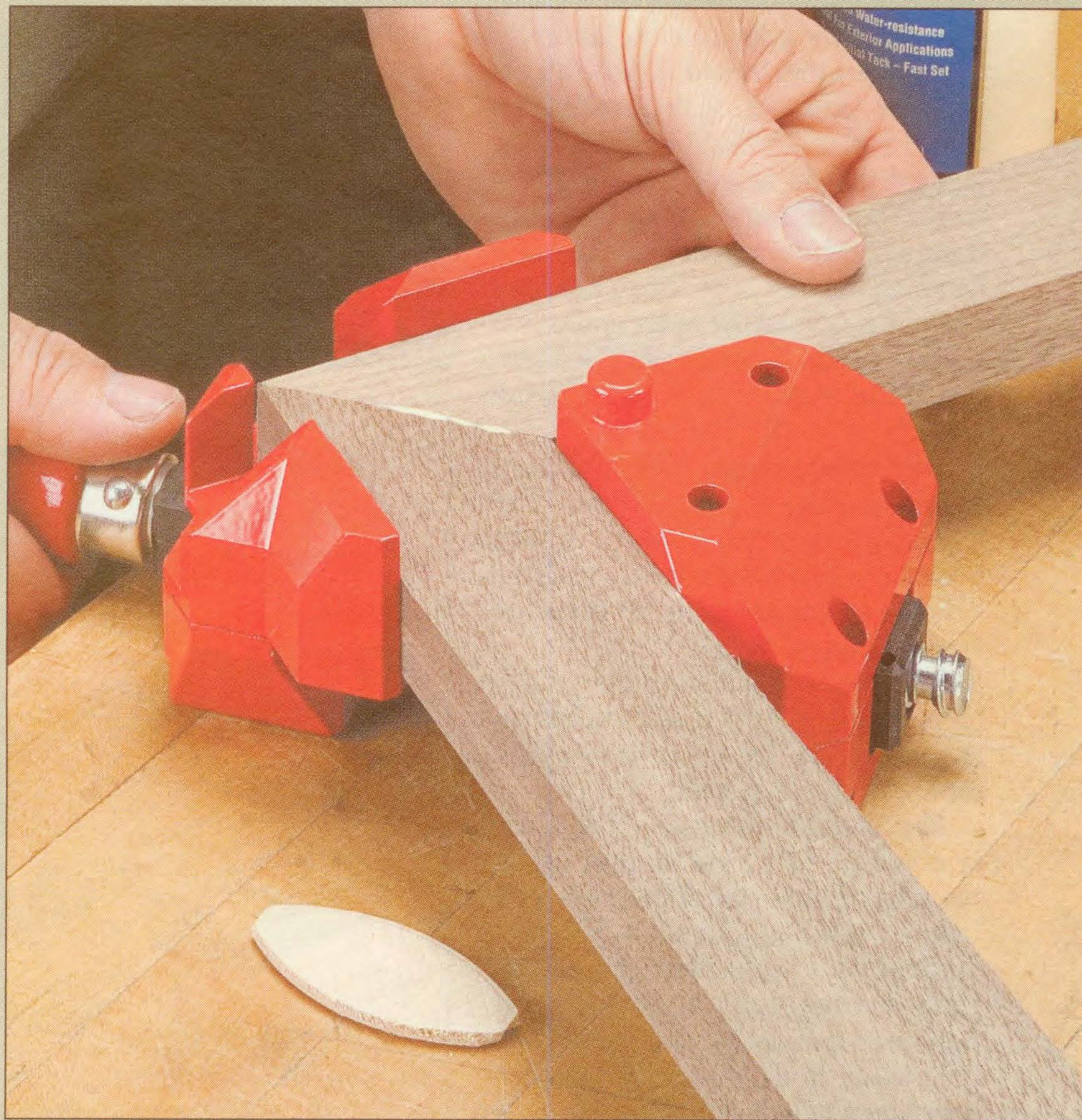
In a perfect world, assembling a project would go smoothly. All the parts would stay aligned and all the joints would fit snugly. But we all know that assembly time can get pretty hectic. So whether it's miter joints, face frames, or even putting together a plywood case, one way to avoid the juggling act is to work on only one corner joint at a time.

For this strategy to work, you'll need some way to keep the joint together. Thankfully, I found a few unique, corner clamps to come to the rescue. These unusual-looking clamps make it easy to get tight-fitting joints. And they keep project parts aligned at exactly 90°.

Bessey Angle Clamp

The first clamp I took a look at is the Bessey Angle Clamp. It's shown in the photos at right and below.

Notched Jaw – What sets this clamp apart are the unique, interlocking jaws. The V-shaped opening in the fixed, rear jaw provides two reference faces for aligning parts. And at the back of this jaw you'll also notice a pair of notches (or openings). These openings do two things. First, they provide access to the joint for drilling holes, driving screws, or attaching other hardware. Secondly, the notches allow



you to clamp T-joints, as in the far right photo below.

As I mentioned, the notched jaw is “fixed.” But that's only partly true. Even though it doesn't slide up and down on the screw, it can still pivot. The advantage of this can be seen in the middle photo below.

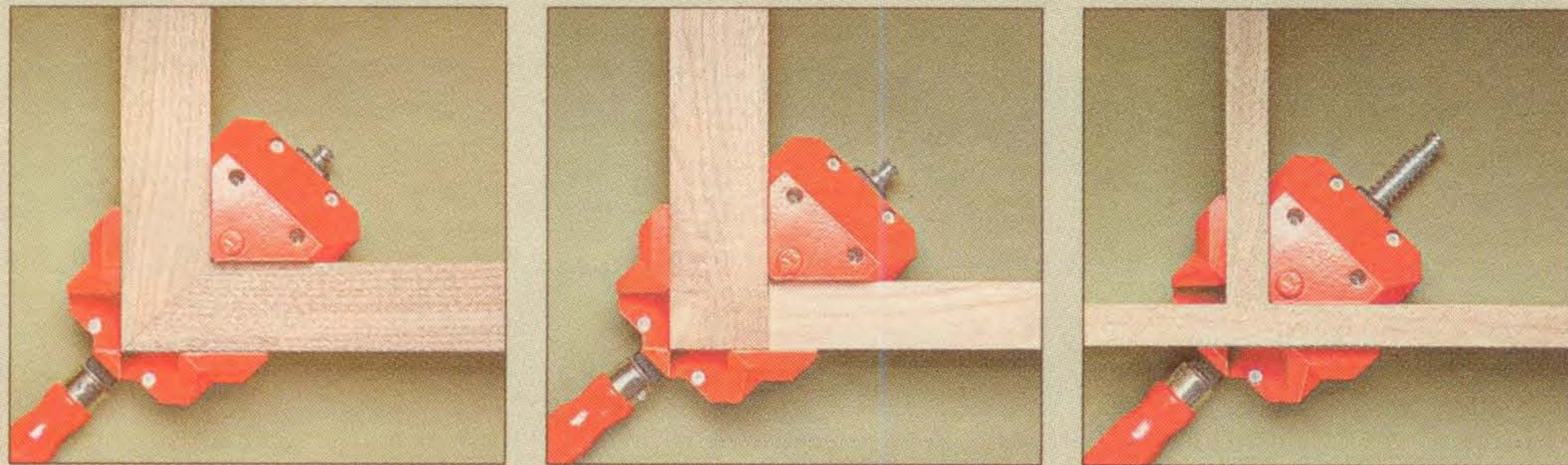
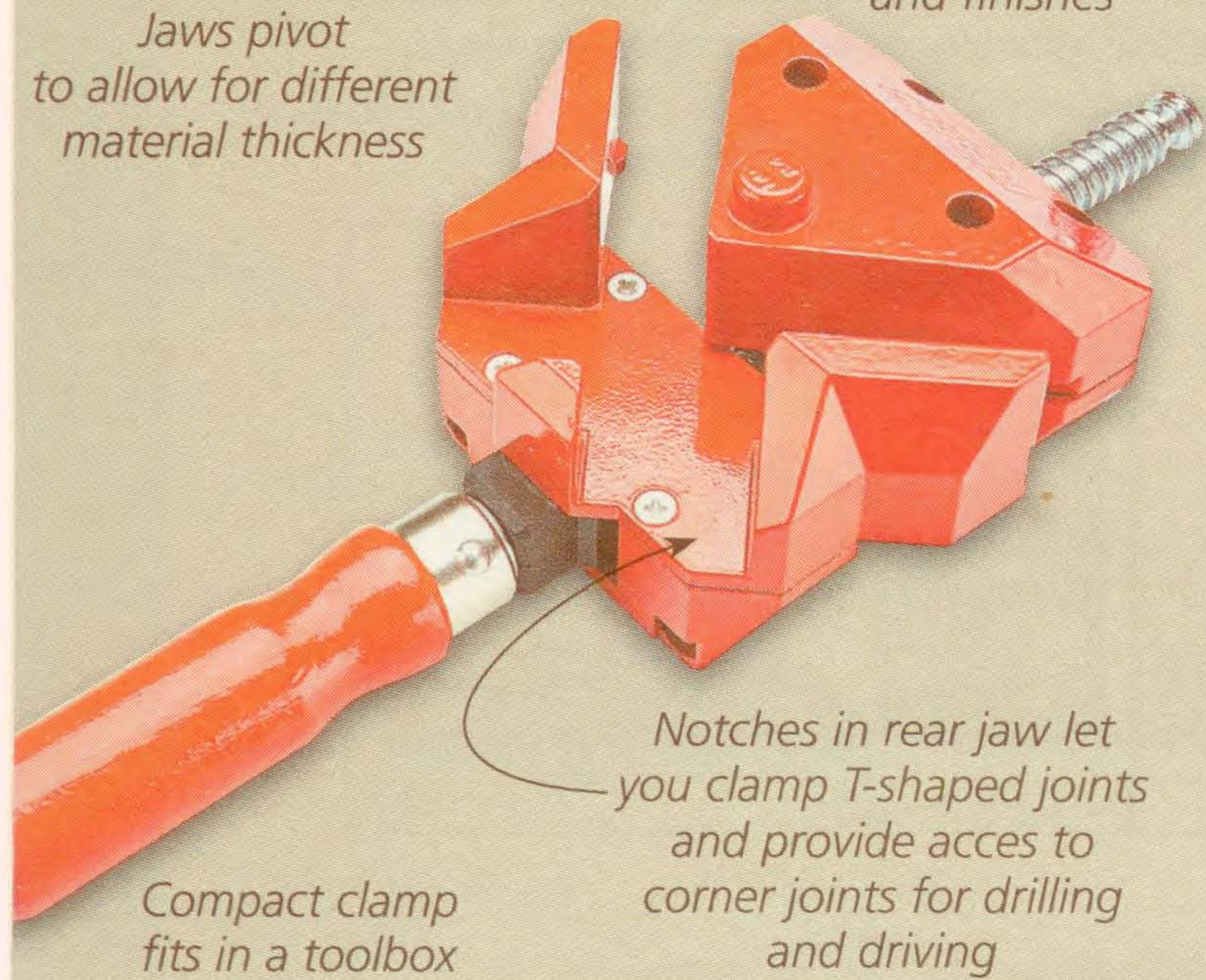
The pivoting action of both jaws enables you to clamp parts that aren't the same width.

Front Jaw – The wedge-shaped front jaw, like the rear jaw, is plastic coated to keep glue from sticking to it. The front jaw slides along the screw and forces the mating pieces

Bessey Angle Clamp

Jaws pivot to allow for different material thickness

Plastic-coated jaws resist glue and finishes



▲ The Bessey Angle Clamp opens wide enough to clamp three types of joinery. The clamps can handle miter joints (left photo), as well as pieces that aren't the same width (middle photo). Notches in the fixed jaw allow the clamp to grip T-joints with ease (right photo).

together and into the reference faces on the fixed jaw — even miter joints like you see in the left photo on the opposite page.

Another thing I like about this clamp is its small size. It easily fits in a toolbox, so you can always have one close at hand.

Gross-Stabil Multi-Spanner

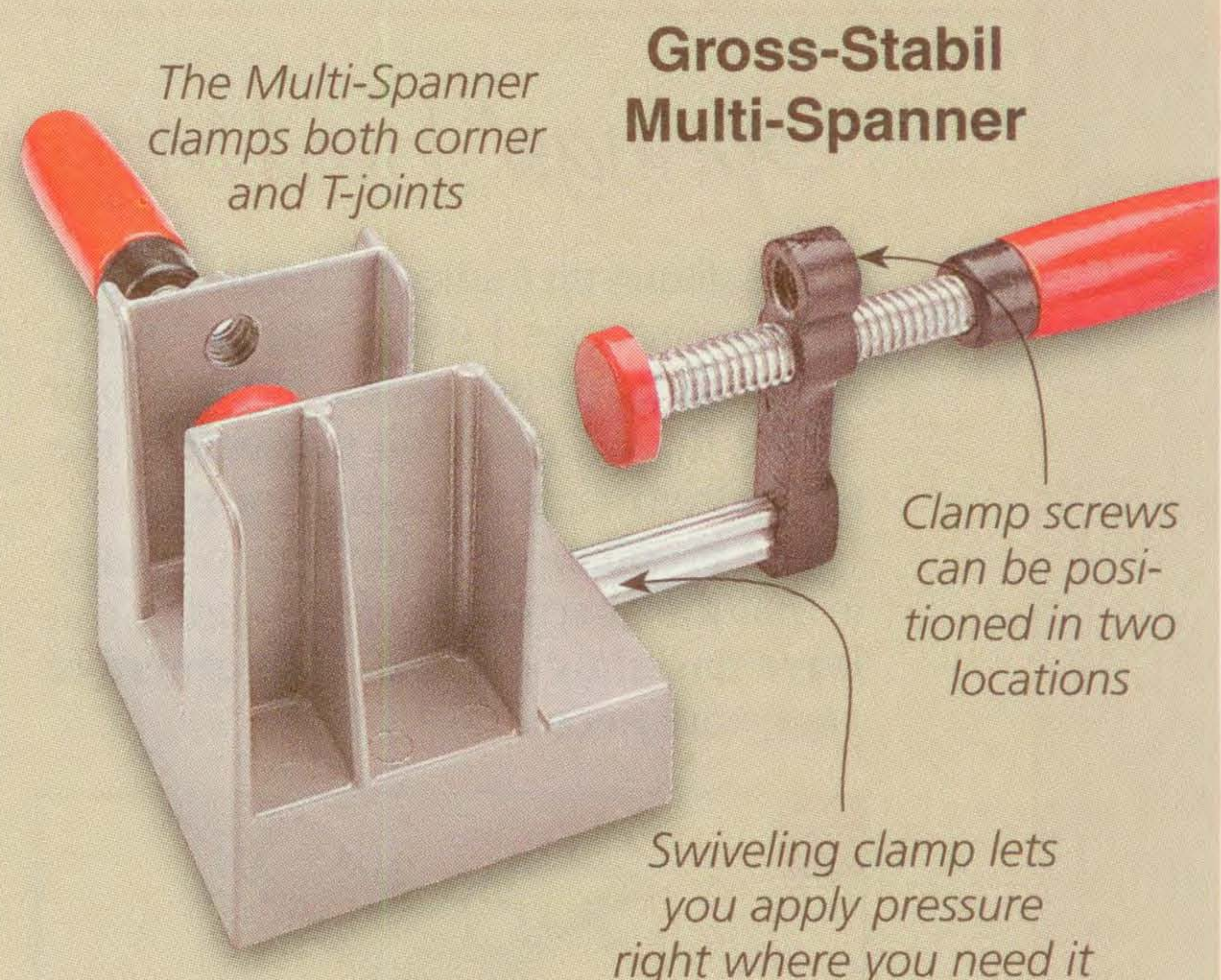
While the Bessey Angle Clamp tackles frame construction tasks with ease, it can fall a little short in case construction. The reason for that is the jaws aren't very tall (only

about 1 $\frac{3}{8}$ "). So when it comes to putting together larger plywood workpieces, I'll turn to the Multi-Spanner clamp from Gross-Stabil that you see in the photo at right.

Big Clamp — The first difference you'll notice from the Bessey clamp is the size. The depth of the faces of the Multi-Spanner are quite a bit larger, almost 2 $\frac{1}{2}$ " in fact. This gives it a bigger bearing surface for clamping up wider projects. The faces are cast zinc and epoxy coated to resist glue and finishes. Just like the other clamp mentioned, the faces of the Multi-Spanner allows it to hold the pieces in both corner joints and T-joints.

Double Screws — Another obvious difference is the way that the workpieces are secured to the clamp. Instead of a single screw, the Multi-Spanner uses two opposing screws. You can see these two screws in the photo above.

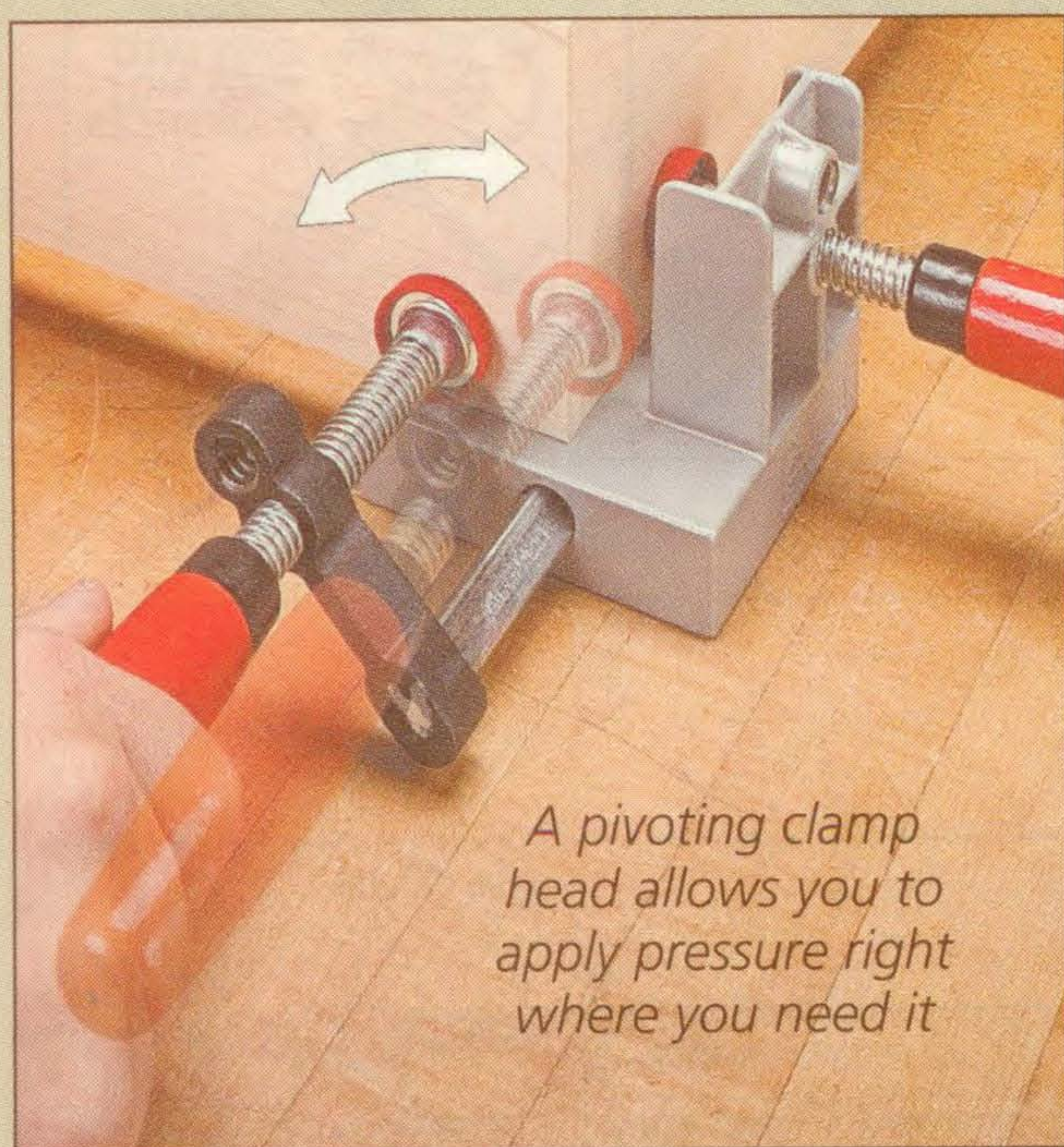
One screw threads through the body to hold a workpiece up to 1 $\frac{1}{8}$ " thick. On the other side of the clamp, the screw is mounted on a swiv-



eling arm (see photo at left). With this feature, you can apply pressure directly in line with the joint. Or if needed, you can tilt the screw out of the way to provide access to the joint for driving screws or nails.

Both sides have a pair of holes that allow you to position the clamp screw in a high or low position. The benefit here is that you can adjust the screws depending on the size of the workpieces.

Finally, check out the box below for some other corner clamping options. And to find out where to get all the clamps shown here, go online or contact your local wood-working dealer or tool supplier.

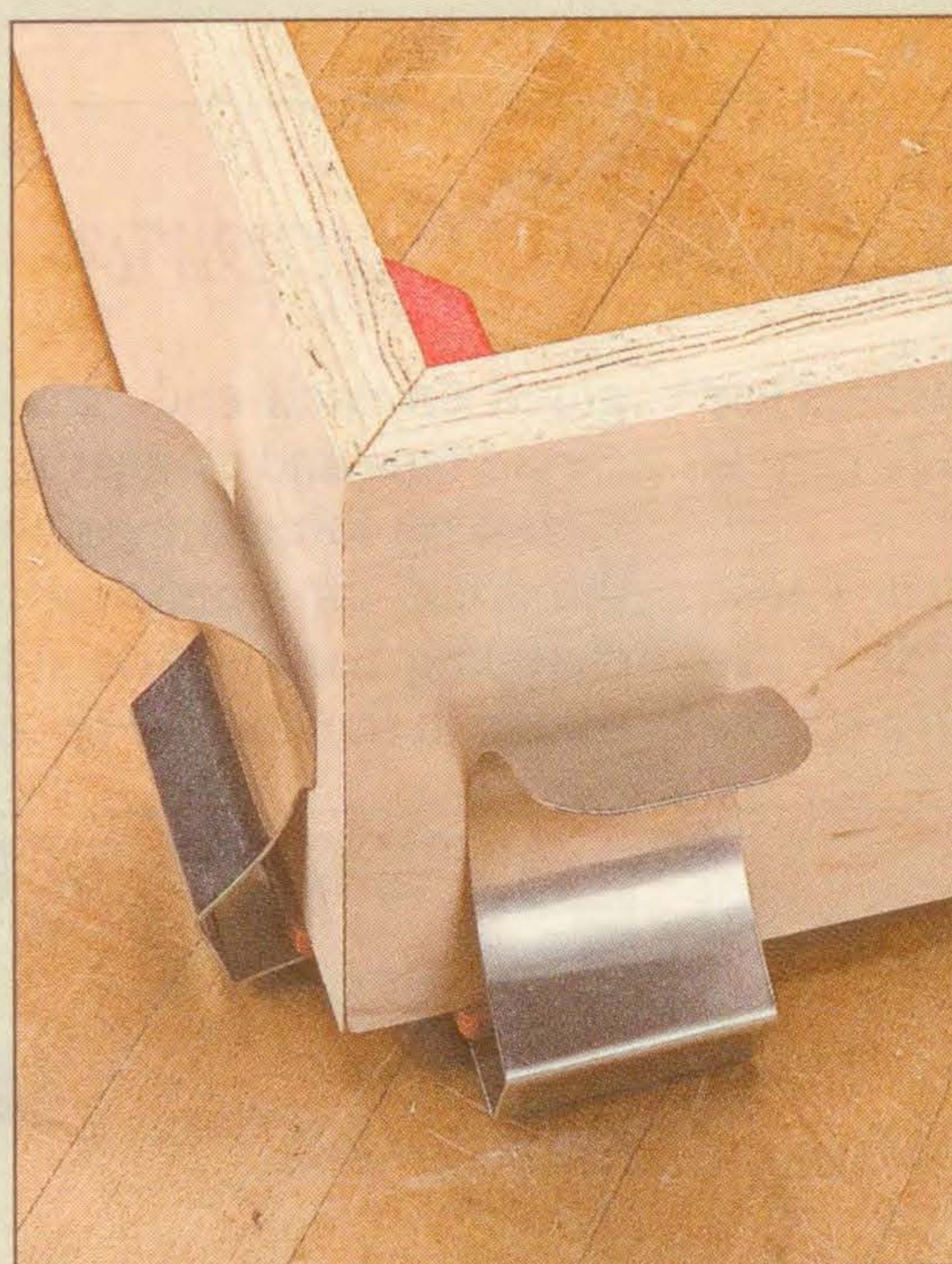


Low Tech: Sometimes, Simple Will Do

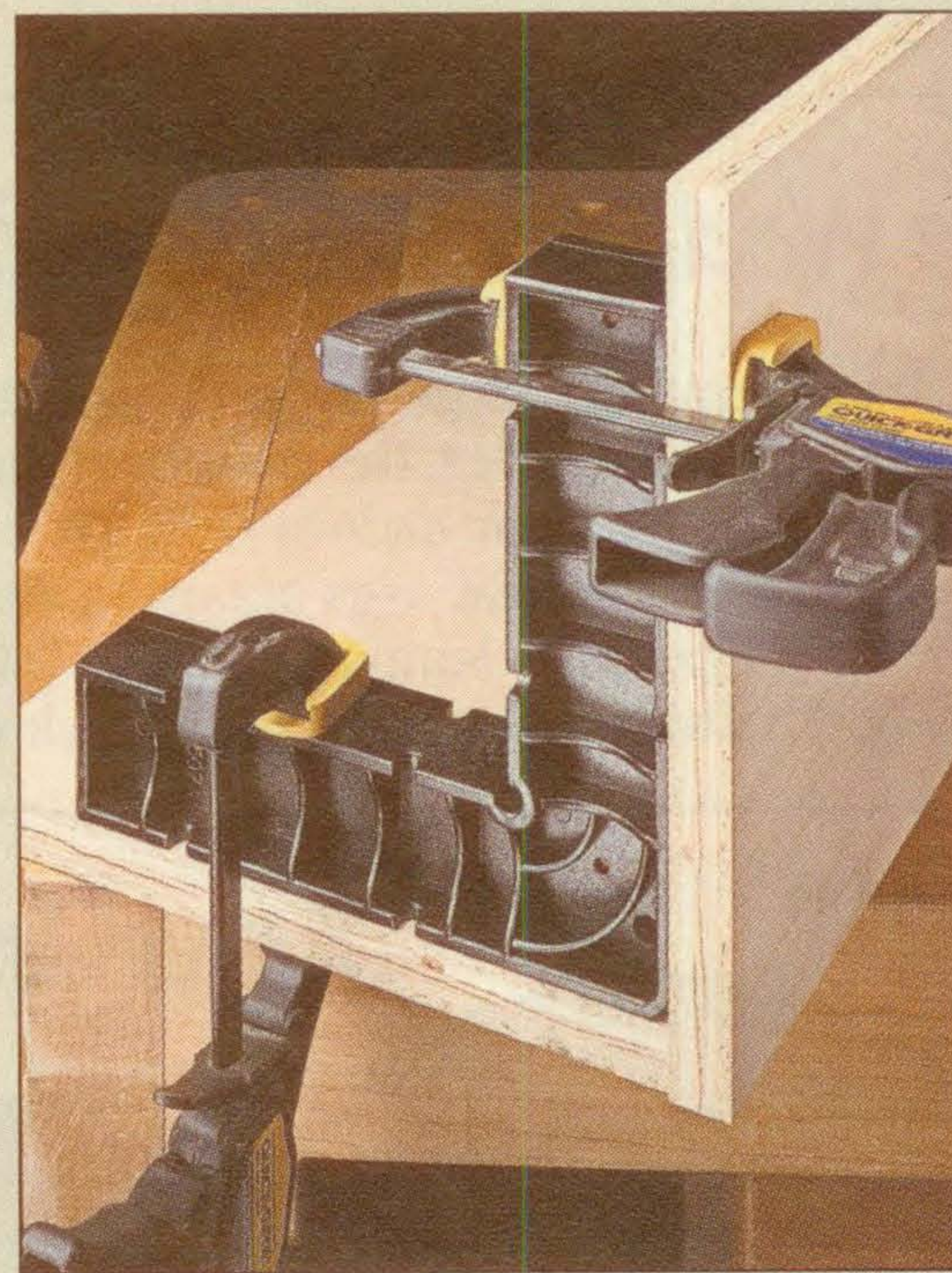
Just about everyone could use a third hand when it comes time for assembly. And that's where the two clamping helpers you see in the photos at right come in.

Jet Jointing Clamp — The simple spring clamps you see in the left photo works like a paper clip for wood. Two stainless steel leaf springs grip workpieces up to $\frac{3}{4}$ " thick and hold them against a glass-reinforced plastic body.

Rockler Clamp-It — This unique precision alignment square (right photo) isn't really a clamp, but its thick, polycarbonate body does make it easy to attach a couple of clamps and hold case parts at a perfect 90° for assembly and glue up.



▲ The Jet Jointing Clamp uses stainless steel spring-action leaves to hold mating parts together at 90° against a rigid center block.



▲ With the Rockler Clamp-It Assembly Square and a pair of clamps you can quickly align and square up large plywood cases.

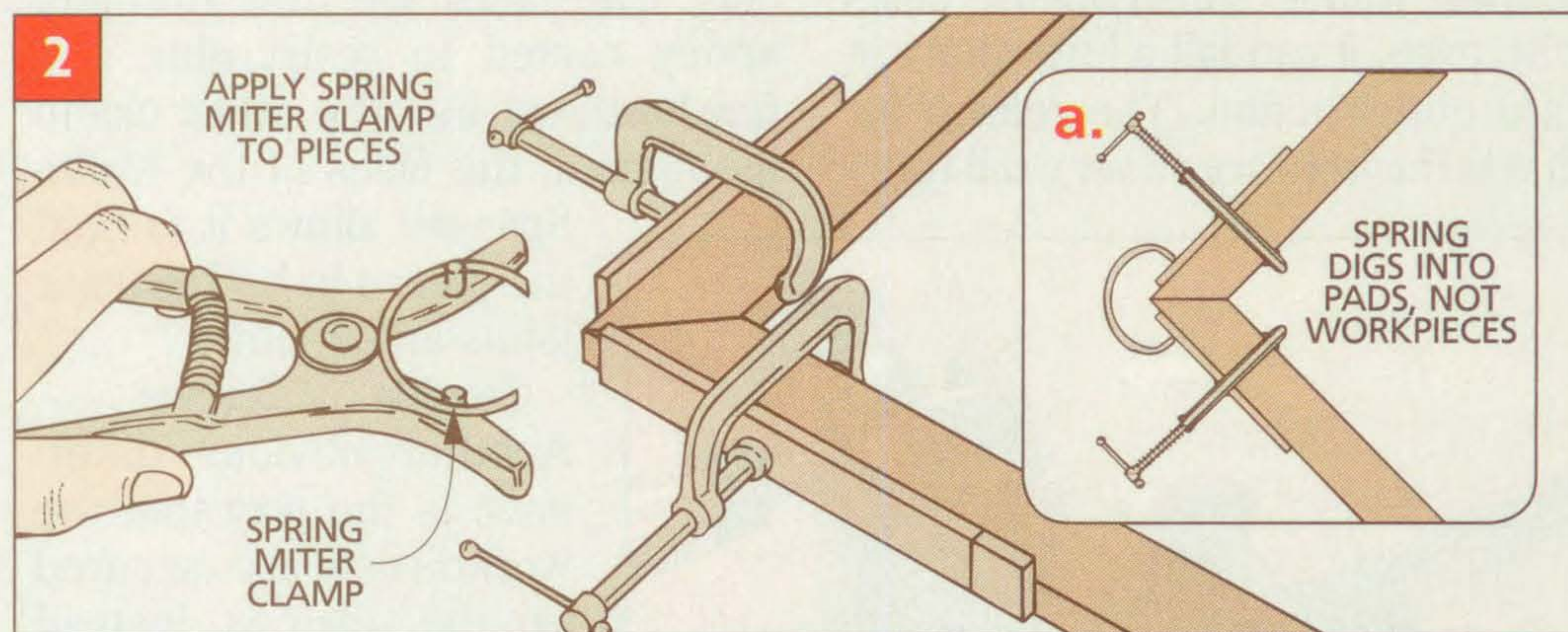
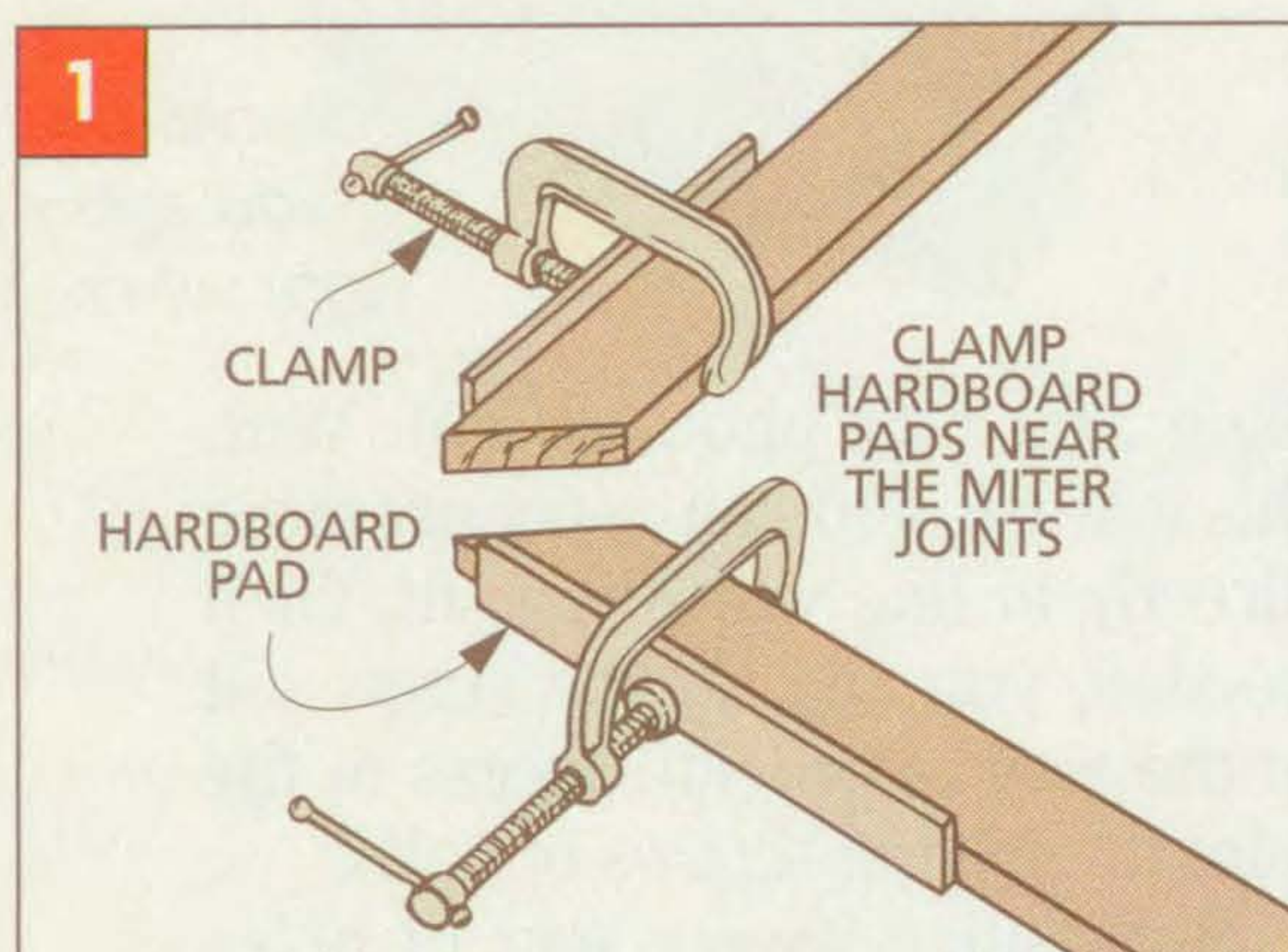
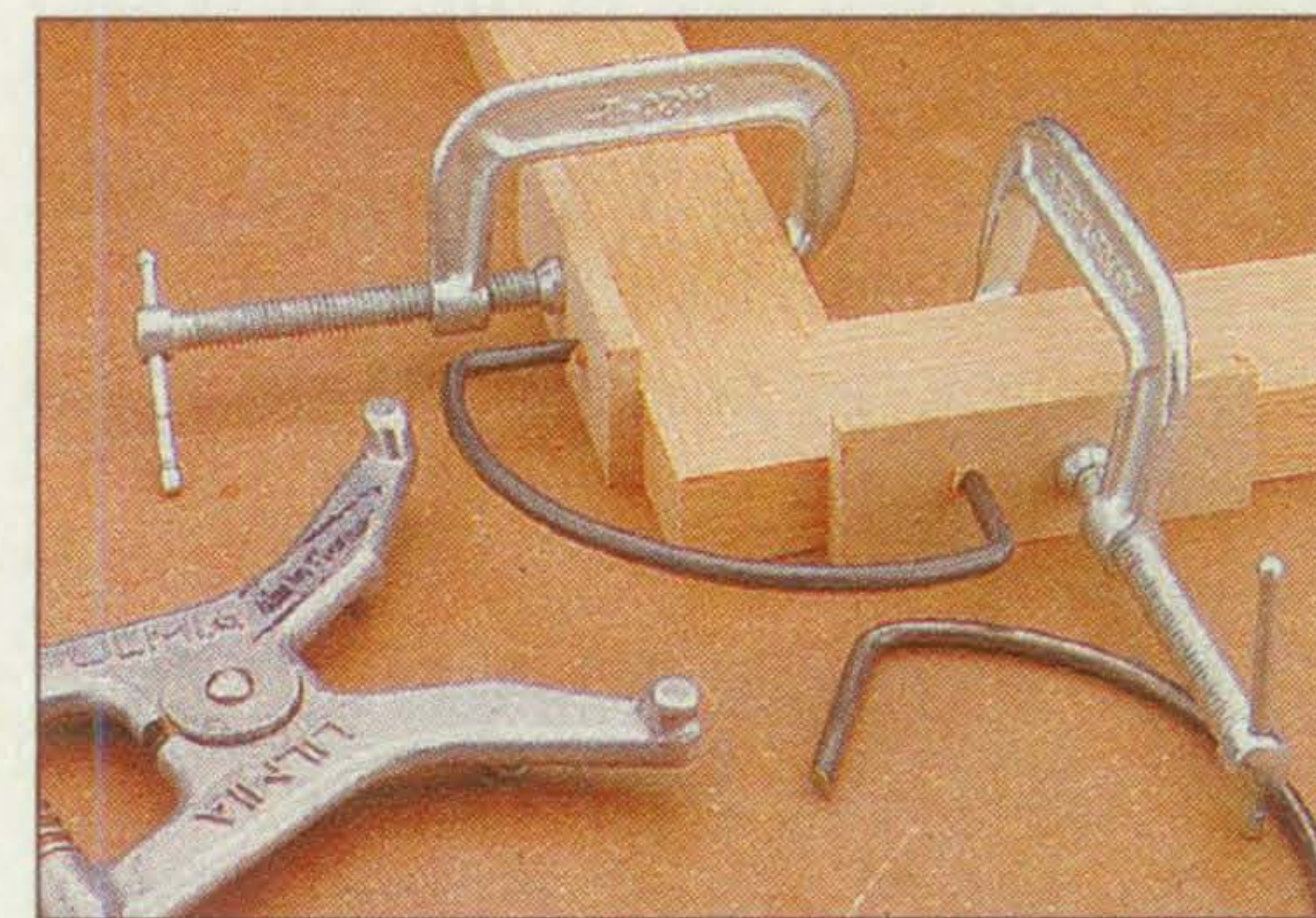
"Springs" Hold Miters Together

When gluing up frames with mitered corners, sometimes I use a "spring" miter clamp to hold the pieces. The strong spring does a good job preventing the pieces from slipping during glue up.

The problem with this type of clamp is that the sharp ends of the spring can leave unsightly dents in the corners of your workpieces.

To avoid this, I clamp hardboard "pads" to the workpieces before attaching the spring (*Fig. 1*).

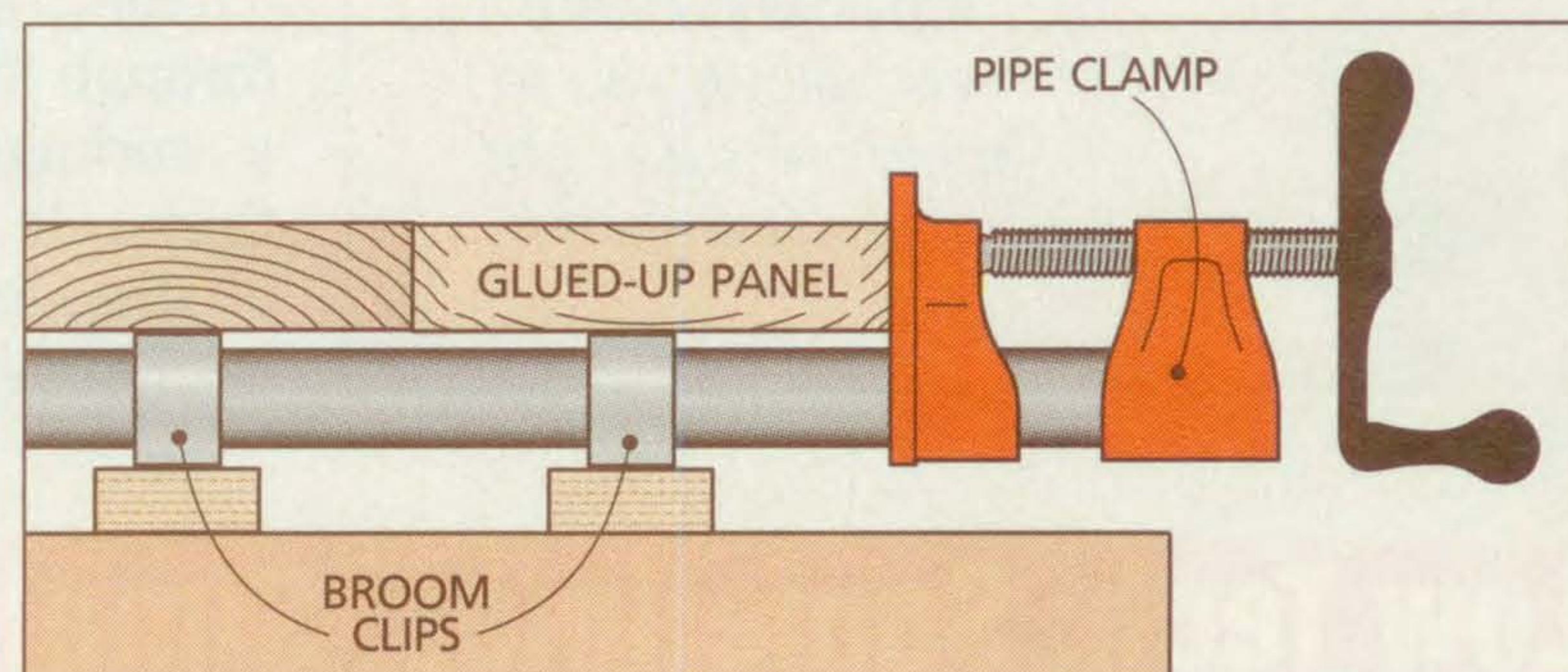
This way, the spring digs into the hardboard pads instead of biting into the workpieces (*Fig. 2*). The spring still applies enough pressure to clamp the joint, without leaving any marks in the workpieces.



Cradles Keep Pipe Clamps Upright

Pipe clamps have a frustrating tendency to tip over when gluing up a solid-wood panel. Also, moisture in the glue reacts with the iron pipes, which creates an ugly black stain on the wood.

To steady the clamps, I make several "cradles" from inexpensive metal broom clips and plywood blocks (*see drawing*). The clips have the added benefit of raising the panel off the clamp, so there's no worrying about the pipes staining the wood (*see drawing*).



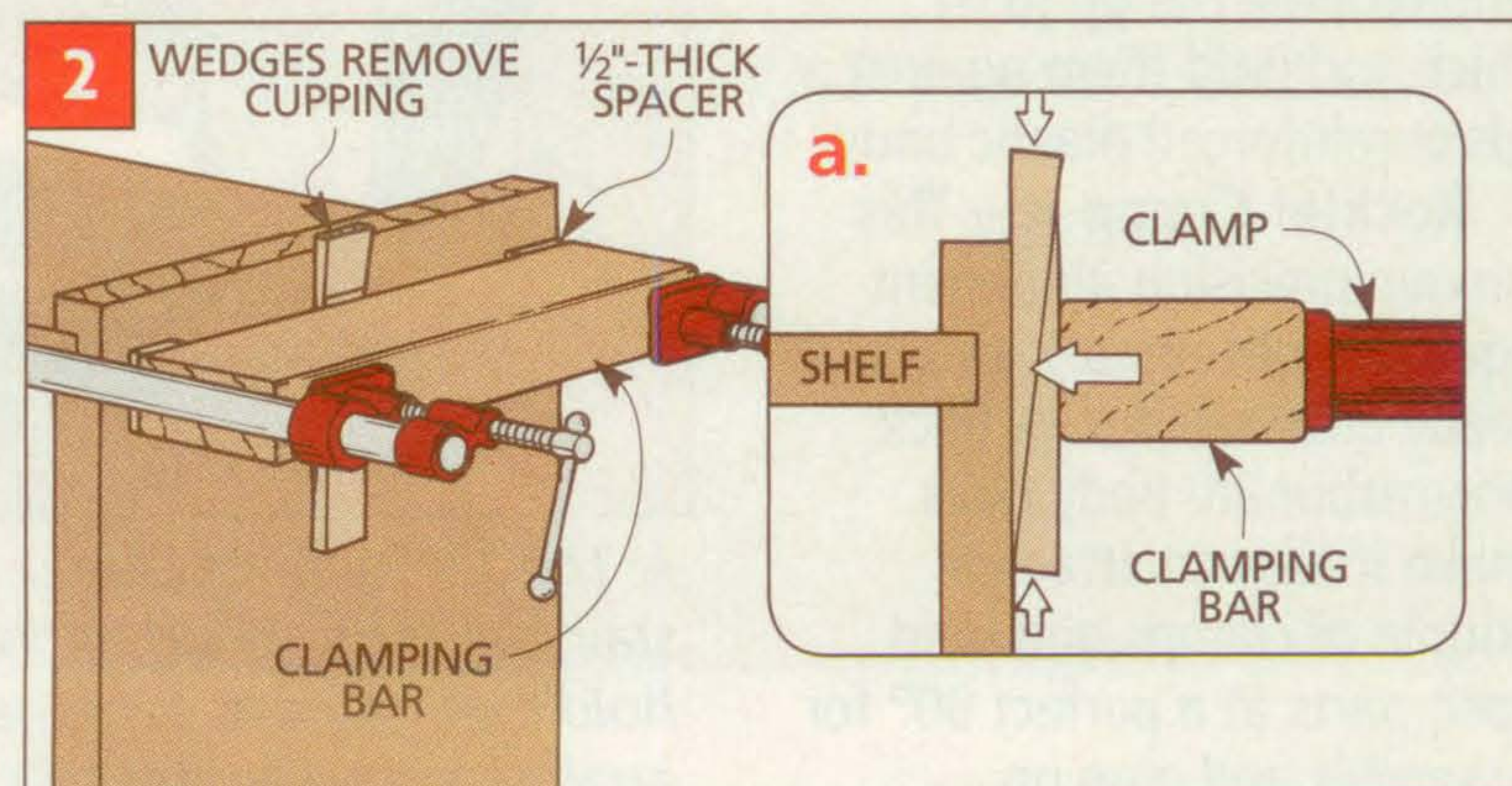
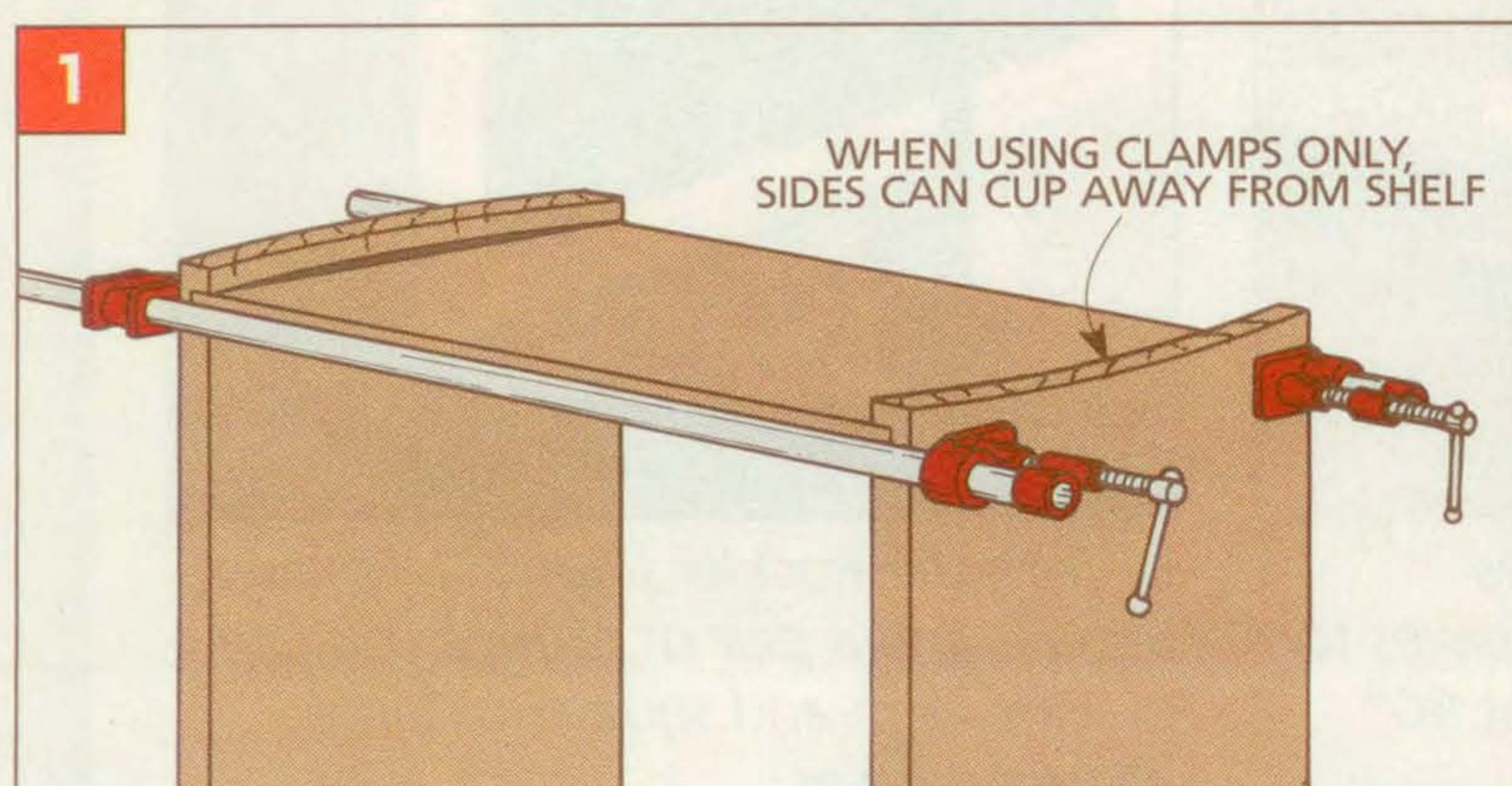
Use Wedges to Stop Panels from Cupping

While dry-assembling large projects, where shelves are clamped between the sides, the centers of the side panels will often cup out from the dados (*Fig. 1*).

I came up with a fix that uses opposing wedges. These wedges work against a clamping bar that "straddles" the sides (*Fig. 2*). This bar is simply a 2x4 block with a spacer

glued on each end. Stick the spacers to the sides with carpet tape and clamp the assembly together.

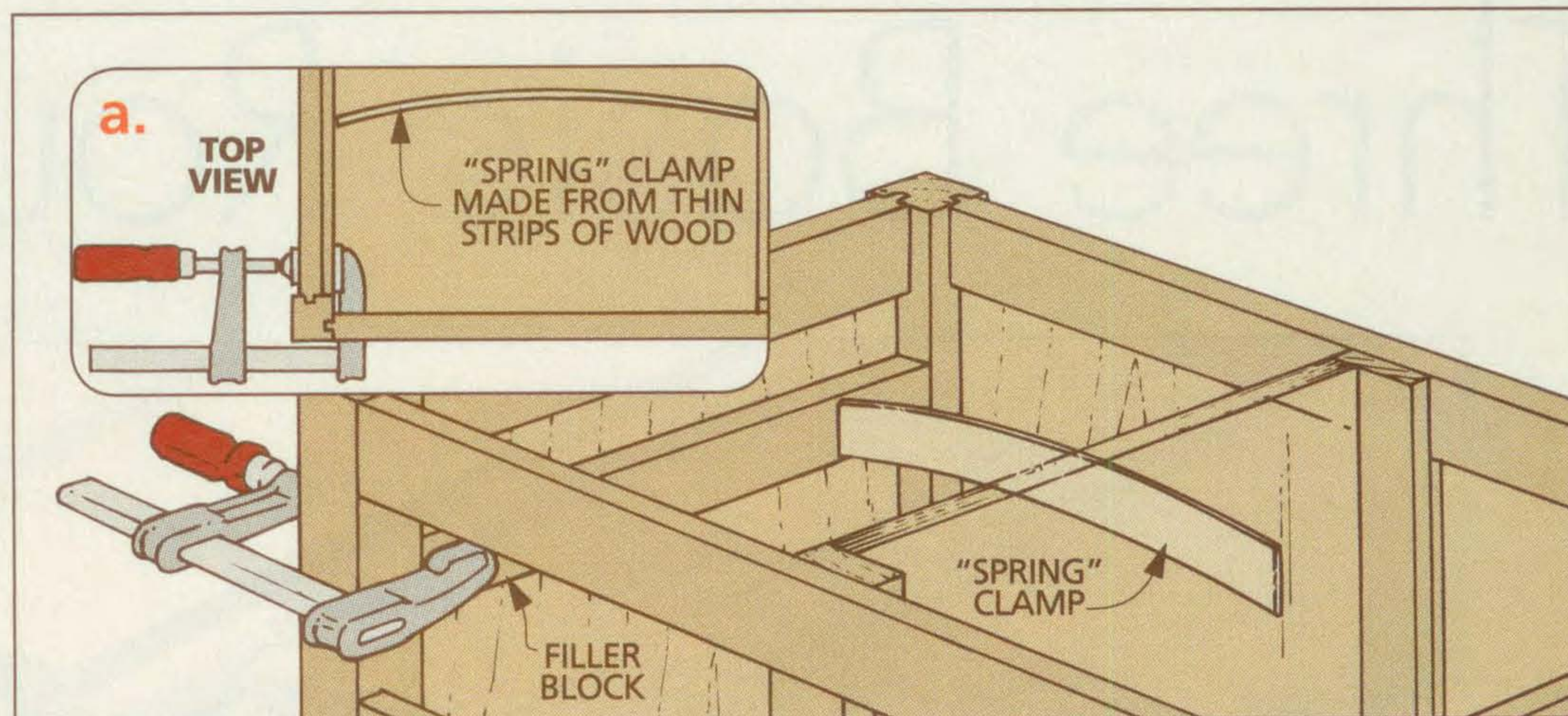
Now, to force the center of the side panel tight against the shelf, tap opposing hardwood wedges between the clamping bar and the sides until the shelf is completely seated in the dado (*Fig. 2*).



Spring Clamps for Hard-to-Reach Spots

Filler blocks help support drawer runners inside a cabinet. But clamping the filler blocks can be a challenge. The blocks are centered in the drawer opening and most clamps don't have wide enough jaws to hold them in place (*see drawing*).

So instead of using a regular clamp here, I flexed some thin strips of wood into the drawer opening (*detail 'a'*). This “spring” clamp (and a bar clamp in front) holds the filler block in place while the glue dries.



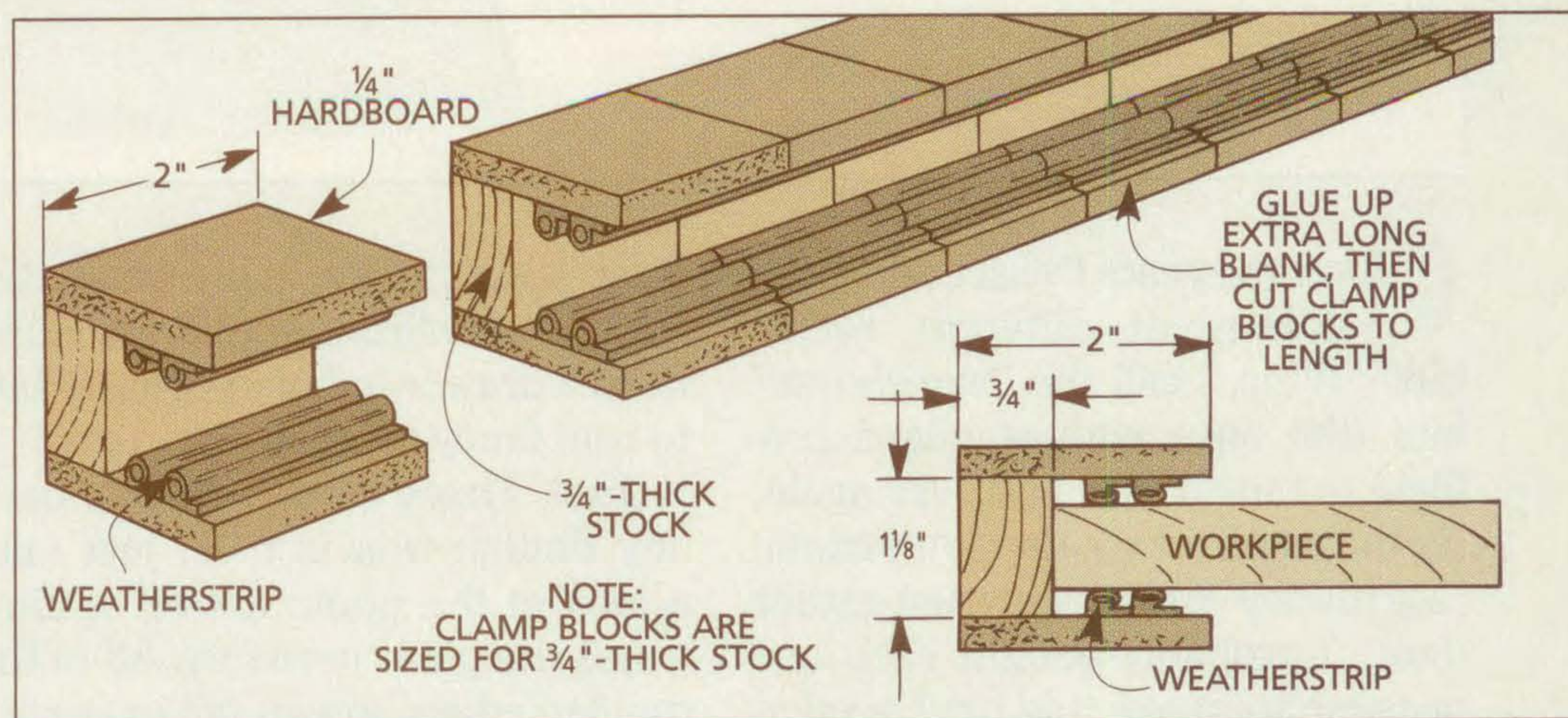
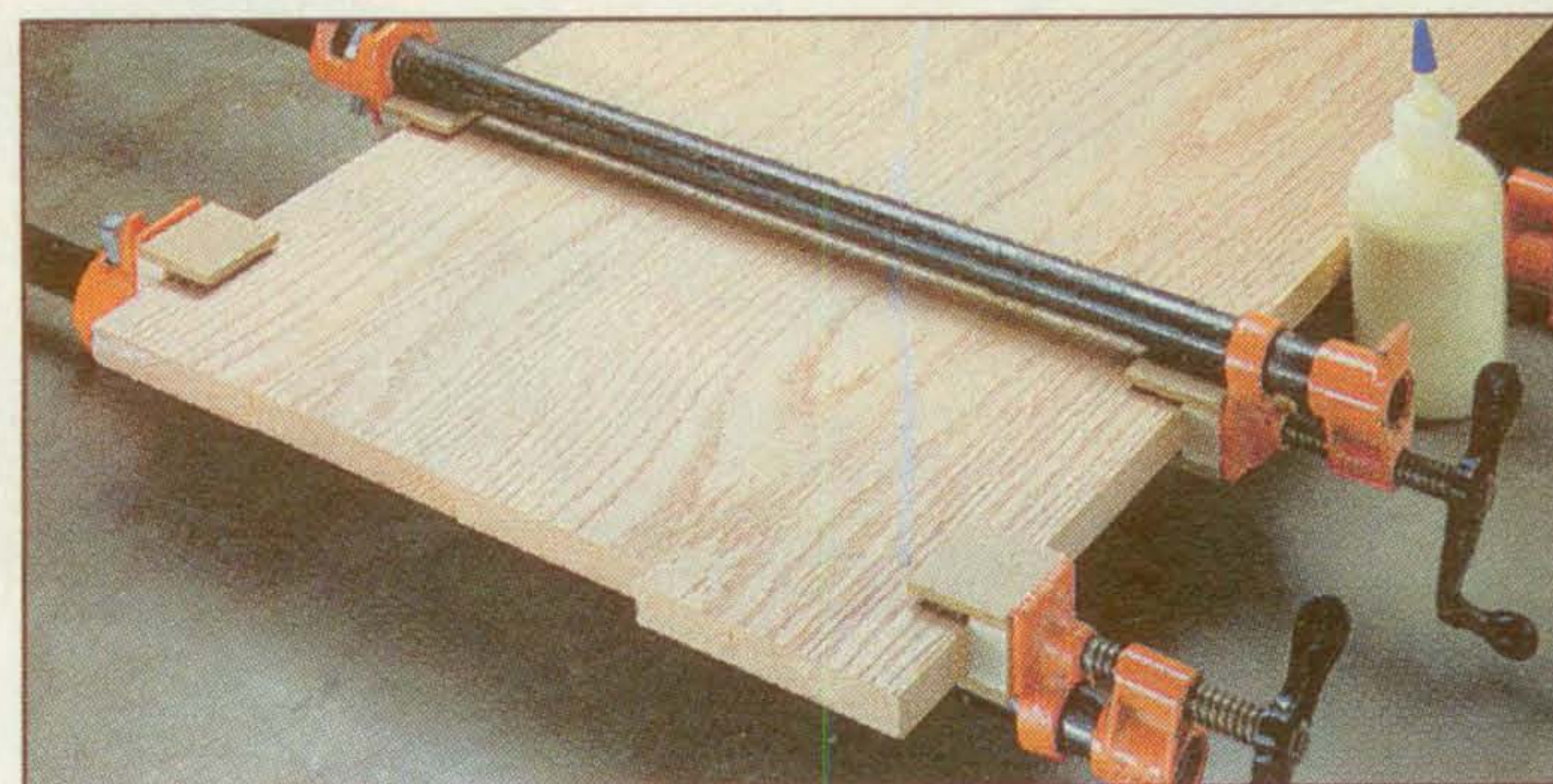
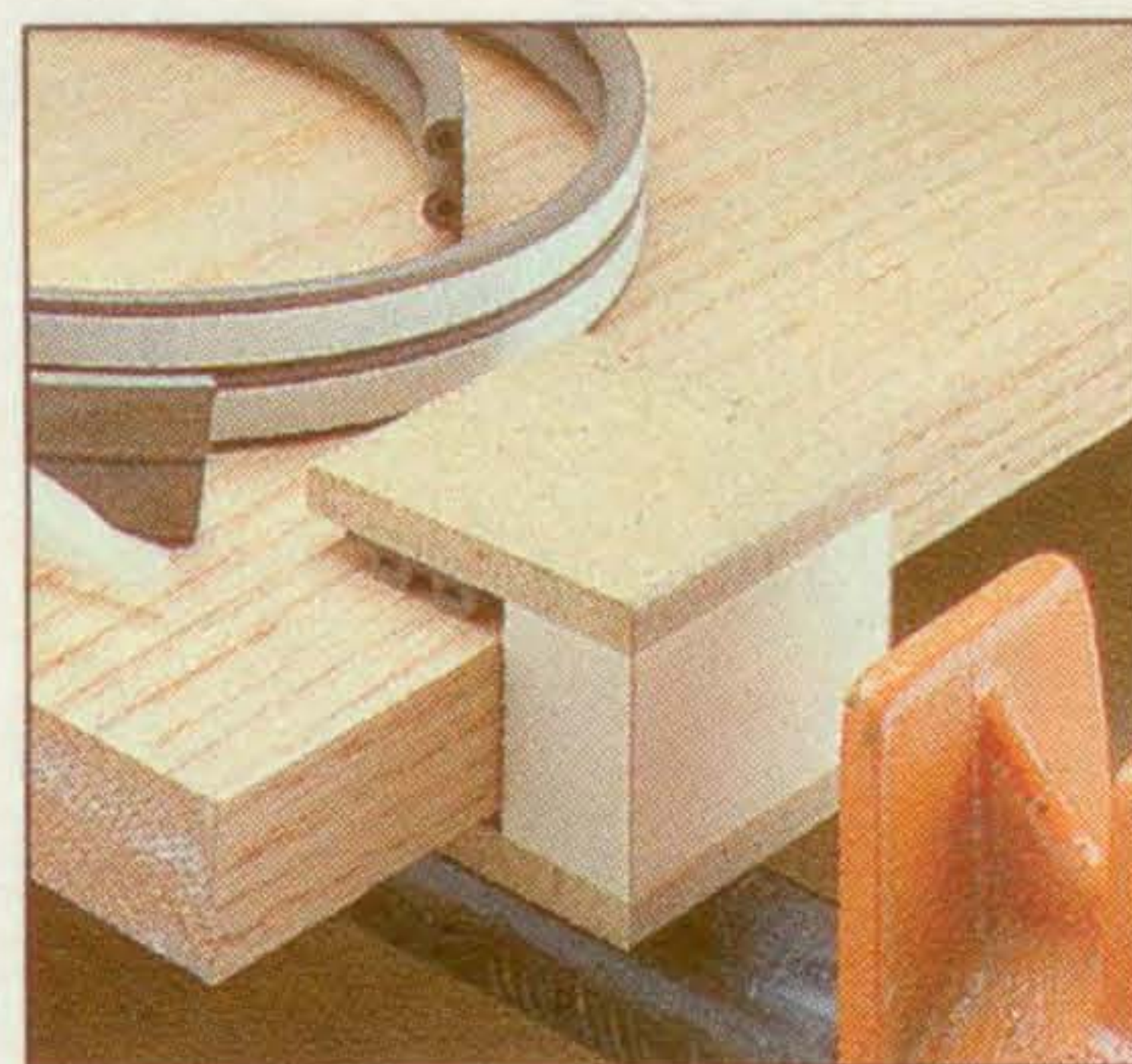
Weatherstrip Improves Your Clamp Blocks

When edge gluing wide panels, I often like to use scrap blocks to distribute the clamping pressure. The blocks also help me avoid denting the edges. But sometimes the scrap blocks fall to the floor before I get the clamps tightened.

To solve the problem, I made a number of U-shaped clamp blocks that stay right where I put them. The secret is a piece of self-adhesive weatherstrip attached to the “jaws” of each block (*see inset photo*).

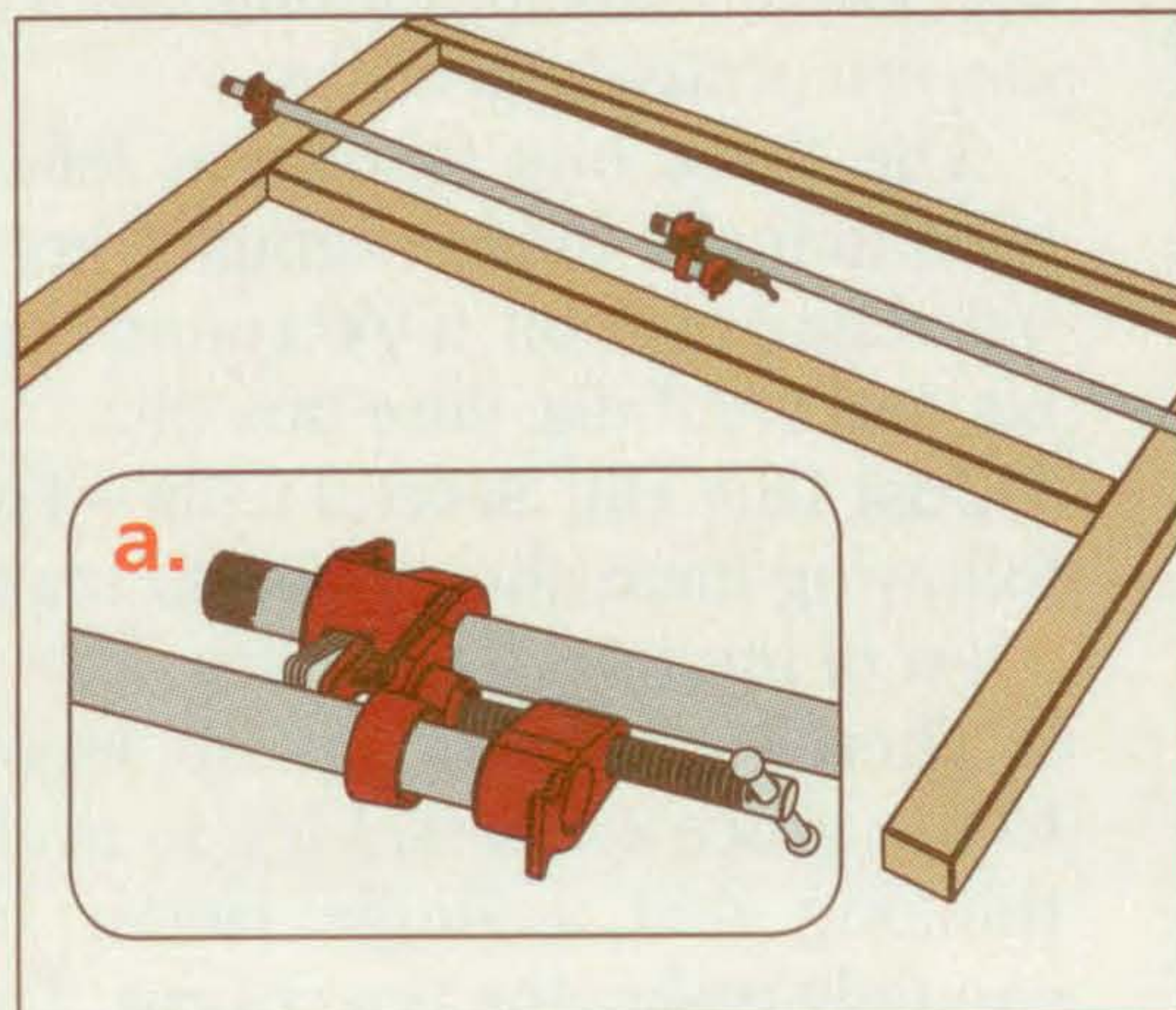
When you slip the clamp block over the edge of the workpiece, it compresses the weatherstrip (*see drawing*). This provides just the right amount of resistance to hold the block in place (*see photo*).

To make the clamp blocks, I find it's easiest to glue up a long blank. Then I just cut the individual clamp blocks to length from the blank.



Two-Timing Clamps for Long Pieces

Sometimes, projects go together without a lot of problems. But occasionally, a large project (like this double headboard) can cause problems during the gluing and clamping stage. In order to clamp the lower rail to the two uprights, I needed a very long clamp. Since I didn't have a long enough clamp on hand, I ended up using two shorter pipe clamps instead, interlocking them to get the length necessary (*see drawing*).



Shop Tip

Tape the Pipe – You can protect your projects by applying a strip of masking tape to the top edge of your pipe clamps. This prevents the iron in the pipe from reacting with the water in the glue and staining the wood. Another solution is to raid the kitchen pantry and simply cover the bars with half-sheets of waxed paper.

Make All These Profiles and More With Three Basic Router Bits



Over the years I've accumulated dozens of different router bits. What I call the "workhorse" bits (the ones with standard profiles) get used over and over again. By the same token, the more exotic "big money" bits usually just gather dust. I probably bought each one because someone told me I needed

it for a special job. This finally led me to the realization that you don't need a drawer full of expensive bits to rout fancy profiles.

Just Three Bits – If you have any doubts this is true, just take a look at the photo above. It illustrates the point perfectly. All of the molded edges shown (all examples are 3/4"-thick stock) can be made using just three common router bits. These are bits you'll find in just about any woodworker's collection. And as you can clearly see, the possibilities for putting them to use are pretty impressive.

The three bits (shown at left) I used to make these examples are a 1/2" round-over bit, a 1/4" round-over bit, and a 1/2"-dia. core box bit.

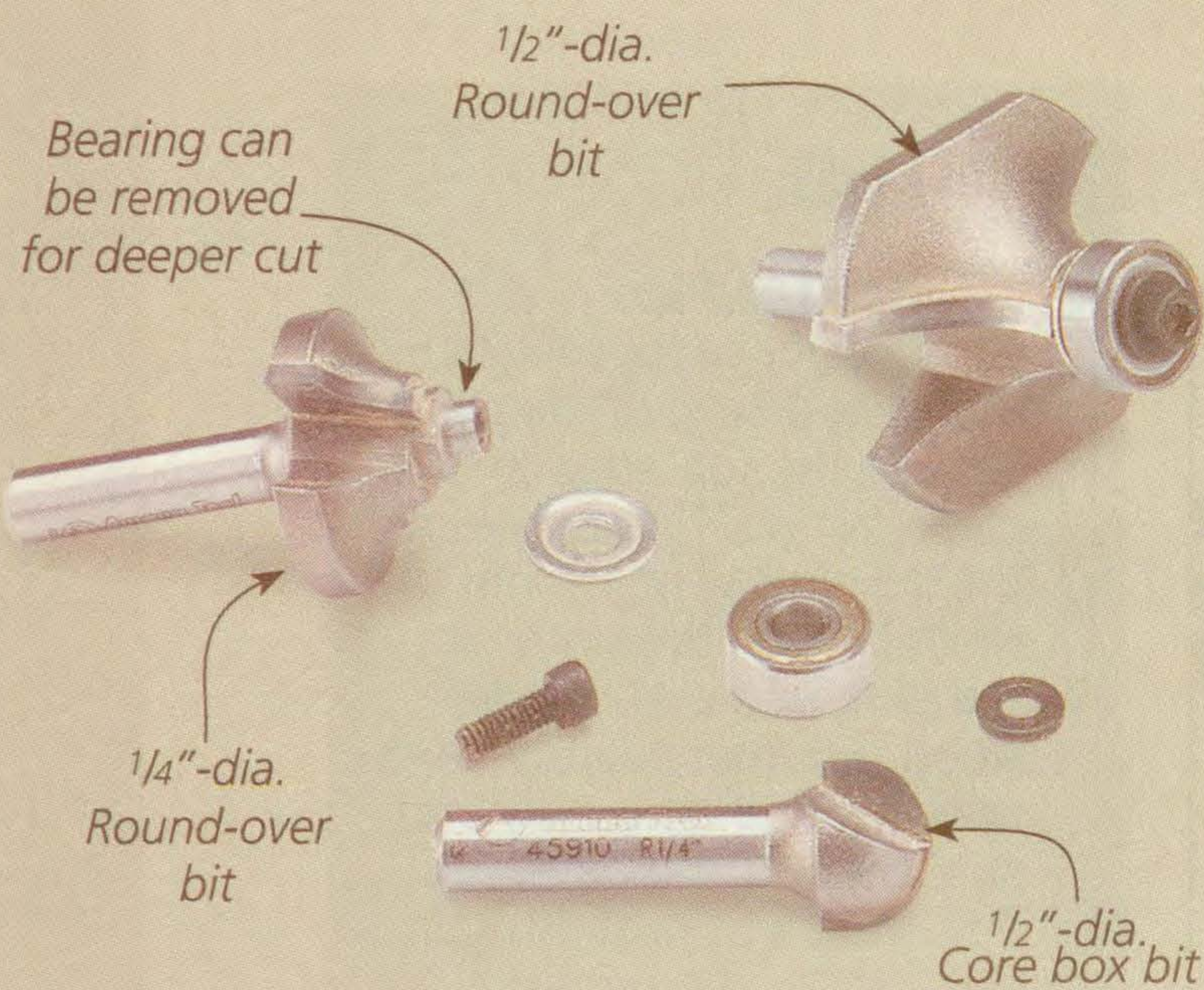
Just One Bit, Several Cuts – The following page shows how to make a few of my favorite profiles.

There's really no great secret to the process. First, I try to avoid thinking that a single router bit can only make one type of cut. The

truth is that many bits can produce a variety of shapes depending on how you put them to use. To make some of the profiles above, I used different parts of the bit or changed the depth or height of the cut. For example, a core box bit (or cove bit) can be used to create a wide, shallow cove or a deep hollow.

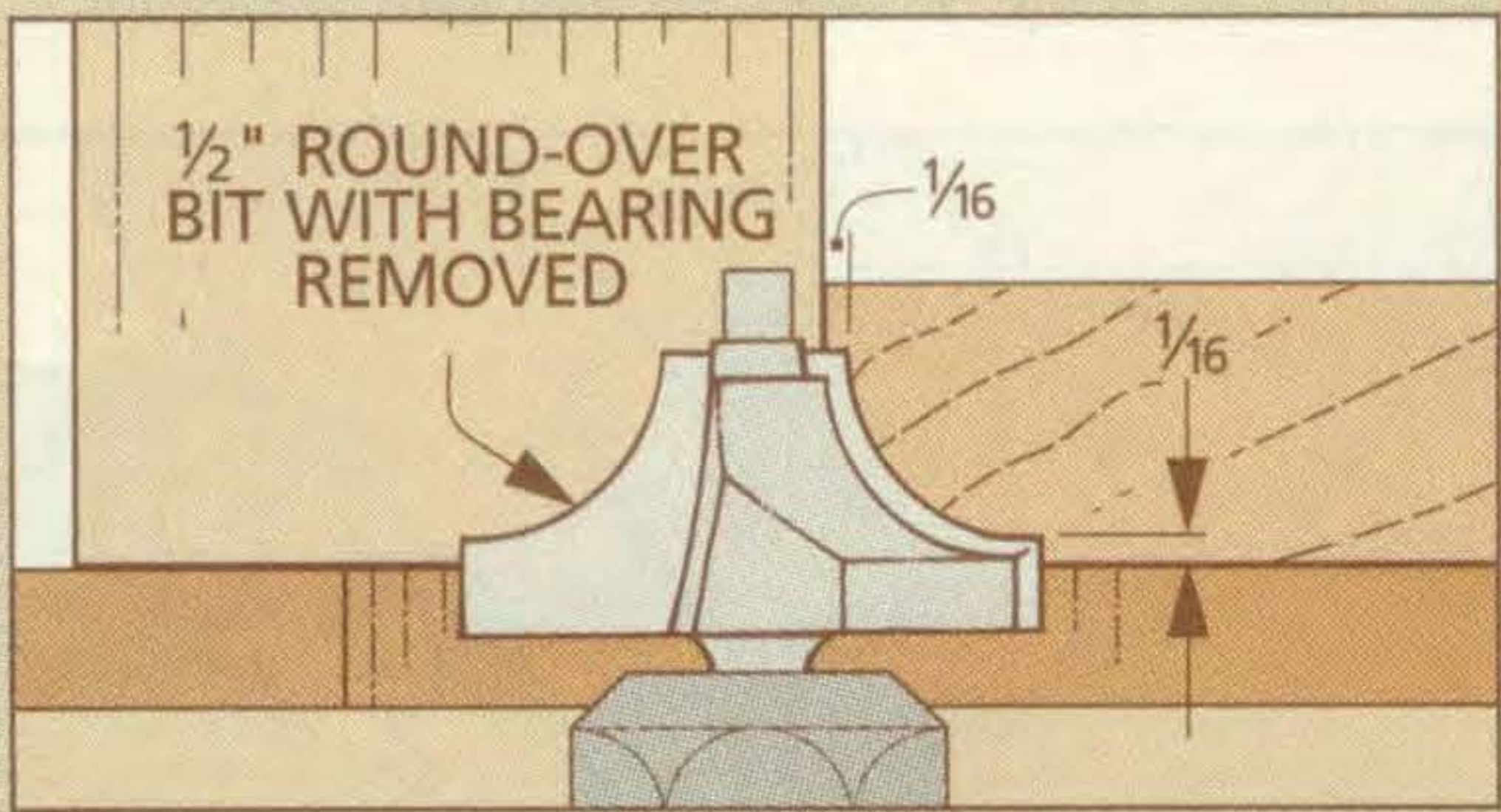
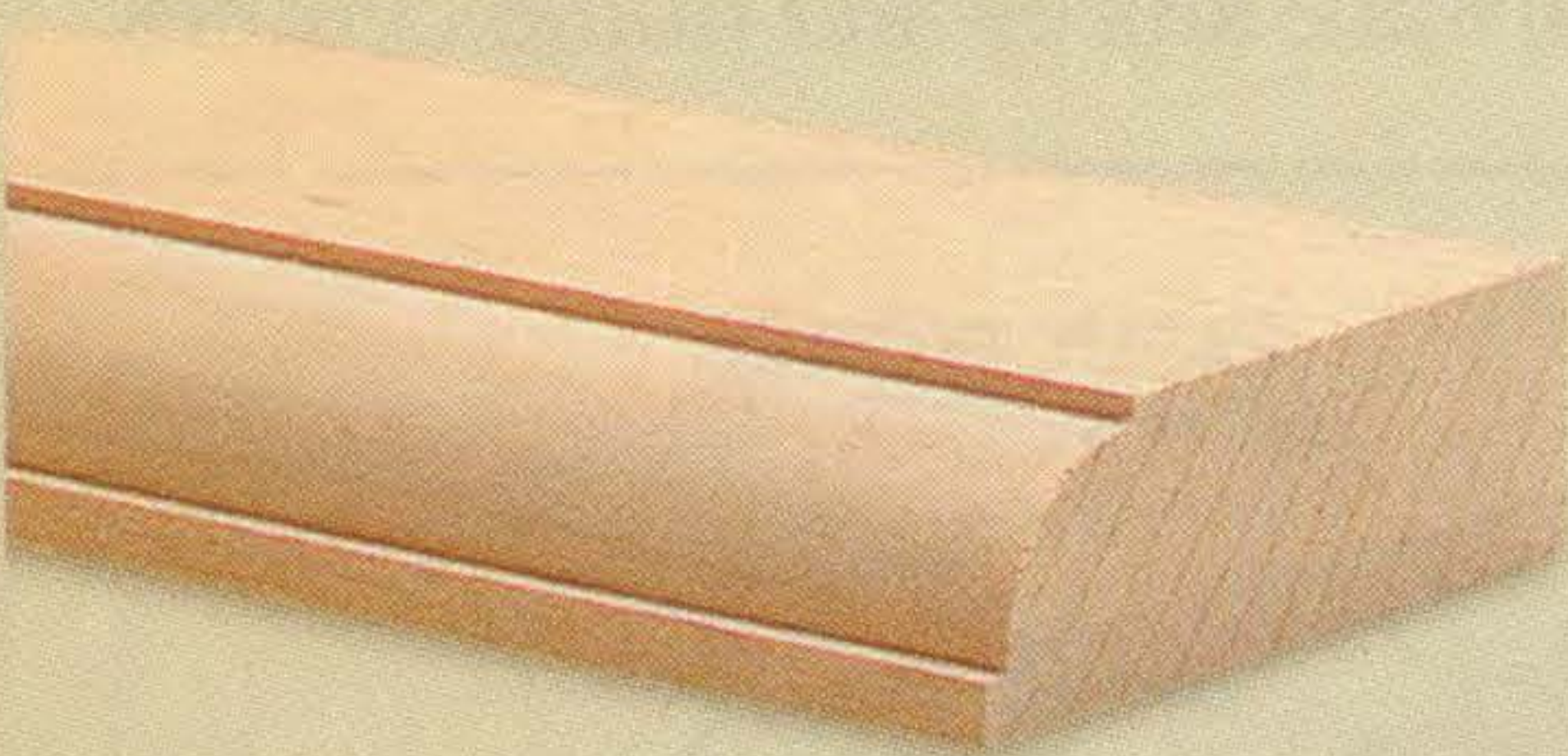
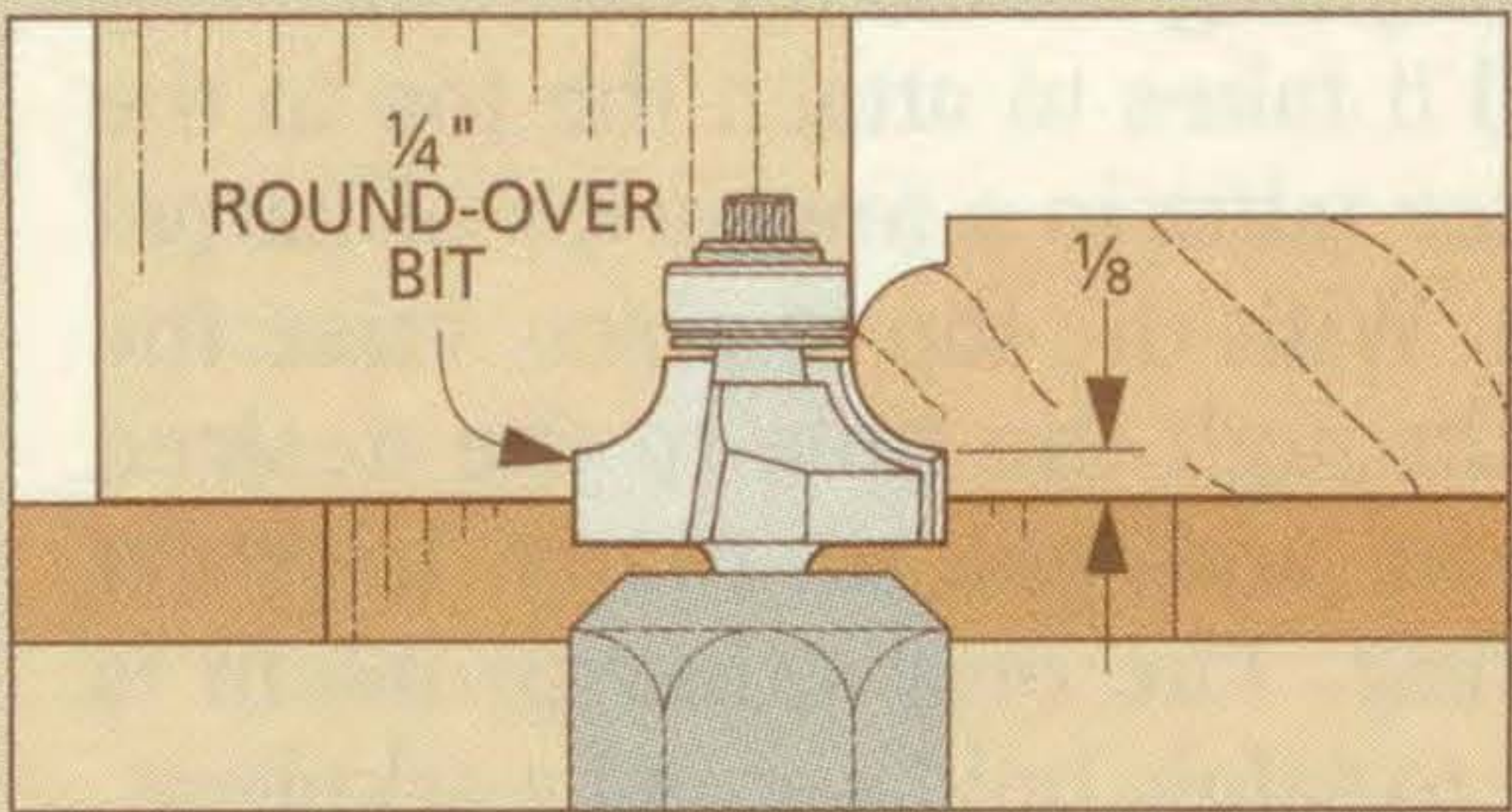
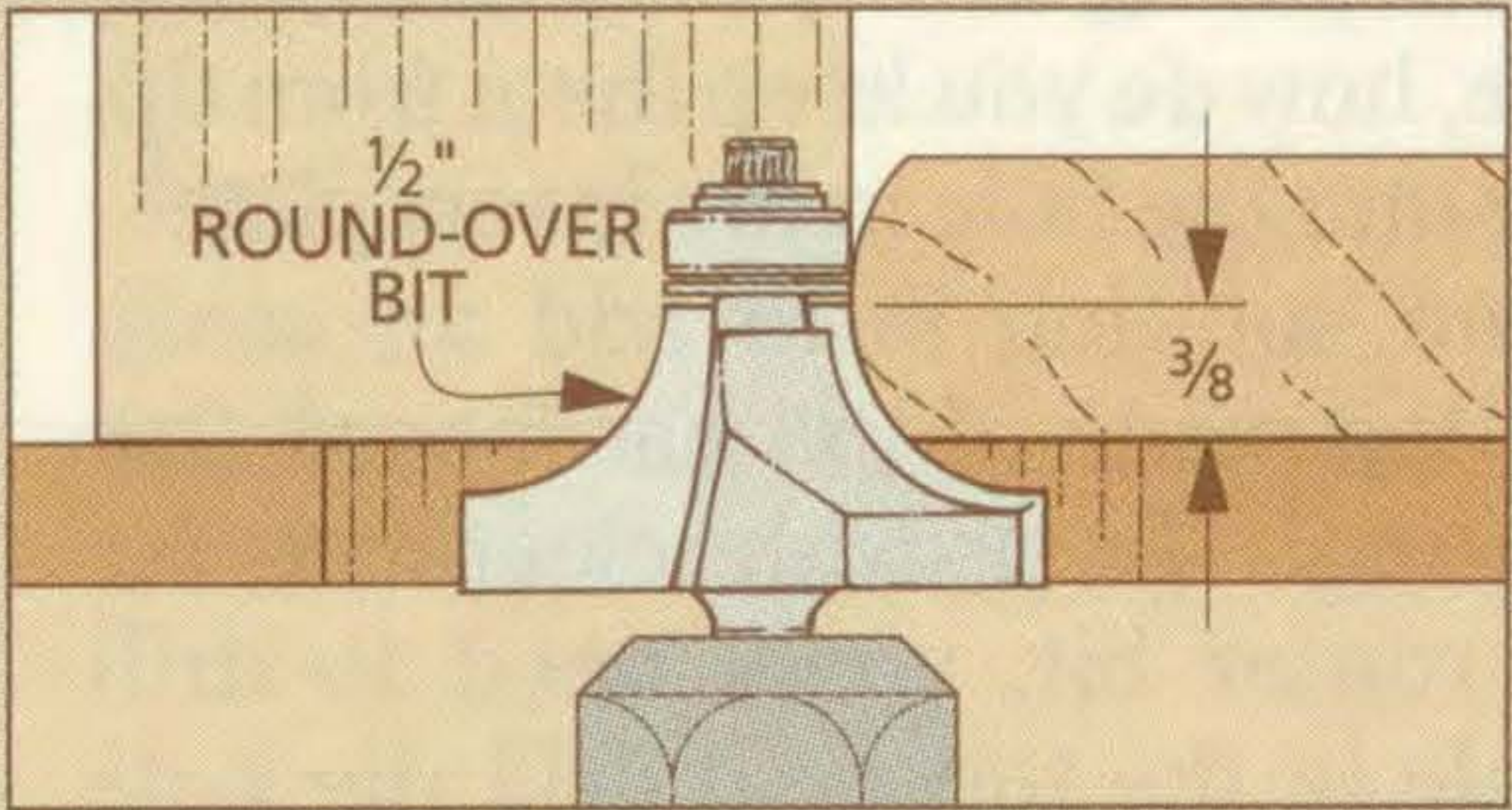
Multiple Bits – Some of the simple profiles you see were made using only a single bit. But to create the more complex shapes, you'll need to use a combination of bits. For instance, a 1/2" round-over along with an accurately cut 1/4" cove creates a large reverse ogee.

Accurate Cuts – One of the keys to successful results is to make the cuts carefully and accurately. Two or three (or more) light cuts will often yield better results than one deep cut. This is more important than doing the job quickly. And finally, a little fine sanding is often needed to "blend" multiple cuts into one smooth, seamless profile.



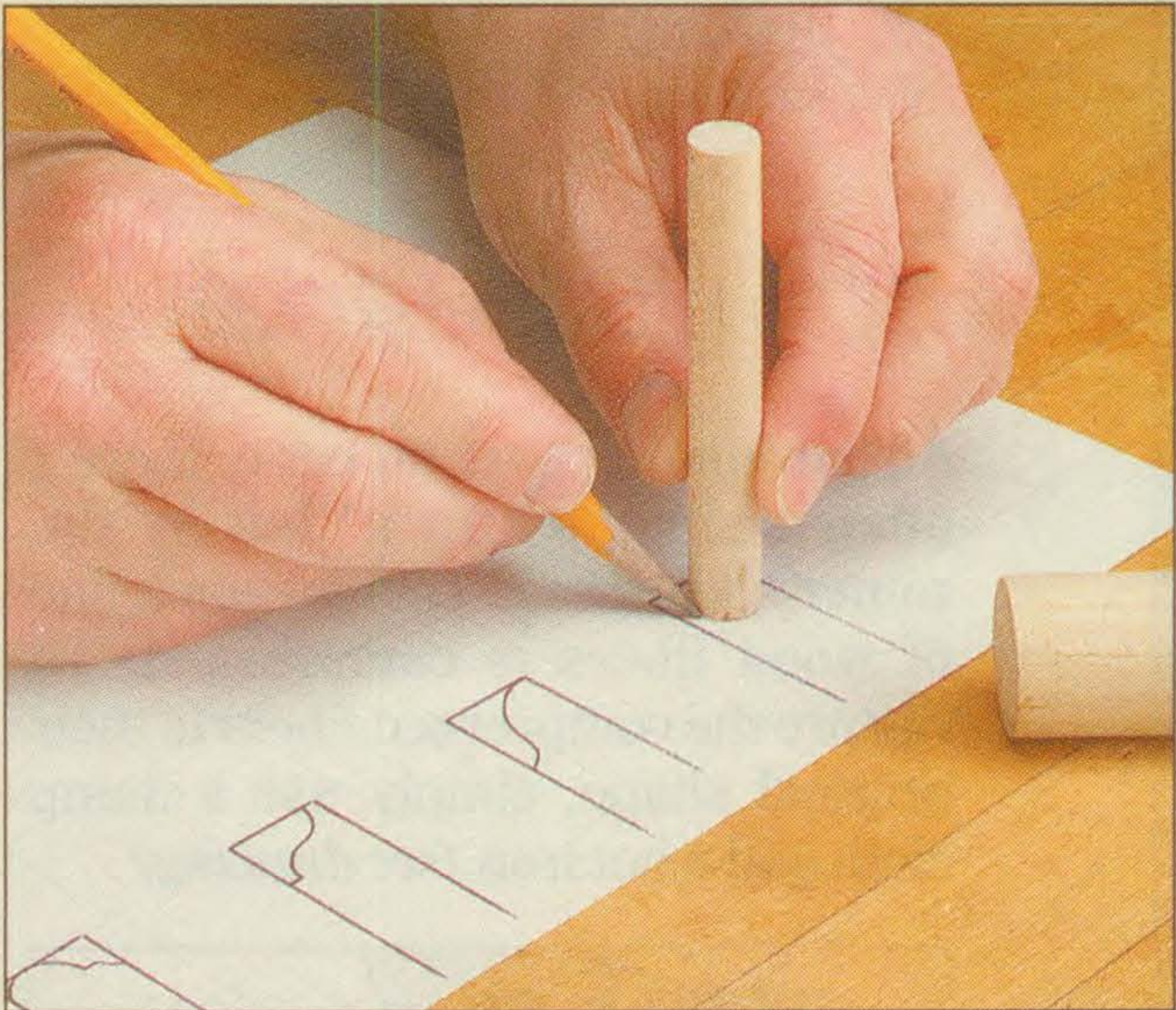
How-To: 7 Easy Profiles

ONE SETUPS

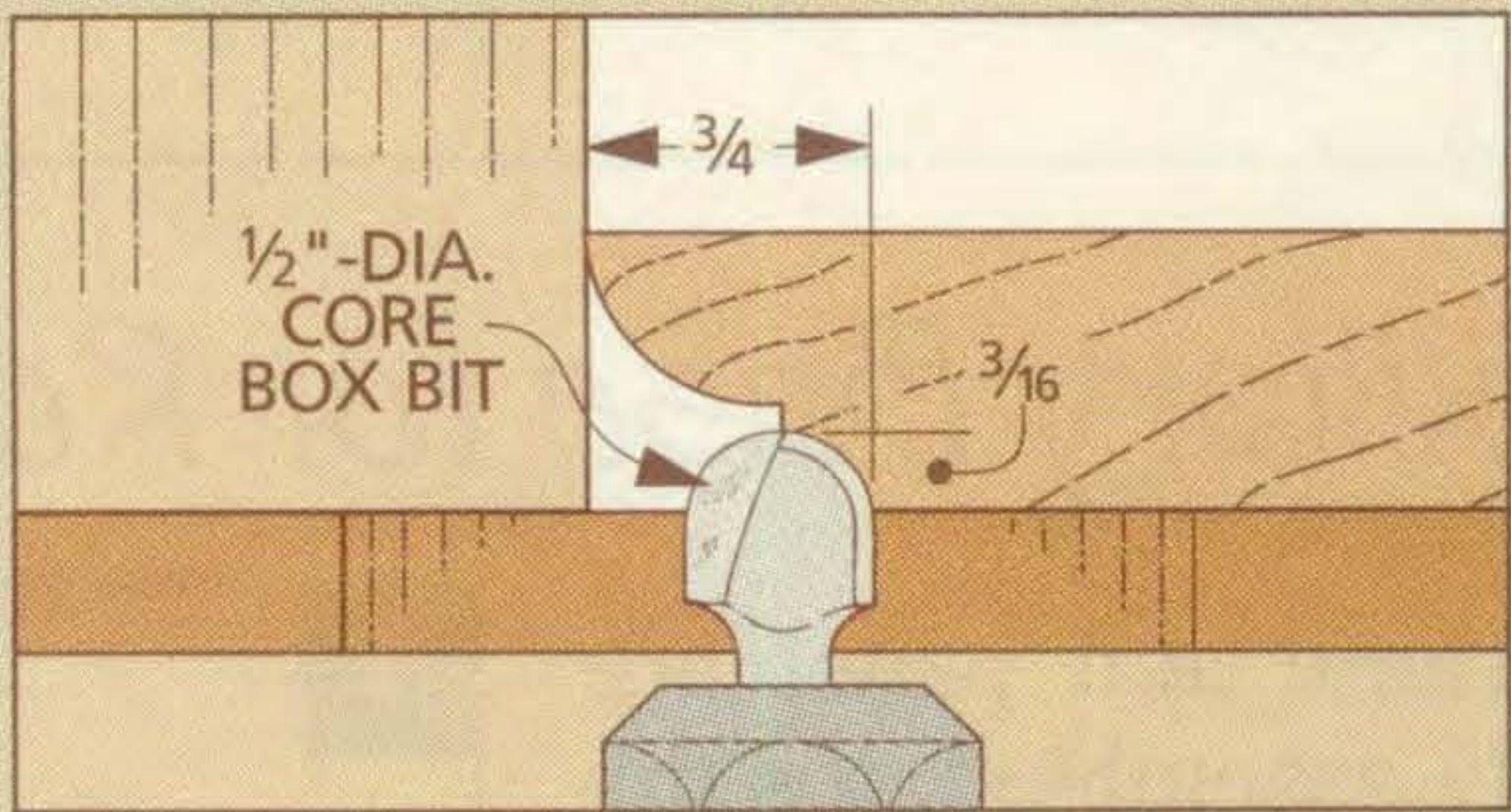
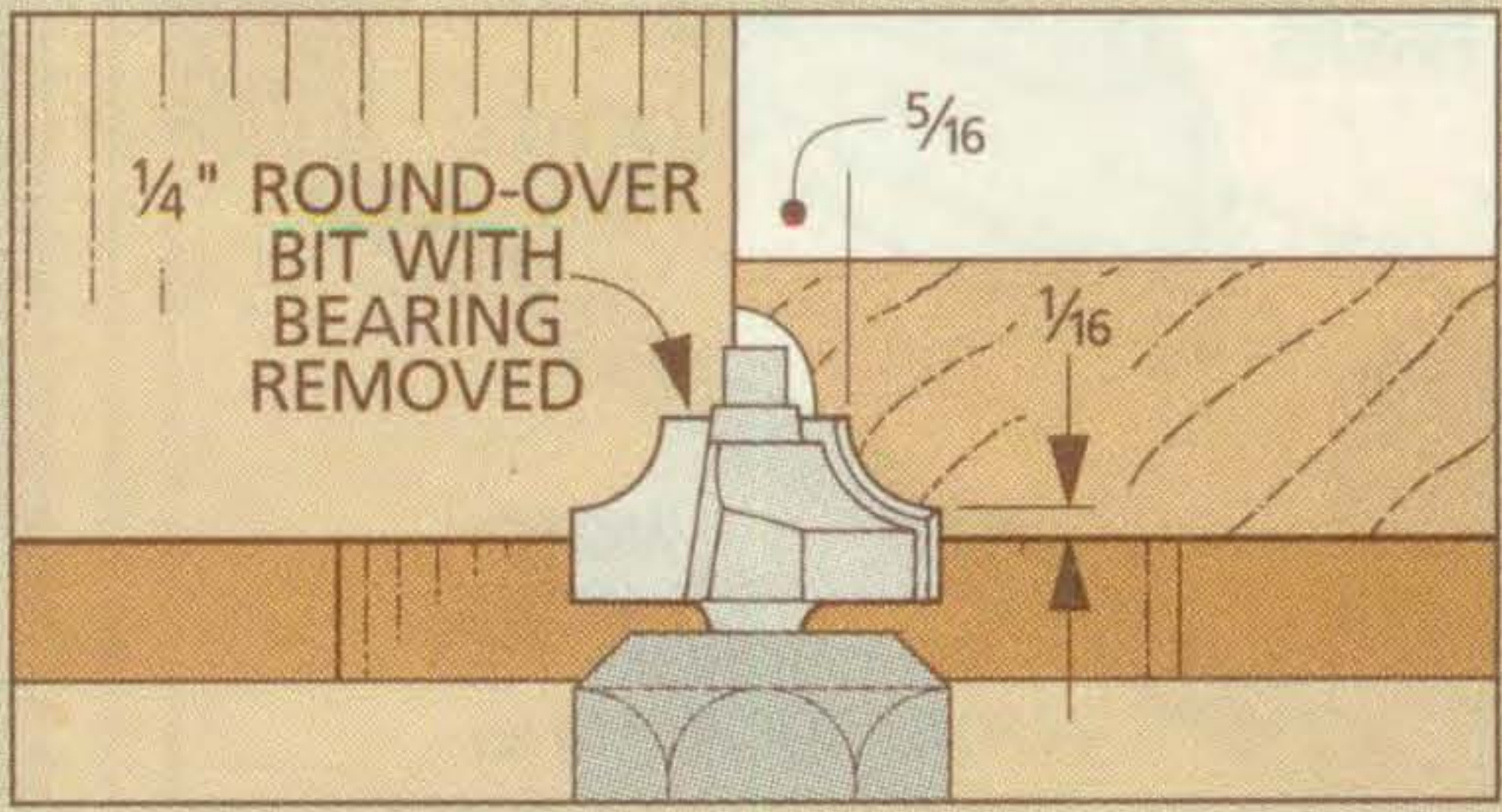
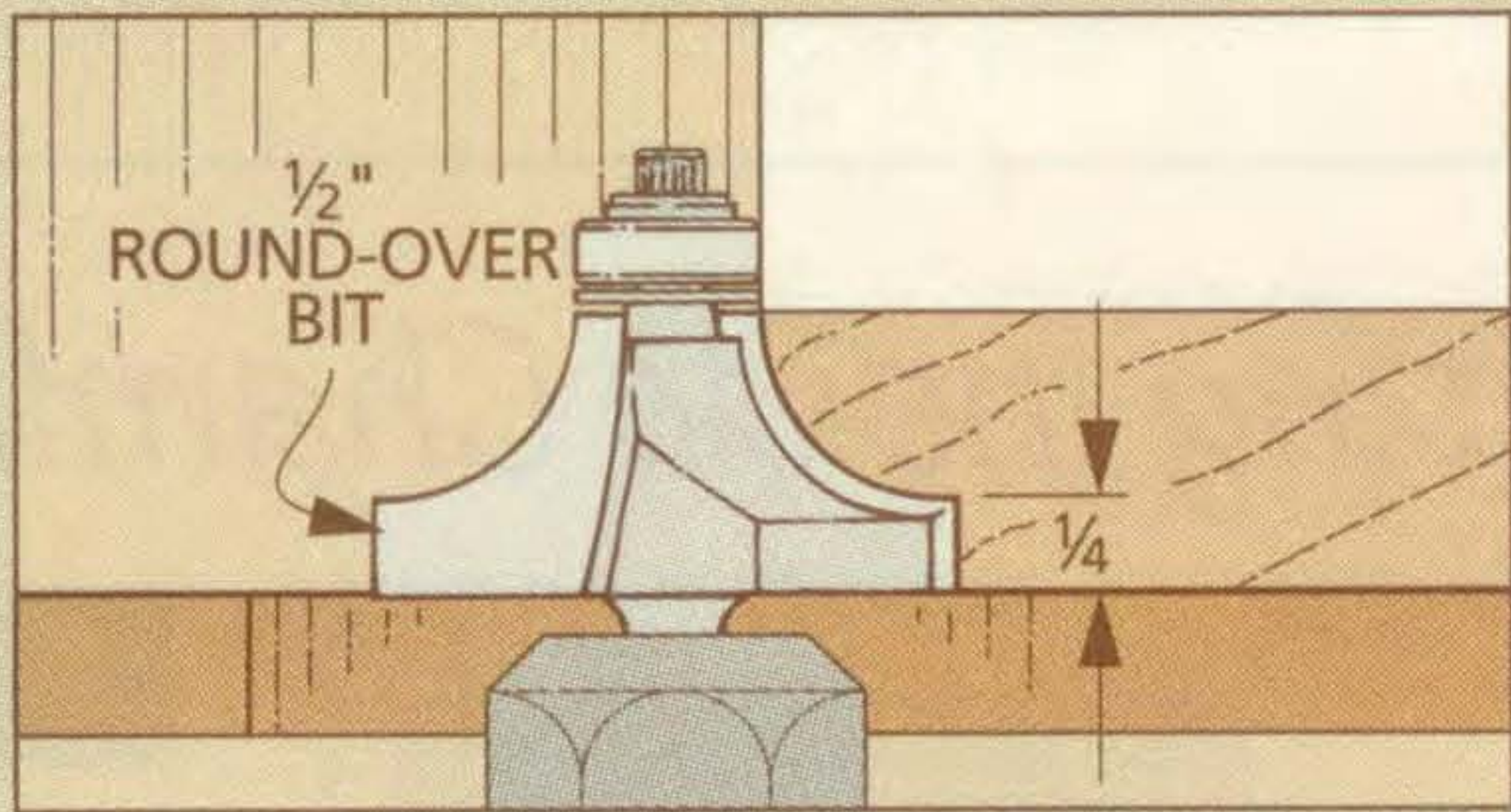
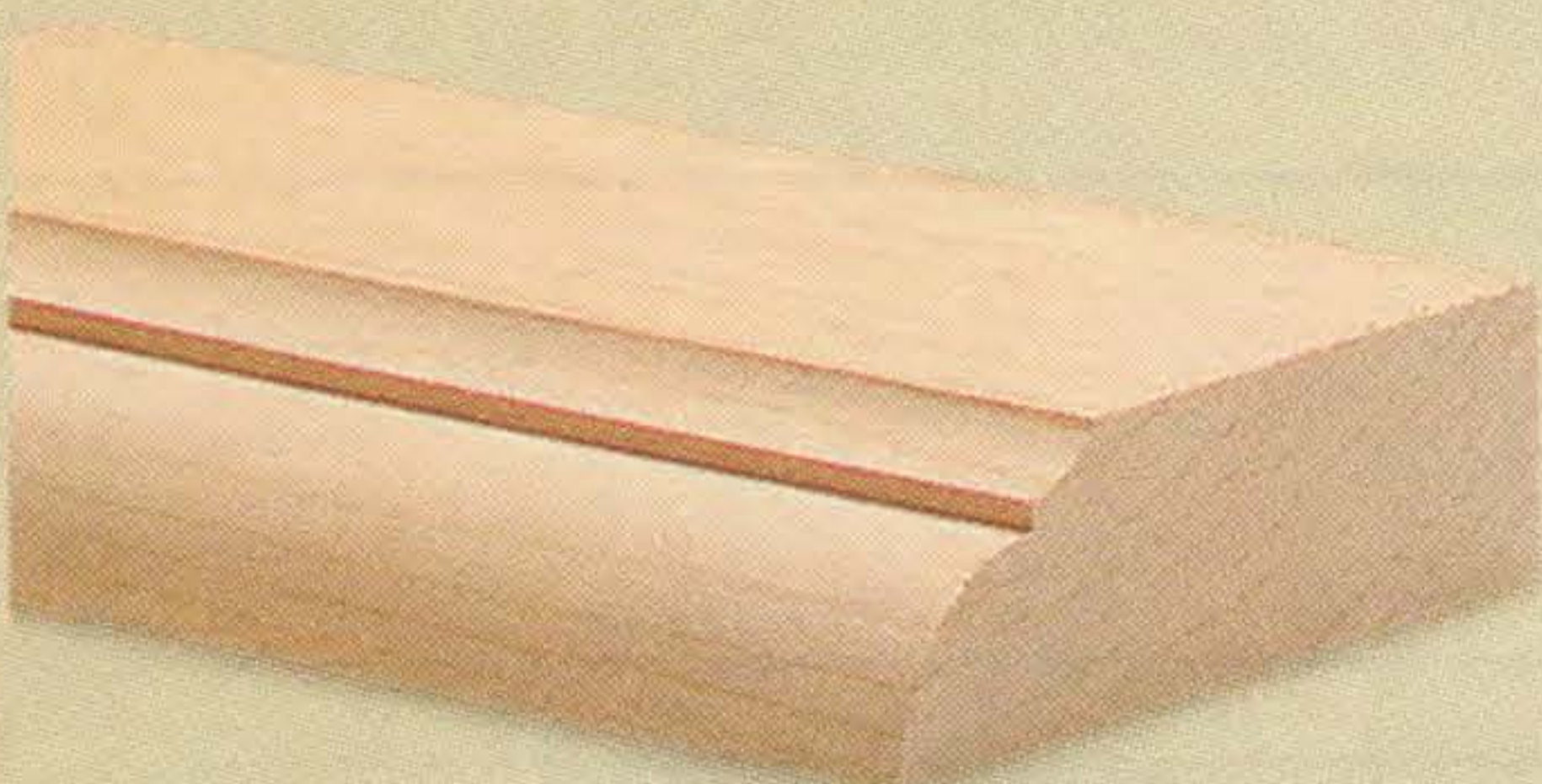
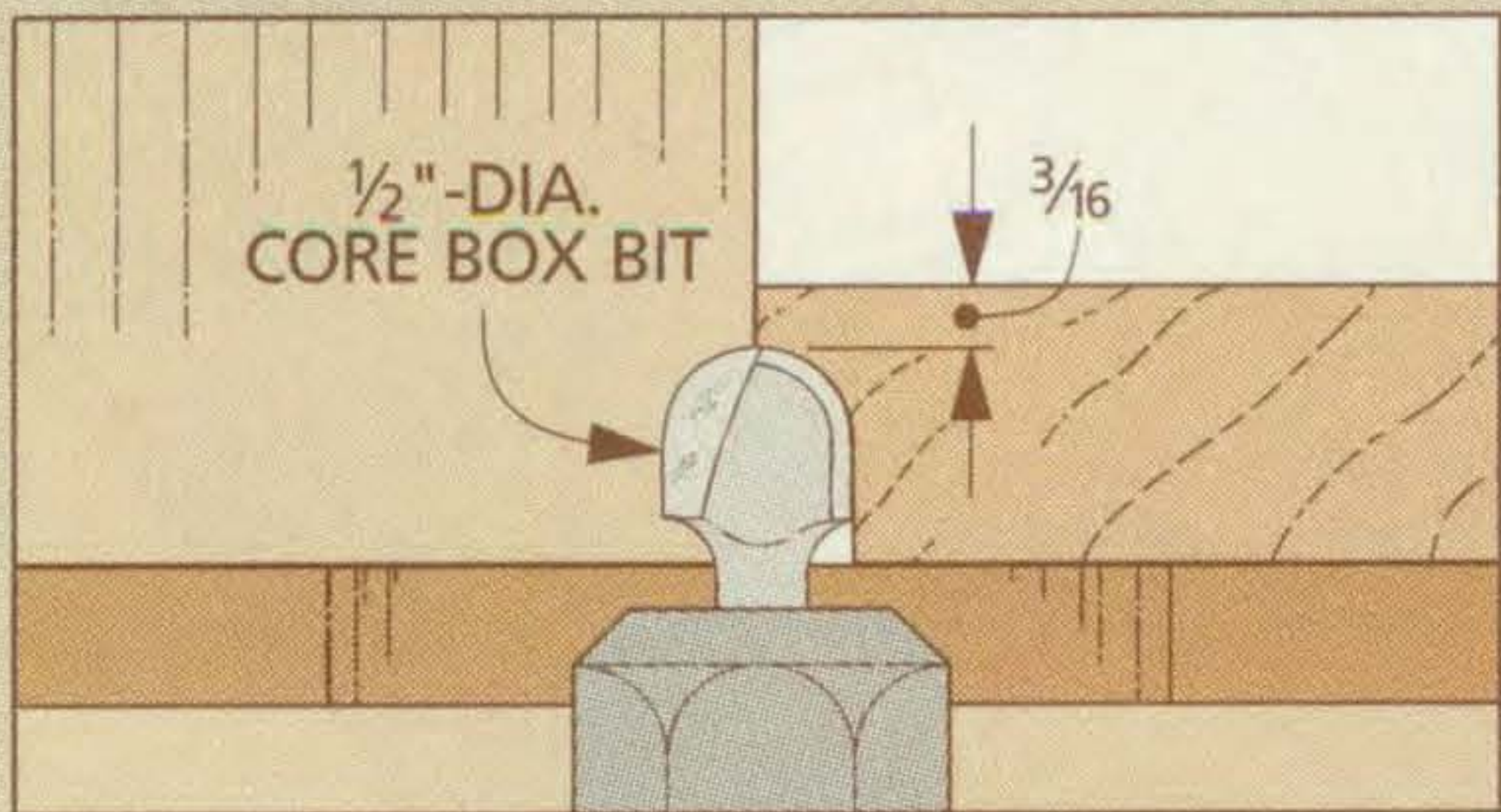
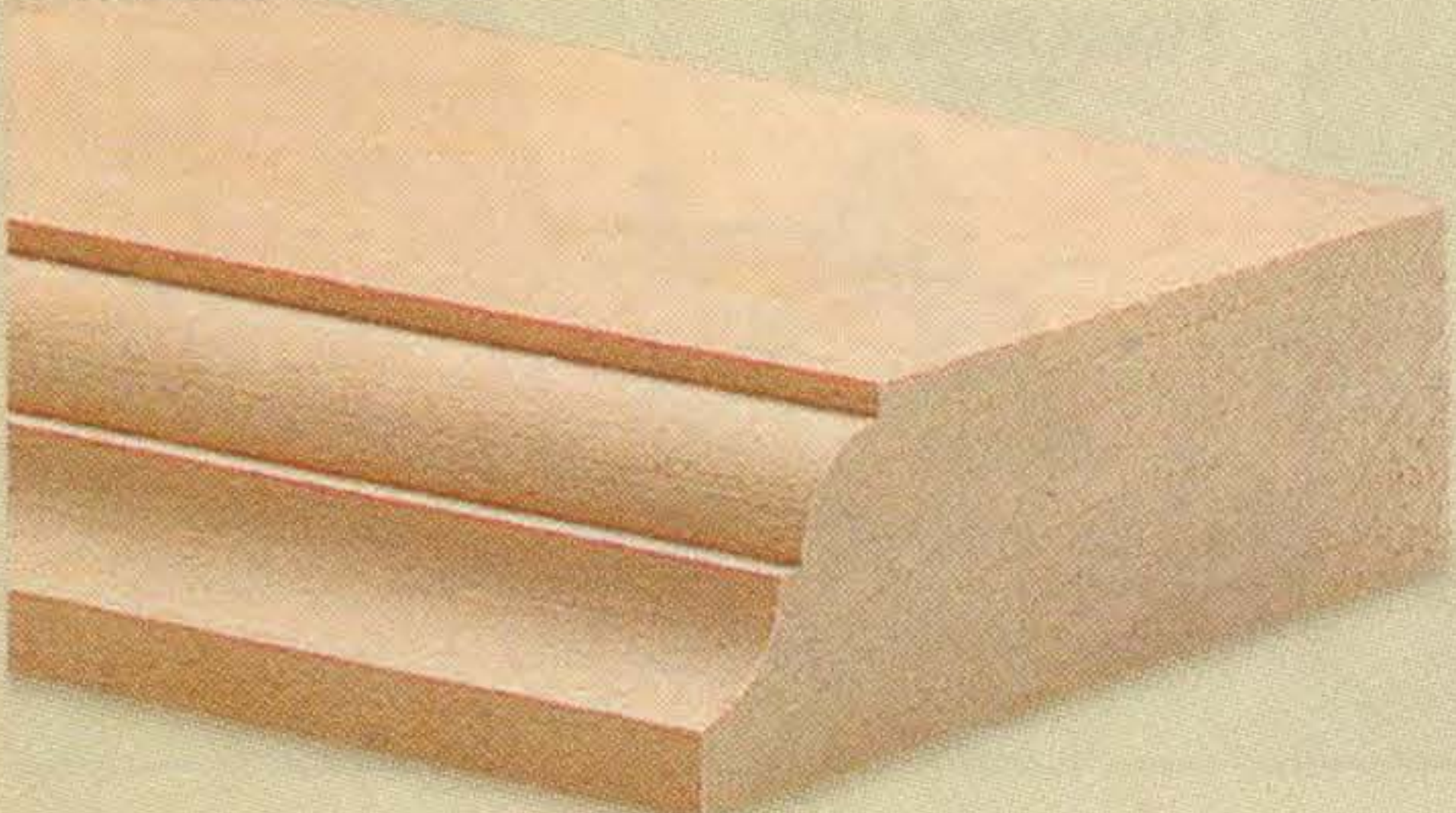


Shop Tip: Design Your Own

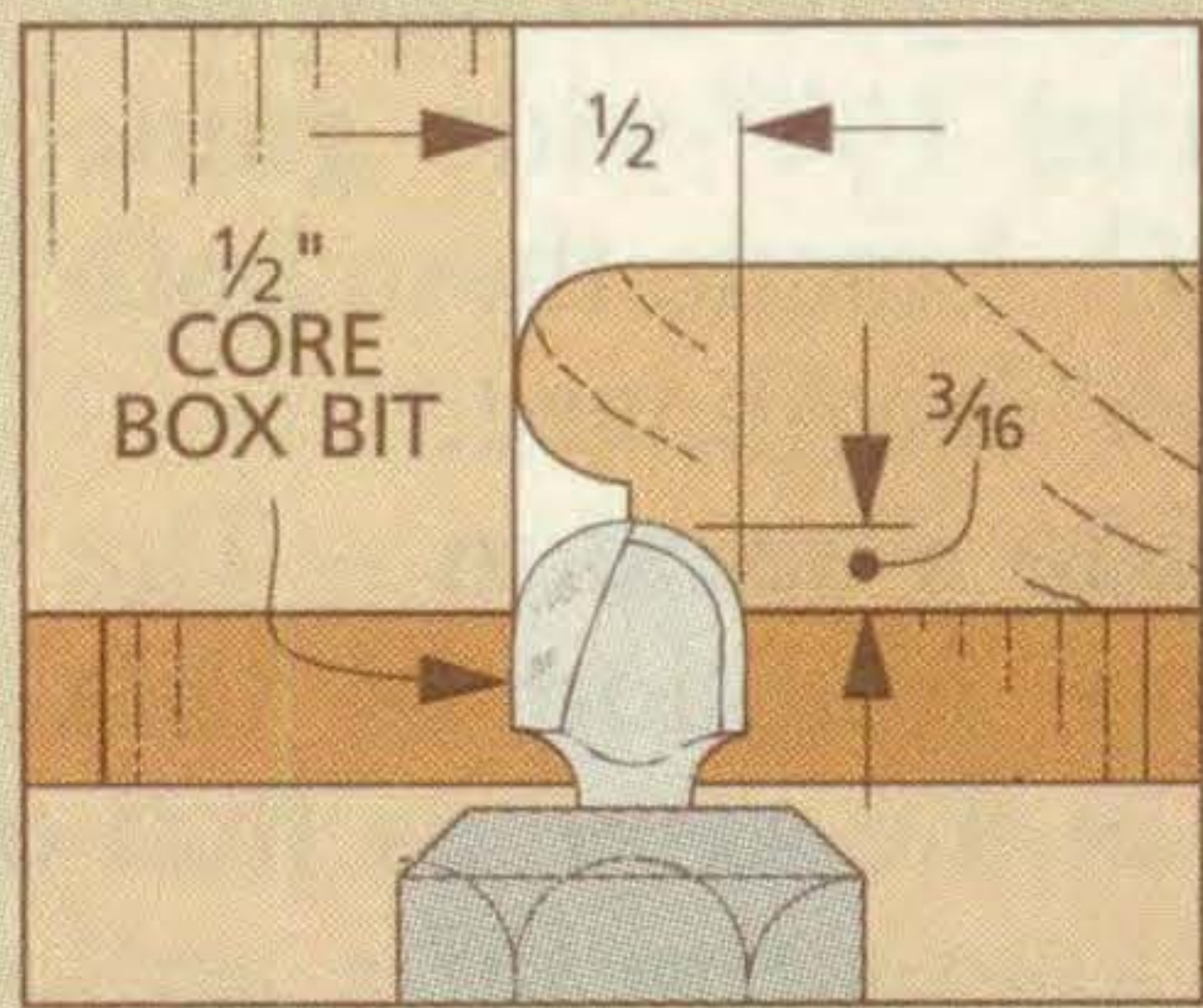
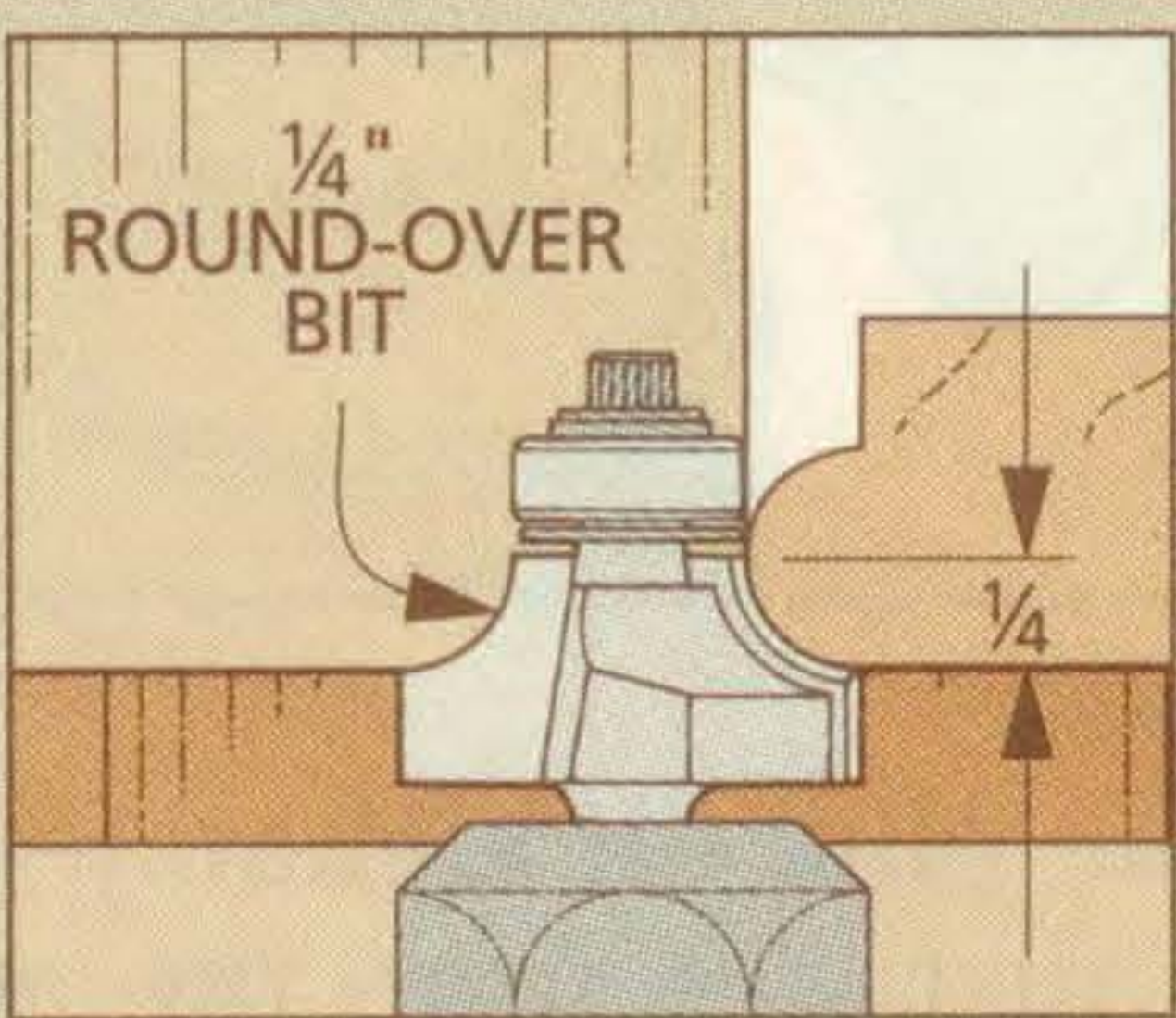
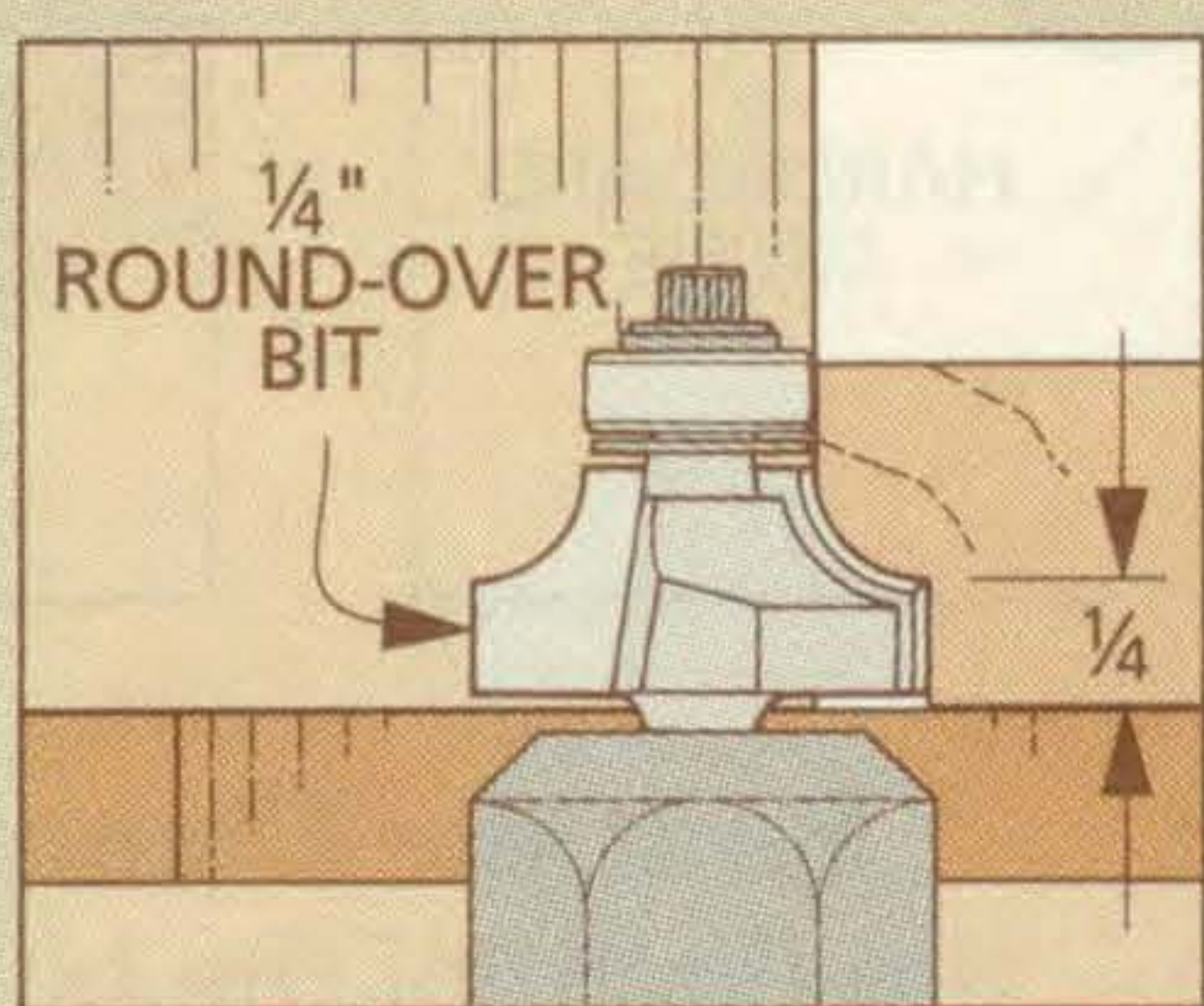
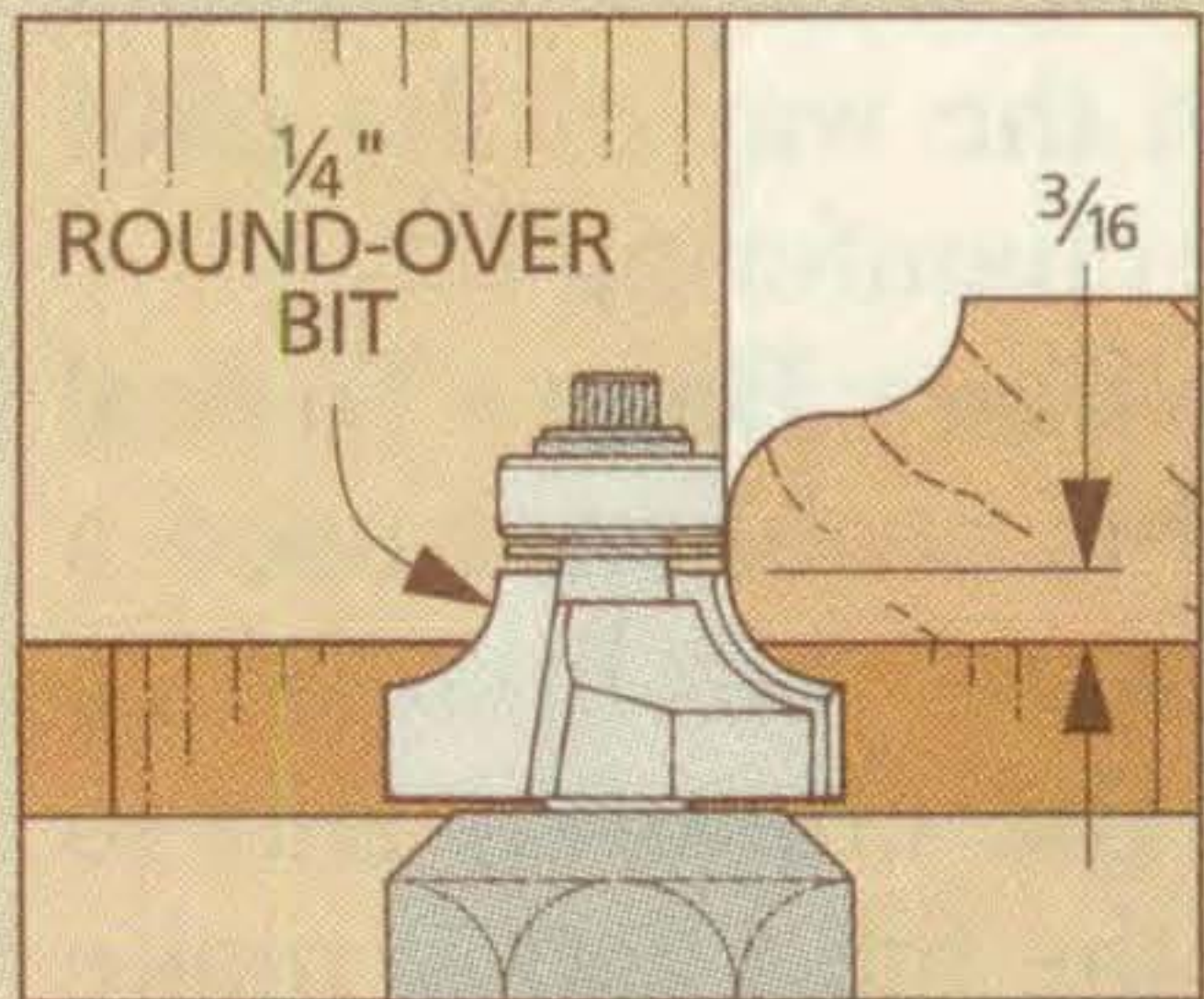
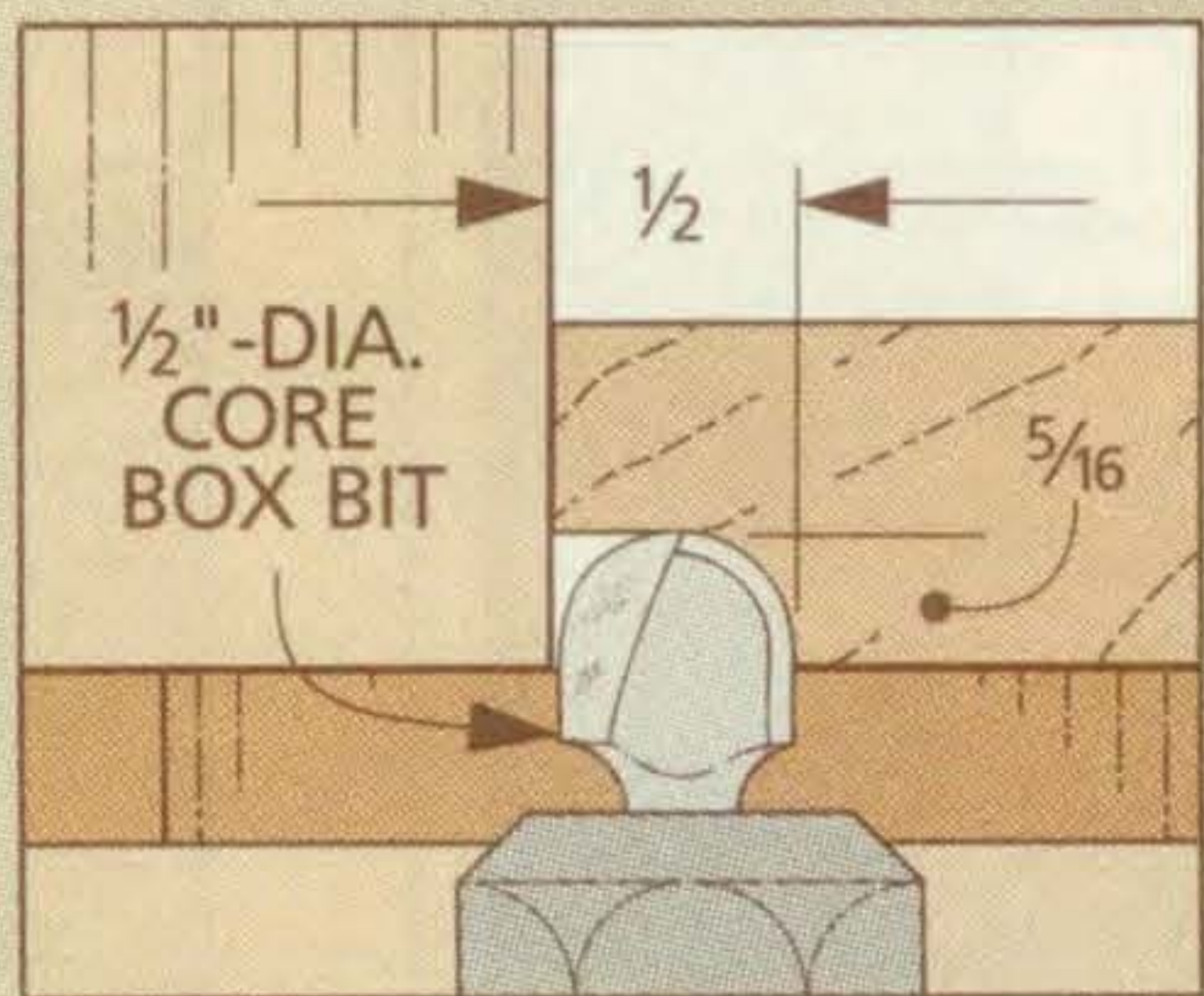
As you can see, the layout tools I used to design these profiles are pretty basic. A section of 1/2"-dia. dowel works great as a template for a 1/4" roundover or a 1/4" cove (1/2" core box bit). And a 1"-dia. dowel was my 1/2" round-over bit. Chances are if you can draw it on paper, you can find a way to make it with a few common router bits.



TWO SETUPS



THREE SETUPS

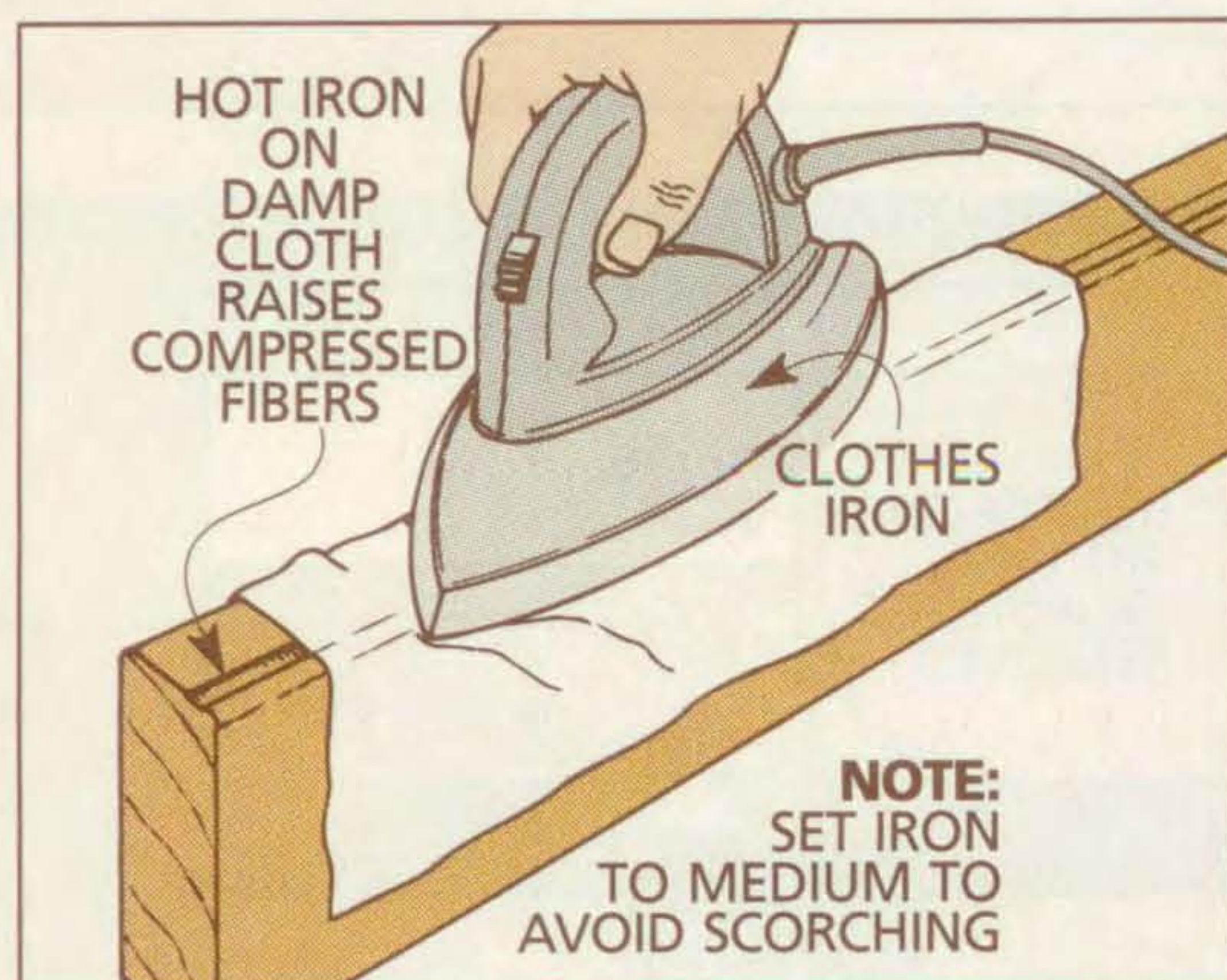


Shop Tip

A Bit Greasy – Before flush trimming a plastic laminate surface, I first coat the bearing of my flush trim bits with a little Vaseline. This prevents the contact cement and laminate dust from building up on the bearing.

Iron Out Marks

After rounding over an edge, there's often a shallow "track" left by the router bit bearing. This means a line of wood fibers is compressed. To restore the compressed fibers to their original shape, simply use a damp cloth and a hot iron (*see drawing*).



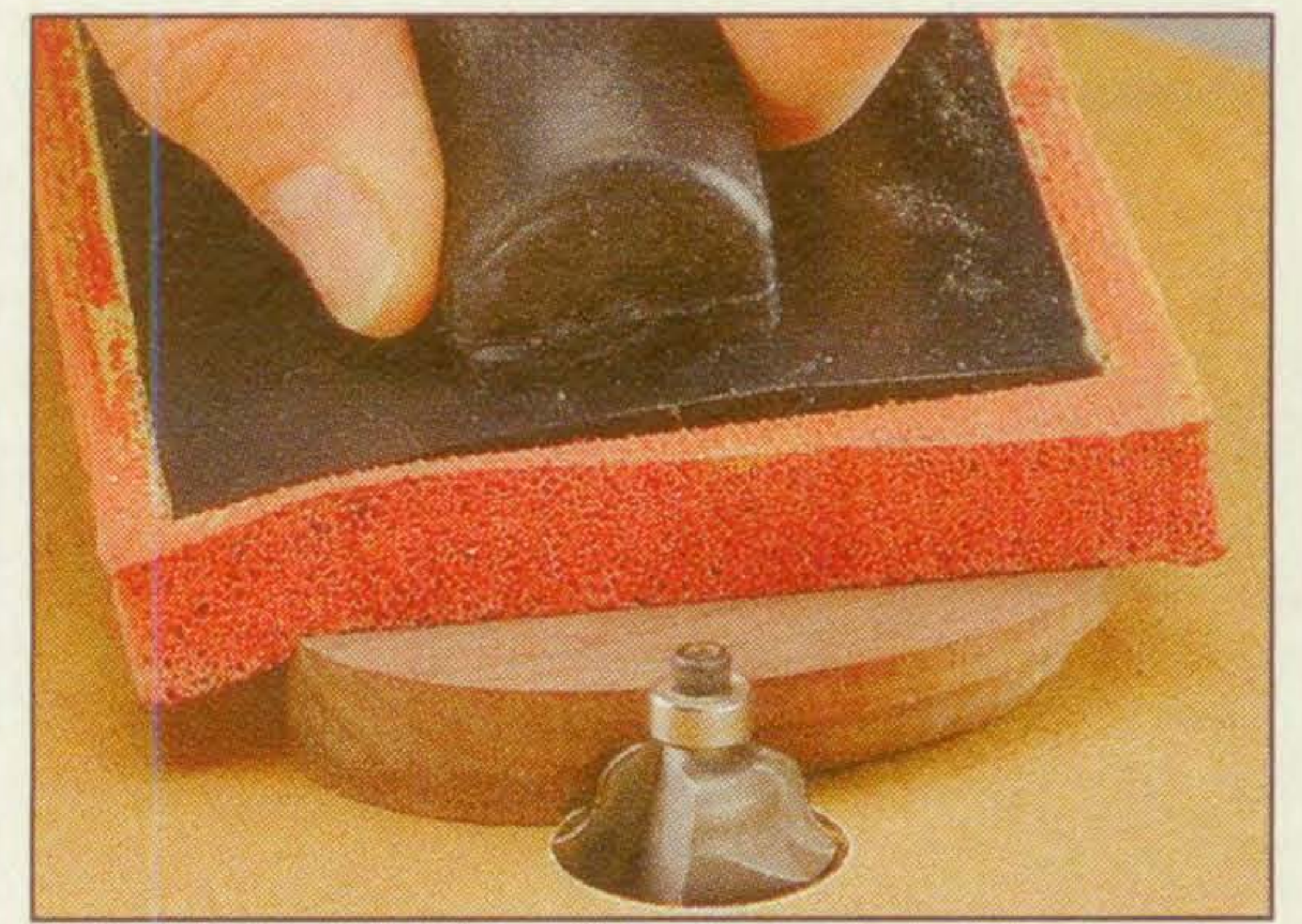
Routing Small Pieces

When routing small pieces on a router table, how do you keep them from tipping into the hole in the insert plate?

One solution is to add an auxiliary top made of 1/8" hardboard (*see drawing*). To provide clearance for the router bit, you'll need to drill a hole in the top. And drill the hole slightly larger than the bit.

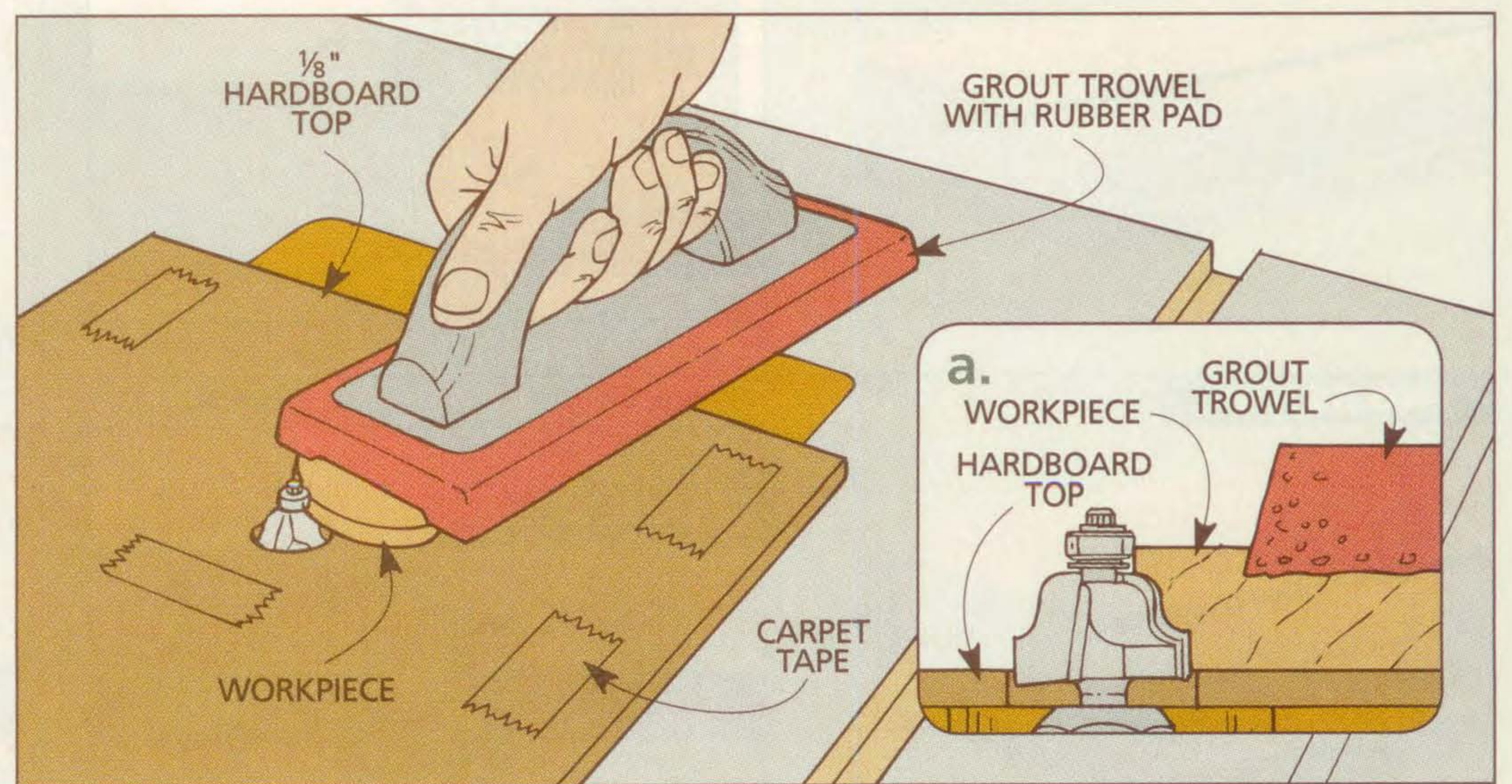
All it takes to attach the top to the router table is a few strips of carpet tape. With the top in place, raise the bit through the hole to the desired height and you're ready to start routing. The only other problem is how to safely hold a small workpiece.

The best way I found to do this is



to hold them with a rubber-bottom grout trowel (*see photo*). This way, I can control the cut without getting my fingers close to the bit.

Note: Grout trowels are available at hardware stores and home centers.

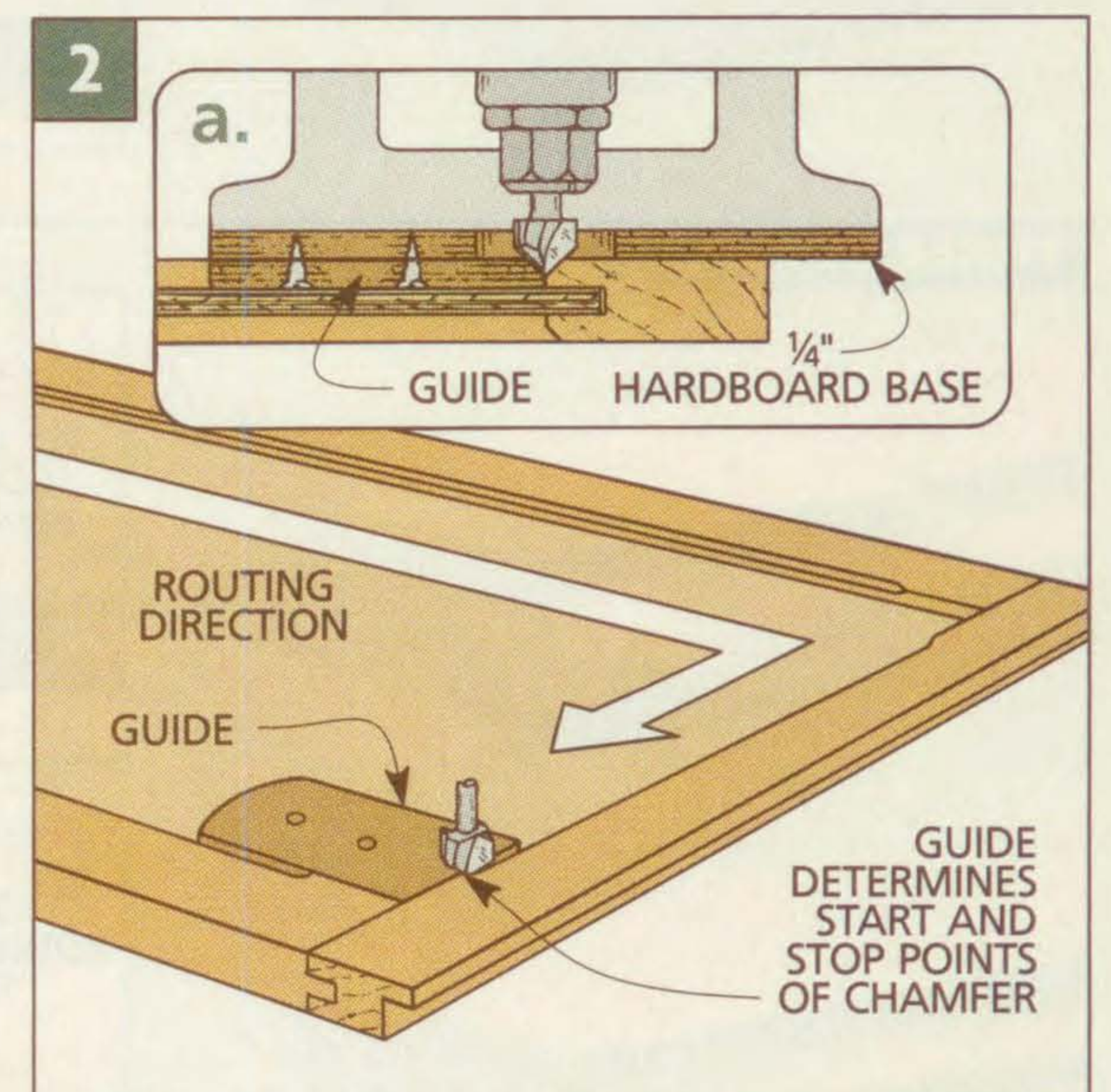
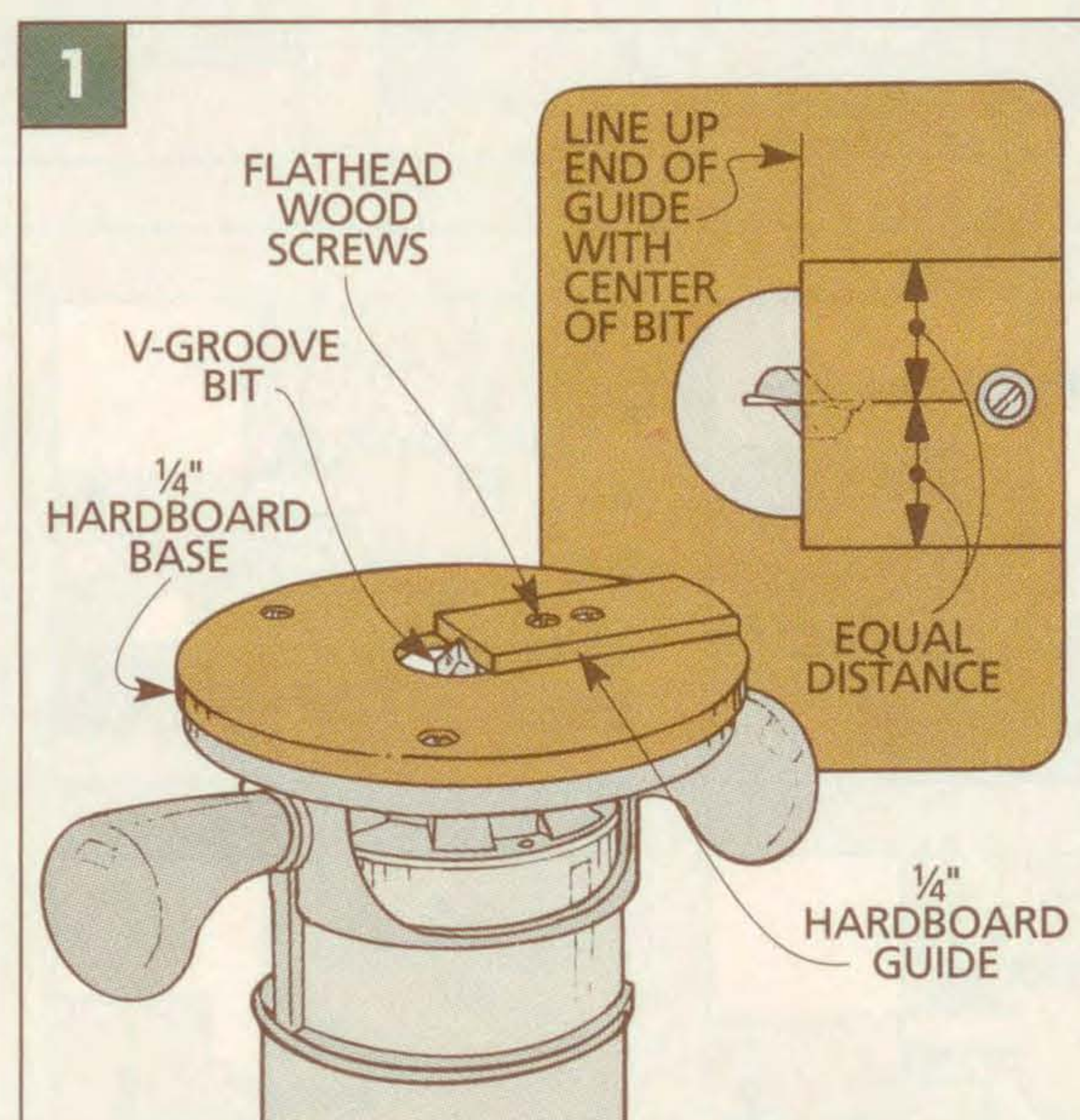


Auxiliary Base for Routing Inside Chamfers

If a frame and panel are already assembled, it's difficult to rout a chamfer on the frame because the panel gets in the way of the pilot on the chamfering bit.

Auxiliary Base – To deal with this problem, I used a "V-groove" bit instead to make the chamfer. But to guide the bit, I had to make an auxiliary router base and a special 1 1/2"-wide guide (*Fig. 1*). I made them both from 1/4" hardboard.

Guide Function – The primary function of this guide is the same as that of the pilot on a chamfering bit. It keeps the bit a uniform distance from the edge being chamfered. But the guide also stops the chamfer a uniform distance (3/4") from the corners.



Route the Chamfer – To make the chamfer, just adjust the depth of the bit to cut a 1/8"-wide chamfer. The guide will maintain a uniform chamfer and stop the cut exactly 3/4" from the corners (*Fig. 2*).

Making Straight Cuts Between Profiles

The base on one of my projects has ogee profiles cut out of it to form feet. In between is a straight cut that separates the two profiles. You might think the profiles were the hardest parts to make. But making the straight cut between them turned out to be more of a challenge.

There's nothing tricky about cutting out the profiles. You just follow the layout lines with your band saw (or jig saw) and sand them smooth. But this won't work when cutting along the layout line that separates the profiles.

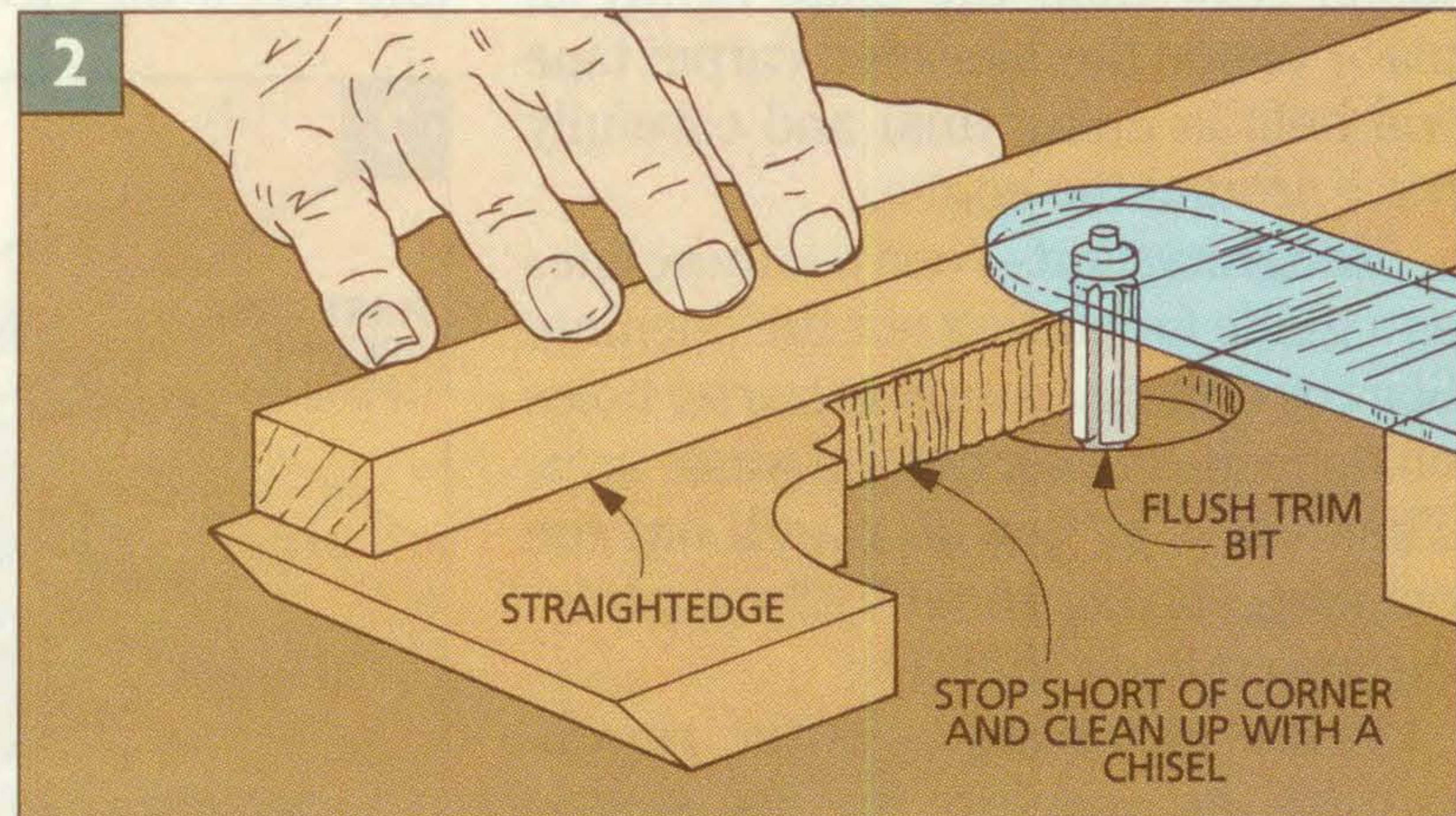
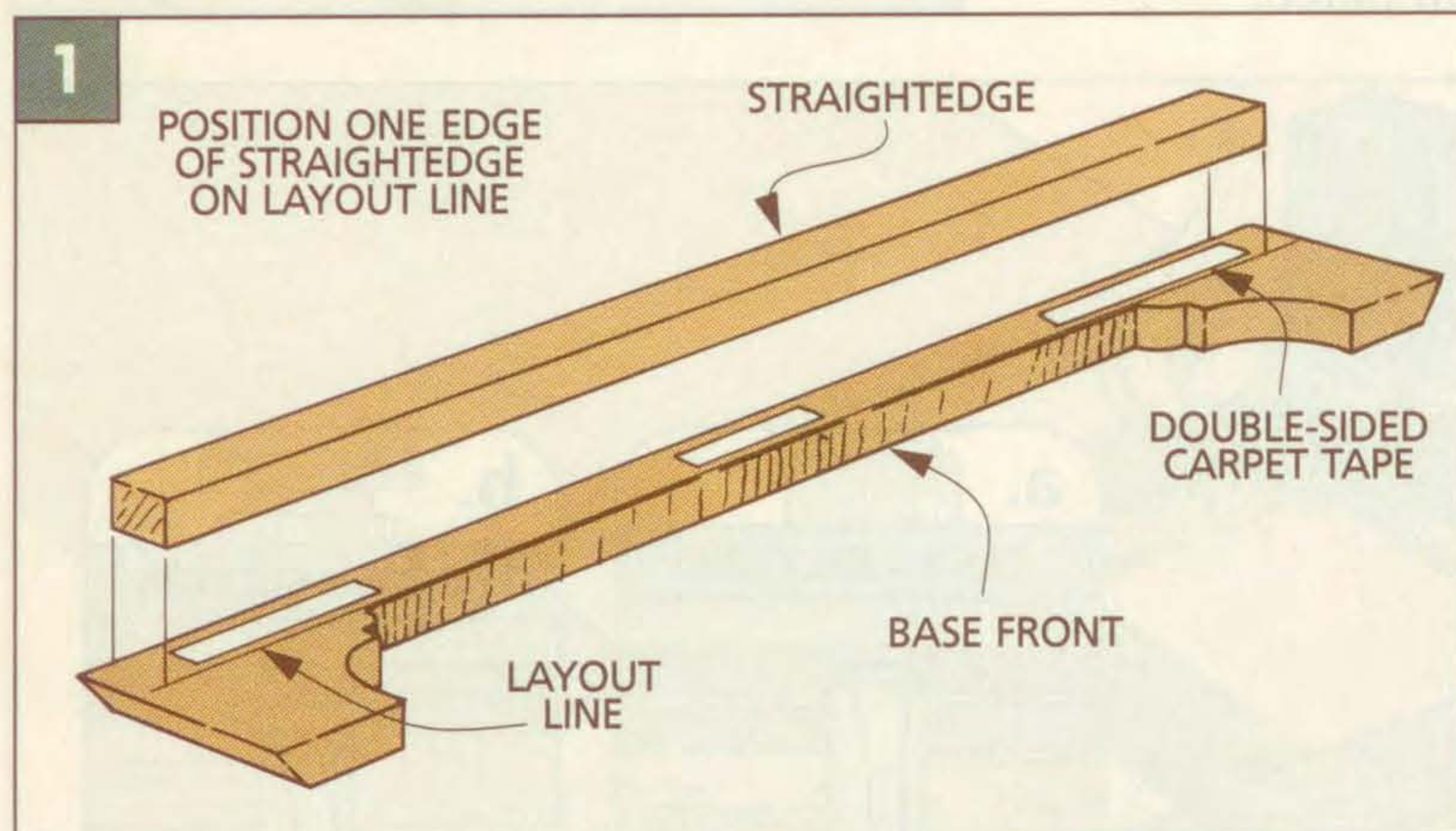
Here, the goal is to have a line that's perfectly straight. If your blade wanders even a little, it's easy to see. So I don't cut right to the line. Instead, I'll cut on the waste side of

the layout line, leaving about $\frac{1}{16}$ " of stock.

Straightedge – Then I switch to a flush trim bit in my router table to rout to the line. But to get a straight cut, you have to guide the bit. To do this, I use double-sided tape to “clamp” a straightedge flush with the layout line (Fig. 1). Now the bearing on the bit follows the straightedge to rout the line (Fig. 2).

You'll have to stop short of the profile because the diameter of the bit ($\frac{1}{2}$ ") won't let you into tight corners. But it's easy to finish the cut. Use a chisel to clean up the corner.

Note: I left the straightedge carpet-taped in place to help guide my chisel.



Safe Routing “On the Edge”

Most routing operations should be done *before* a project is put together. That's because it's easier to rout a groove or a profile if the workpiece is lying flat. But, there are times when it's necessary to do some routing on a project *after* it's assembled. A good example is when you're routing the rabbets for a back panel.

On this project, the rabbet had to be routed after the case was assembled. But this led to another small problem — I soon realized I was going to have trouble keeping the router level on the sides of the case.

The problem is, if you try to balance the router on the narrow edge of a piece of $\frac{3}{4}$ "-thick stock, it will probably tip one way or the other and dig into the wood (Fig. 1). Luckily, there are a couple of simple ways to solve this problem.

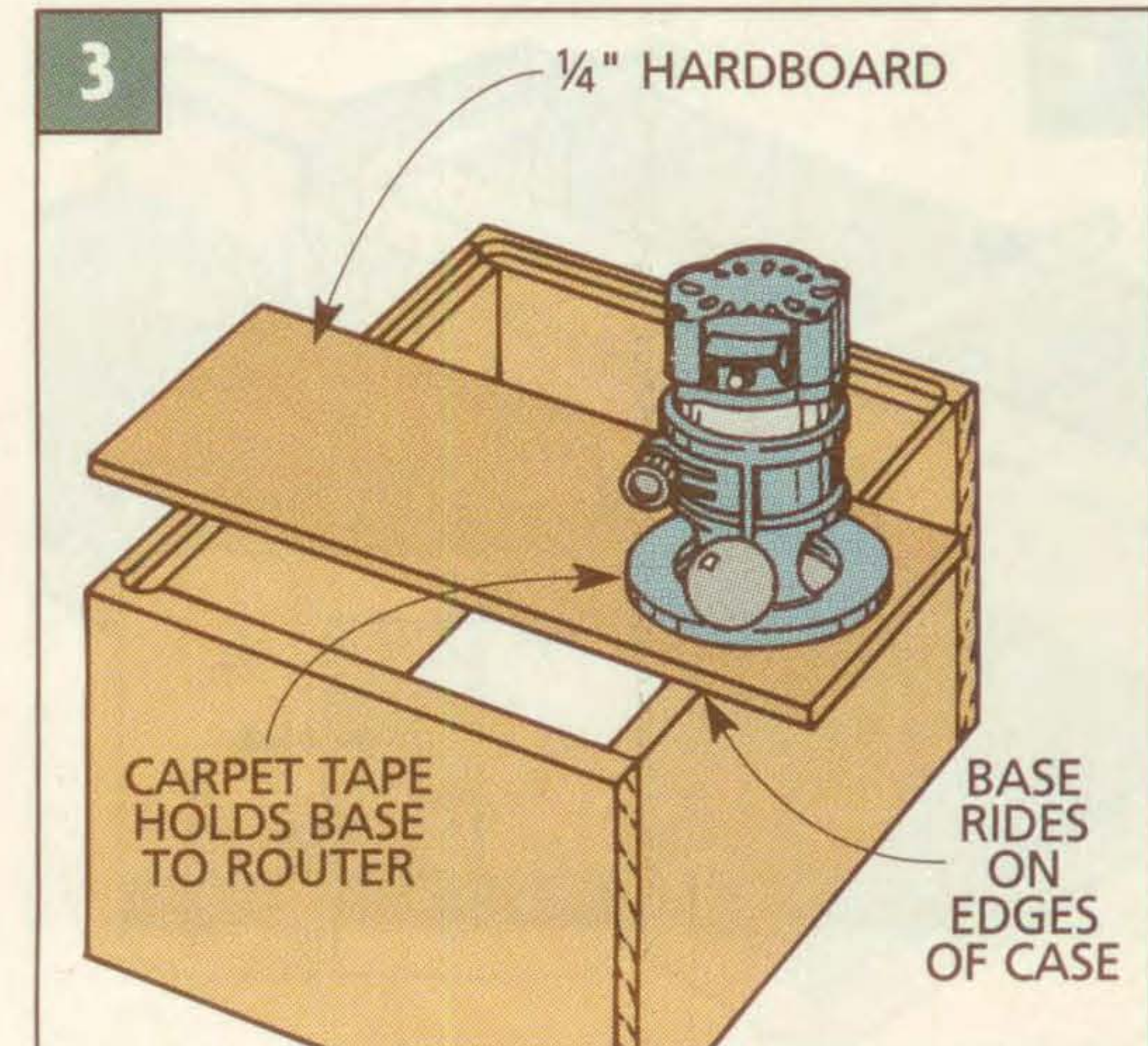
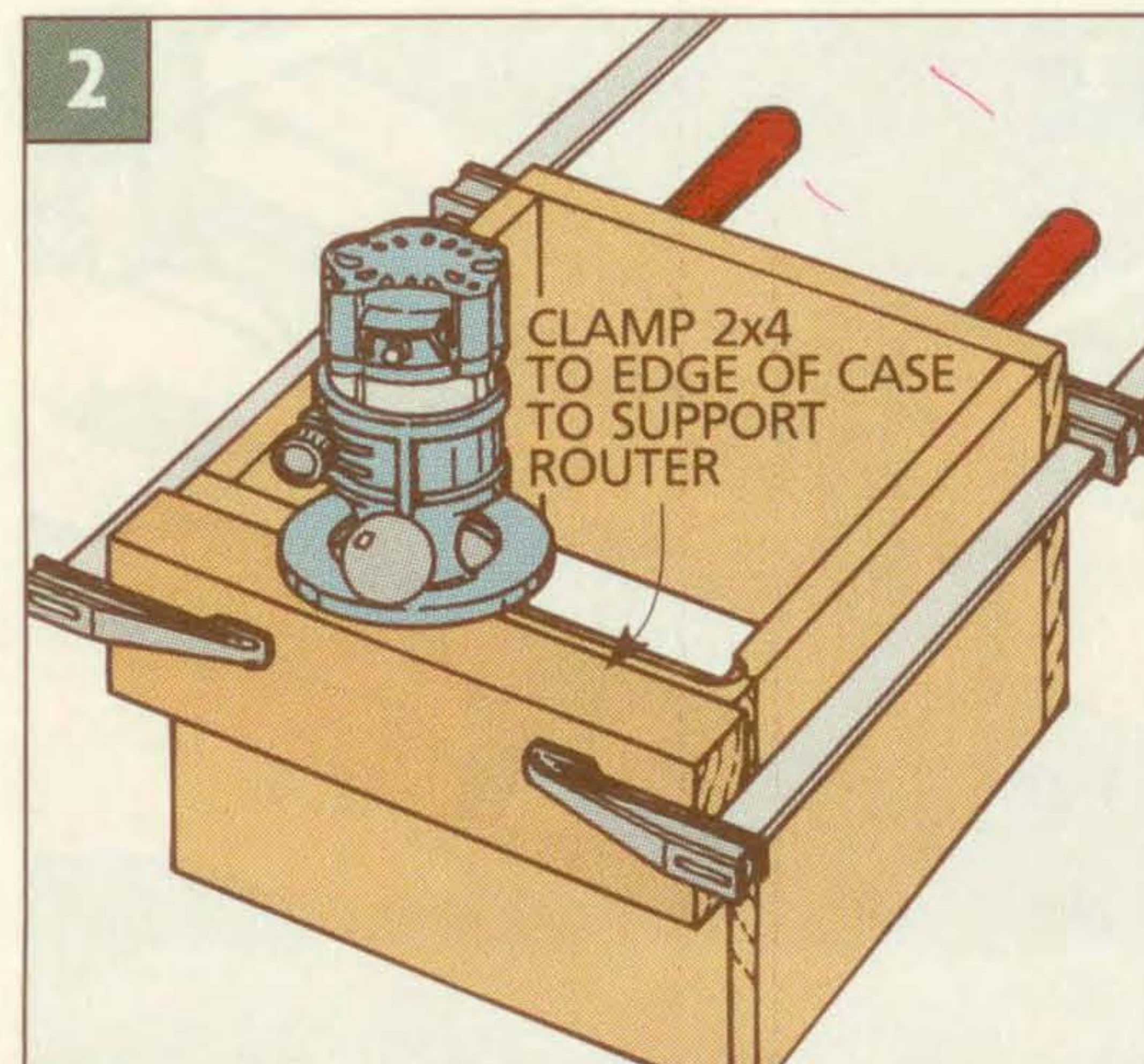
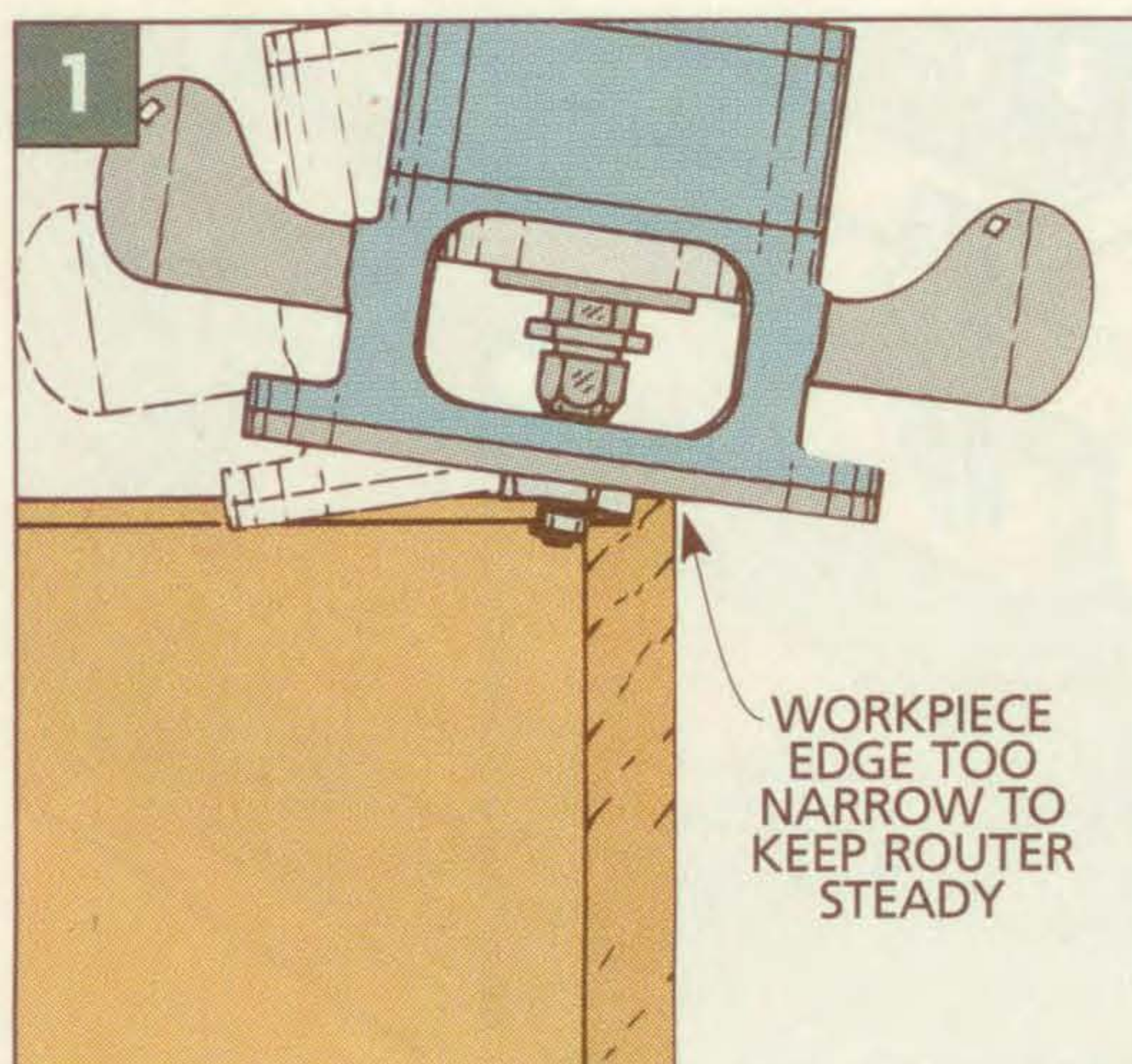
First Solution – If the case is constructed in such a way that clamps will reach around it, clamp on a 2x4 block flush with the edge to be routed (Fig. 2). This provides an extra $1\frac{1}{2}$ " of solid support for the router base.

Second Solution – The second method is to add an auxiliary base to

the router (Fig. 3). The base serves as a bridge across the case to the opposite side. I make this auxiliary base from a short piece of $\frac{1}{4}$ " hardboard.

After drilling a hole in the hardboard platform for the bit to come through, I use double-sided carpet tape to stick the auxiliary platform to the plastic base on my router. (Or, you can remove your existing base and screw the new platform directly to your router.)

Rout the Rabbet – Then, you can rout as usual with the new base straddling over both edges of the case.



Adding a Router Table Insert

There are two things to look for when creating the opening for an insert plate in a router table: the plate should fit the opening like a glove *and* it has to be flush with the top of the router table. Here's an easy way to do both.

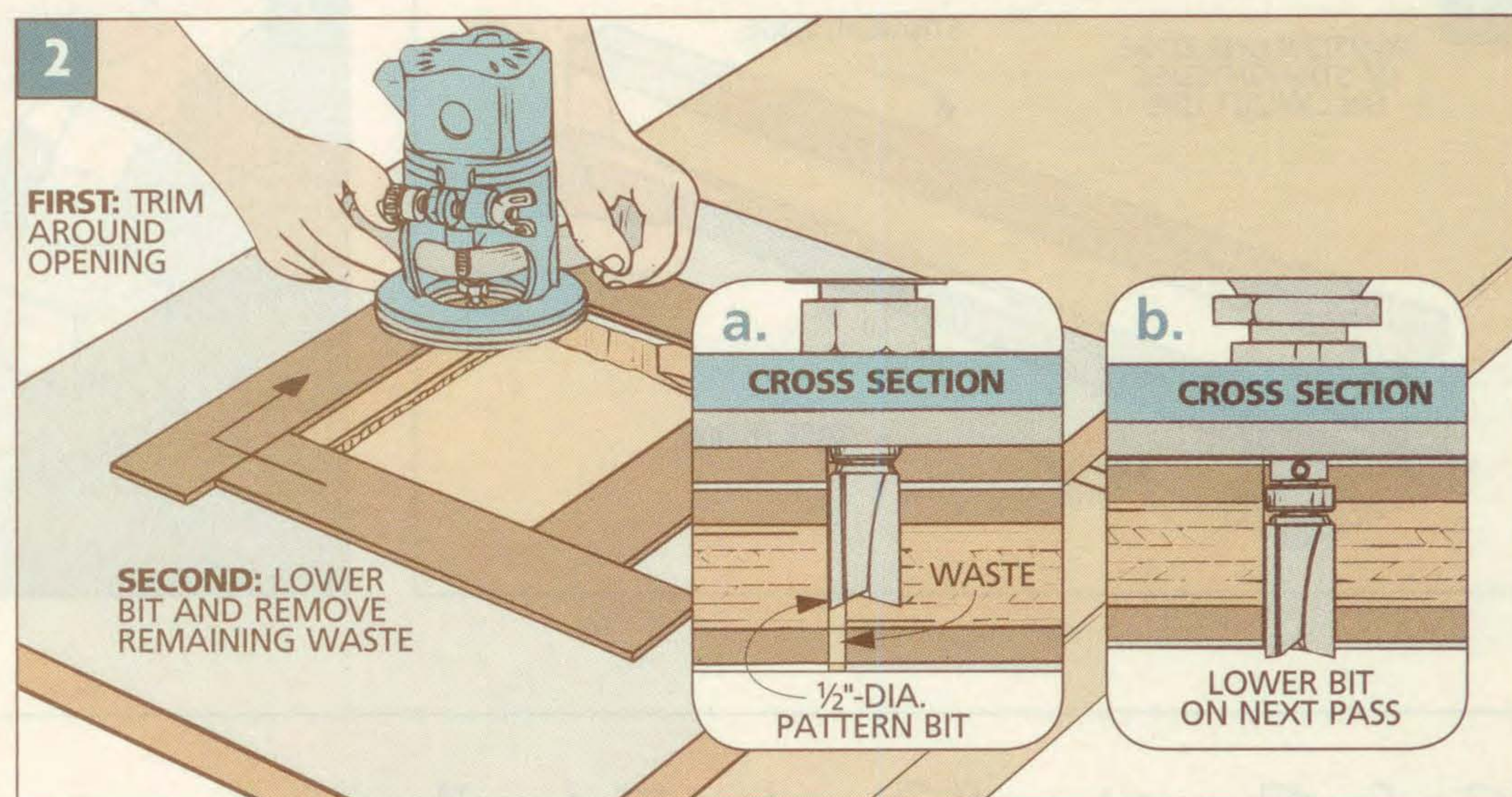
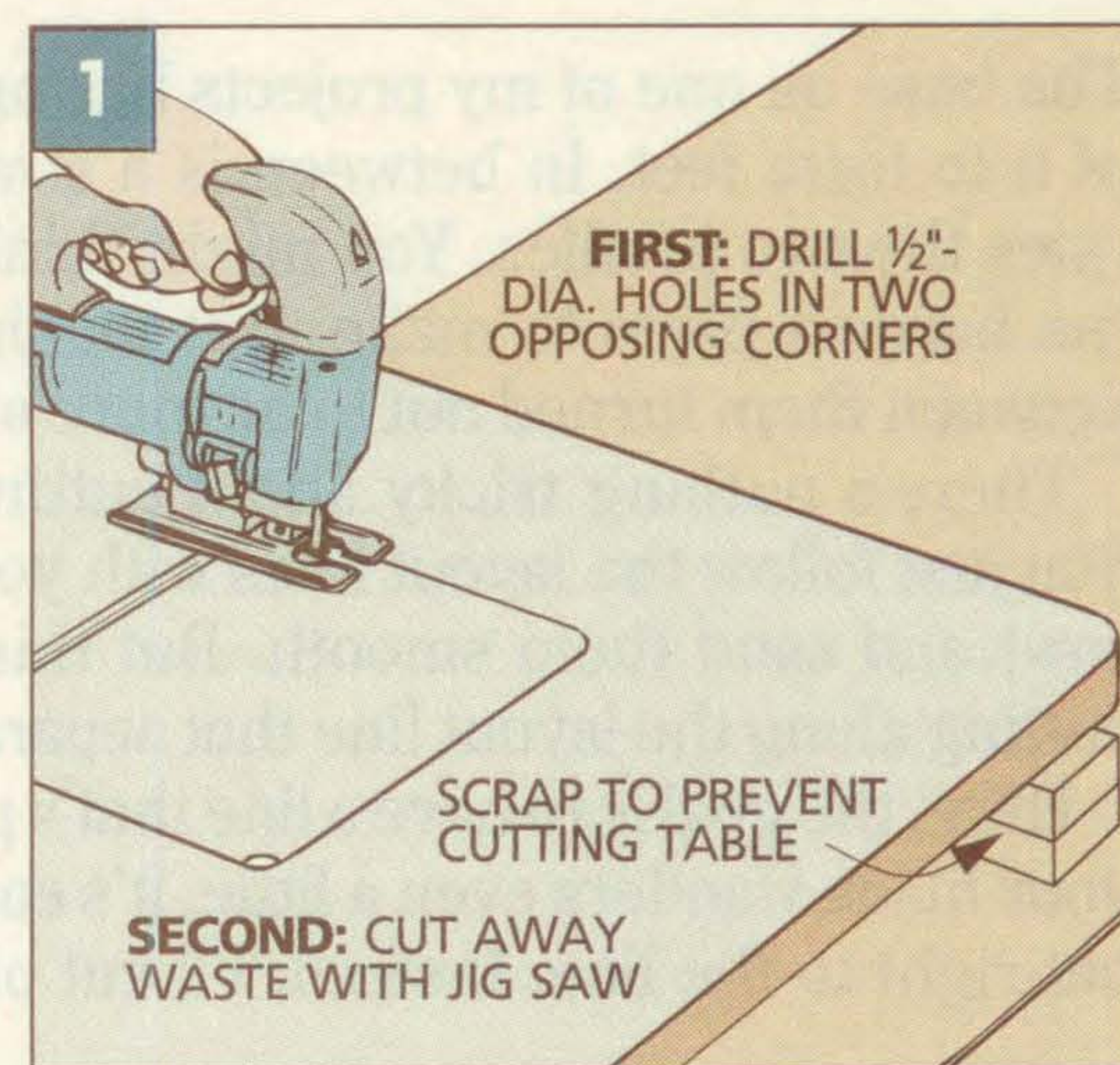
Layout – To lay out the opening, start by using the insert plate as a template. A framing square makes it easy to center the plate on the table, allowing you to position the insert plate square with the edges of the table. Now hold the plate firmly in place (some double-sided carpet tape will help in doing this) and carefully trace around the edges.

Roughing Out – Next use these lines as a guide for cutting out the opening. Start by drilling a couple of starter holes on opposite corners of the waste area. Then use a jig saw to rough out the opening, staying about $\frac{3}{16}$ " away from the layout lines (Fig. 1).

Trim Opening – After rough-cutting the opening, the last step is to trim the edges to match the size of the insert plate. To do this, tape down some strips of $\frac{1}{4}$ " hardboard along the lines on the top.

Once the strips are in place, the opening can be trimmed with a hand-held router and a pattern bit (Fig. 2). You'll need to do this in two passes, since most pattern bits are only 1" long (Figs. 2a and 2b).

Attaching Cleats – With the opening complete, you can attach the cleats that hold the insert plate in place. To position the cleats, flip the top face-down on a flat surface. Then drop the plate in the opening and glue and screw the cleats in place.



Routing Odd-Size Rabbets

Routing a rabbet on a curved piece isn't difficult. A router table and a rabbeting bit with a pilot bearing will do the job just fine.

But what if you don't have a rabbeting bit? To get around this, you can use a $\frac{1}{4}$ " straight bit on the router table and a zero-clearance fence with the router bit partially "buried" in the fence (Fig. 1).

Adjust Bit – First, mount the straight

bit in the router table and raise it to the desired height (depth) (Fig. 1a).

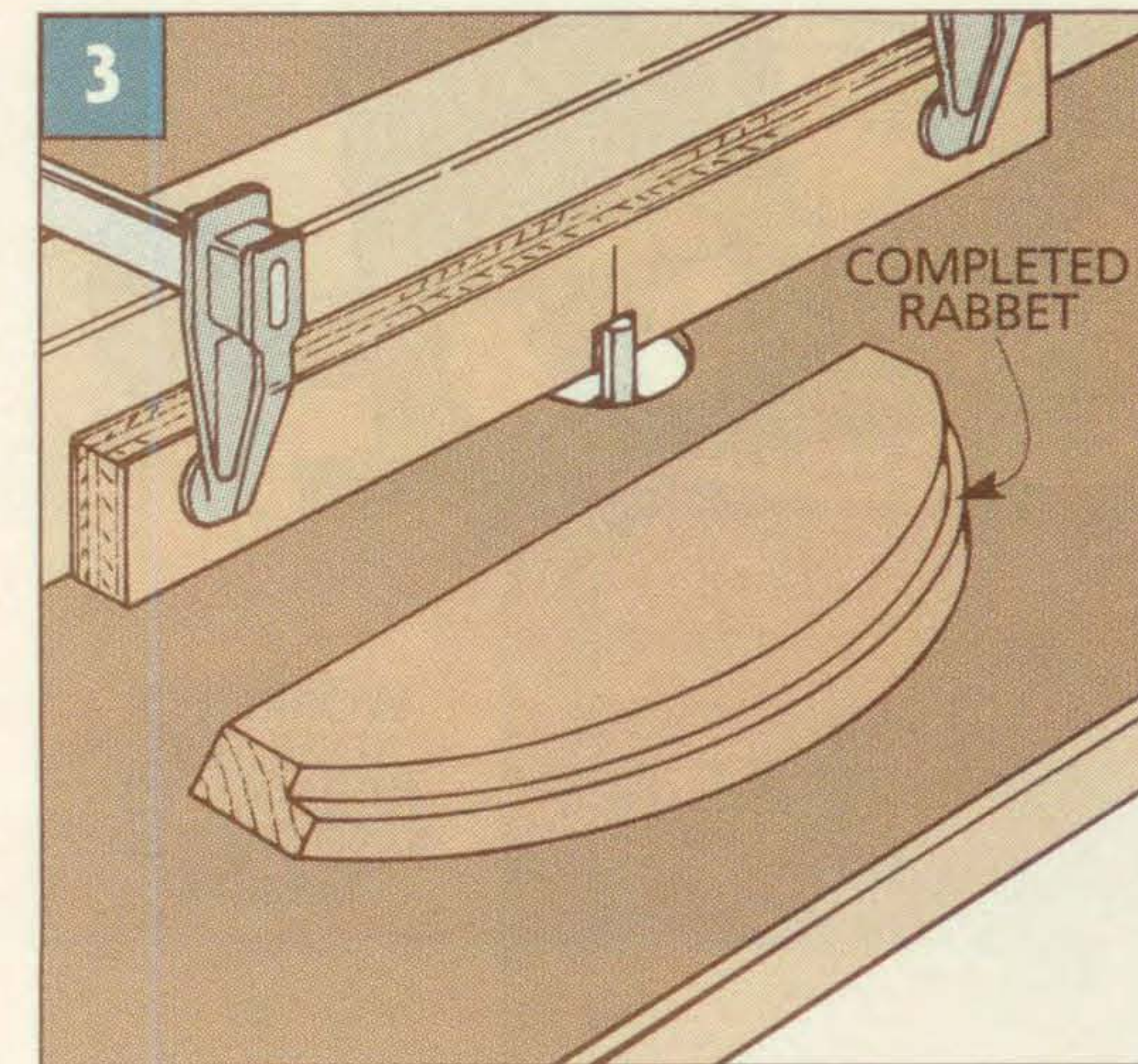
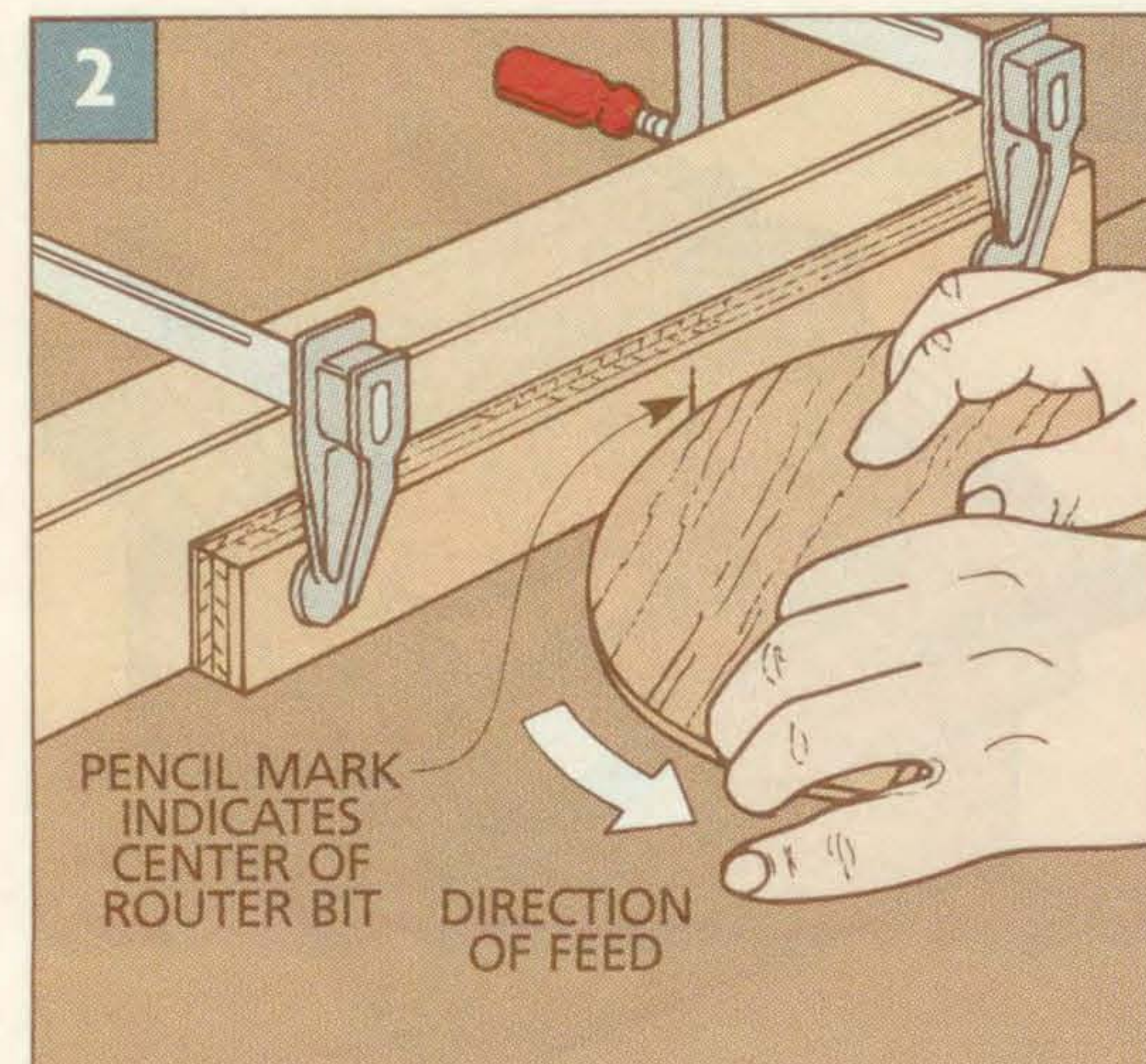
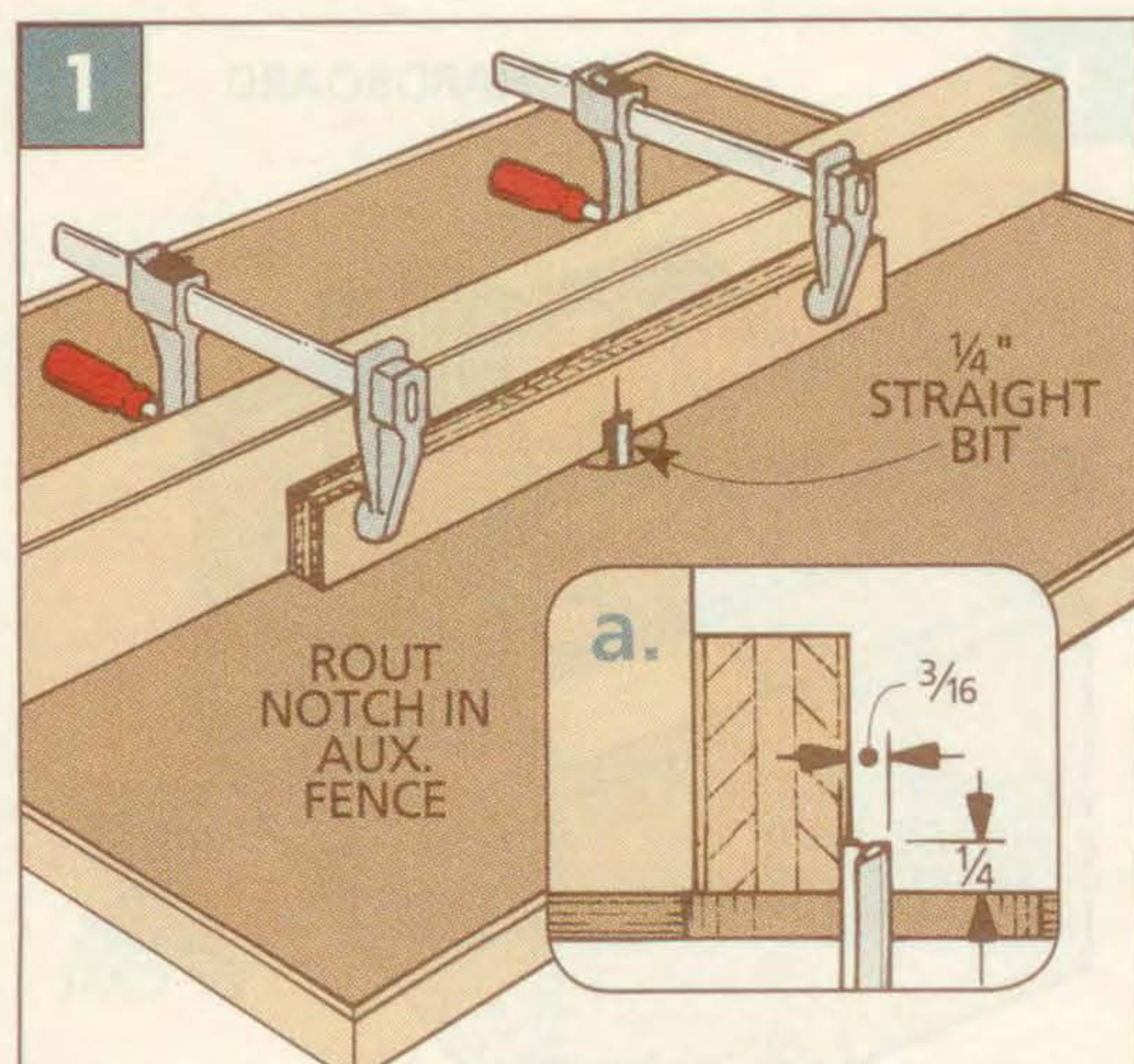
Cut Notch – Then use a piece of plywood scrap as an auxiliary fence, cutting a notch in the center to make it a zero-clearance fence (Figs. 1 and 1a).

To cut the notch, clamp the scrap piece to the router table fence. Then turn on the router and push the fence into the bit until $\frac{1}{16}$ " of the bit is buried in the fence (Fig. 1a). (This

leaves $\frac{3}{16}$ " exposed to cut the rabbet to the desired width.)

Next, clamp the auxiliary fence to the table. Then draw a line on the fence directly over the center of the bit. (This is a reference mark used for routing the rabbet.)

Rout Rabbet – Now rout the rabbet, always routing right-to-left. Be sure to always keep the piece in contact with the fence (Fig. 2).



Backrouting for Clean Rabbets

Cutting rabbets for panels on the *insides* of door frames isn't complicated, even if it's done after the doors are assembled. To do it, I just use a hand-held router and a rabbeting bit.

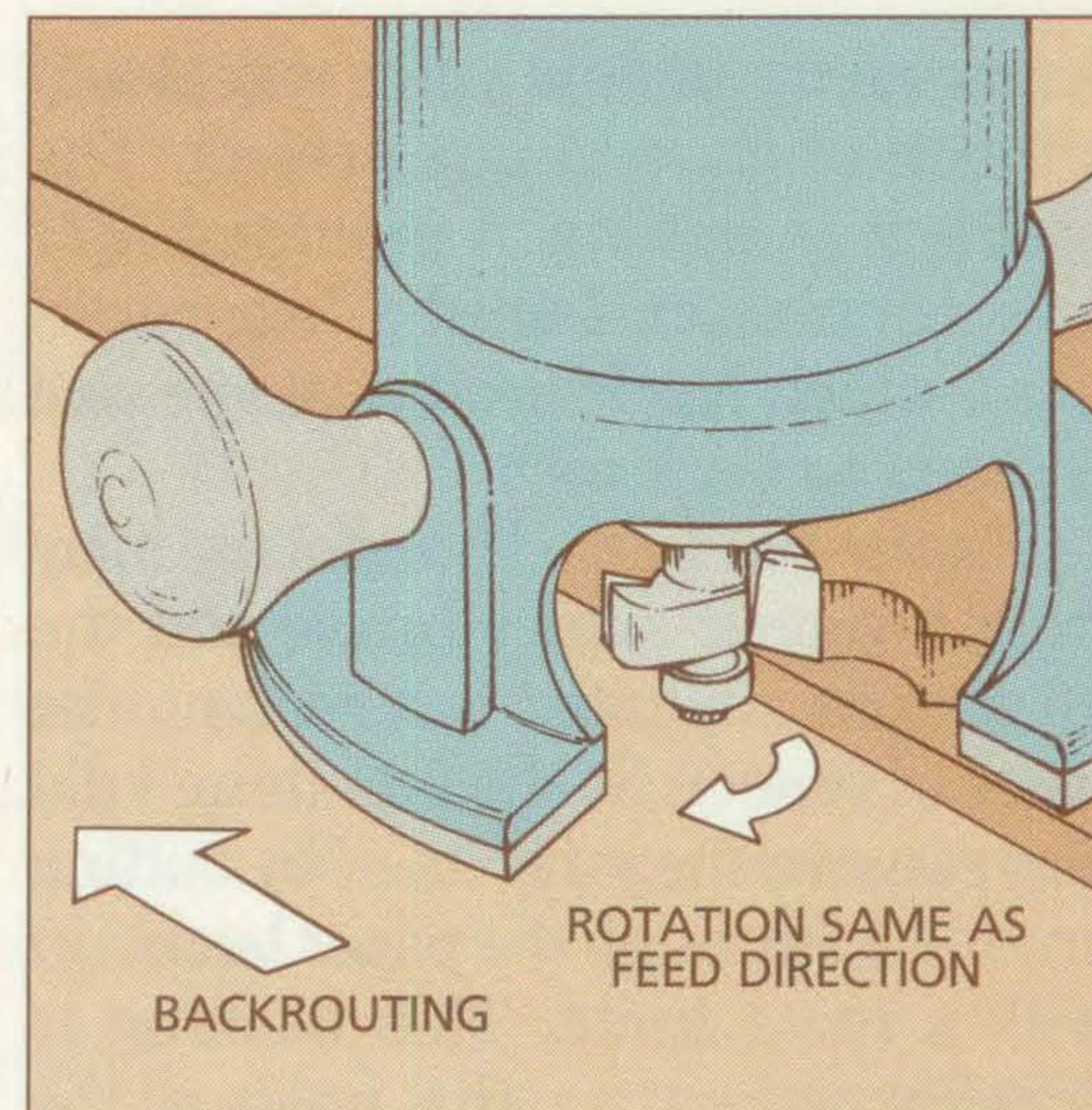
Scoring Pass – Whenever I rout a rabbet though, I worry about chipout along the edge. There is a way around this — by taking a light backrouting pass first. This means a pass in the direction *opposite* in which the router usually runs. (This would be counter-clockwise inside the frame.)

Backrout – The reason this works is that the bit is cutting into the workpiece. The material behind the cut supports the material being removed (*see drawing*). On a normal pass, the bit cuts out of the workpiece. The unsupported wood at the edge of the workpiece is what chips out.

Make It Safe – So if backrouting is so great, why not do it all the time? The problem is that the router bit won't pull itself into the workpiece, as it normally would. Instead, the bit will bounce along the edge, trying to pull the router along. This can make it harder to control. So whenever backrouting, take a light pass, keep a firm grip on the router, and brace your arms against your body.

The idea is to remove just the material at the front edge of the cut so there won't be chipout when the cut is completed.

Rout Rabbet – After the edge has been scored, you can make deeper passes to cut the rabbet to full width. But this time rout in the normal direction. (In this case, clockwise around the inside of the frame).



Square Corners – When the rabbet is completed, you'll notice the corners where the bit couldn't reach are rounded. These can easily be squared up by paring away the waste with a chisel.

Trimming Edging Flush

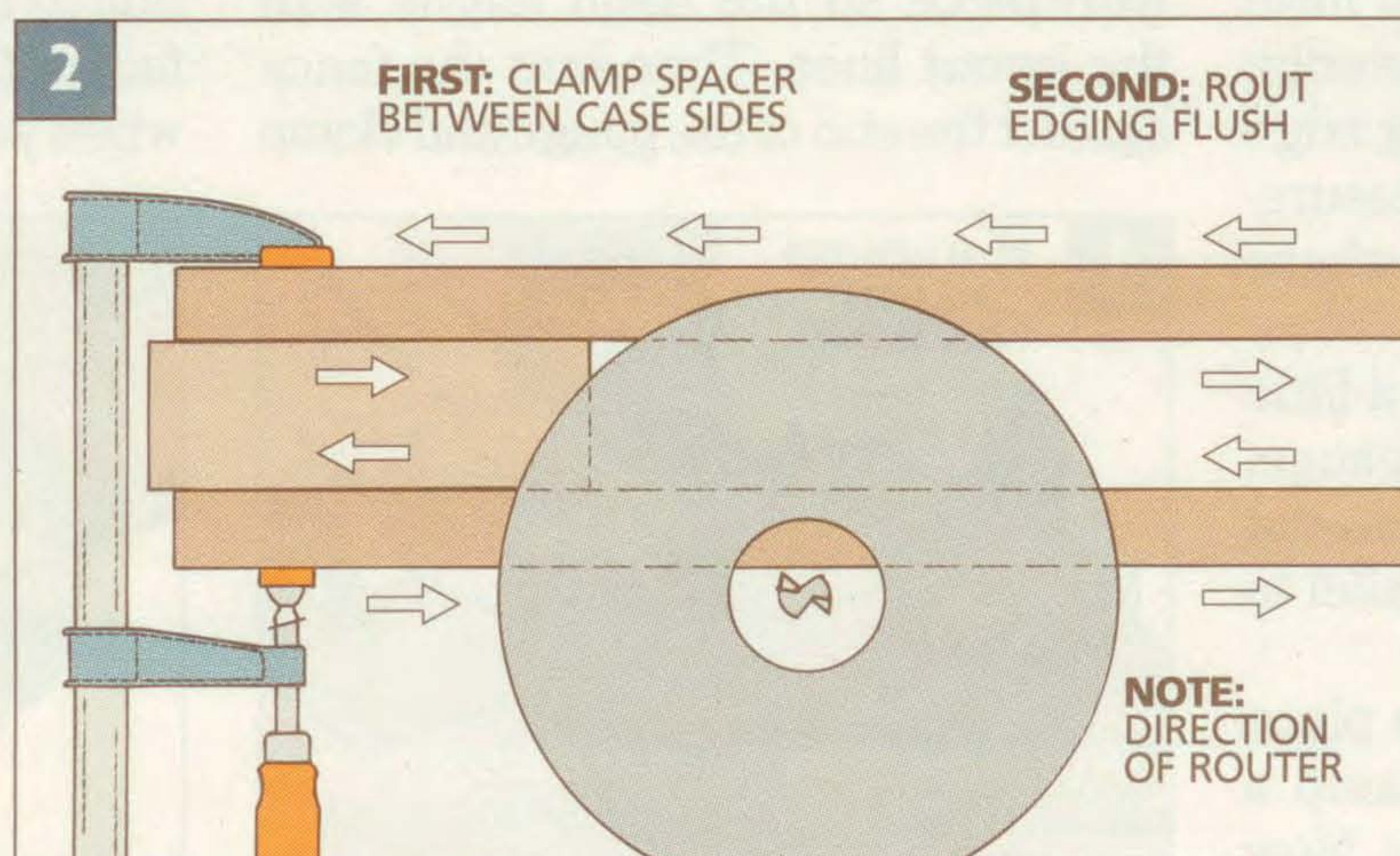
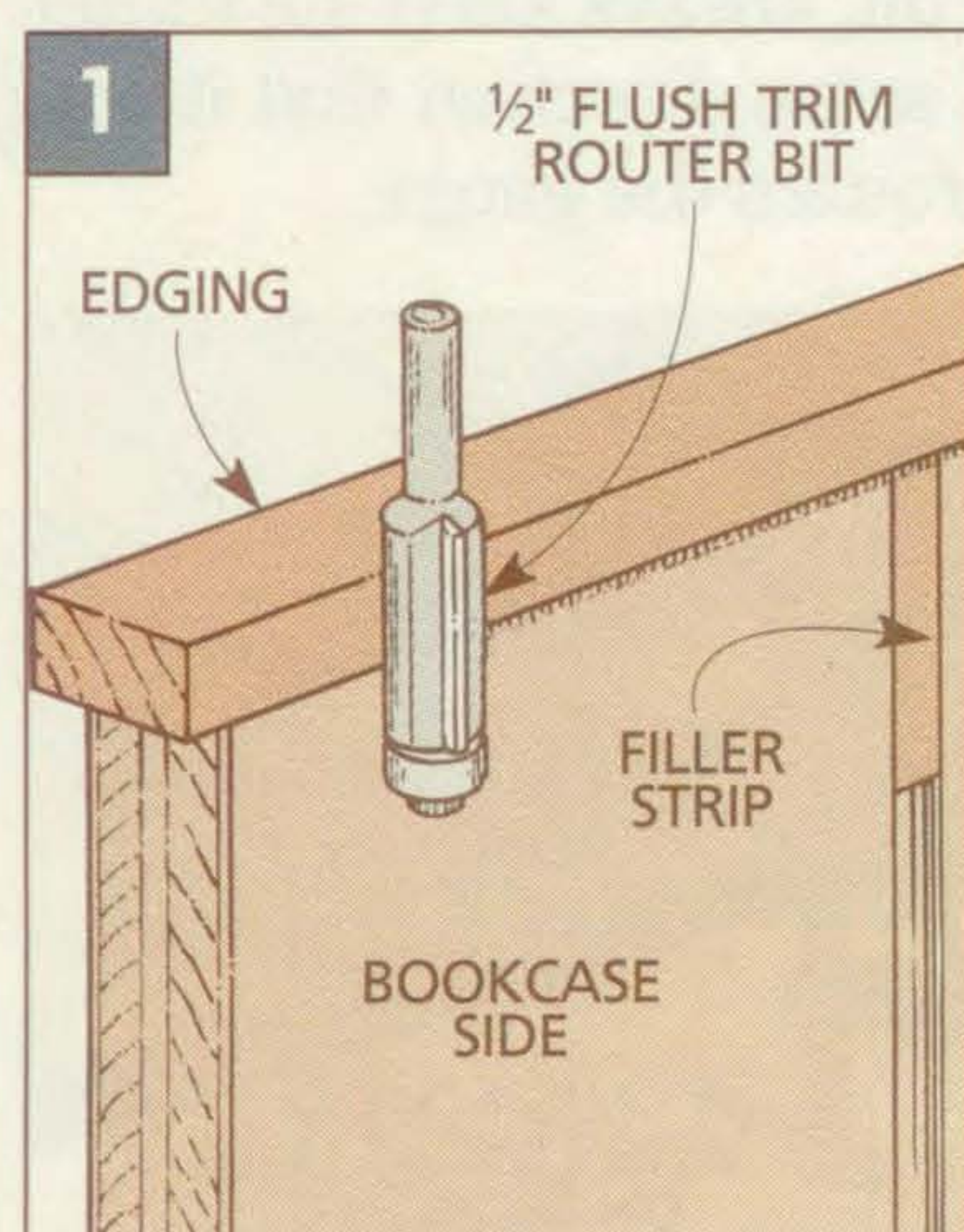
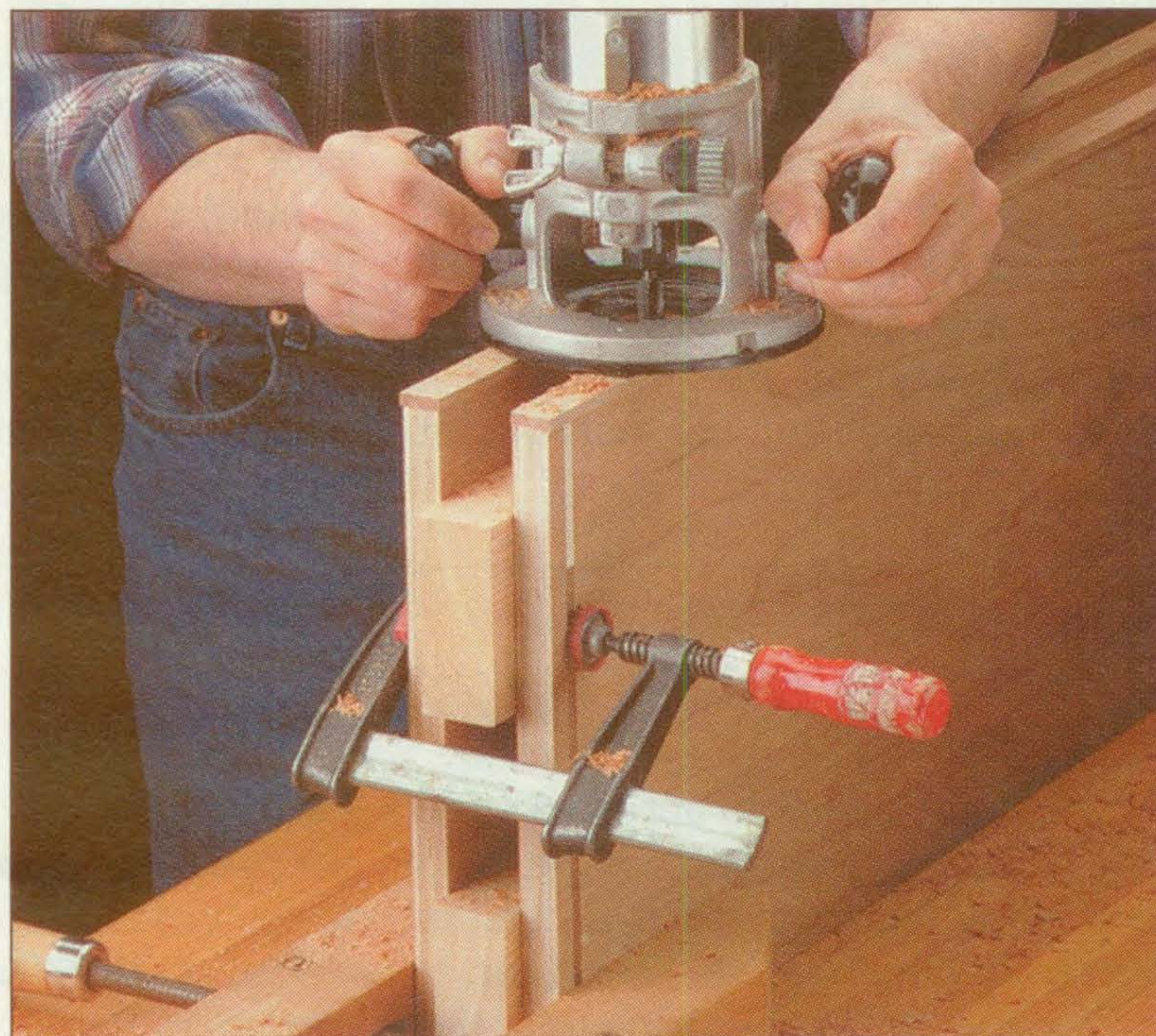
I like to trim the sides of my plywood bookshelves with hardwood edging. And once the edging is glued in place, it needs to be trimmed flush. To do this, I use a router with a bearing-guided flush trim bit.

Fill the Dadoes – If the case has dadoes to hold shelves, you need a way to keep the bearing from dropping into them. So I fill each dado with a filler strip that is just thick enough to fit flush with the face of the plywood (*Fig. 1*).

No More Tipping – Then the trick to keeping the router from tipping when working on the thin edges is to clamp both side pieces together. It gives a wider surface for the router to sit on. And it lets you rout the edging on both pieces at the same time.

To make this work, you'll have to separate the sides to make room for the router bit. Then I clamp 2x4 spacers between the sides to hold them apart and make a wide platform for the router (*see photo at right and Fig. 2*).

Finally, I trimmed the edging that sticks out past the ends to length with a sharp chisel (*Fig. 3*).



Routing Out for a Circular Inlay

A marquetry inlay is a nice way to add a touch of class to any project. The problem is getting it mounted. For a recent project, I used a “starburst” inlay, which has a circular shape that is easier to work with.

Paper-backed – I bought my inlay from a veneer supply house and the inlay came mounted in a rectangular piece of veneer. So the first thing I did was remove the inlay itself by cutting around it (through the paper backing) with a razor knife. This backing is actually veneer tape that holds all the pieces of the pattern together.

When the inlay is removed, measure its diameter and cut a recess to fit (*see drawing*). Because this

particular inlay was close to a true circle, I used a circle cutter to score the outside edge of the recess.

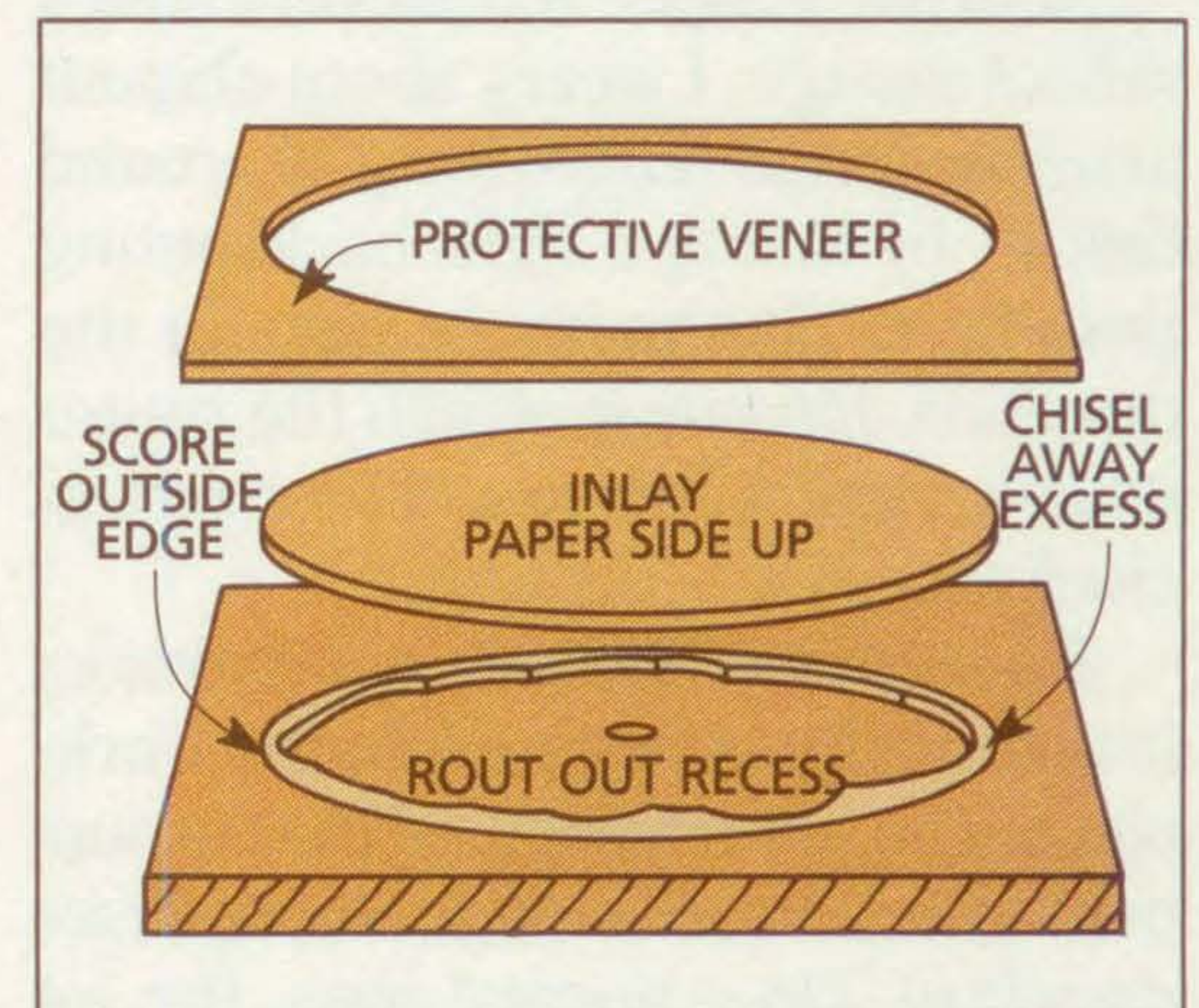
Then I removed a majority of the waste in the recess with a router and a 1/2" straight bit. Set the depth of cut to about three-fourths the thickness of the inlay and rout to within about 1/8" of the score line. To remove the remaining waste, I used a sharp 1/4" carving chisel.

To mount the inlay, apply a coat of contact cement in the recess and also to the “back” of the inlay.

Note: The side with the brown paper is actually the front, or top side.

Press the inlay into the recess (with the paper side up). Place a softwood

block over the inlay and tap it in place with a hammer. Then place a board on top of the inlay to clamp it down evenly. Finally, sand the inlay flush with the surface of the board.



The Best Way to Get Edges Flush

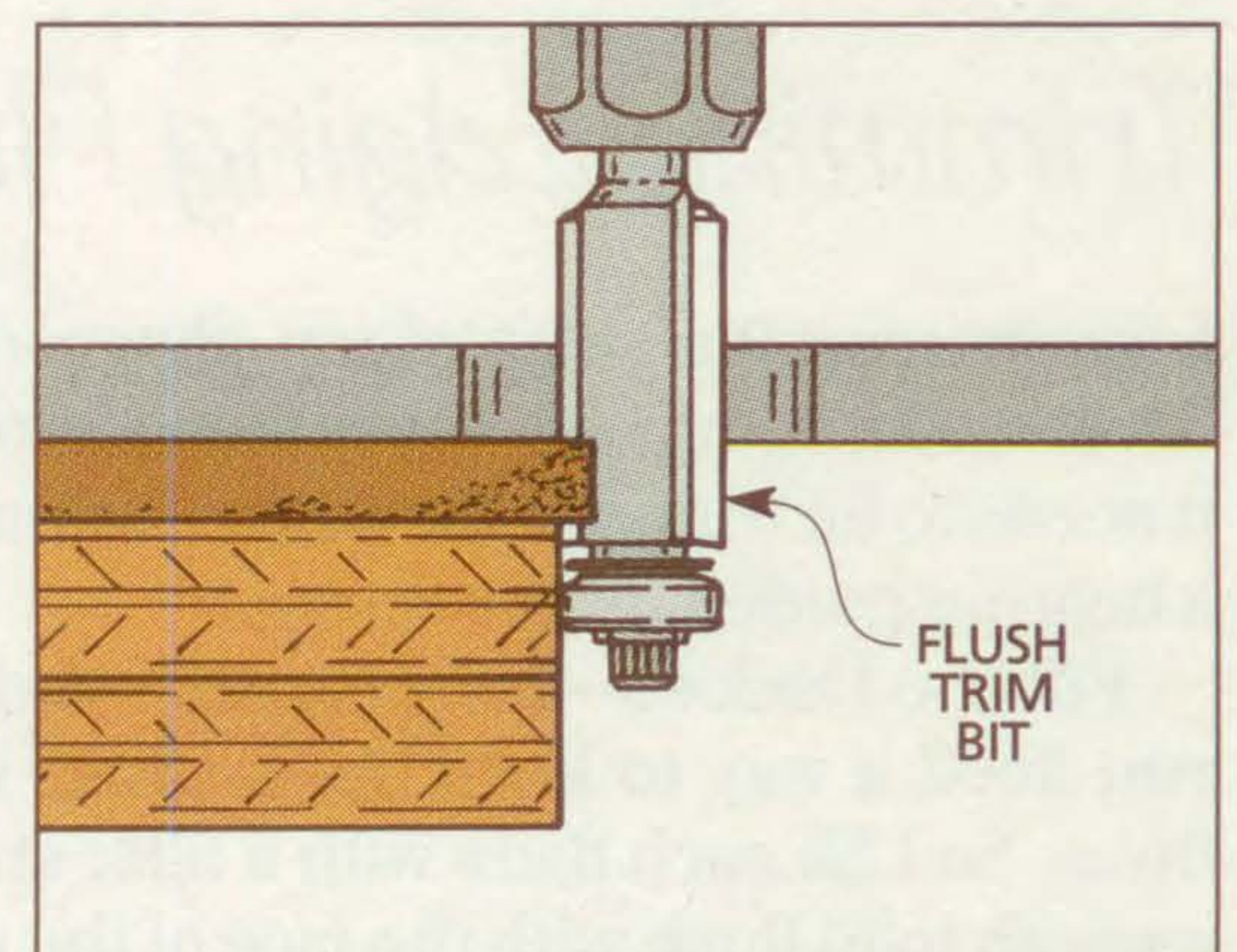
Trying to get the edges of two workpieces exactly flush can be close to impossible if you just try to position them by hand.

That's why when I need two surfaces perfectly flush, I cut one slightly oversize and then use a flush trim bit to take off the excess after the pieces are glued up (*see drawing*).

A flush trim bit works because it has a bearing at the end that is right

in line with the cutting edge of the bit. As the bearing rolls along one surface, the other surface is trimmed exactly flush with it (*see drawing*).

For smaller pieces, you can mount your router in the router table and guide the workpiece past the bit. But it's not safe or practical to handle large workpieces on the router table. In those cases, use the flush trim bit in a handheld router.



Router Fence Alignment

When routing a dado across a wide panel, I mark the location of the dado first. Then I clamp a fence parallel to the layout lines to guide the router.

The problem is figuring out the exact location of the fence. You have to measure the distance from the edge of the router base to the cutting edge of the bit, then transfer this measurement to the workpiece. Somewhere there's likely to be an error.

Alignment Gauge – To be a little more accurate, I made a simple gauge. It's a piece of scrap with a dado cut across it to align the fence parallel to the layout lines (*Fig. 2*).

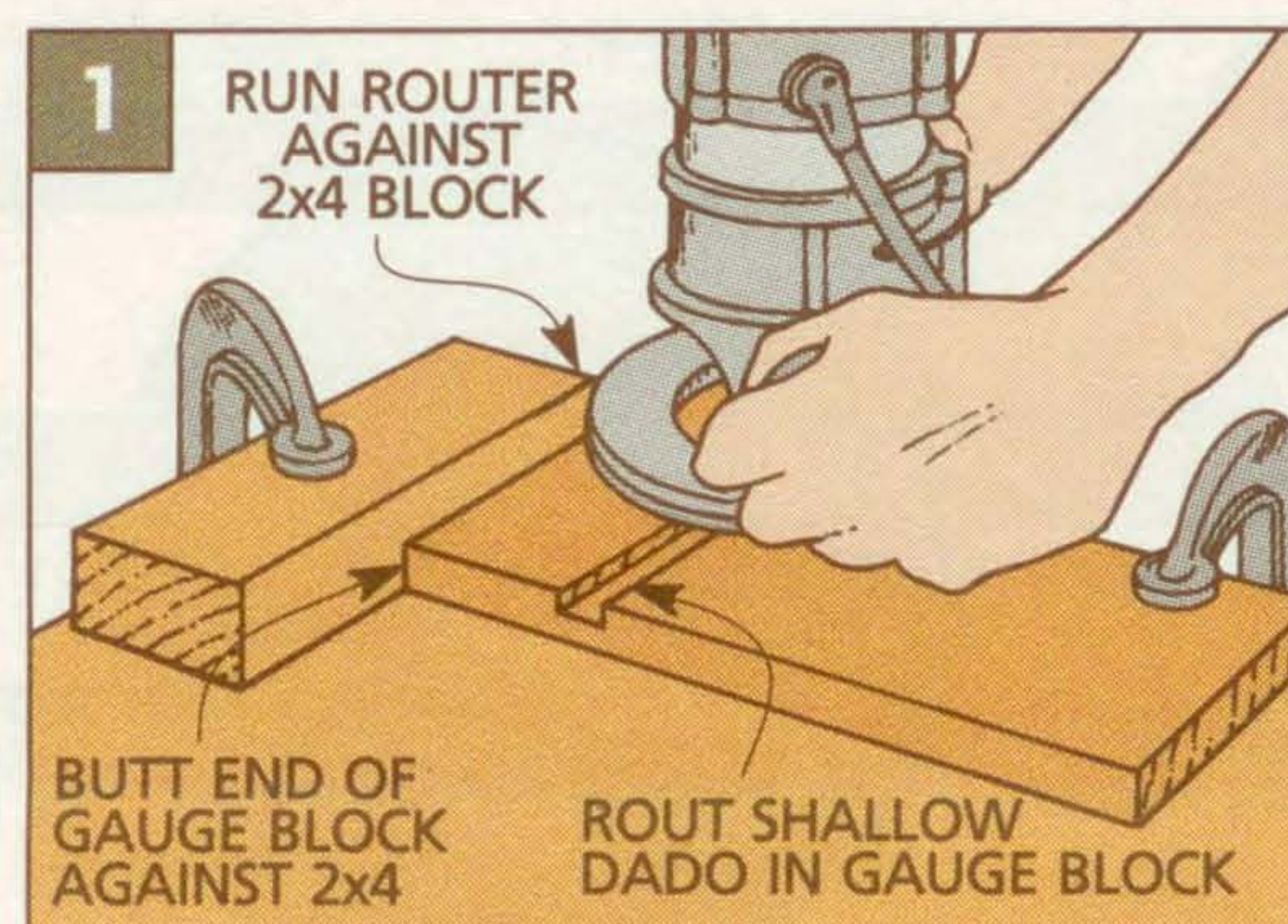
To make the gauge, clamp a piece of scrap to the bench and clamp a higher fence at one end (*Fig. 1*). Now

mount the bit in the router and run the router base against the high fence to rout a dado across the scrap.

Using the Gauge – To use the alignment gauge, turn it over on the workpiece so the dado aligns with the layout lines. Then butt the fence against the end of the gauge and clamp

it down (*Fig. 2*). Now rout along the edge of the fence. The dado should match the layout lines.

Router Base – Since router bases can be mounted off center in relation to the bit, always keep the router facing the same direction that it was when you routed the gauge.



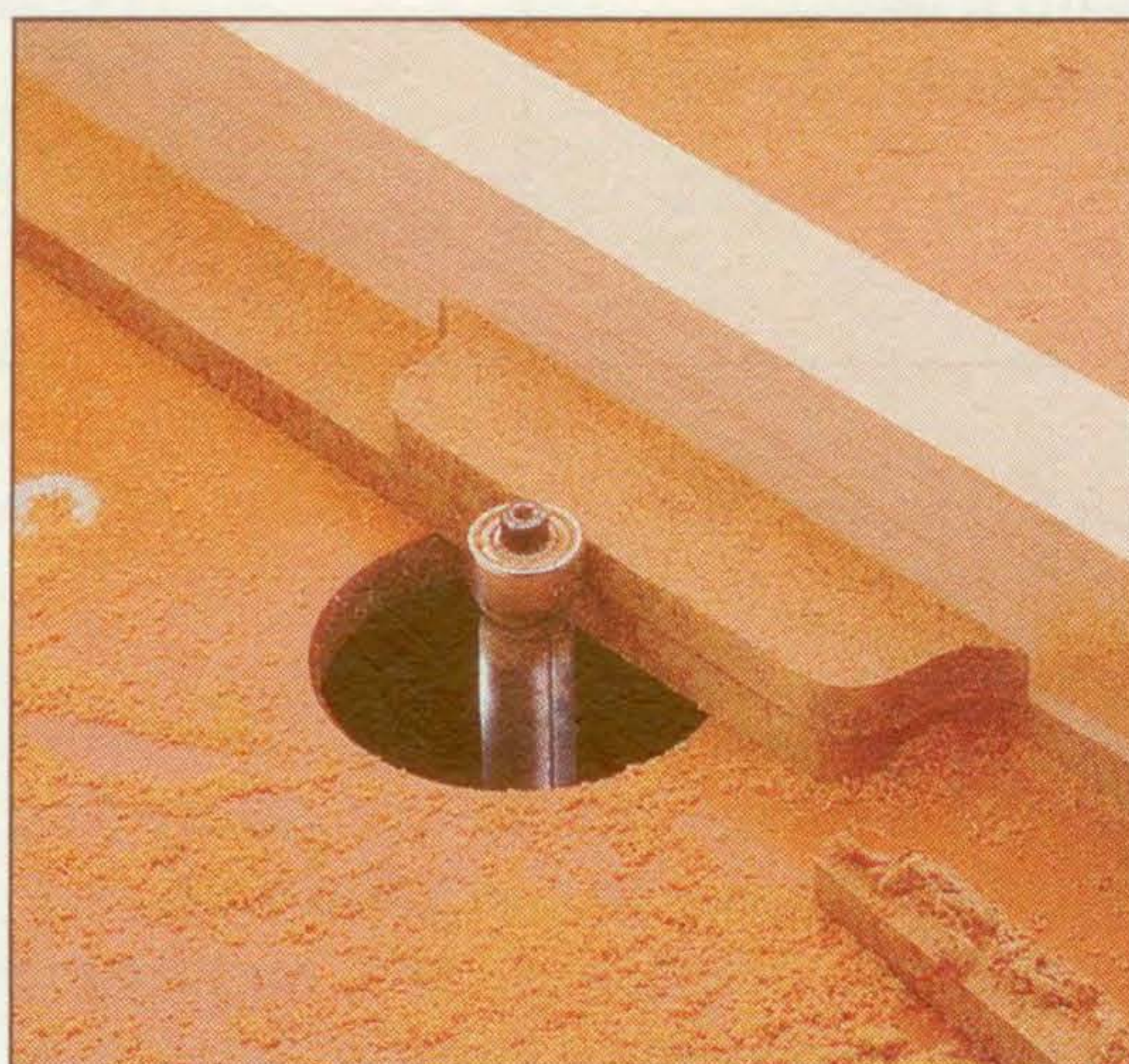
Pattern Routing with a Flush Trim Bit

I just completed building a storage cabinet for my saw blades. All ten trays on the storage cabinet have identical bottoms, made of 1/4" hardboard with rounded pulls on their fronts (see right photo). So I wanted a simple way to cut them all to the same profile.

Pattern Template – One of the quickest ways to make identical parts is to use a pattern template and a flush trim bit in the router table.

To do this, just secure the template to a blank with carpet tape, and set the bearing on your router's flush trim bit to ride against the template.

For the pulls on the cabinet trays, the template is made up of two parts: a small piece of 1/4" hardboard in the shape of the pull you want, and the hardwood front already fastened to each tray (see left photo).



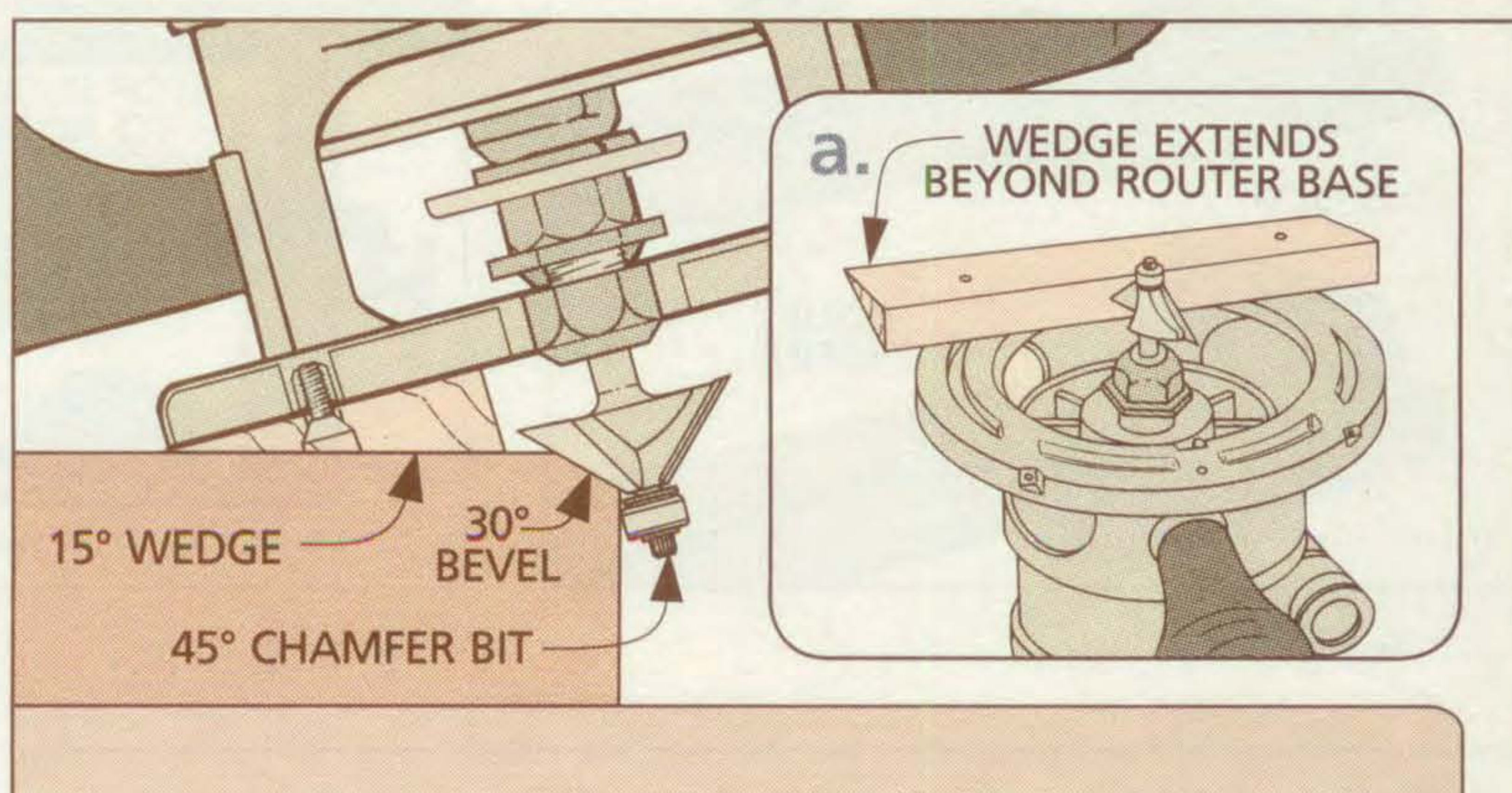
After cutting the bottoms oversize, you can use this template to rout all the profiles.

This template will create a uniform appearance for all the trays in your cabinet (see right photo below), and it will also save you time and effort.

Bevels of Another Angle

On a recent project, I wanted a 30° chamfer on an edge. However, all I had was a 45° chamfer bit. Not wanting to buy a new bit for what was likely to be a one-time use, I found a way to make the 45° bit work.

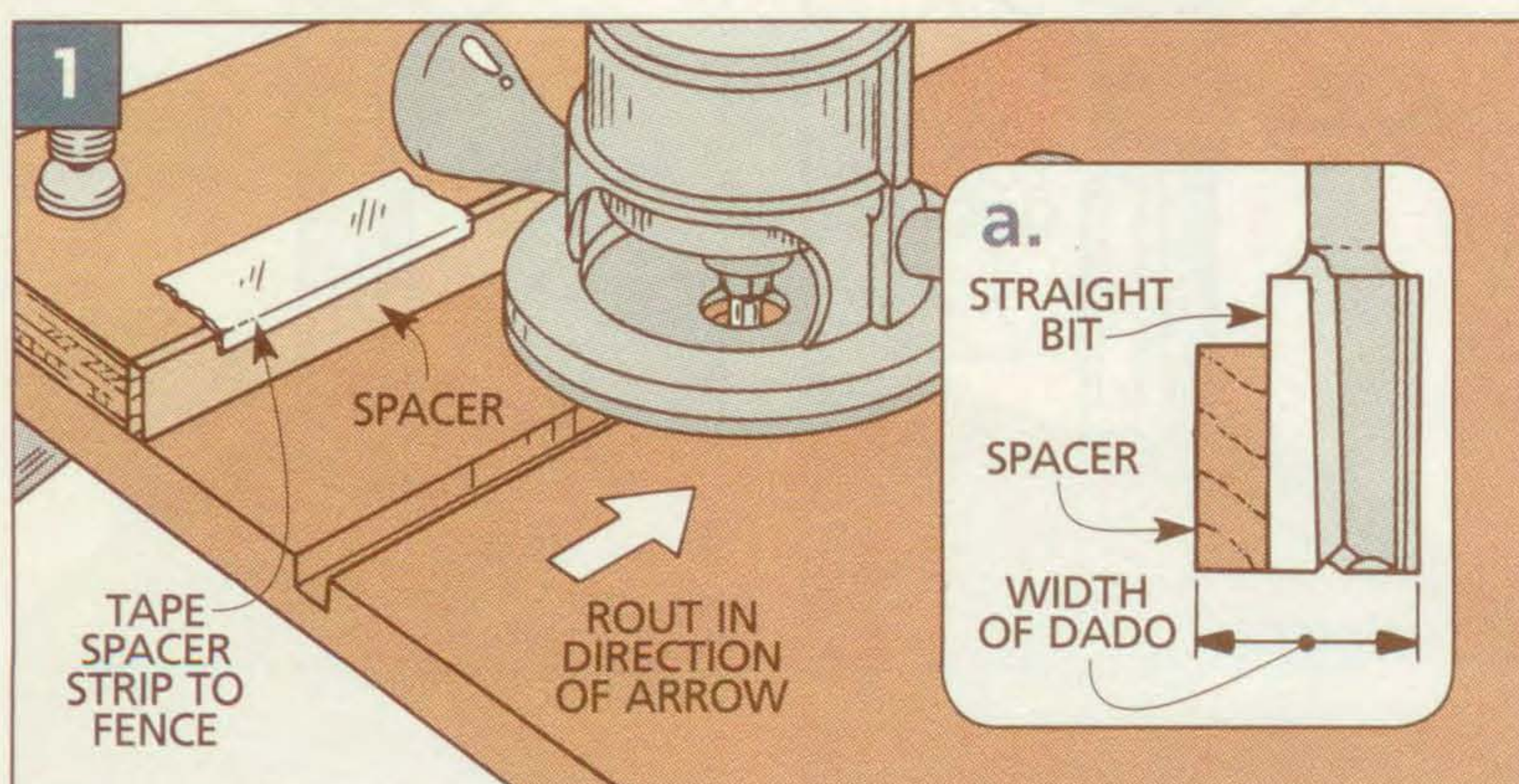
Wedge the Router Base – The solution was a 15° wedge for the base of my router. To ensure a stable base, the wedge has to be wide enough to reach the outside edges of the router (see detail). I removed the base plate and used it as a template when drilling the mounting holes. To ensure an even chamfer, make sure to keep the wedge parallel to the edge when routing.



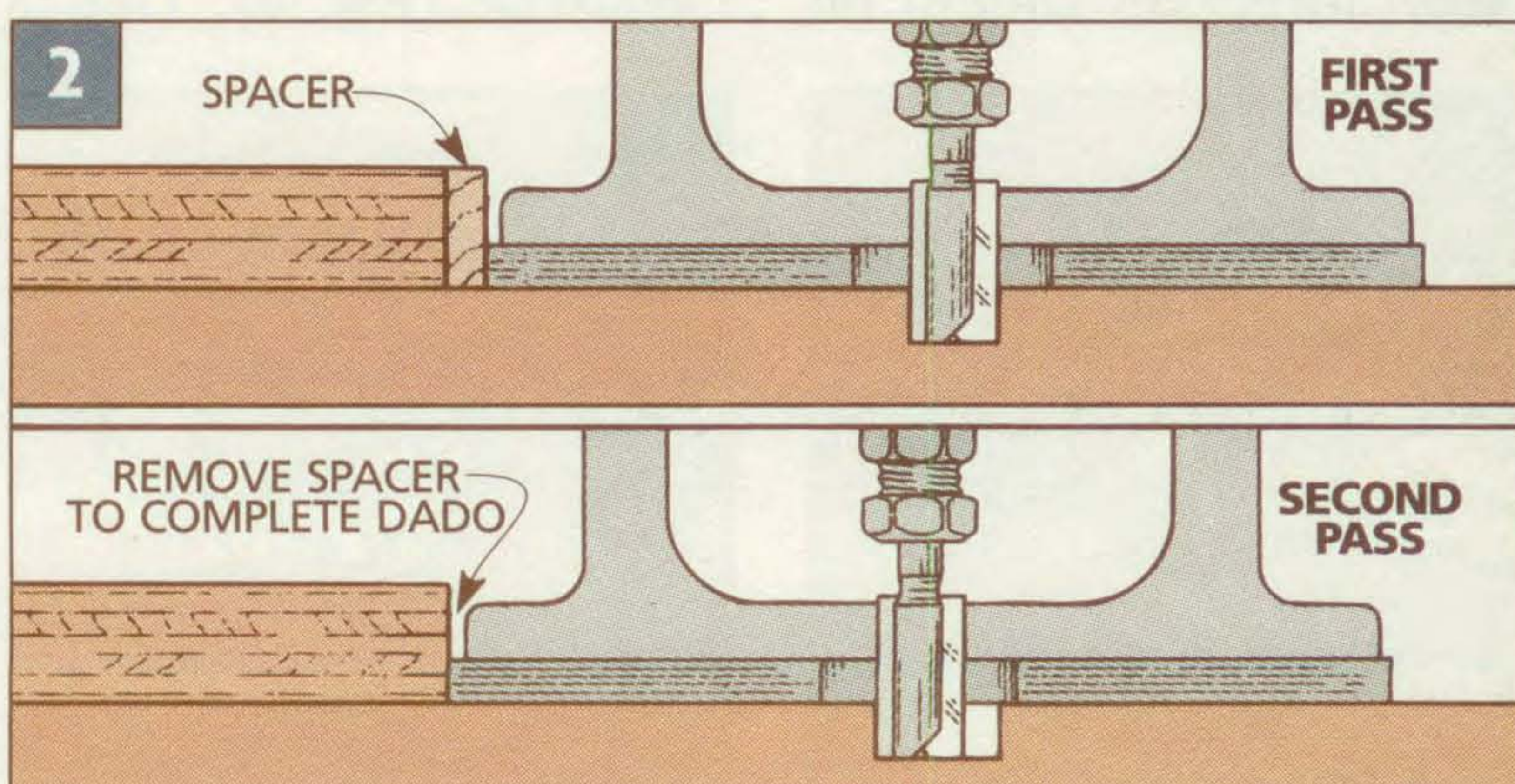
Routing Custom-Fit Dadoes

When routing a dado in a large panel, I find using a hand-held router is much easier than wrestling with a large panel on my table saw or router table.

Two Passes – Since lumber is rarely the exact same thickness as the diameter of a router bit, I use a smaller bit and make two passes.



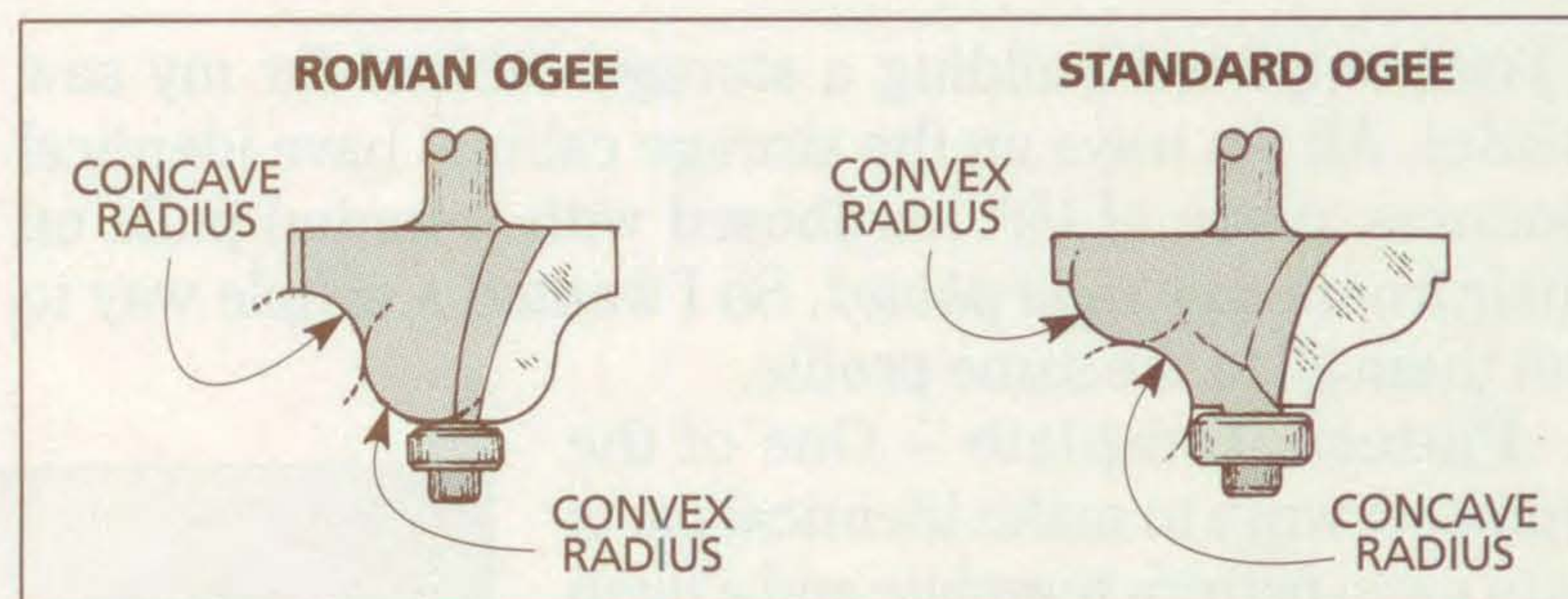
To do this, I set up a fence with a spacer strip that determines the exact finished width of the dado. The width of the strip, plus the diameter of the router bit should equal the finished width of the dado (Fig. 1a). After the first pass, remove the spacer. Then make the second pass to complete the dado (Fig. 2).



Choosing Ogee Bits

An ogee router bit is simply one that has two radii (one concave and one convex) that are the same size, which create a distinct profile. A standard ogee bit is similar to a Roman ogee, but the locations of the concave and convex curves are reversed (*see drawing*). (If an extra shoulder is added to the ogee bit it is called an ogee with a fillet.)

Either can be substituted for the other, because it doesn't affect the size of the profile, only the style.



Routing Stopped Profiles

When routing a stopped profile on an edge, it's easy to determine the end of the cut with a couple of simple stop blocks.

To make the stop blocks, clamp a block to a piece of scrap (*Fig. 1*). Then rout the inside corner formed by the block and the scrap. Now it's

just a matter of marking the points on the finished workpiece where you want the profile to start and stop.

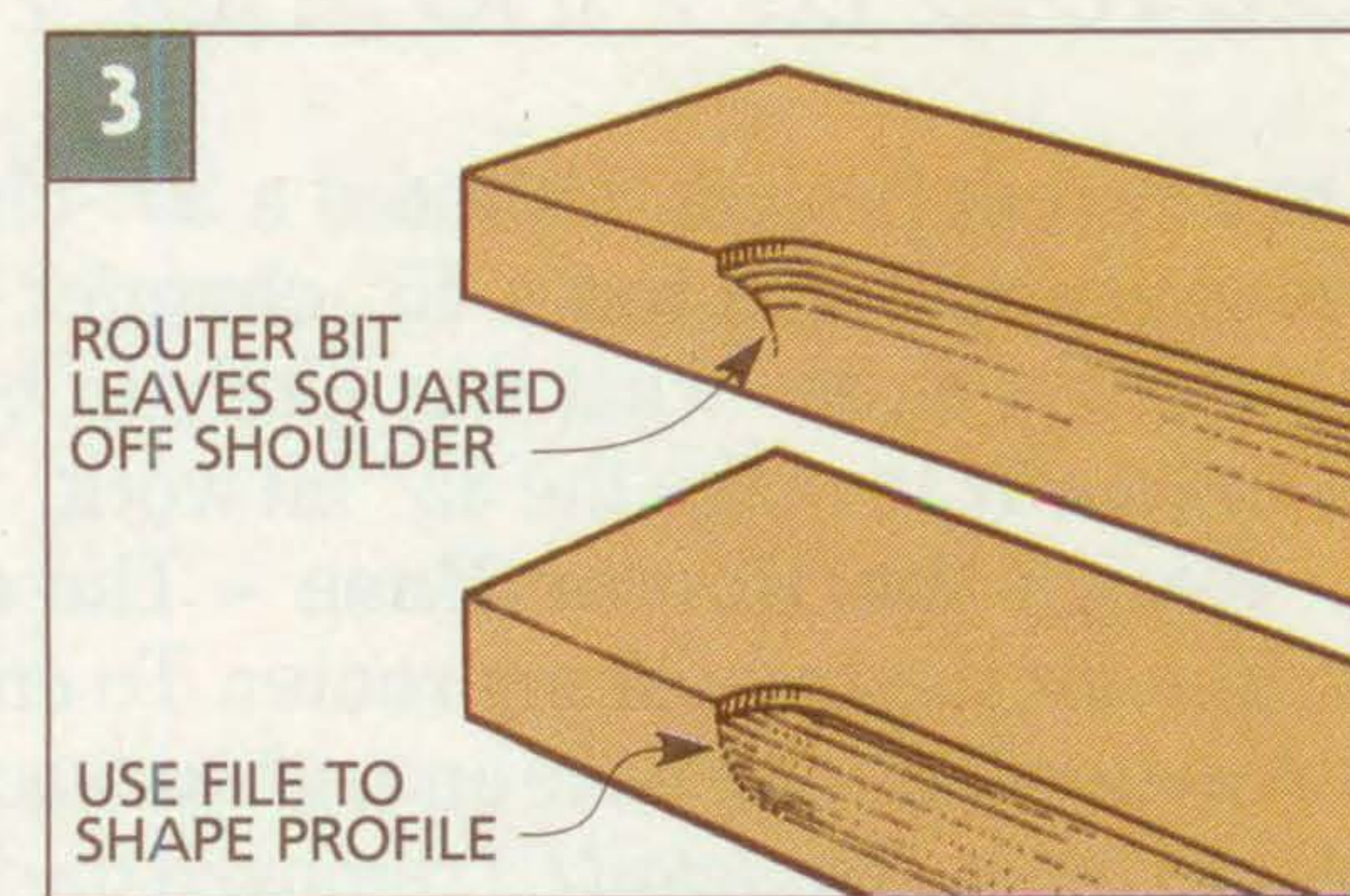
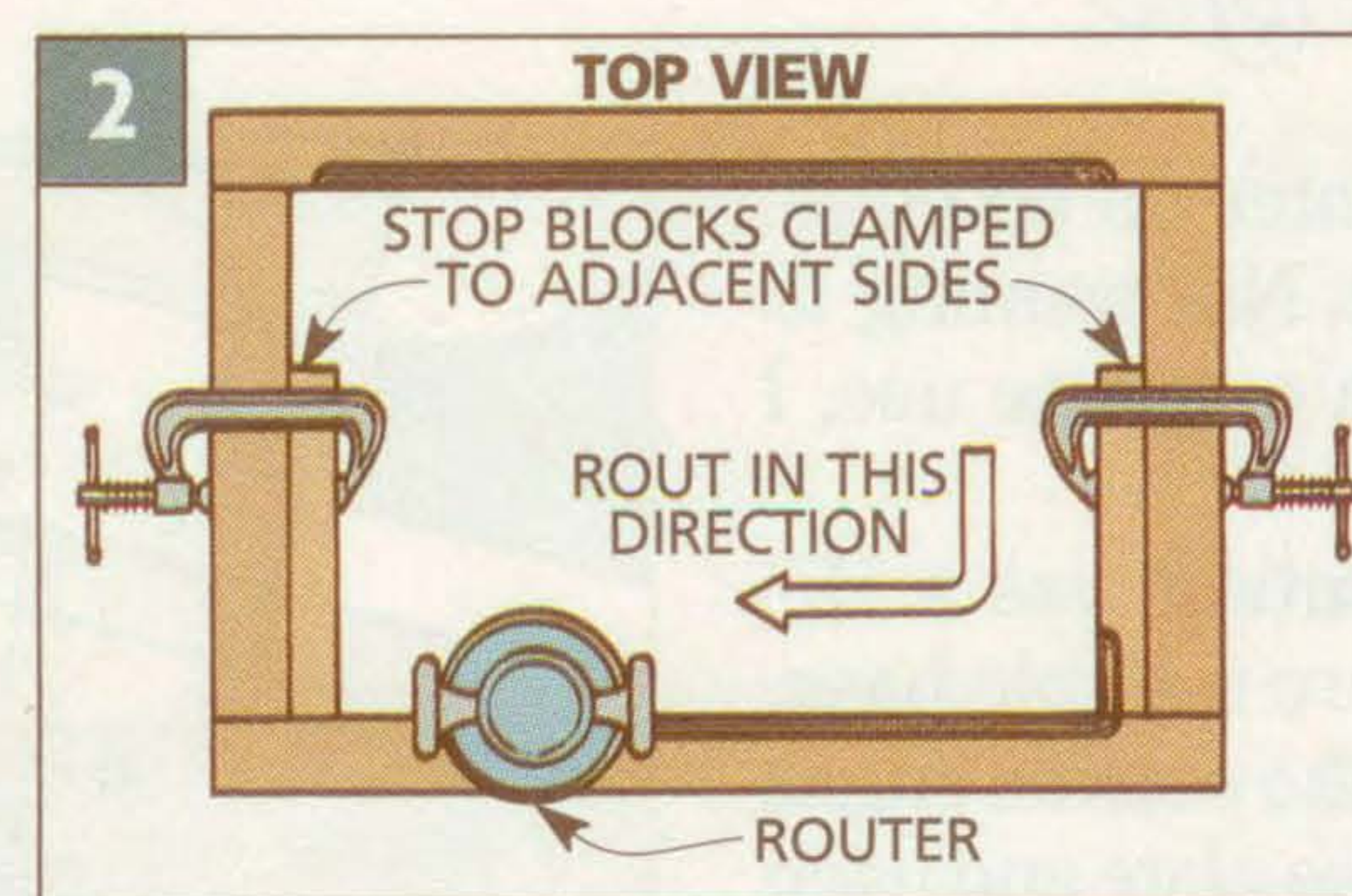
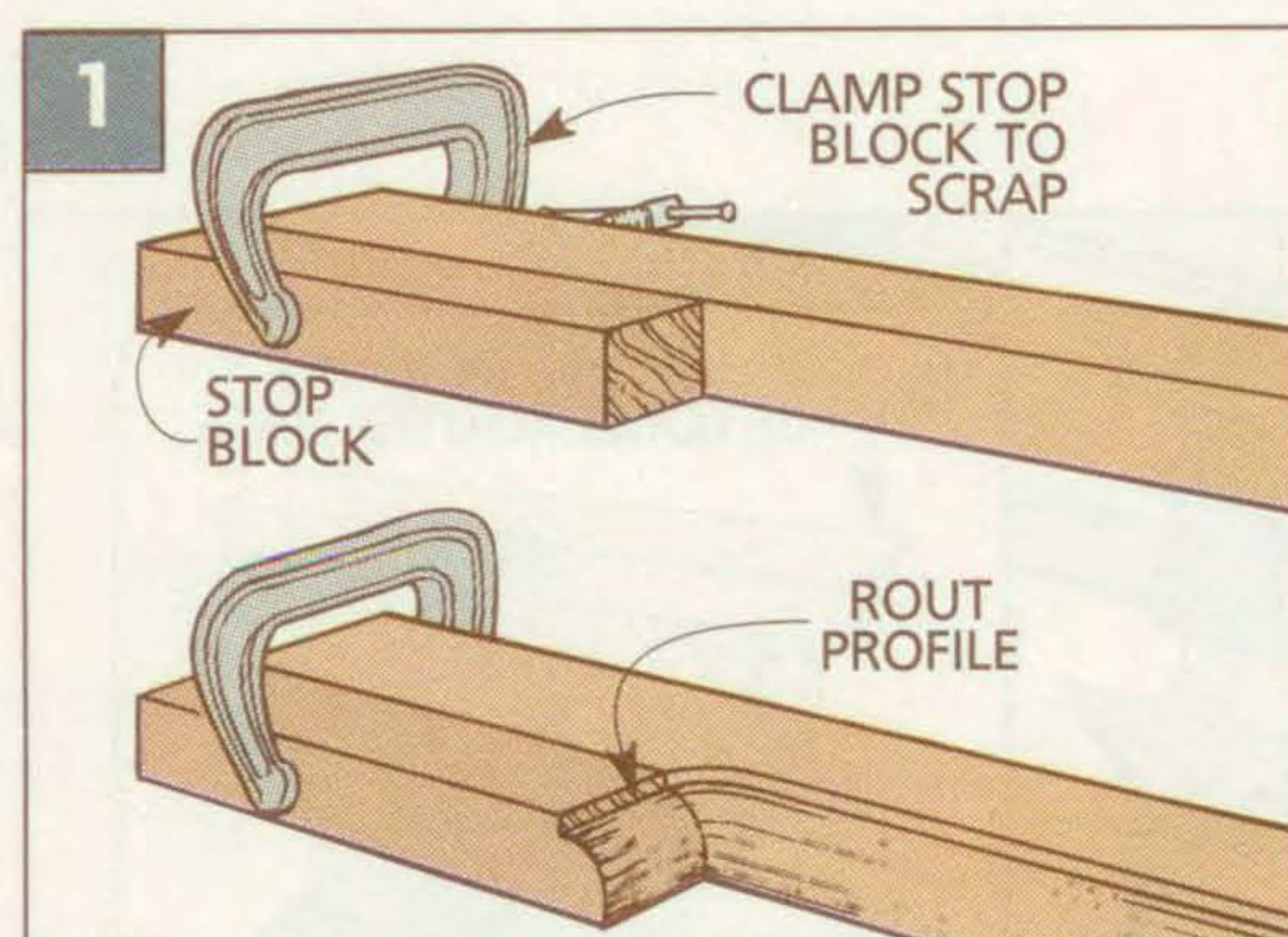
Then, by clamping a stop block next to each mark, you can stop the cuts at the correct position.

To make the stopped cuts on the inside edge of a small frame or box, you may need to trim each stop block

to width so the profile routed on it lines up with the mark (*Fig. 2*).

After routing the edges, there is still some hand work to be done.

At both the start and the stop points, the bit leaves a squared-off shoulder (*Fig. 3*). Round this shoulder with a file and sandpaper to match the rest of the profile.



Routing Direction

If you're cutting a circle from a larger workpiece using a trammel, it doesn't matter which direction you rout. Since the bit is surrounded by stock, the cut is always backed up and won't chip out (*Figs. 1 and 2*).

When routing an outside edge, direction should be

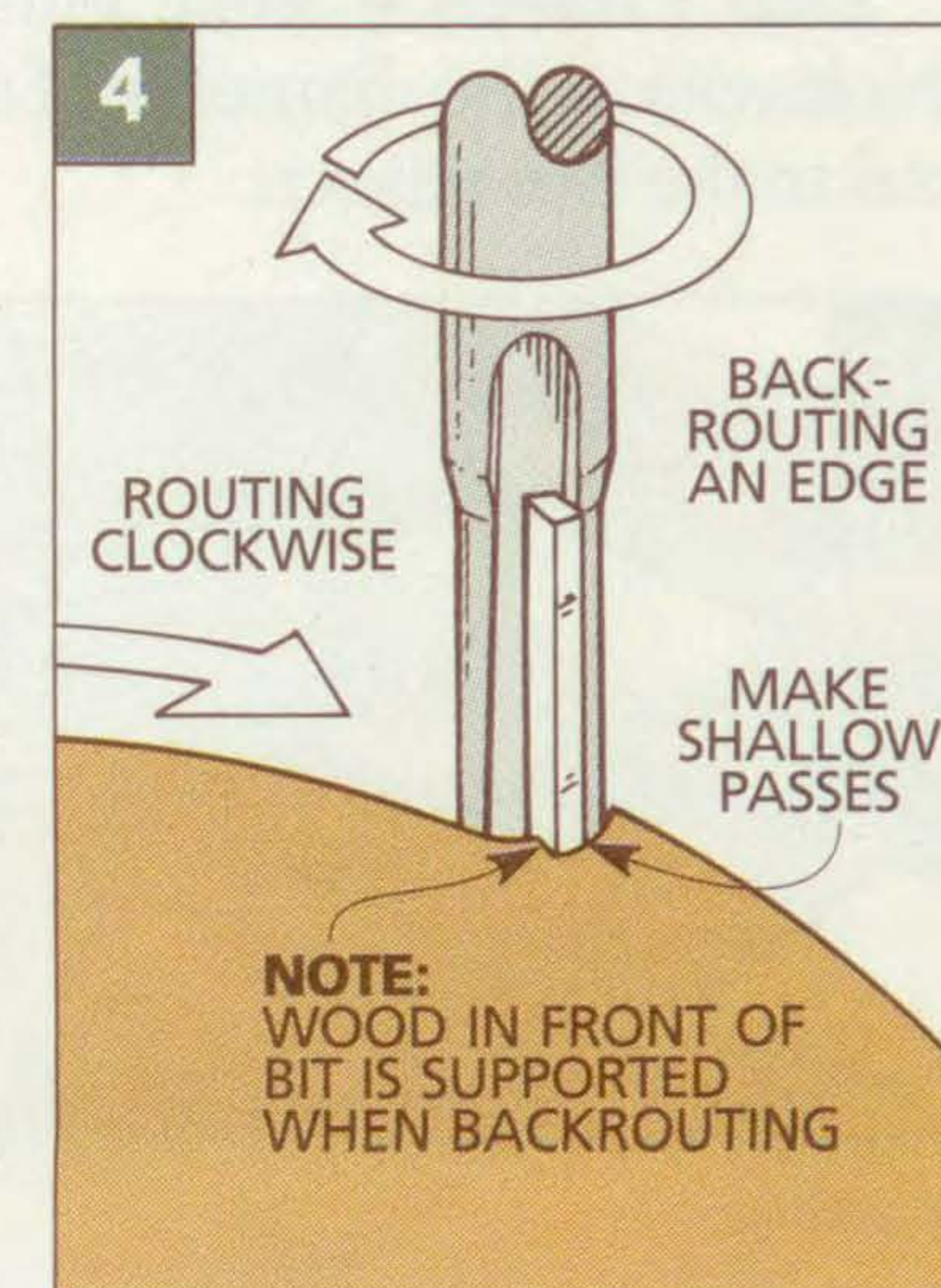
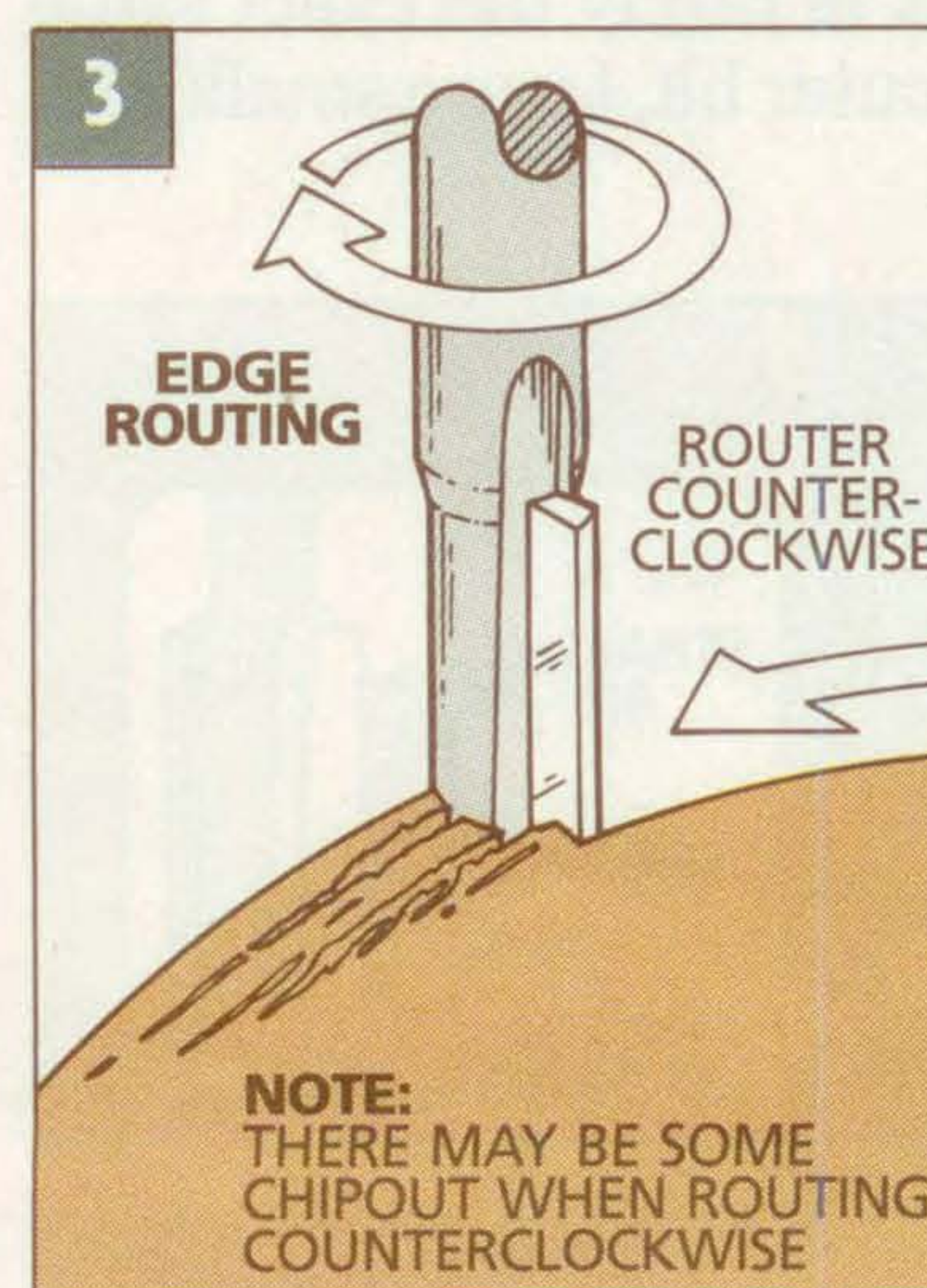
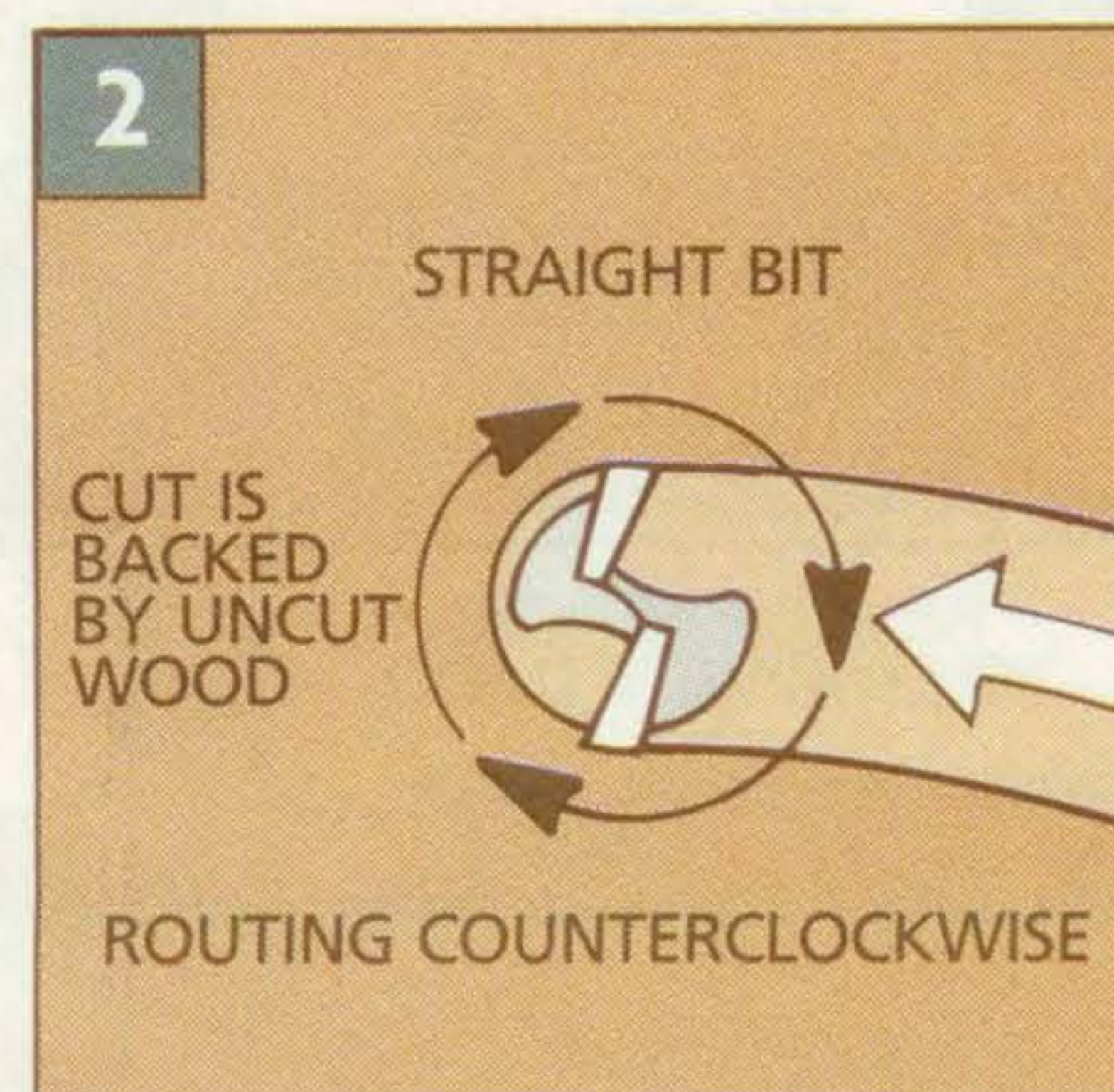
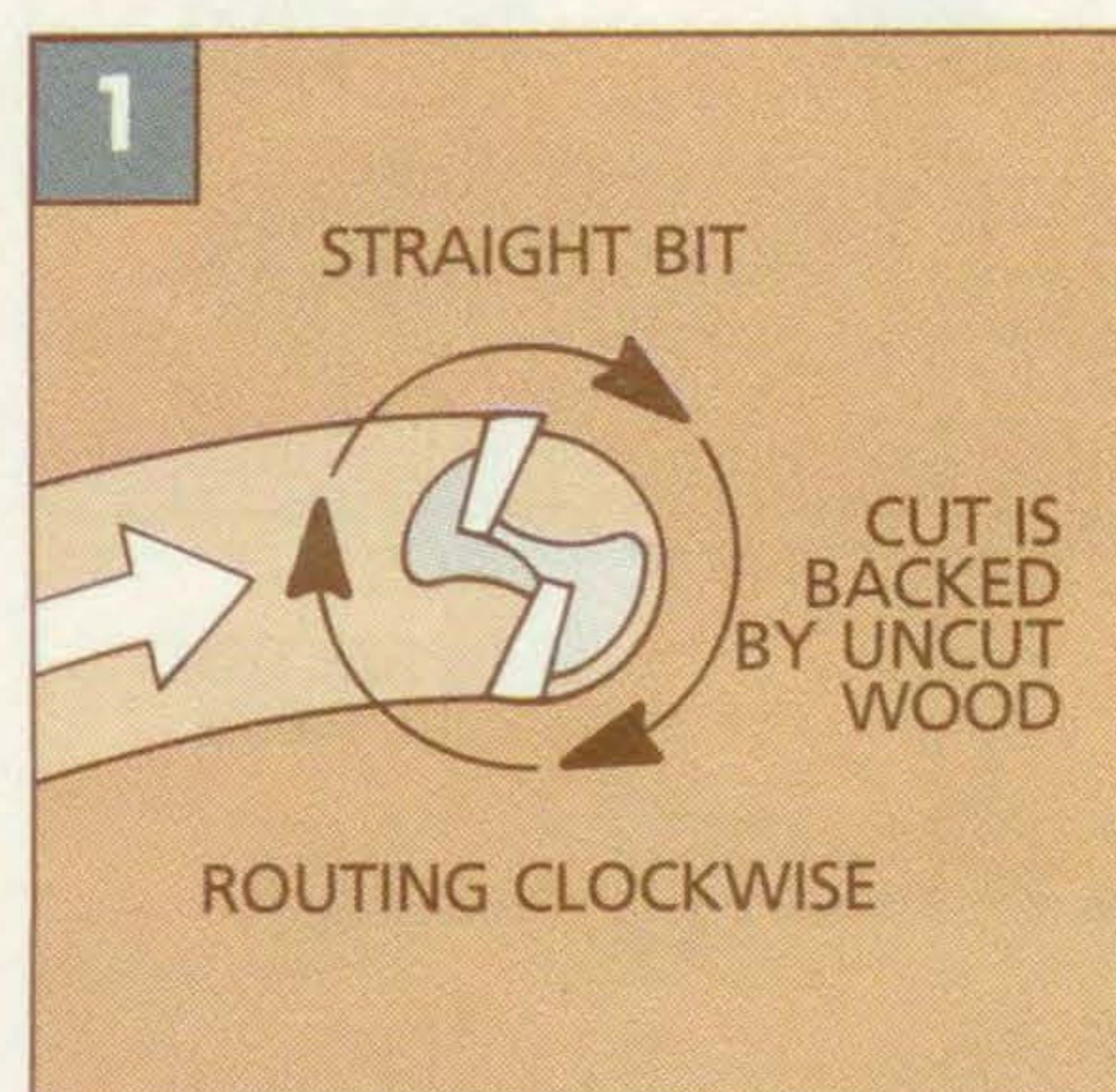
a consideration. Typically, you would run the trammel in a counterclockwise direction (*Fig. 3*). This gives you the best control. But the cut isn't backed up, so it may chip out.

A way to get around this is to move the trammel clockwise (*Fig. 4*). This is

called "backrouting" and it can be tricky to do free-hand, as the router wants to bounce along the edge. But with a trammel, the tool is anchored and you

have more control.

The rotation of the bit will still cause the router to want to pull itself along. So keep a firm grip on it and make shallow passes.



Dovetail Depth Gauge

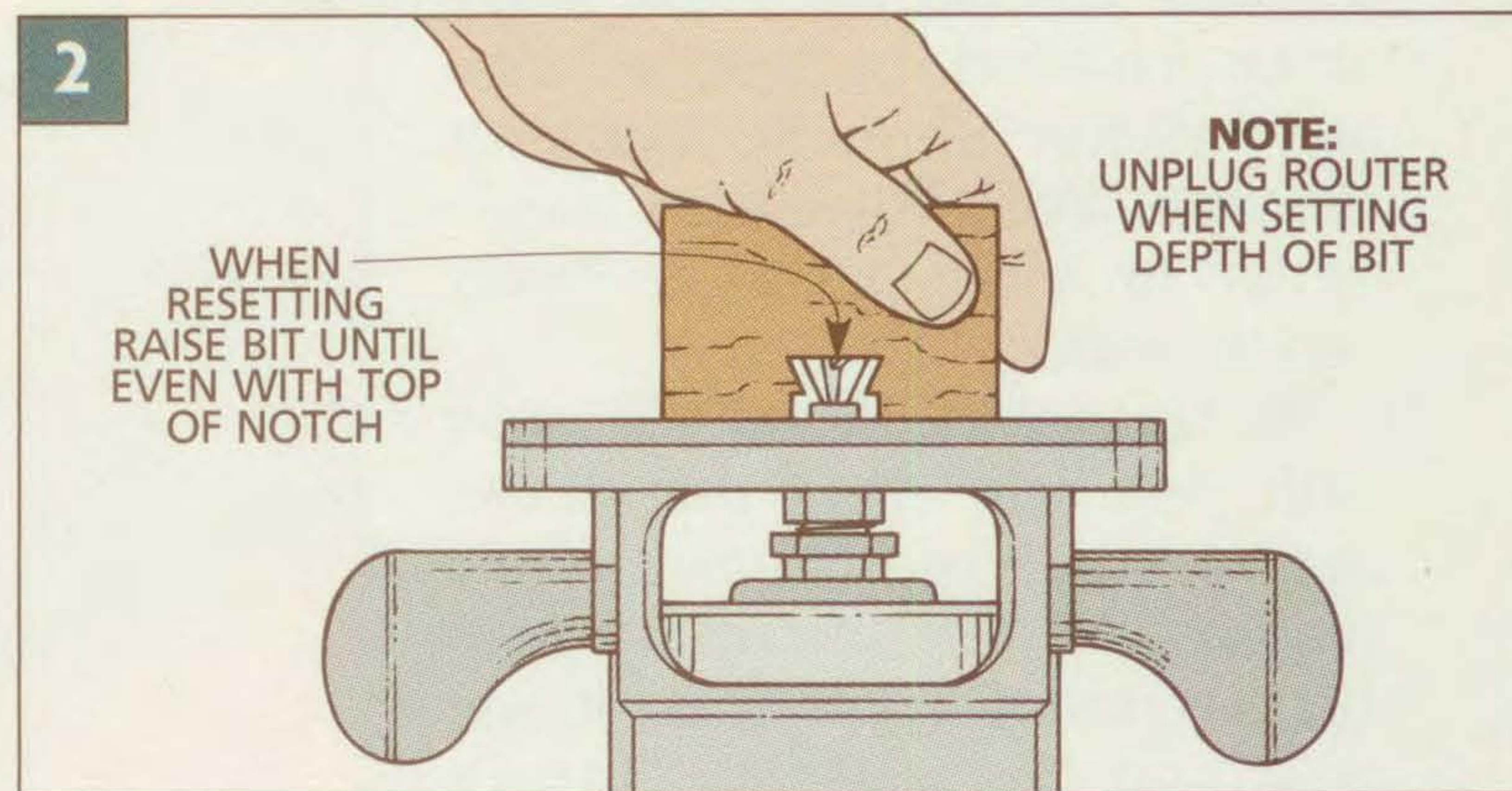
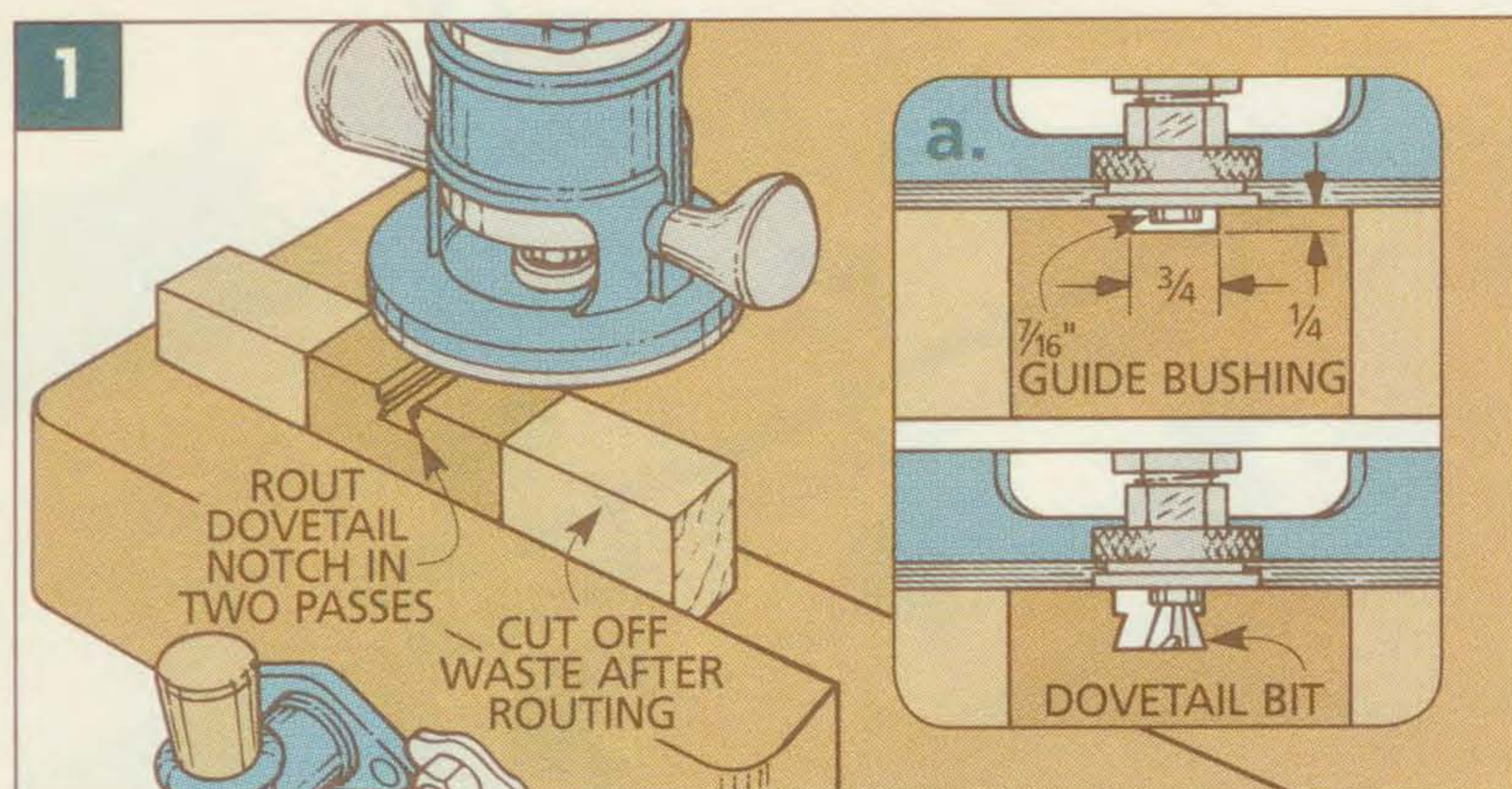
Once you have the bit set to cut a nice, tight dovetail joint, it's worth taking a few minutes to make a simple depth-setting gauge. Then you can easily reset the bit the next time you want to cut dovetails.

To make the gauge, start with a long piece of scrap that you cut to length later (Fig. 1). To provide clearance for the guide bushing, use a straight bit to cut a $\frac{3}{4}$ "-wide dado

across the width of the block (Fig. 1a).

Next, clamp the piece in a vise and rout an oversized dovetail-shaped notch across it (Figs. 1 and 1b). To do this, run the bushing against the left shoulder of the dado and then back out along the dado's right shoulder (Fig. 1b).

Now whenever you need to set up your router for dovetails, use the gauge to reset the height of the bit (Fig. 2).



Using a Rub Arm for Raised Panels

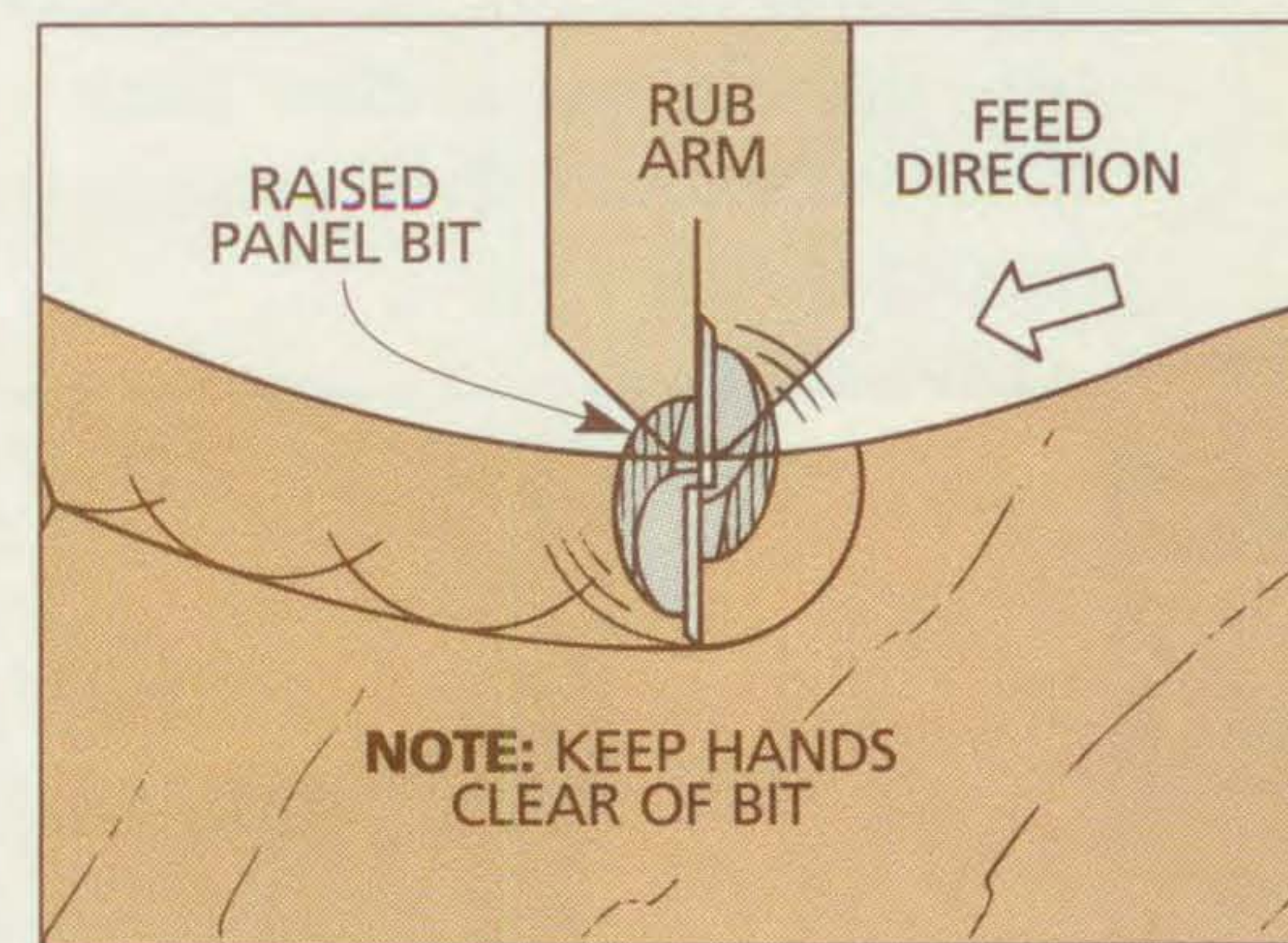
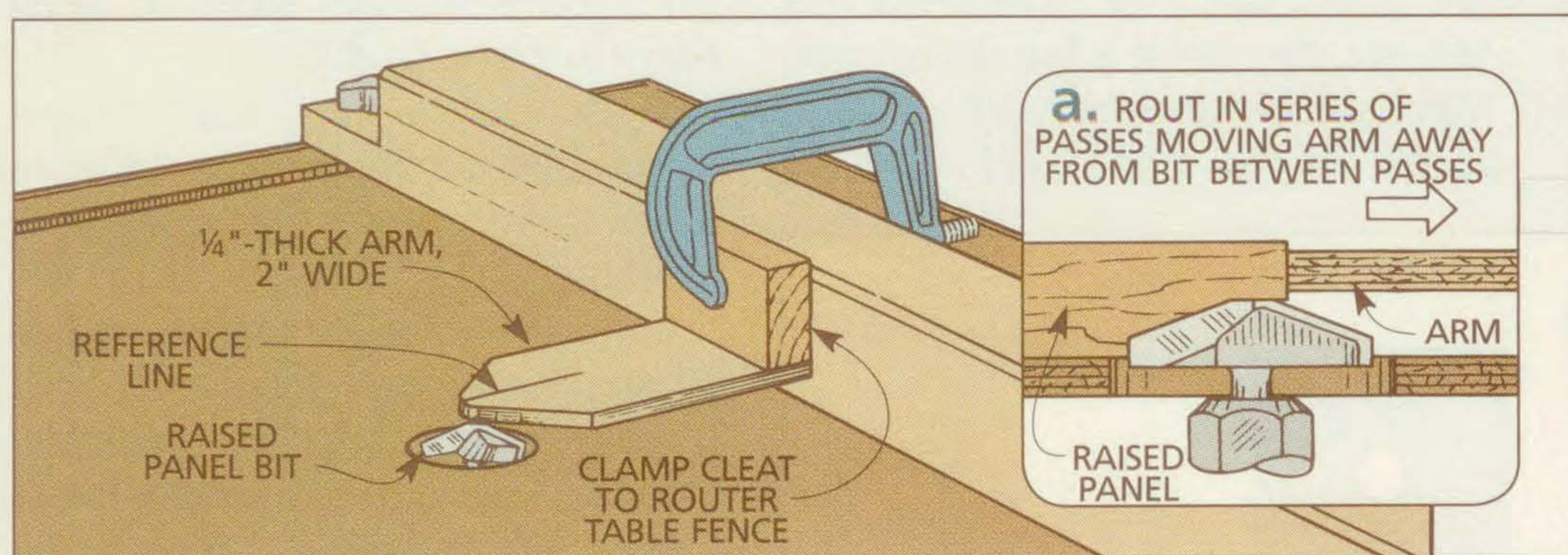
Cutting arched raised panels is often done with an expensive router bit with bearings that follow the arch.

However, a less expensive bit is available that doesn't have a bearing.

It's called a raised panel bit (Fig. 1).

When routing the arched top edges of a panel, you'll need to add a rub arm and position it over the top of the bit (Figs. 1 and 1a).

To rout this edge, first draw a reference line on top of the rub arm. Then, to maintain a consistent width, move the workpiece so the edge is always perpendicular to that line (Fig. 2).

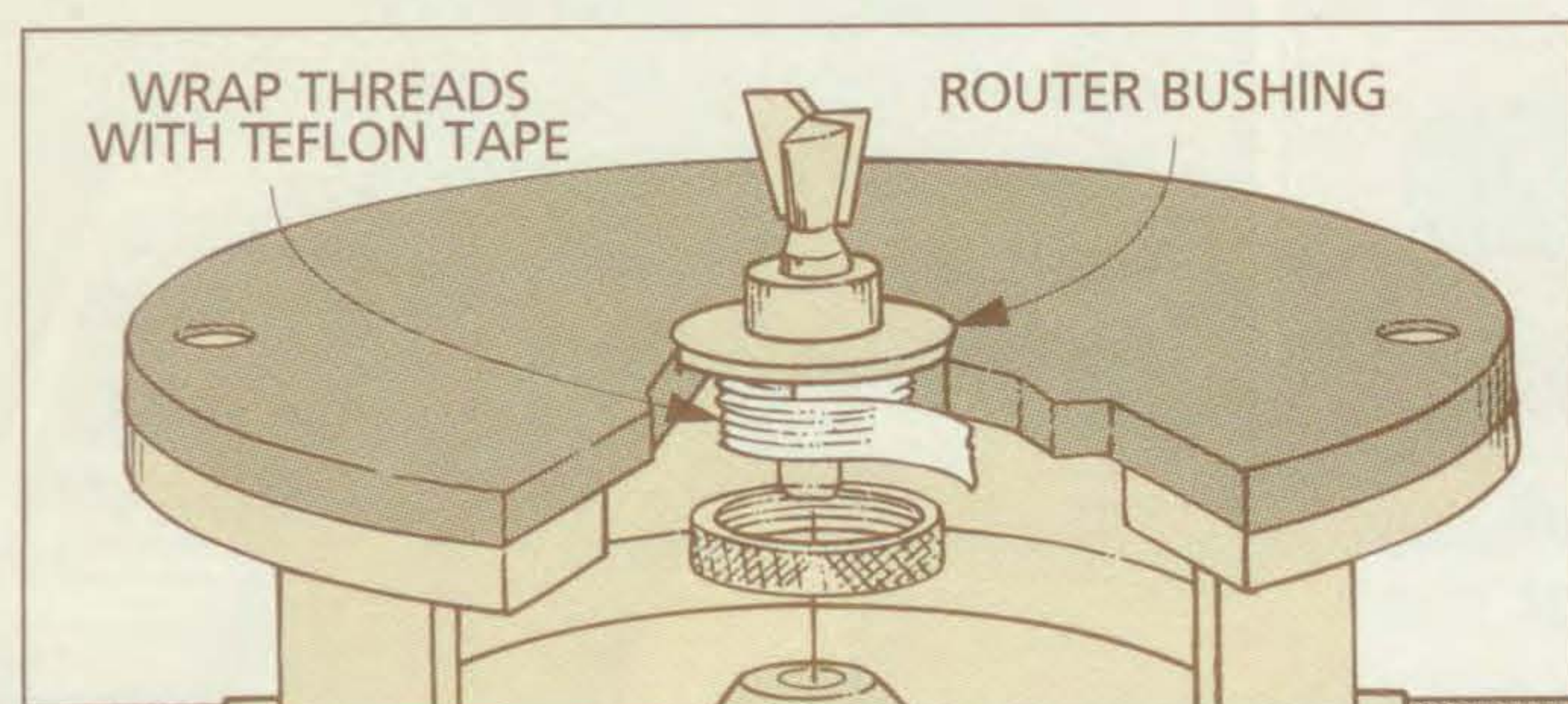


Router Bushing Thread Lock

When I'm routing dovetails or following a template, I use a guide bushing on the base plate of my router (see drawing). But sometimes

I have a problem with the threads of the bushing working loose due to the vibration of the router.

To solve this problem, I use a simple fix. Before installing the bushing on my router base, I wrap the male threads of the bushing with Teflon tape (the kind used with threaded pipe connections). The tape prevents the threads from vibrating loose.



Shop Tip

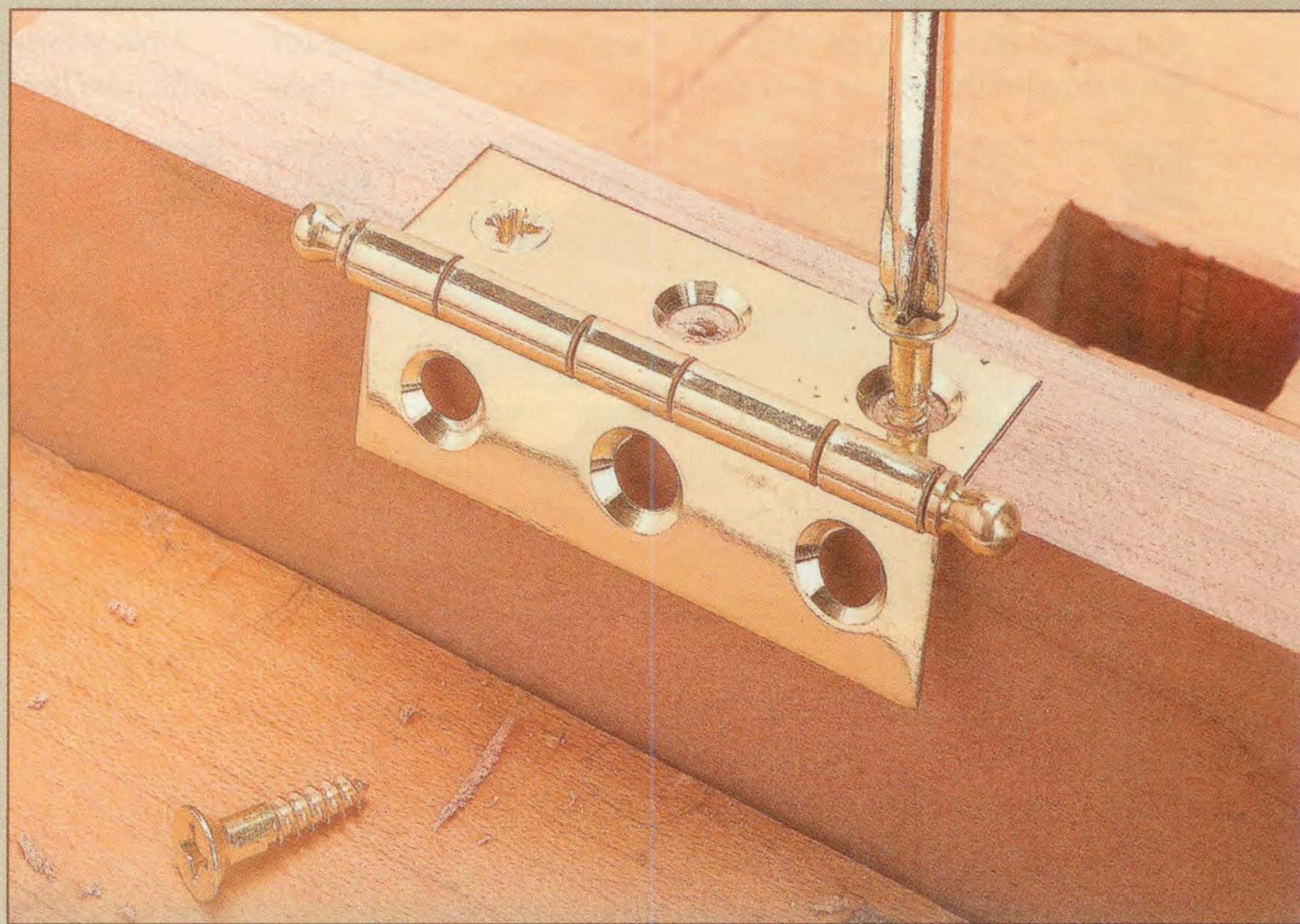
Burn Marks – It's easy to leave nasty burn marks when routing a profile onto the edge of a piece of cherry. And sanding a routed profile is tough. I find that it's easier to remove burn marks if you apply mineral spirits to the mark before sanding. The solvent penetrates the glazed area, and after a few minutes, you can sand it off easily.

Easy Steps for Installing Brass Screws

Installing hinges with brass screws always makes me a little nervous. Just one misplaced hinge screw can affect the fit of the hinge and therefore, the entire door. Over the years, I've learned a few simple tricks to make installing brass screws easier.

Working with Brass – To start with, let's talk about the screws themselves. When it comes to traditional hardware, that means solid brass screws. They look great, and best of all, they won't rust. But for anyone who has used brass screws, you'll know they have one big drawback — the brass is pretty soft, so it doesn't take much to strip out the head or even snap it off.

Another big problem I've discovered is that the screws that come with some hardware can be pretty wimpy. So I usually throw them out and buy better-quality screws from the hardware store or online. I've found that high-quality screws are quite a bit beefier than regular screws and they usually have deeper threads.

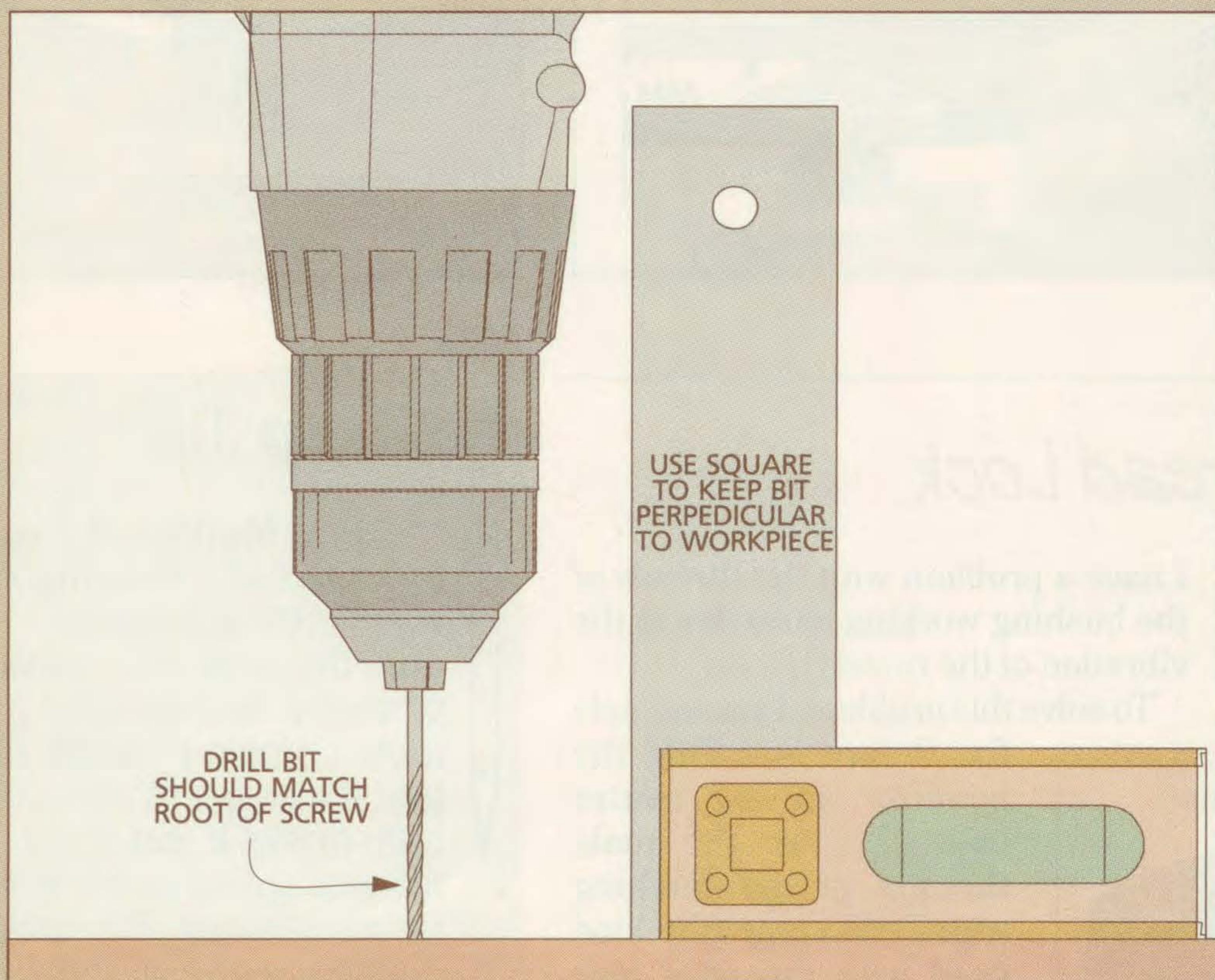


Although slotted screws look more traditional, they're harder to keep in good shape. If you do use them, the type of screwdriver you use can make a big difference. Mechanic's screwdrivers (shown at left in the photo below) have

tapered sides, which can lift out of the slot. Instead, you should look for "cabinetmaker's" screwdrivers. They have parallel sides to keep them in place (right).

If the screw head isn't critical to the look of the project, I like to swap them out for easier-to-drive Phillips-head screws.

Laying Out Pilot Holes – Once I have the type of screw selected, the next step is to lay out the screw location. To do this, I always try to use the hinge itself. Even a slightly off-center hole can pull a hinge out of alignment. So, after laying out the hole, you'll need to make sure the drill bit stays on course. There are two ways to do this. One is to dimple the workpiece with an awl. This gives the bit a place to start. Or you could use a self-centering



▲ **Straight Shooting.** For the best fit, the screw needs a perfectly perpendicular pilot hole. Sighting against a small square keeps the bit straight and on target.

► A straight-sided screwdriver (right) is less likely to slip out of the slot than the tapered screwdriver (left).



bit. (These bits are known as Vix bits, but that's another story.)

Picking the Right Bit – Next, you'll need to select the right bit for the pilot hole. I usually pick a bit that's the exactly same size or slightly larger than the root of the screw. This makes driving the screw easy, but still gives the threads plenty to bite into.

When drilling the pilot hole, it's important to keep the bit square to the workpiece. To do this, I use a try square to align the drill, as in the drawing on the opposite page.

Don't worry if, despite all your best efforts, the pilot hole goes off course, there's a simple solution to

this problem. Just take a look at the Shop Tip box below.

A Good Hardware Fit – The hinge itself plays a big role in the fit of the screws. On some hinges, the countersink doesn't match the angle on the screw head. Although it may not seem like much, the difference is enough to prevent the screw from seating properly. This can keep the hinge from closing.

Weldon Countersink – To solve this problem, I use a Weldon countersink to rebore the countersinks in the hinge, as you can see in the photo below left. A Weldon countersink has a single cutting edge that leaves a smooth surface in

soft metals and wood.

Start with Steel – Oftentimes, I'll need to install and remove the hinges several times when fitting doors. To avoid damaging the heads of the brass screws, I've come up with a little trick to avoid having this happen. Instead of using the brass screws, I'll use steel screws for this process, as you can see in the photo below right.

Help Driving the Screw – At last, you're ready to drive the screws in place. To make this easier to do, lubricate the screws with a chunk of wax. You'll end up with a hinge in the right place, fastened tightly, and looking its very best.



Steel screws can take the place of soft brass screws for repeated driving and removing while fitting hinges.

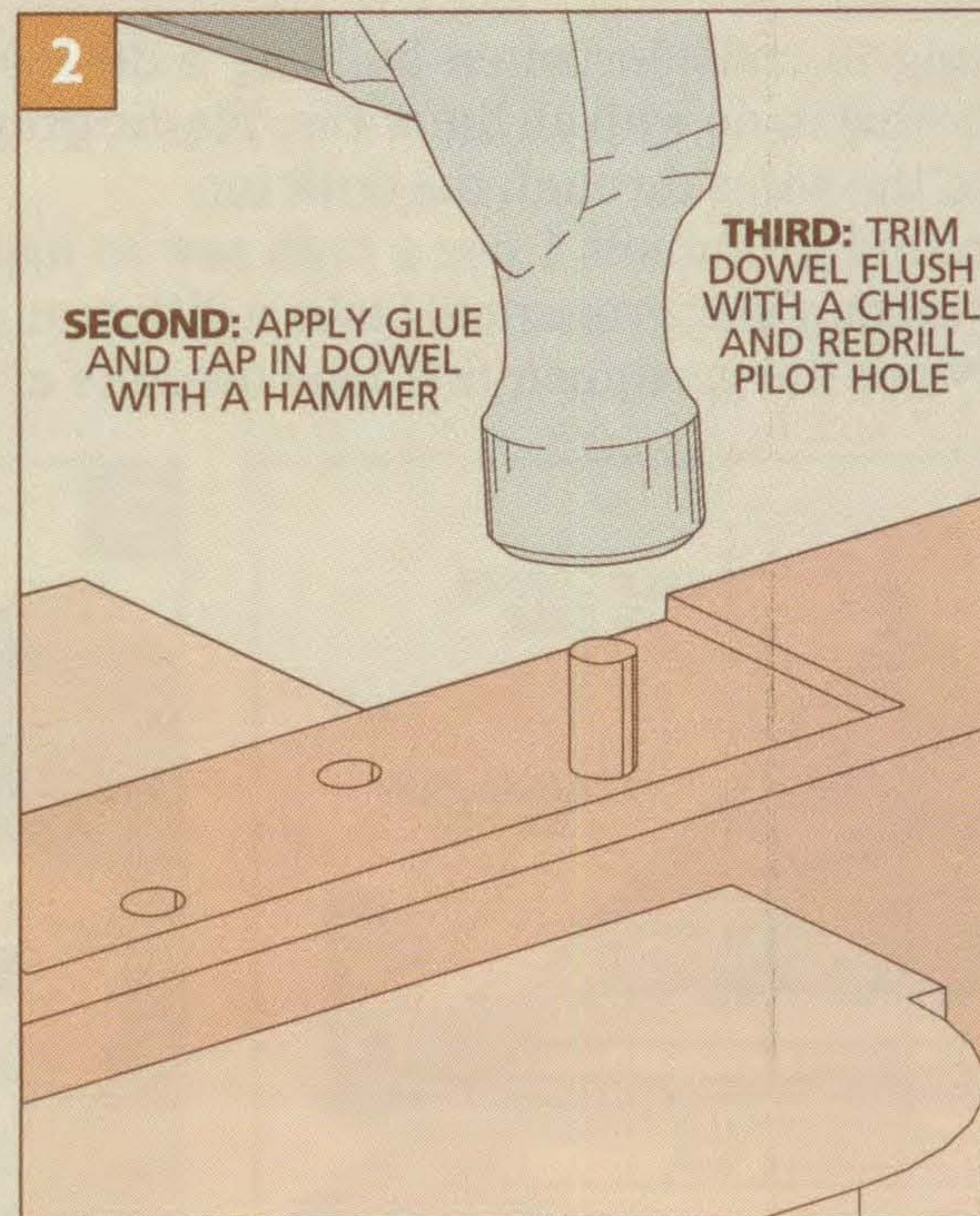
◀ A Weldon countersink makes quick work of reboring the recess in a hinge to match the screws. A poor fit can prevent the hinge from closing fully.

Shop Tip: Adjusting Screw Holes

No matter how carefully I've marked and drilled a pilot hole, sometimes one still ends up in the wrong place. When that happens, there's a simple solution that will take care of the problem — invisibly.

First, I drill out the pilot hole with a 1/4"-dia. twist bit (Fig. 1). Then I apply some glue to a matching dowel and tap it into the hole (Fig. 2).

Once the glue dries, you can trim the dowel flush with a sharp chisel. Then lay out and drill a new pilot hole. Best of all, after you screw the hinge in place, it covers up any evidence of the repair.



Installing Inset Hinges

Inset hinges can be more frustrating to install than ordinary butt hinges. When the door is closed, both leaves of the hinge are inside the cabinet. This makes the screw holes in the hinge almost impossible to reach.

Luckily, when you use inset hinges on a cabinet with glass doors, it's easy to solve this problem. I install them before the glass panes are in place.

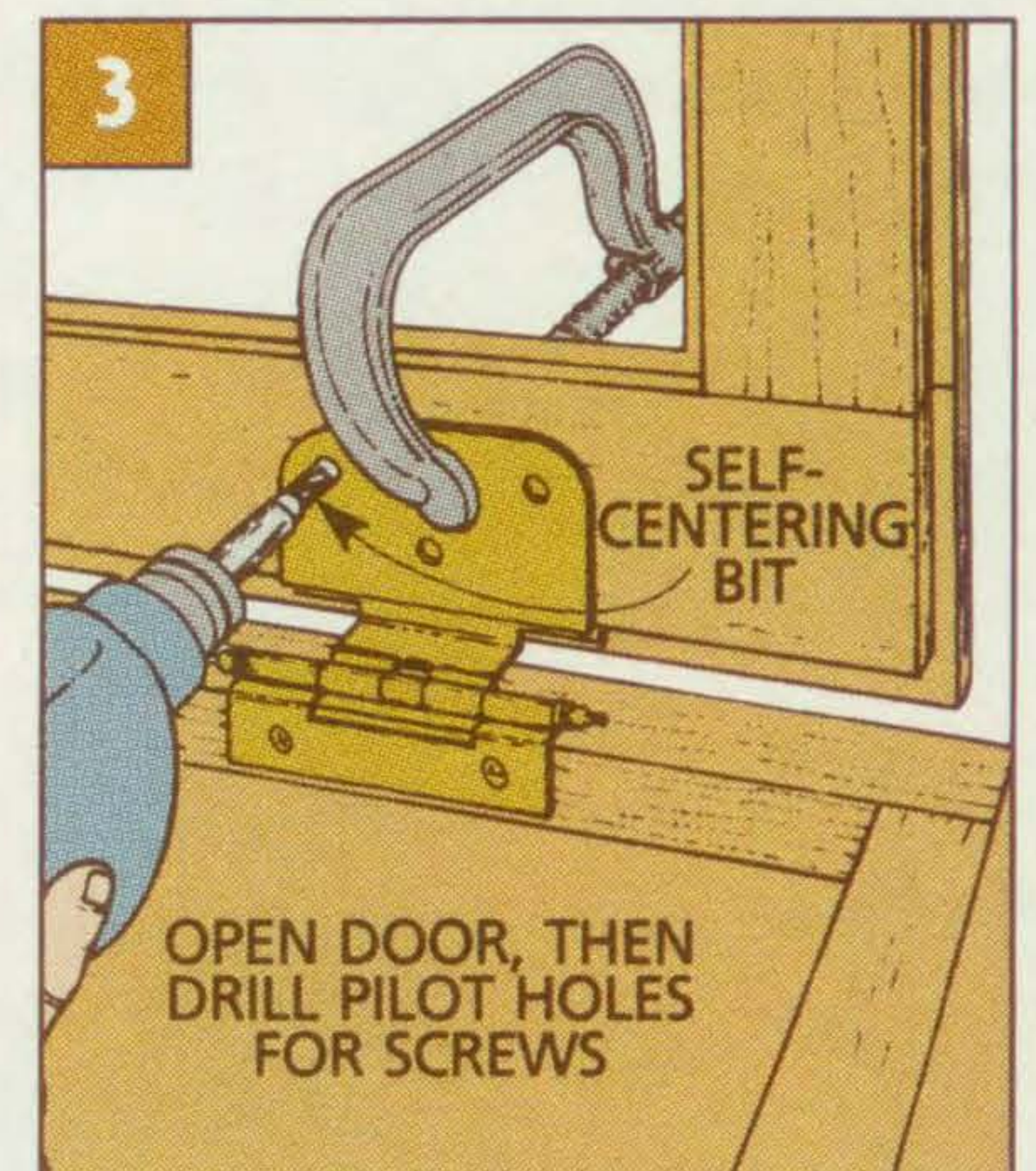
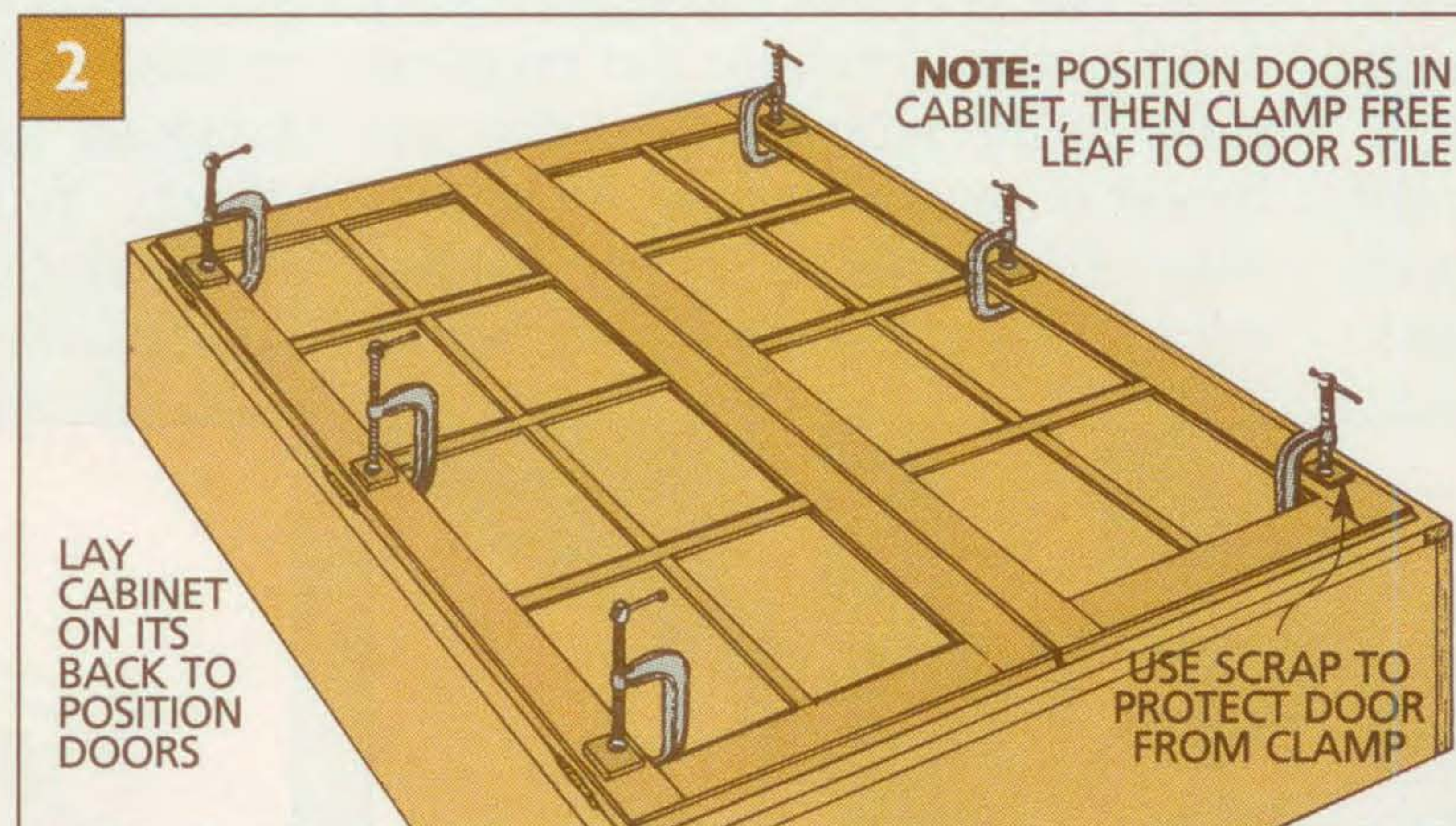
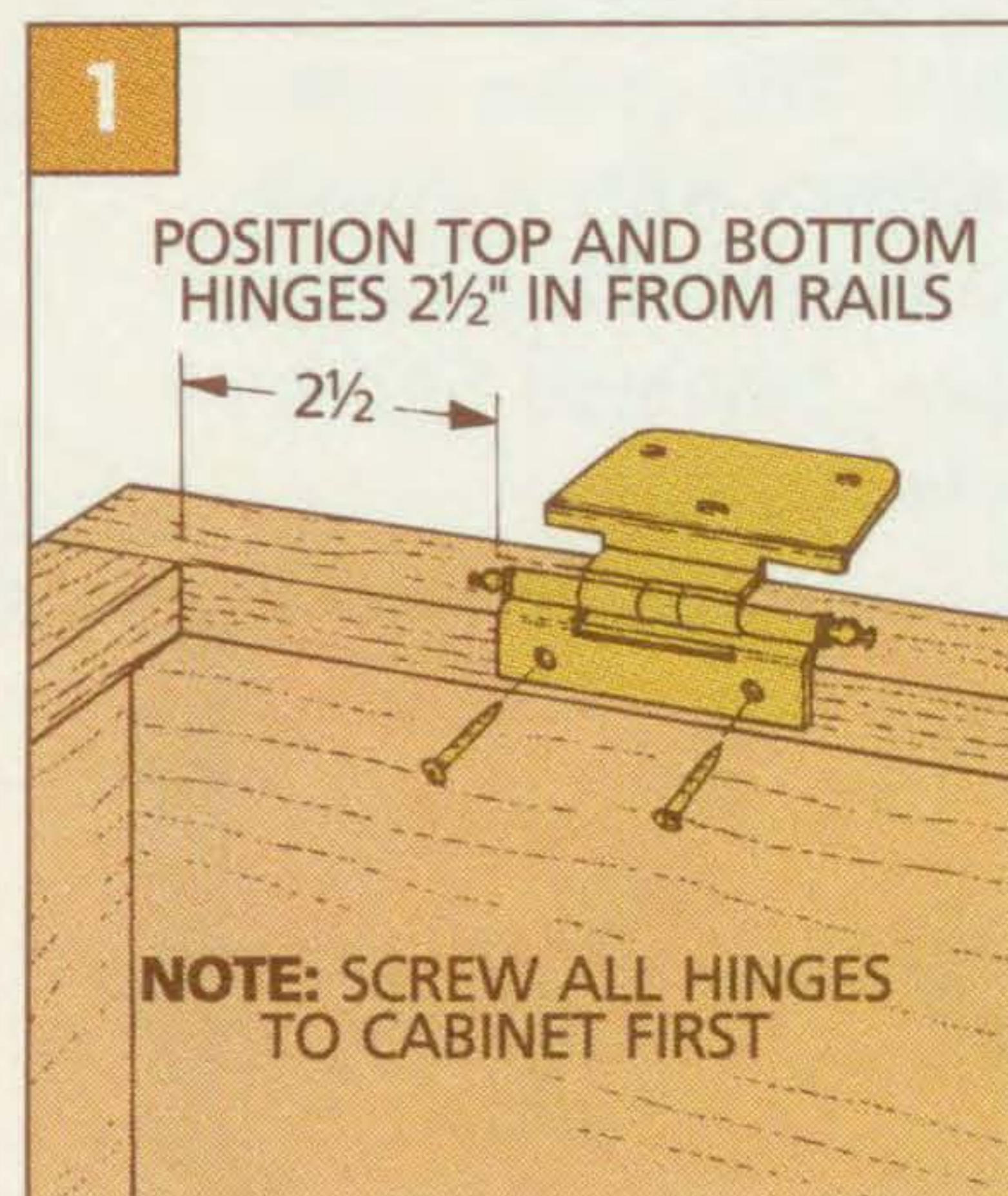
To do this, first screw all the hinges to the cabinet frame (Fig. 1). Now lay the cabinet on its back, and put the doors

in the opening centered up and down and also left to right.

Then clamp the free leaf of each hinge to the door stile through the opening where the glass will be (Fig. 2).

With a C-clamp on each hinge, open the door and drill pilot holes for the screws (Fig. 3). (I use a self-centering drill bit.) Then, screw in the screws and remove the clamps to check the fit.

Now, the screws should be removed and then reinstalled later, after the glass is in place.

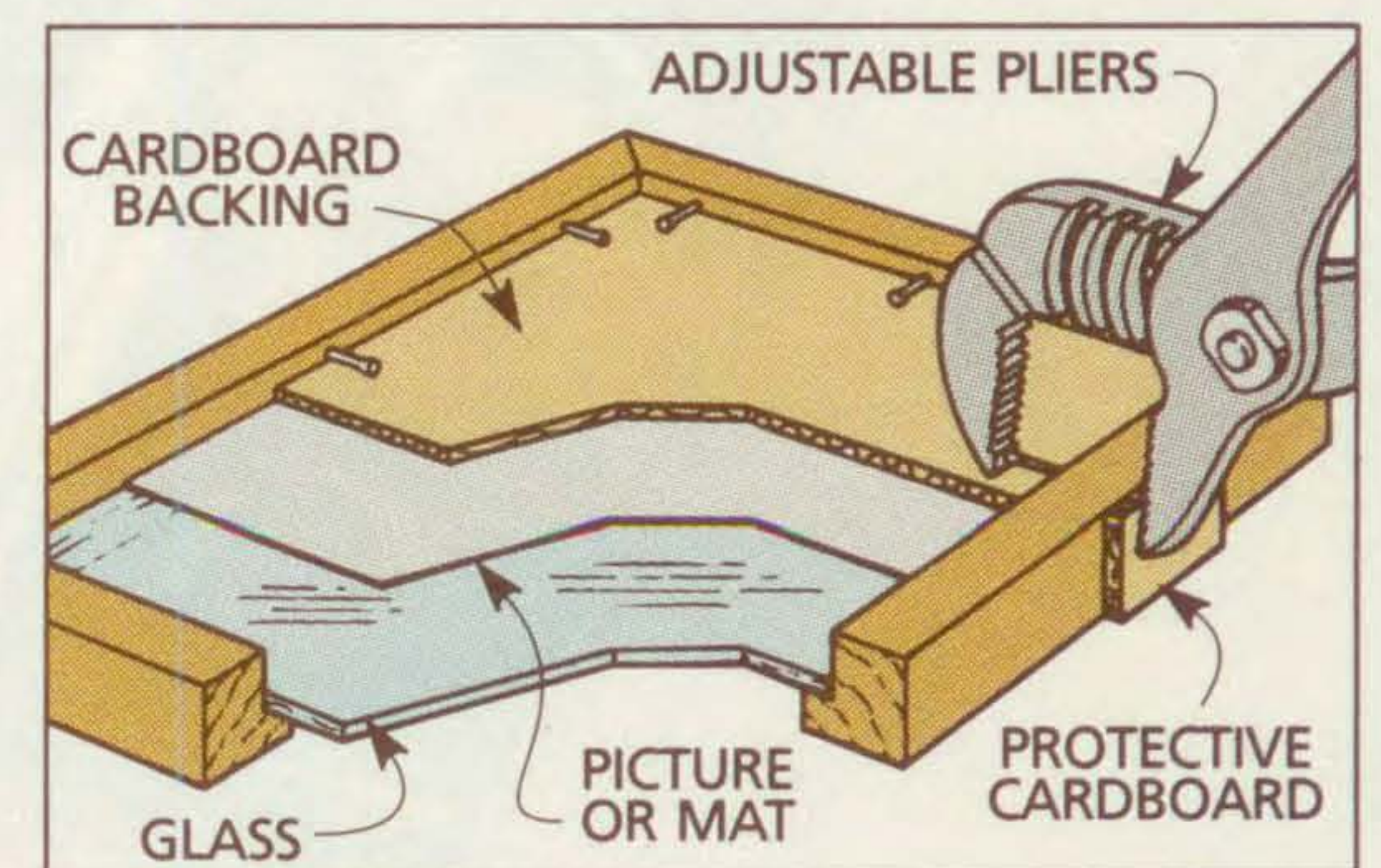


Installing Brads

One way to mount the glass, picture, and mat in a picture frame is to use ½" brads to hold everything securely behind the backing. A great method for doing this is to use a pair of adjustable pliers (see drawing).

Just set the opening width of the

pliers to fit around the frame and brad, and squeeze the brad into place. (You may need to adjust the pliers so the jaws stay parallel as the brad is driven into the frame.) To prevent marring the frame, place a piece of cardboard on the outside edge of the frame.



Installing Grommets

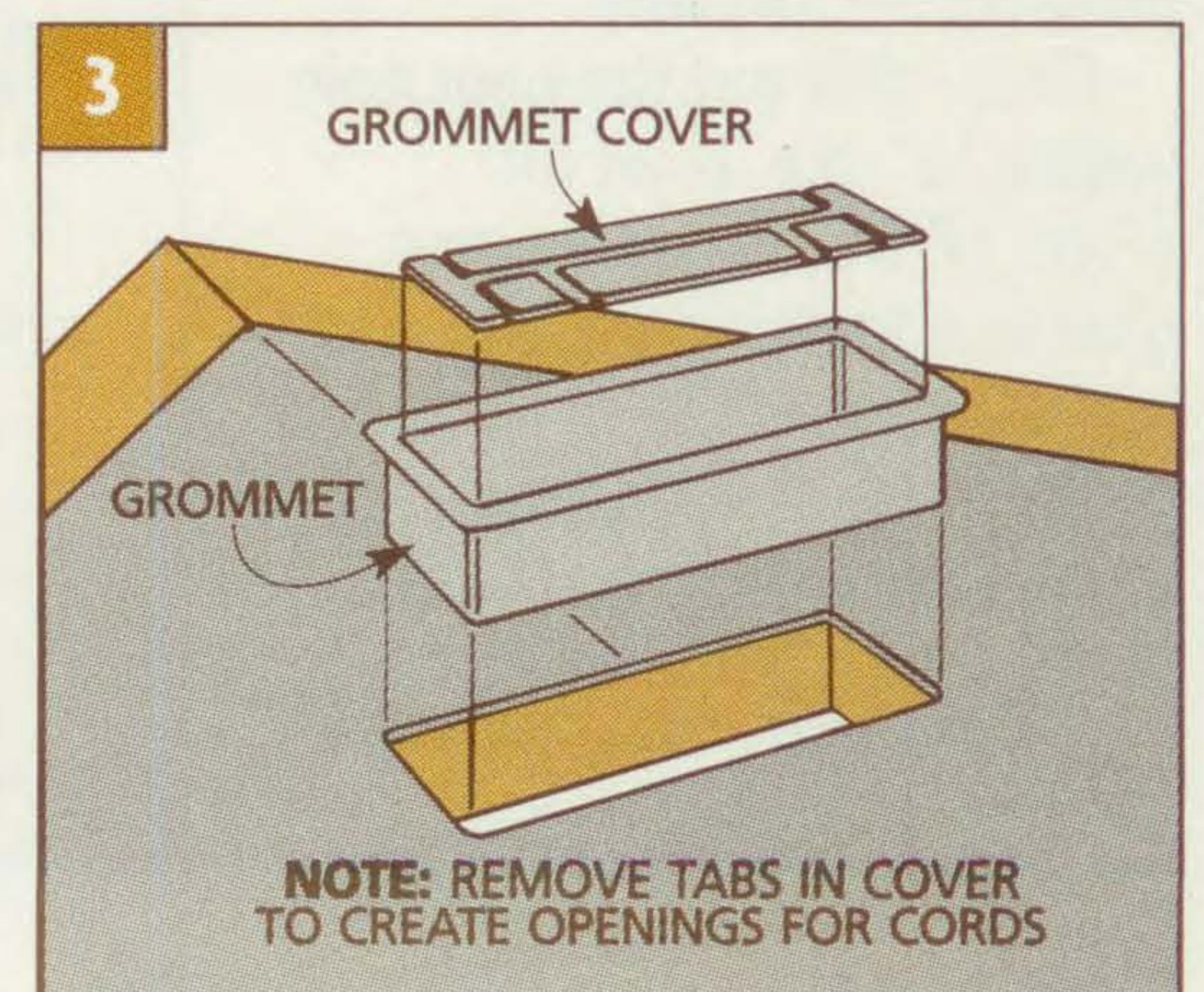
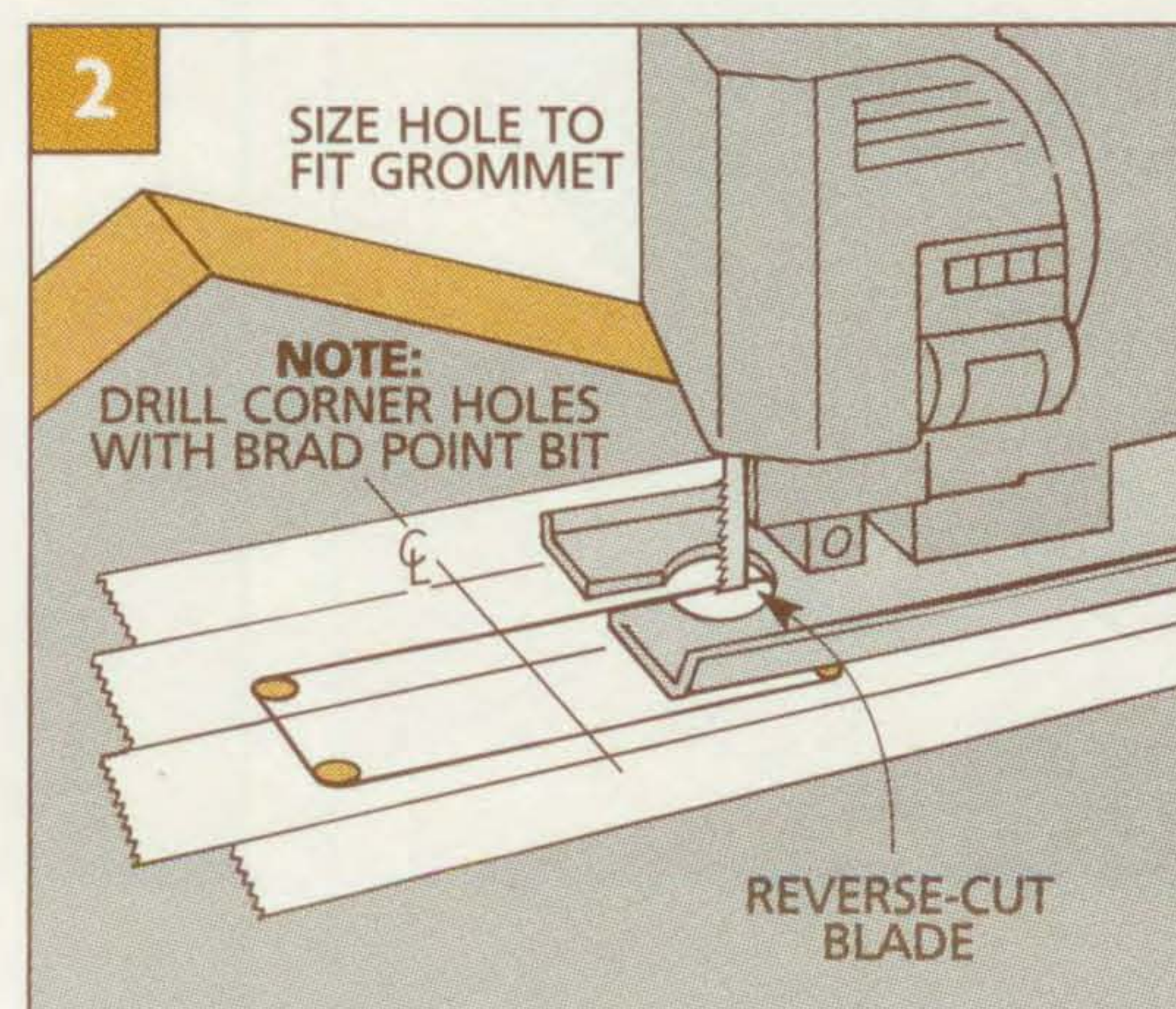
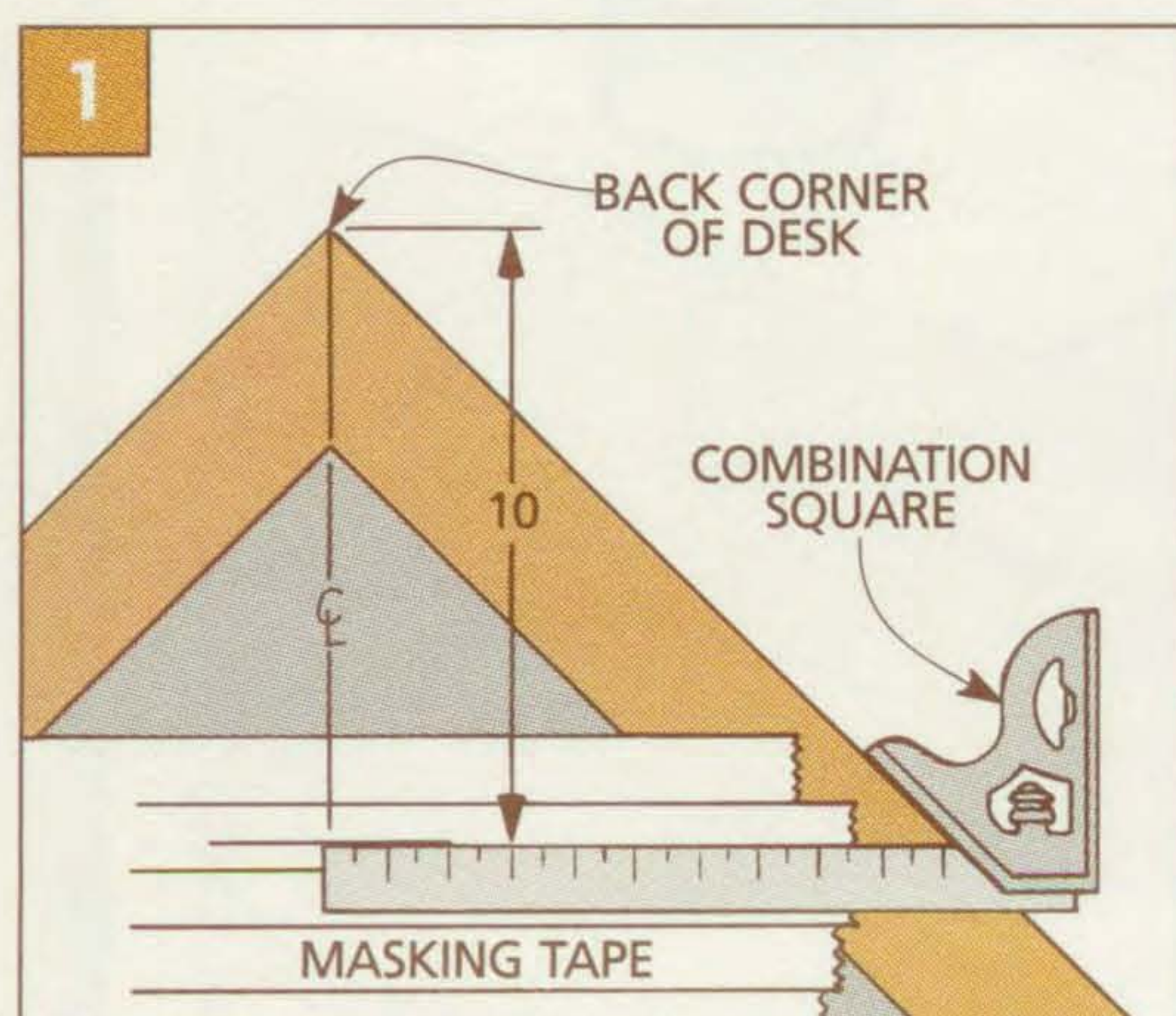
One thing to consider when building a desk for a computer is what to do with all the wires. Plastic grommets let you feed the wires through the desk top.

For round grommets I use a hole saw to install them. But for rectangular grommets I take a different approach.

To lay out the grommet, first tape over the area so you

can see your layout lines. Then lay out the location using a combination square (Fig. 1). Now, drill a hole in each corner and cut out the waste with a jig saw. To prevent chipout, I used a special reverse-cut jig saw blade (Fig. 2).

Finally, install the grommet and punch out tabs in the cover to create the openings for cords (Fig. 3).

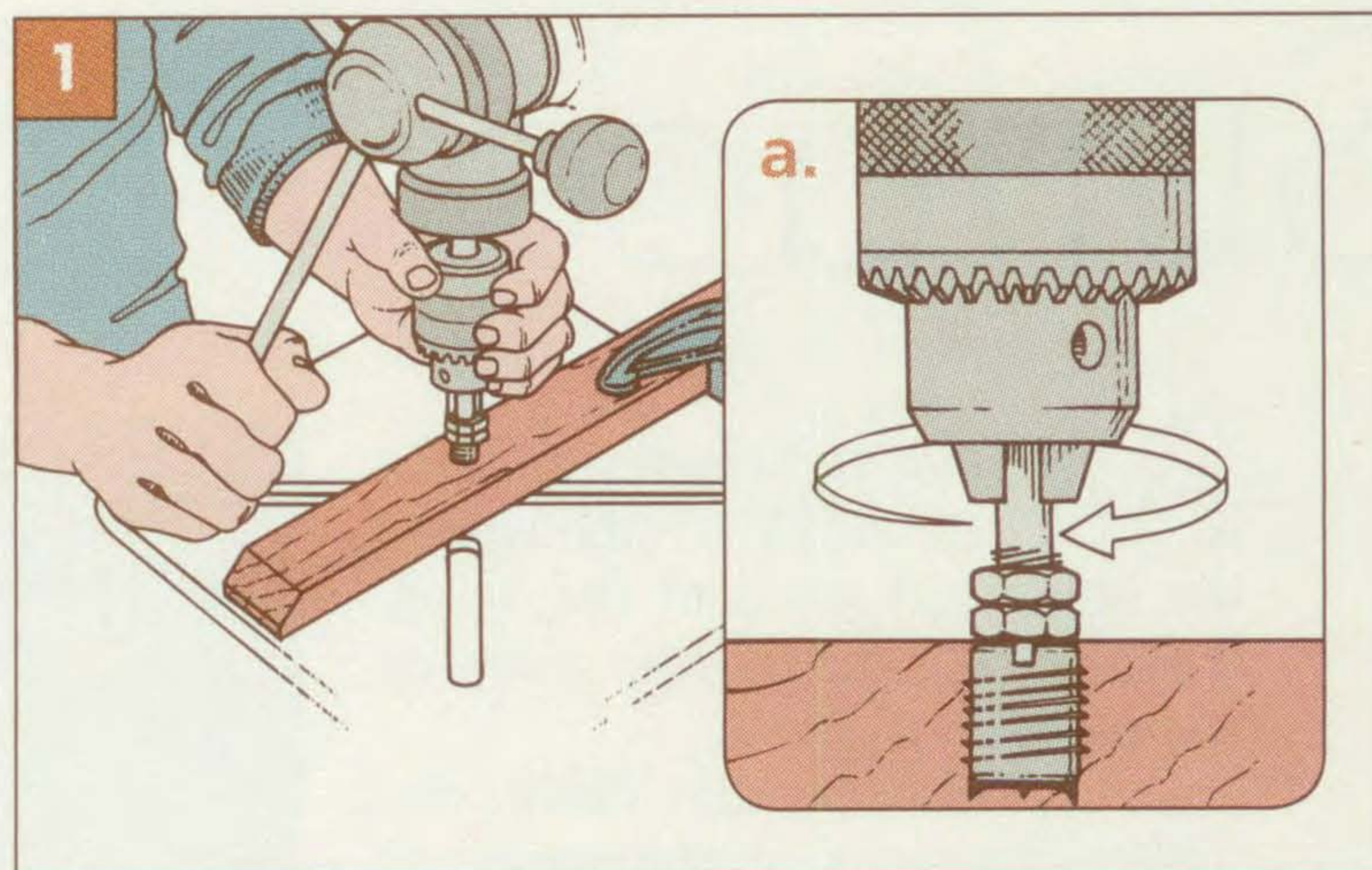


Installing Threaded Inserts

Whenever it's possible, I like to use my drill press to install threaded inserts. It's the best way to make sure they are straight and square in the workpiece.

Cut Off Bolt – To use the drill press for installation, start by sawing off the head of a bolt that fits the insert. Next, thread two nuts and the insert onto the bolt and tighten the nuts against the insert. The next step is to mount the bolt in the chuck.

Install the Insert – Finally, with the drill press turned off, you can install the insert. Using the control arm for pressure, screw the insert into the hole, turning the chuck clockwise by hand until the insert is flush with or slightly below the surface of the workpiece.



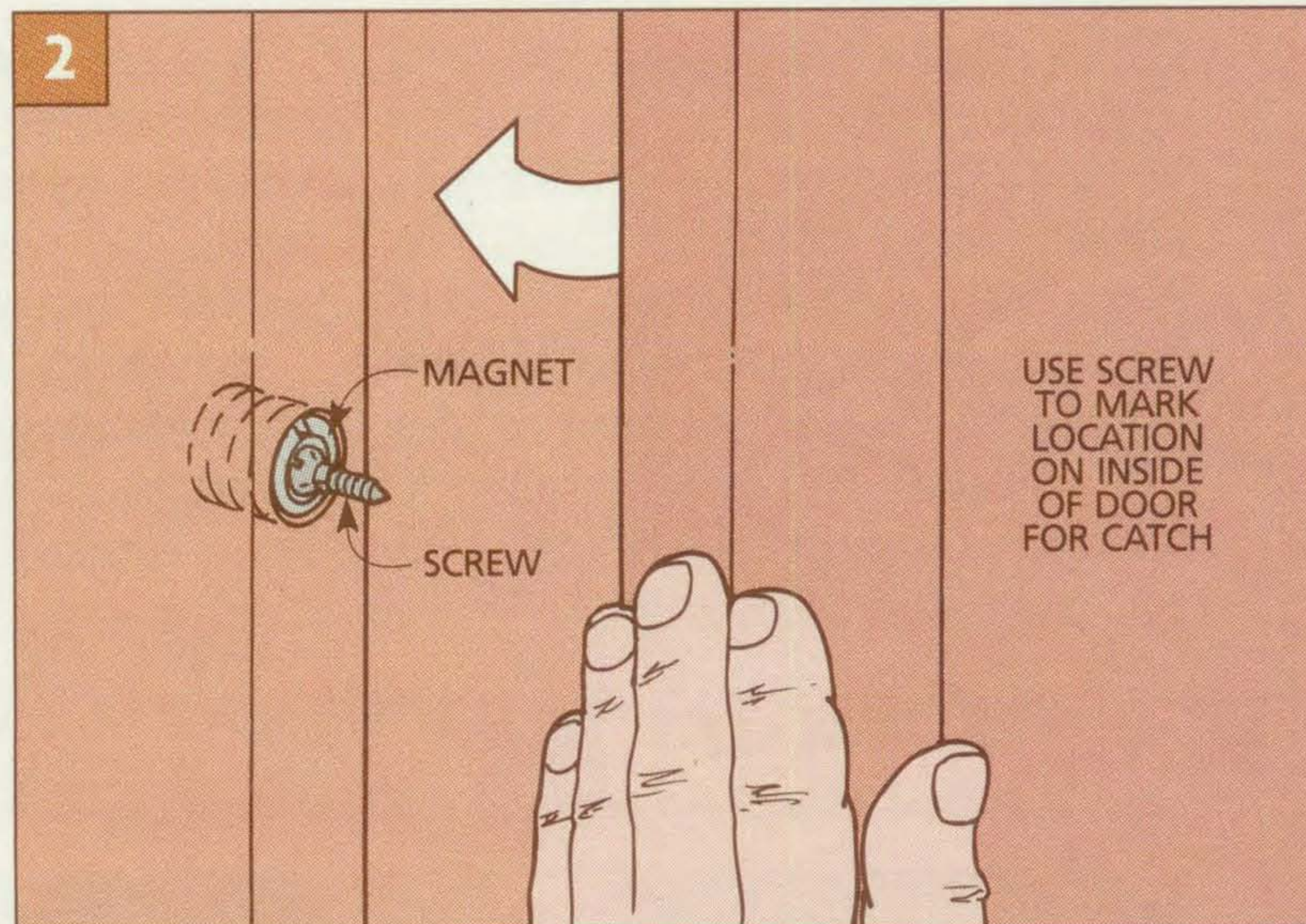
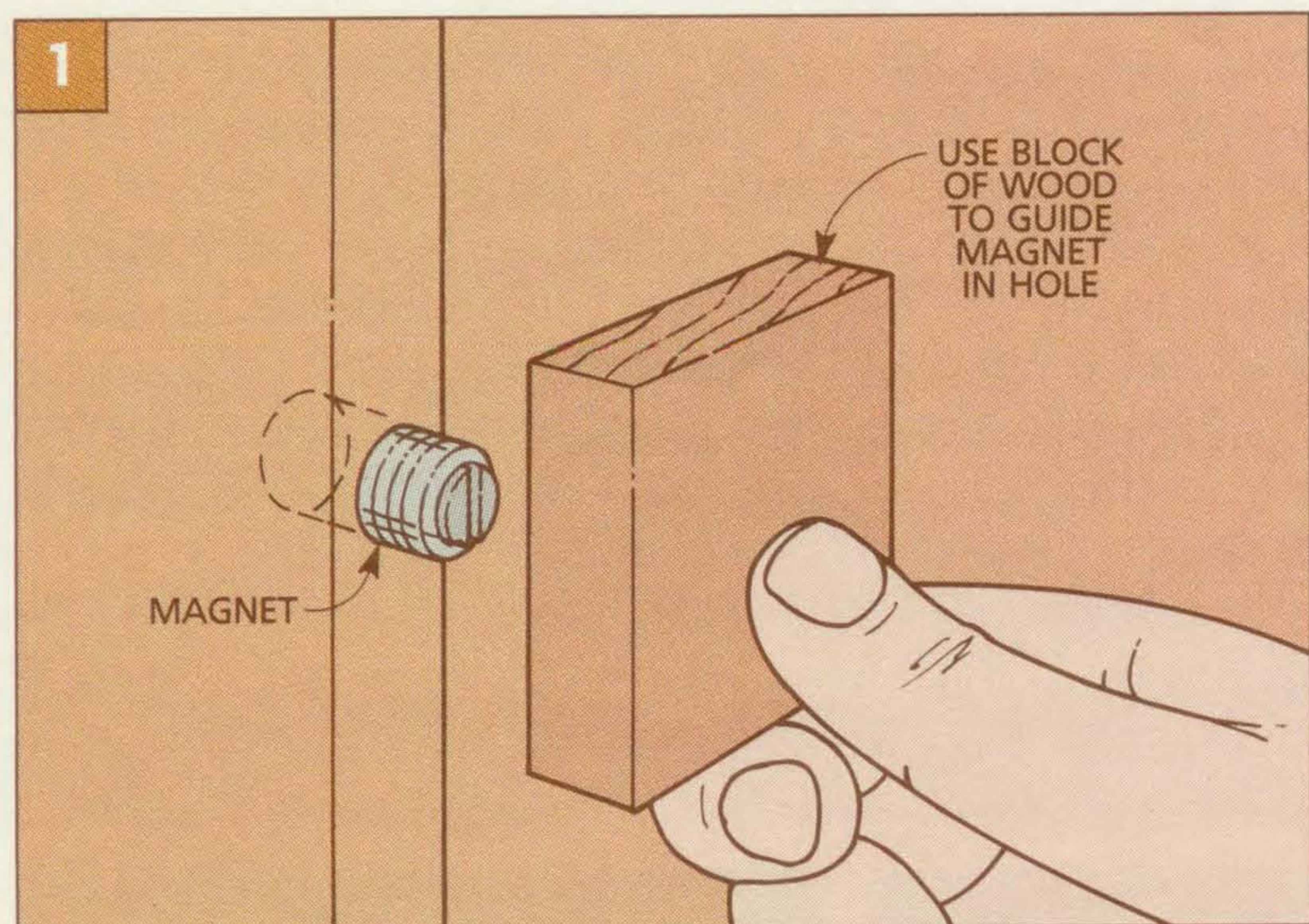
Installing a Magnetic Catch

Magnetic catches are generally fairly simple to install. But on a project with a narrow wooden frame surface (like a small box or cabinet that's under $\frac{3}{4}$ " thick), you need to be able to install one accurately.

Seat the Magnet Straight – The catch I used, like most, consists of two parts: a magnet and a catch plate (or screw). To install one properly, two things must be done. First, the magnet has to be seated straight in the hole and

flush with the work surface. To do this, I guide the magnet in the hole with a square, flat block of wood (*Fig. 1*).

Align the Catch – Second, in order for the door to stay closed, the catch must align with the magnet. To ensure it does, I place the screw on the magnet, close the door, and tap the door with a no-mar hammer (*Fig. 2*). Then when you open the door, the mark left behind will indicate where to mount the catch.



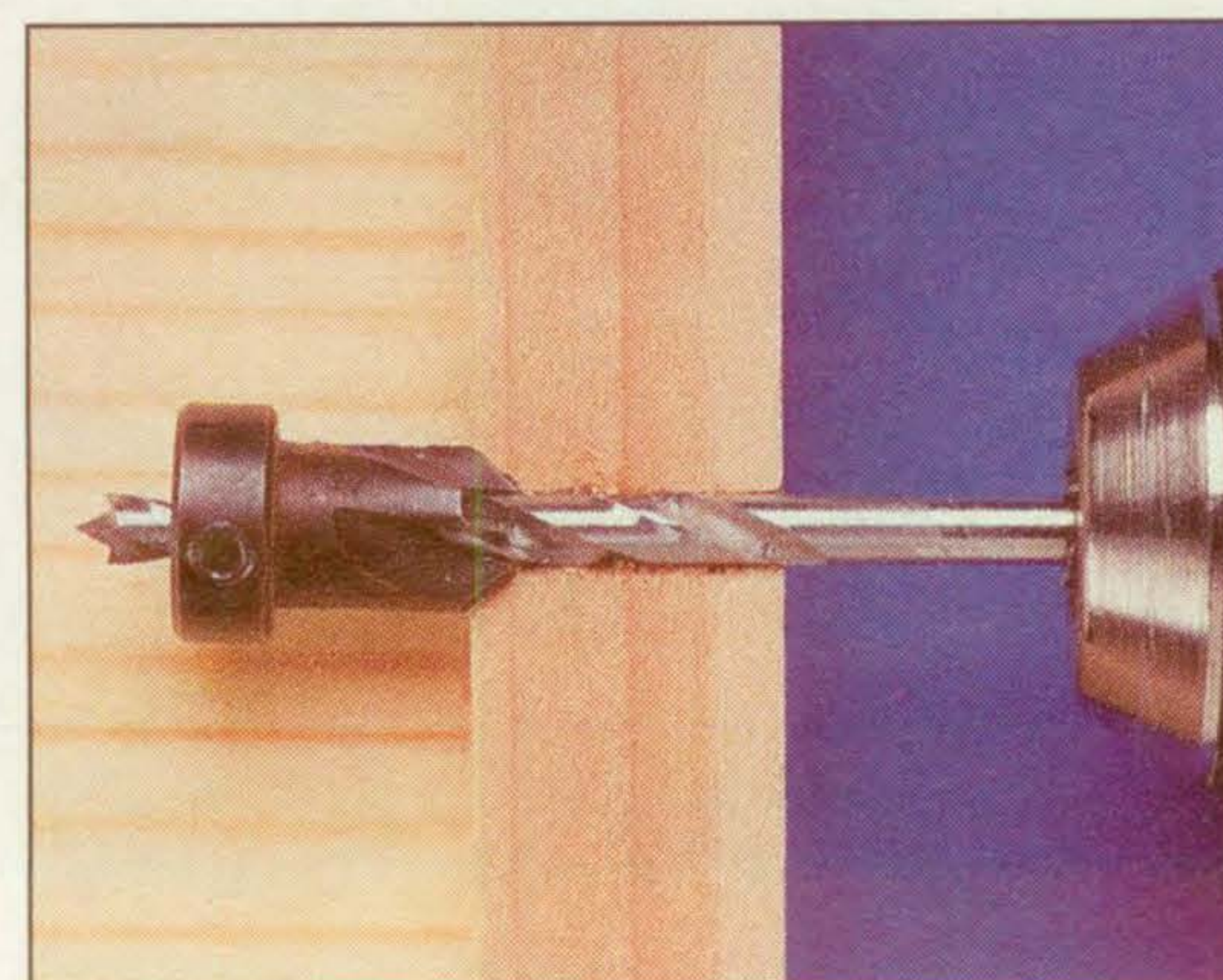
Reverse Countersink Tip

Recently, after gluing up a number of small drawers for a project, I suddenly realized that I had failed to drill and countersink holes on the back of the drawer fronts for the pulls and woodscrews. Drilling the holes was not a problem, but the drawers were too small to allow my drill to fit inside to countersink the holes.

Bright Idea – As I sat contemplating my dilemma, an idea suddenly

hit me. I simply reversed the countersink cutter on the end of the drill bit, as you can see in the photo.

Reverse the Direction – With the bit inserted through the hole and then chucked up in the drill, all you have to do is reverse the direction of the drill and gently pull back on the bit to countersink the hole. Once the holes and countersinks are all drilled, all you have to do is install the pulls.



6 ways to get a perfect finish

Surface Preparation

Applying a finish is like a “Catch 22.” Although it emphasizes the color and grain of the wood, it also puts a magnifying glass on even the tiniest flaws.

Once you apply the finish, any tool marks, nicks, or glue spots will stand out like a chrome bumper on a hay wagon. Fortunately, you can prevent this by carefully preparing the surface of the wood.

As a rule, I get as many pieces as possible ready for the finish *before* assembly. Take a table for instance. It’s easier to sand the legs and apron separately than when they’re joined together at right angles.

Note: To ensure a tight fit, just be sure not to sand around the areas where the pieces join together until after you assemble the project.

Tool Marks – Working on pieces individually also makes it easy to see the “ridges” that often get left behind by the cutters on a jointer, planer, or router. Especially if you shine a light across the work at a low angle (see photo above). To remove these machine ridges, I use an ordinary hand scraper, as you can see in photo A below.

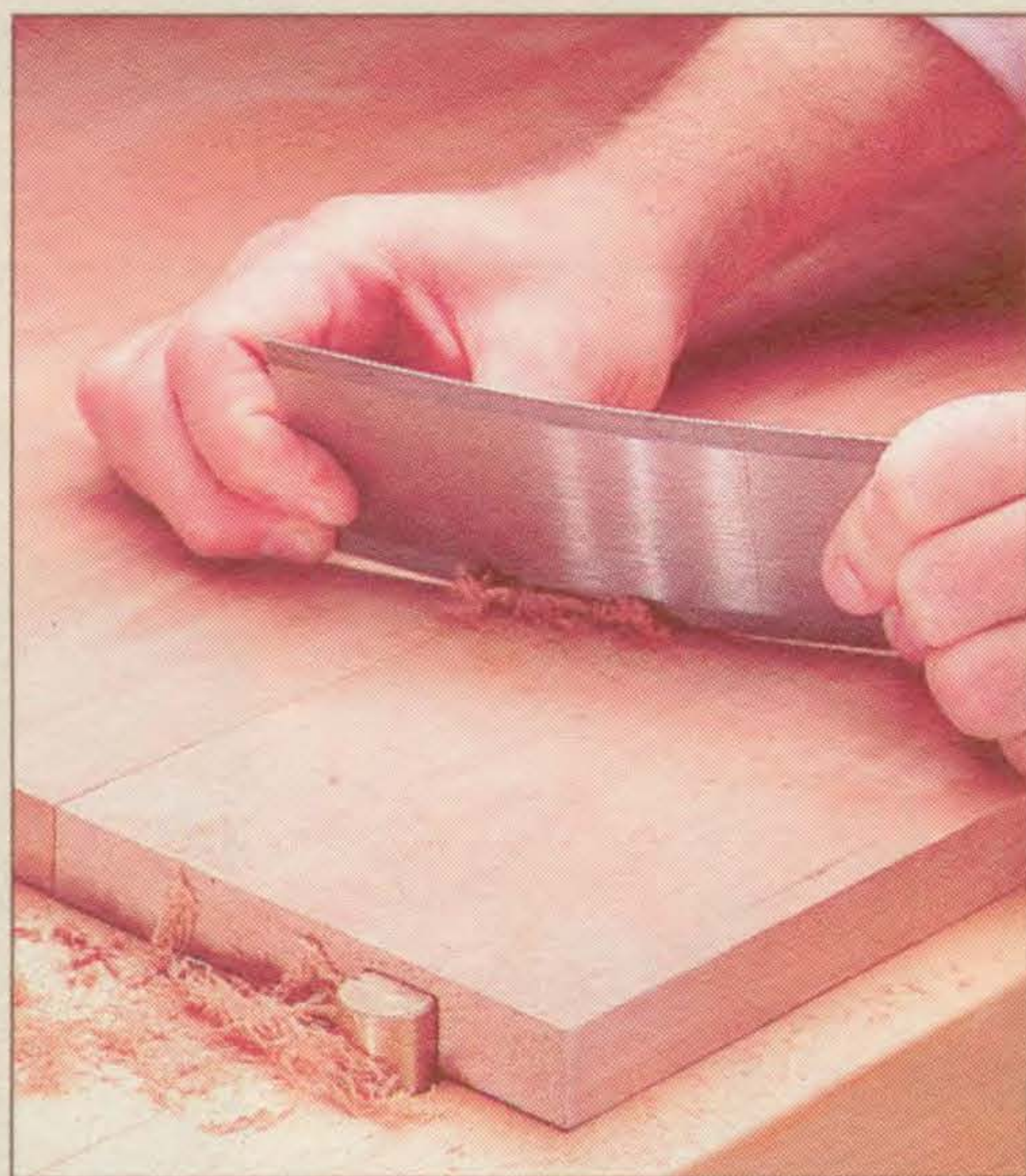


But scrapers leave a surface that looks different than the surrounding area when you apply a finish. So you need to create a smooth, uniform surface by sanding.

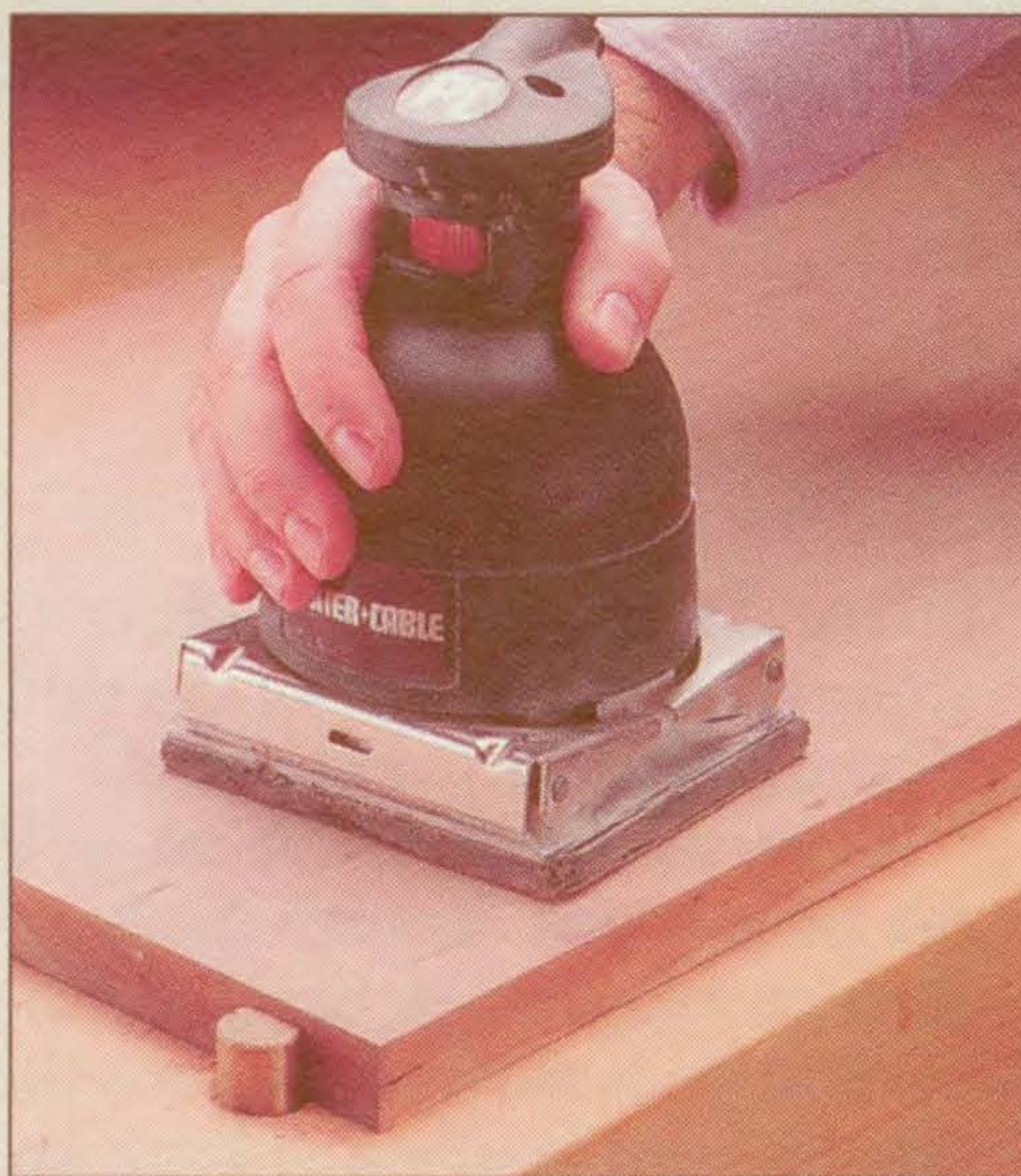
Sanding – Sanding is not the most exciting job in the world, but it doesn’t have to be a chore. The key is to work efficiently — not harder.

It goes without saying that a power sander speeds up the process, see photo B. But while this works fine on large, flat surfaces, the “give” in the foam pad tends to round over the edges. To maintain a crisp edge (especially on narrow pieces), I switch to a sanding block, see photo C.

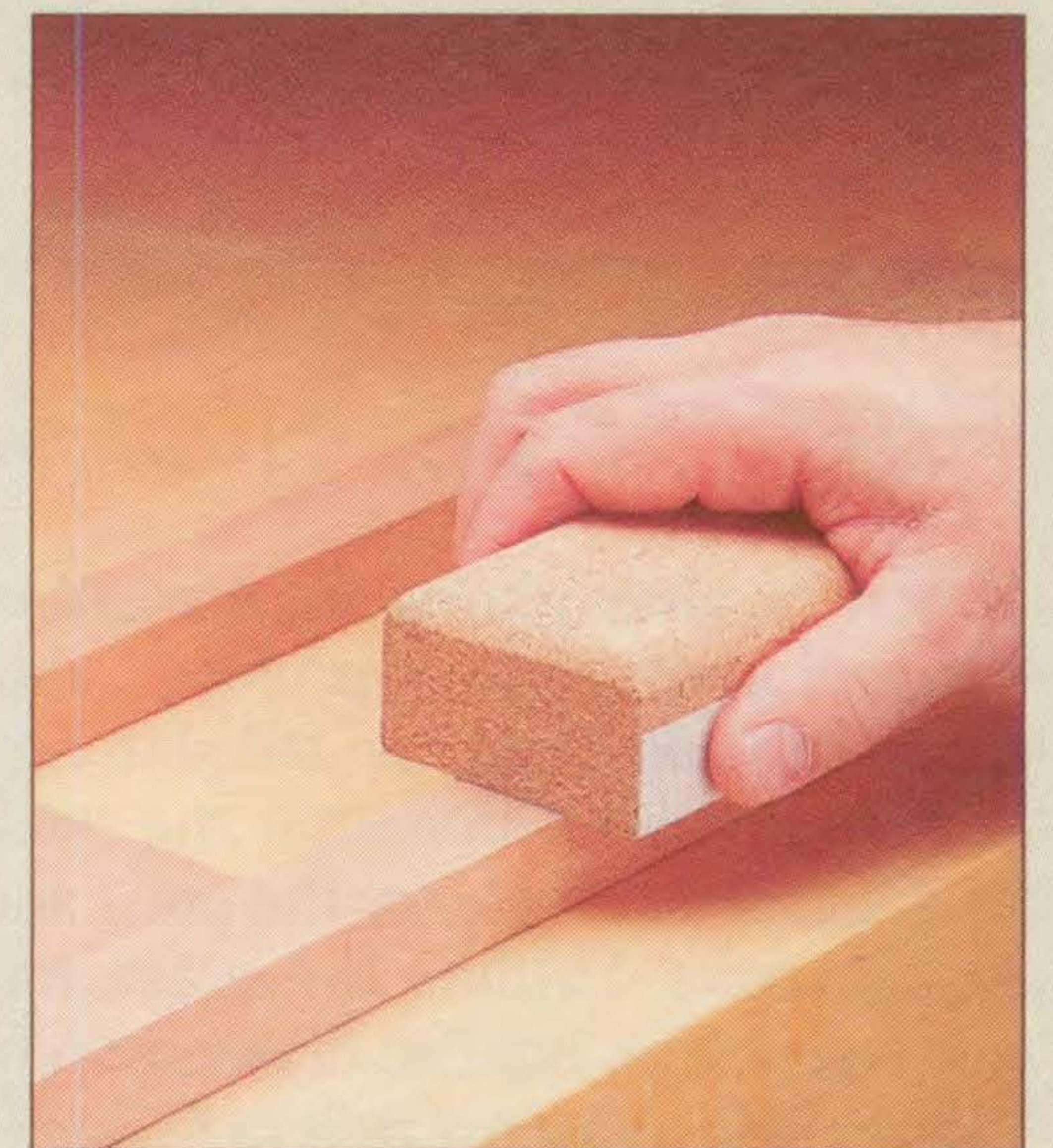
Step-by-Step



A. Use a scraper to remove any tool marks or ridges. Skew the scraper at an angle for the best cut.



B. A power sander makes quick work of removing material on large, flat surfaces.



C. But on a narrow workpiece, a sanding block ensures a crisp corner and a flat surface.

Grit – Another thing to consider is the sandpaper grit. If it's too coarse, the sandpaper leaves deep scratches that take a long time to sand out. So unless the surface is extremely rough, I start with 120-grit sandpaper on most projects

Even so, don't waste time with 120-grit if you run across a deep scratch. Switch to a coarser grit to remove the scratch. Then, to ensure that the area takes the finish (or stain) evenly, go back over it with 120-grit sandpaper.

Change your sandpaper often. The abrasive particles only cut fast for the first few minutes. It doesn't pay to massage the surface with worn out sandpaper.

Direction – The direction you sand is also important. The old rule of thumb holds true here — sand *with* the grain in a back and forth motion. The scratches left behind if you sand across the grain require a lot of resanding to remove.

The dust that builds up as you sand will make the surface *feel* smooth. But the real test is how it *looks*. The goal here is to get a consistent pattern of scratches.

But in order to check, you'll need to clean off the dust, see photo D. This also picks up any loose pieces of abrasive which can leave telltale scratches of their own when you sand with a finer grit.

Fine Grit – Basically, the fine grit sandpaper creates a series of small scratches that replace the

ones made by the previous grit. While it's tempting to "jump" a few grits to save some time, you actually end up sanding longer with very fine grits. So I always follow up with the next finest grit (150).

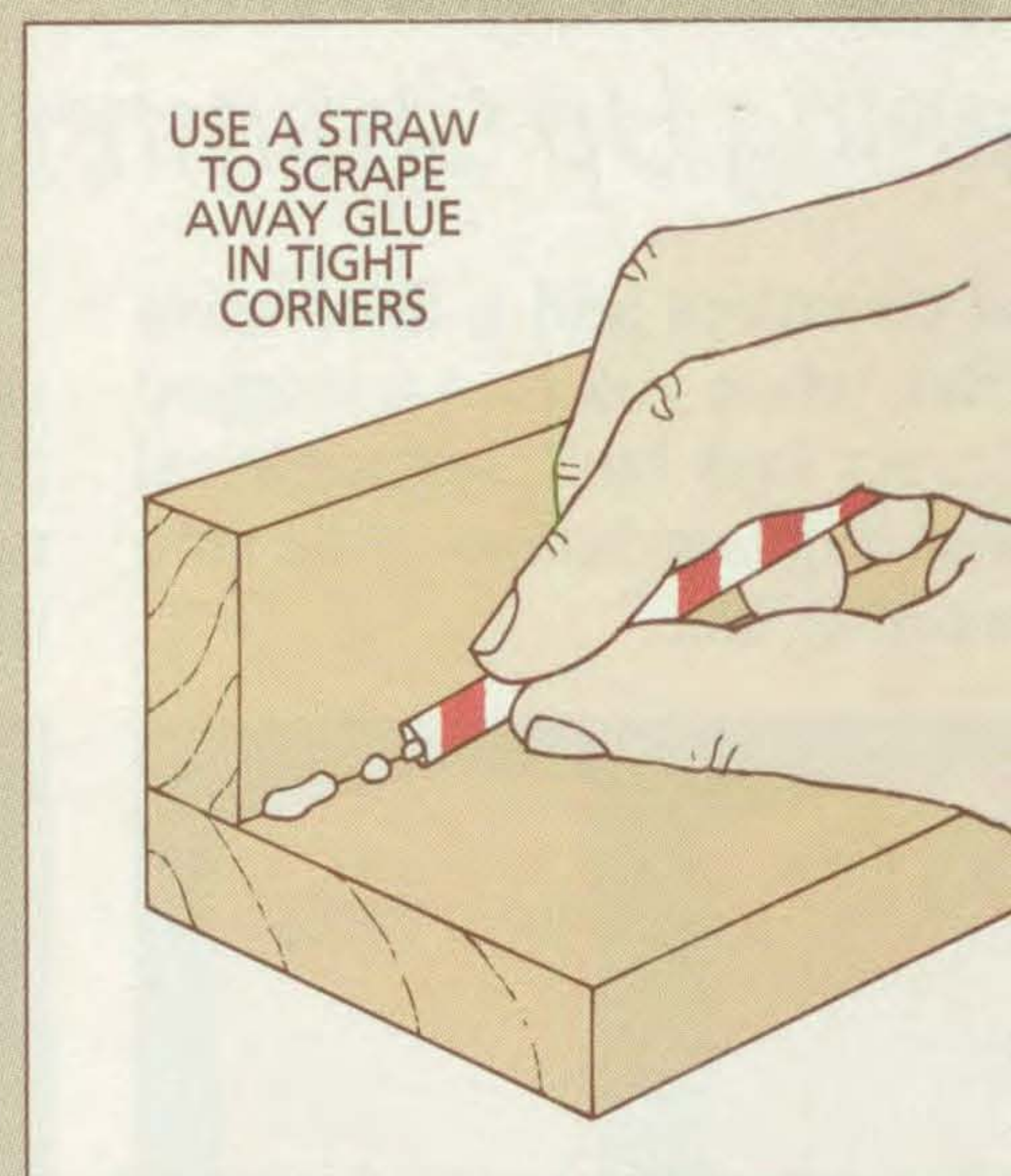
The final grit you work up to depends on the finish. For a thin, oil finish where the feel of the wood is important, I sand with 180 and 220 grits for an extra-smooth surface. But with a built-up finish like varnish or lacquer, 150-grit is plenty smooth.

End Grain – One exception to all this is end grain. Because it's porous and soaks up more finish (or stain), the color will be darker than surface grain. To get around this, an old trick that works well is to sand end grain one grit finer.

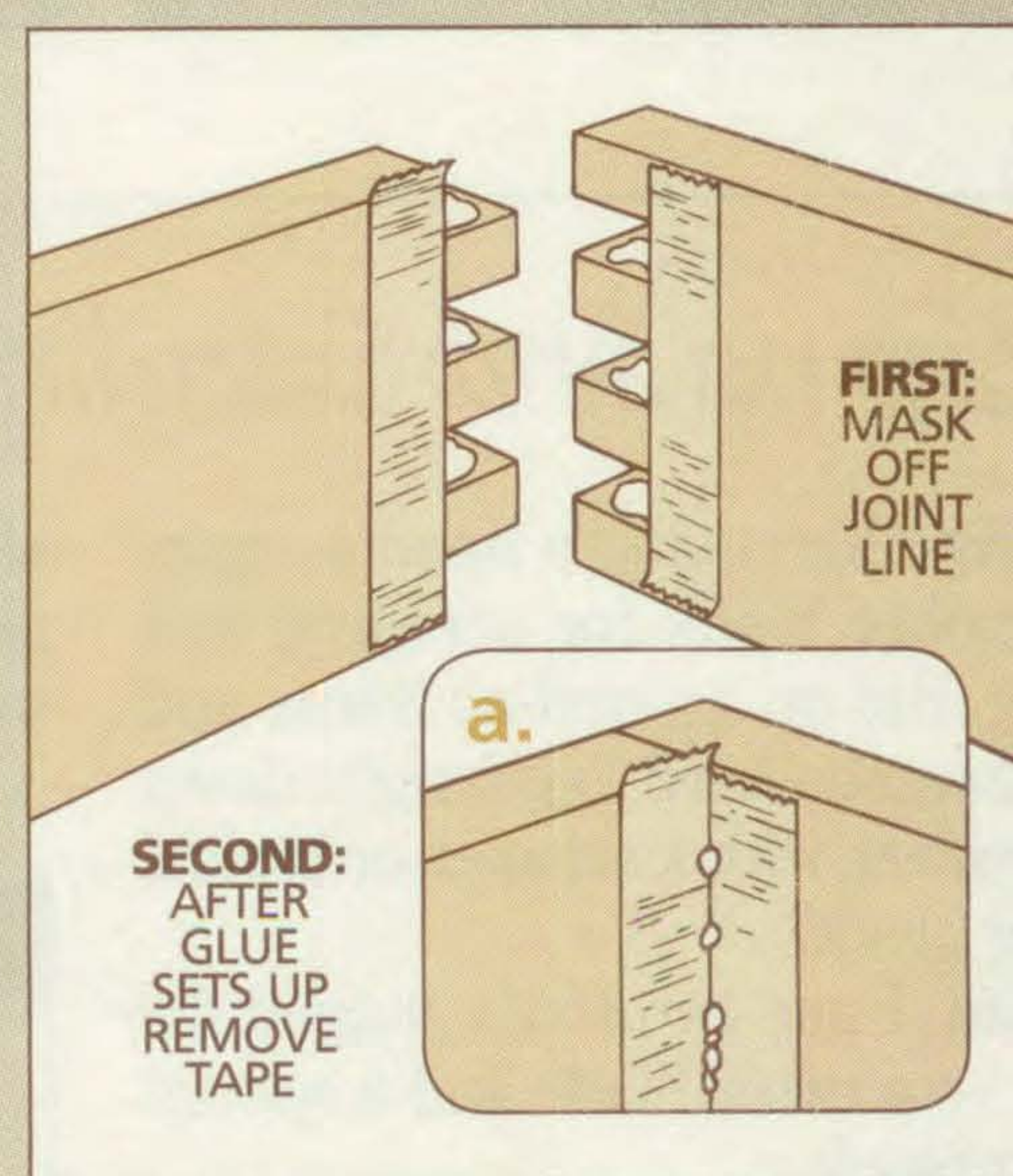
Glue – Although it's convenient to sand pieces in advance, there may be problems later. Any glue squeezeout left on the wood surface will show up as a light spot when you apply a stain or finish.

The best way to remove glue is to wait until it "skins" over and scrape off the excess, see photo E. Or simply keep the glue from getting on the wood in the first place, see margin at right.

Mineral Spirits – One final note. No matter how careful you are, there's always a chance of a stray "glueprint" going unnoticed. To make these smudges reappear, I wipe down the project with mineral spirits, see photo F.

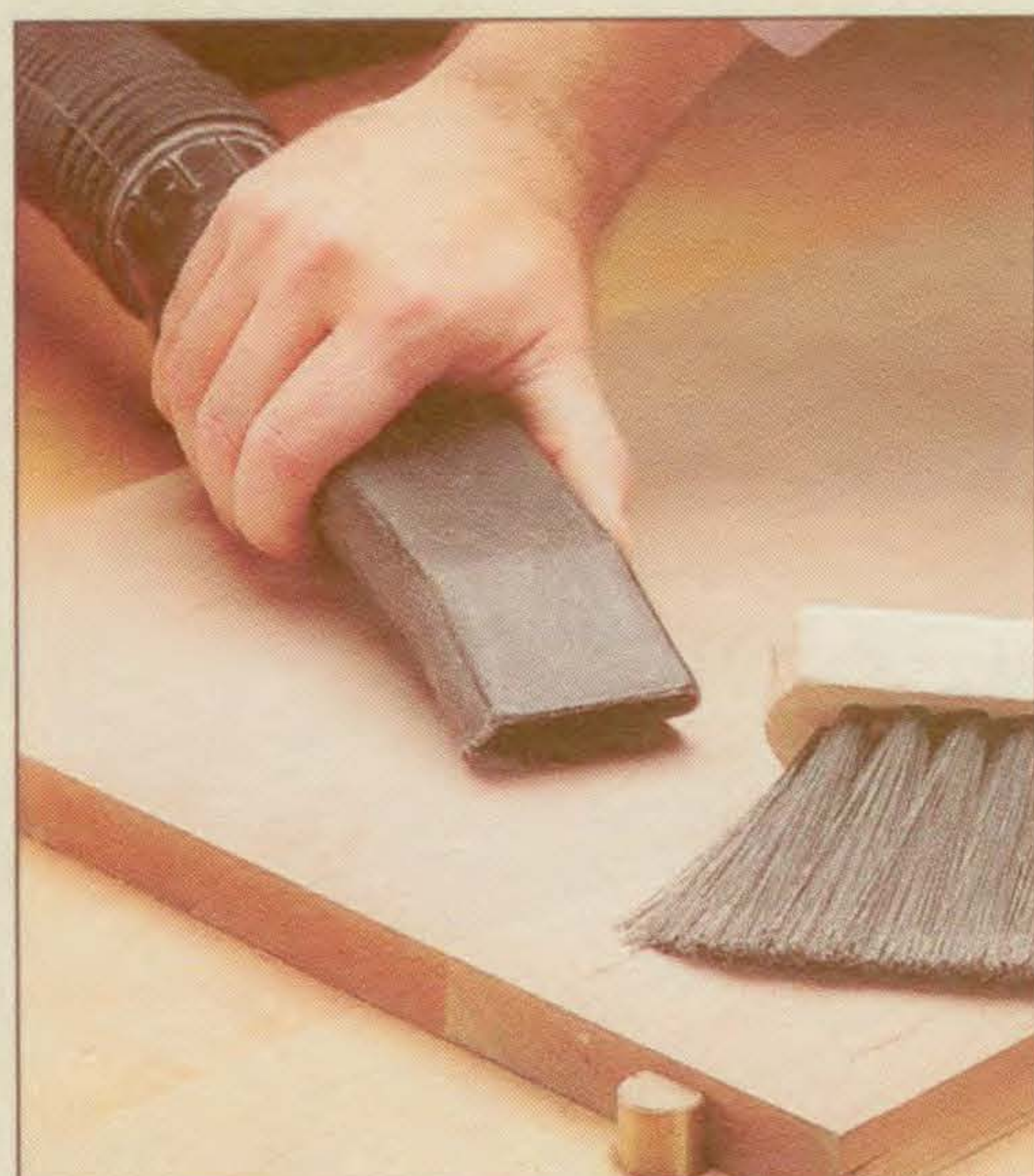


▲ **Glue Scooper.** A straw works great for scooping away skinned-over beads of glue that are trapped in tight corners.

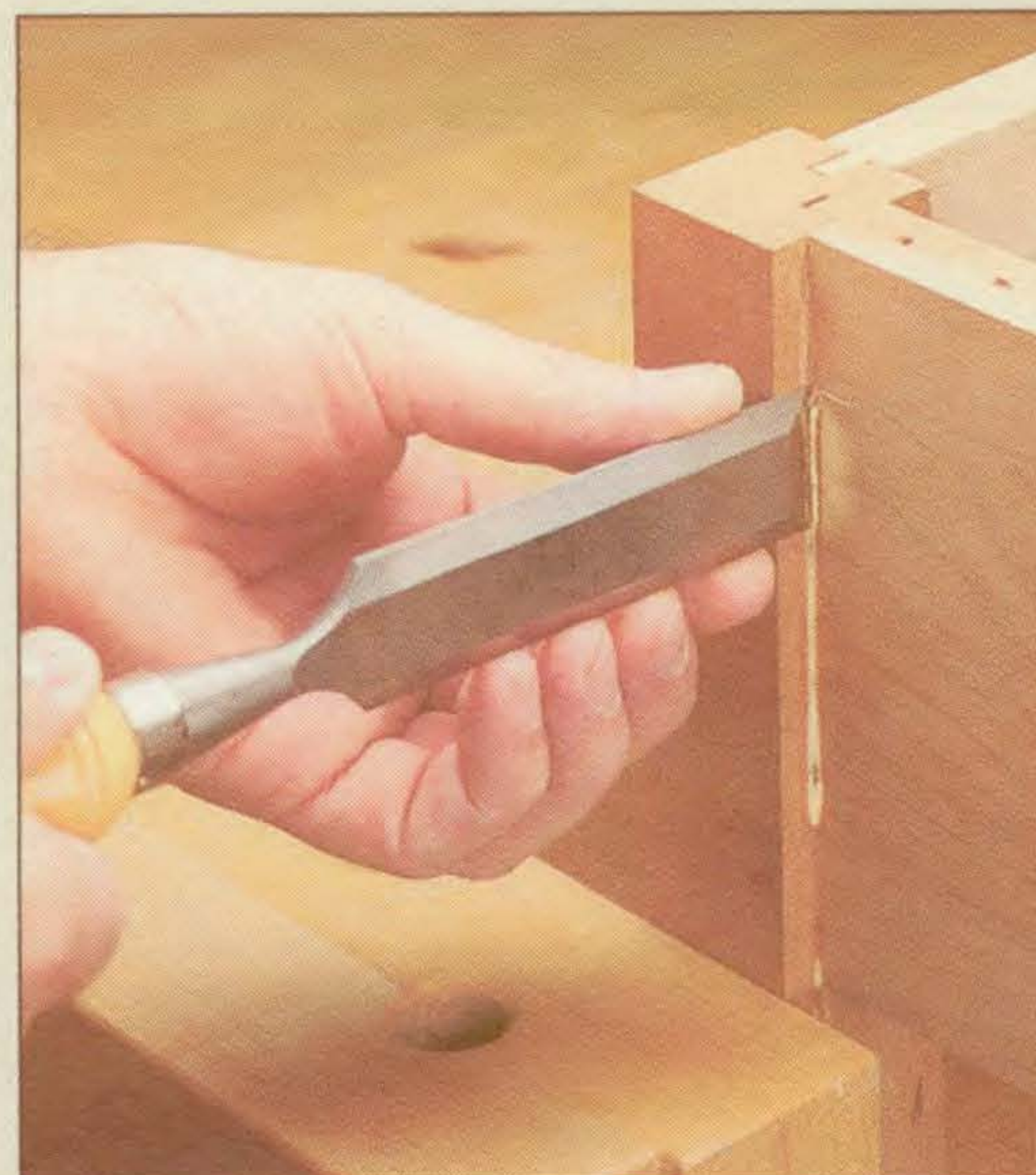


▲ **Mask Corners.** Taping off inside corners before gluing and assembly reduces the time spent later cleaning out the corners.

Step-by-Step, cont.



D. Remove sanding dust and bits of abrasive that have fallen off with a shop vacuum and brush.



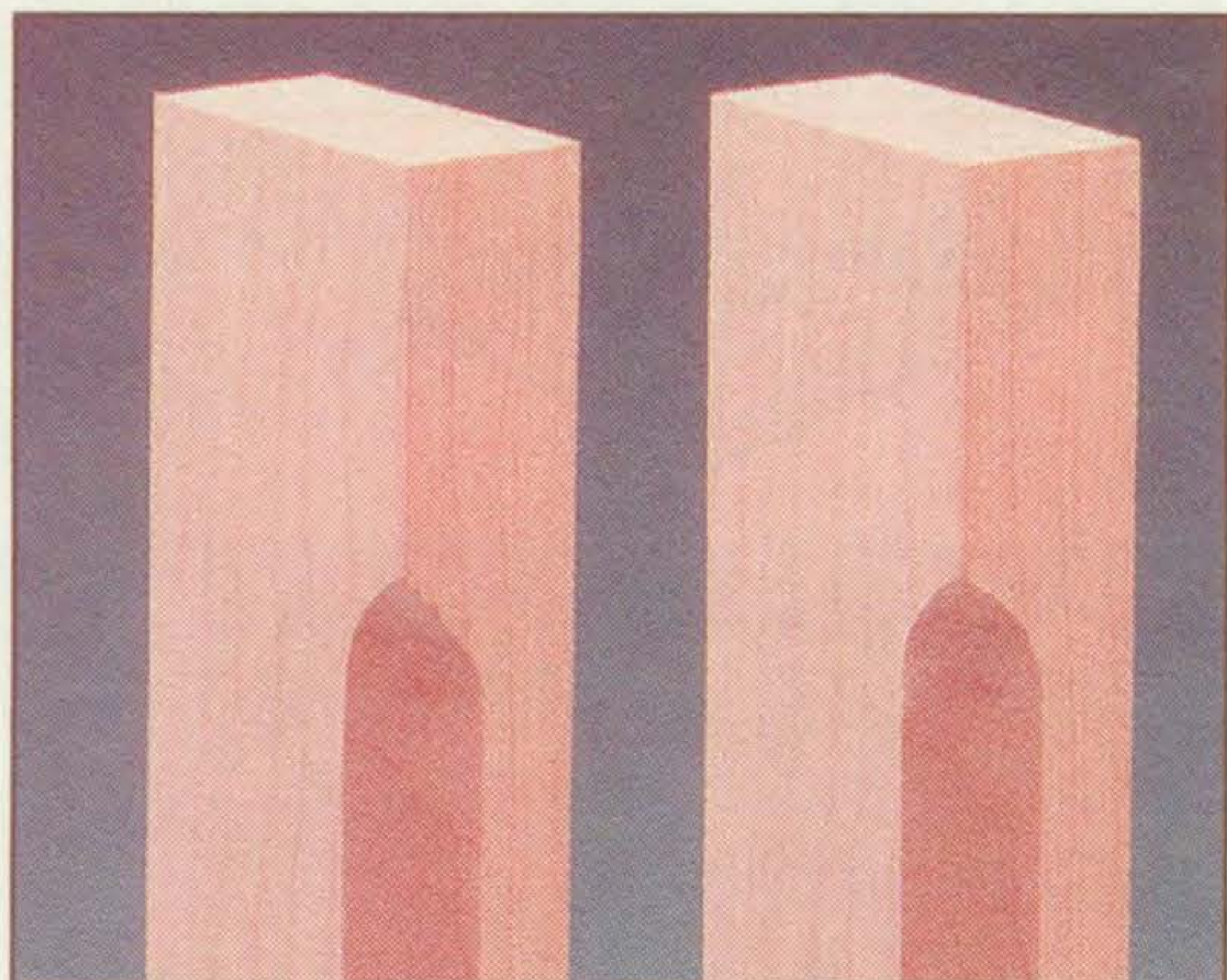
E. After you've assembled the project, scrape off the "skinned-over" glue with a chisel.



F. Wiping down the surface with a rag soaked in mineral spirits reveals stray glue smudges.

Cleaning Up Chamfers

Stopped chamfers add a decorative touch. But, when you rout a stopped chamfer, its end isn't symmetrical (*left piece in photo below*). One side ends up a little "flat."

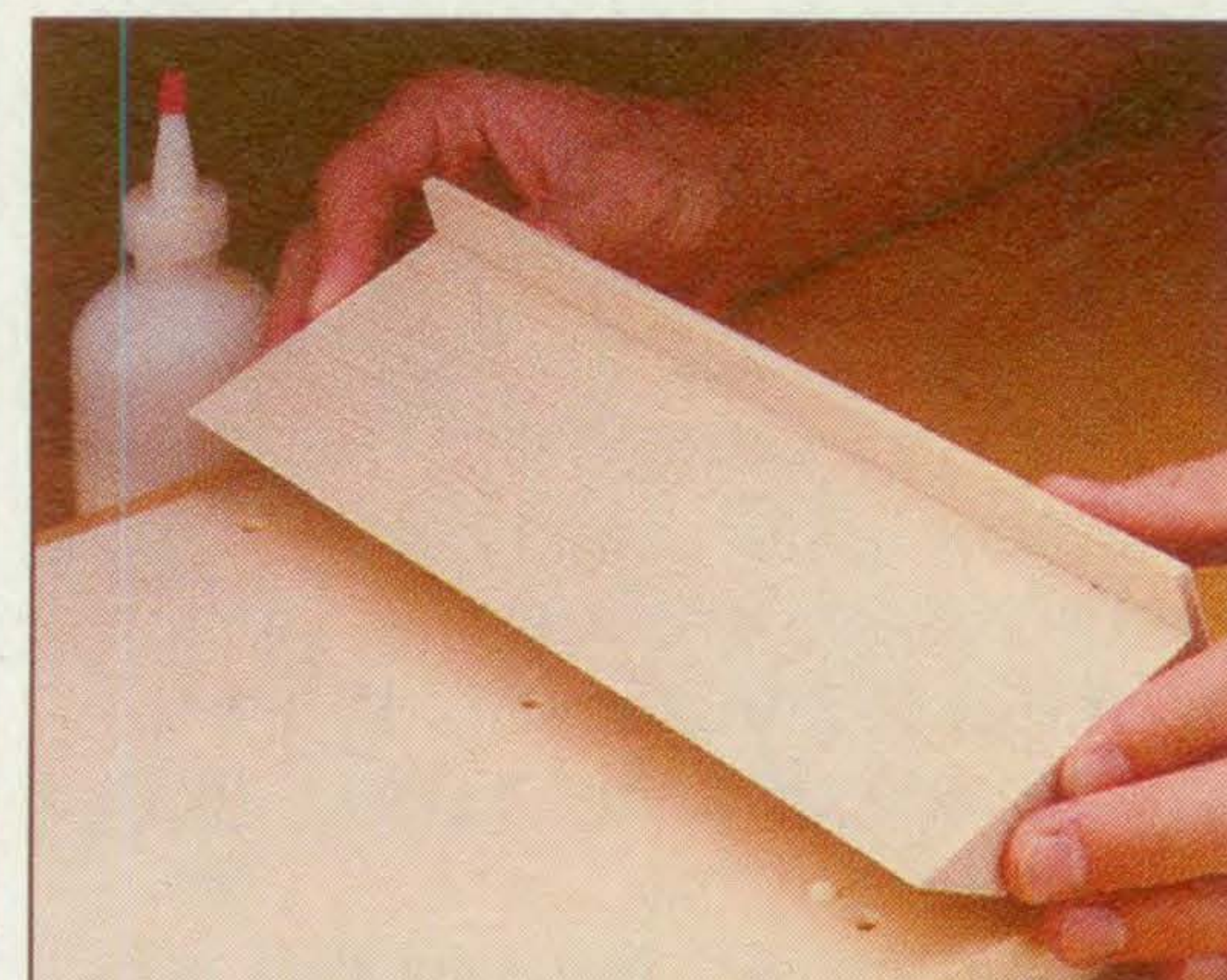


To solve this, simply wrap a piece of sandpaper around a dowel and sand the end (*right photo*). It won't take much work to get both sides looking the same (*right piece in first photo*).



Spot Gluing

If you're screwing a shelf to a panel, all you need are two drops of glue and some hand pressure to get it set in place exactly where you want it. Later, it can be secured with the screws.



Scraping and Sanding In the Corners

Normally I like using a hand scraper and sanding block for scraping and sanding. But on a glued-up frame and panel, it can be hard to get right down into a corner with a scraper or typical sanding block.

Instead, I use two tools shaped for the job — a razor blade and a special sanding block.

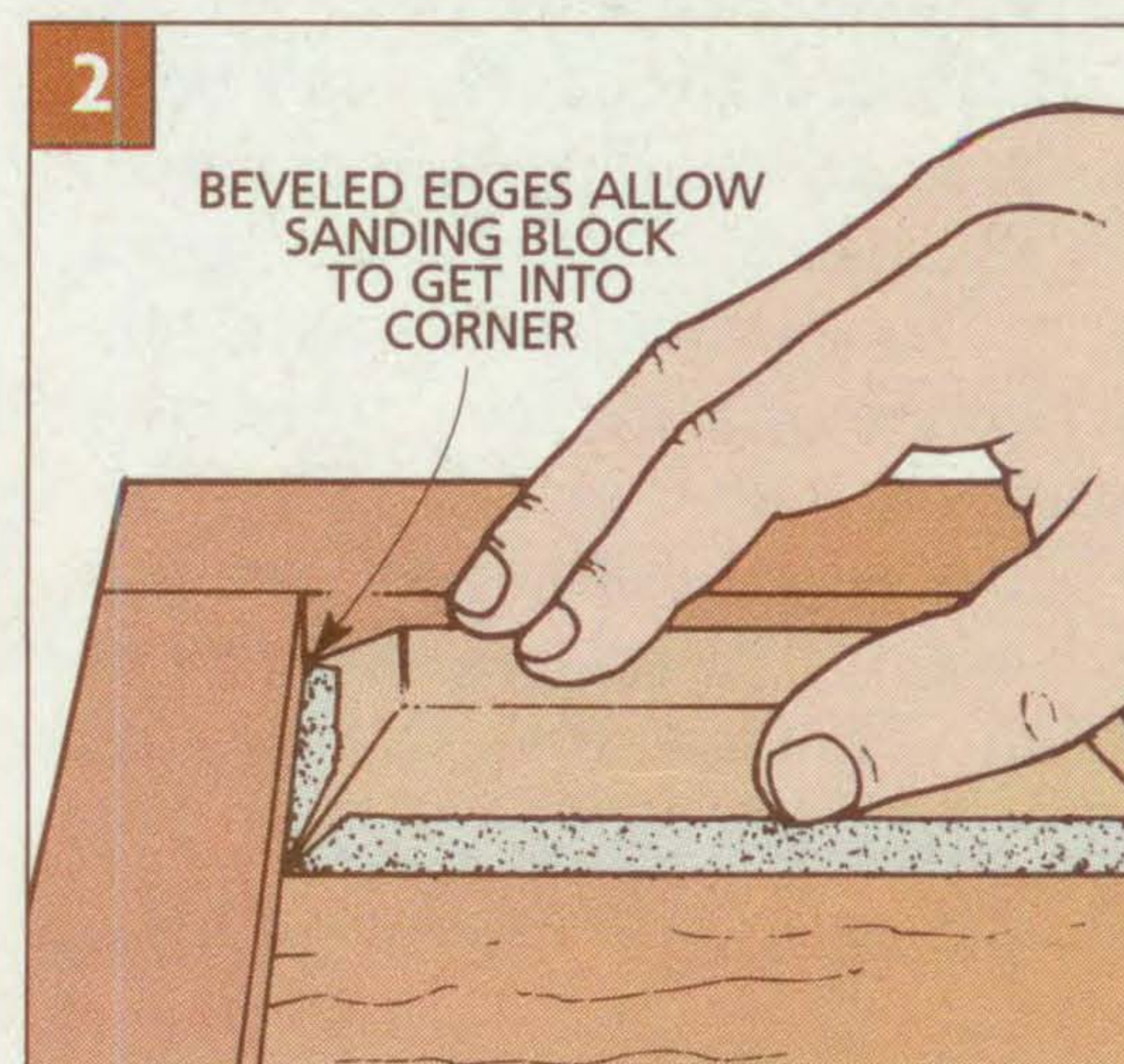
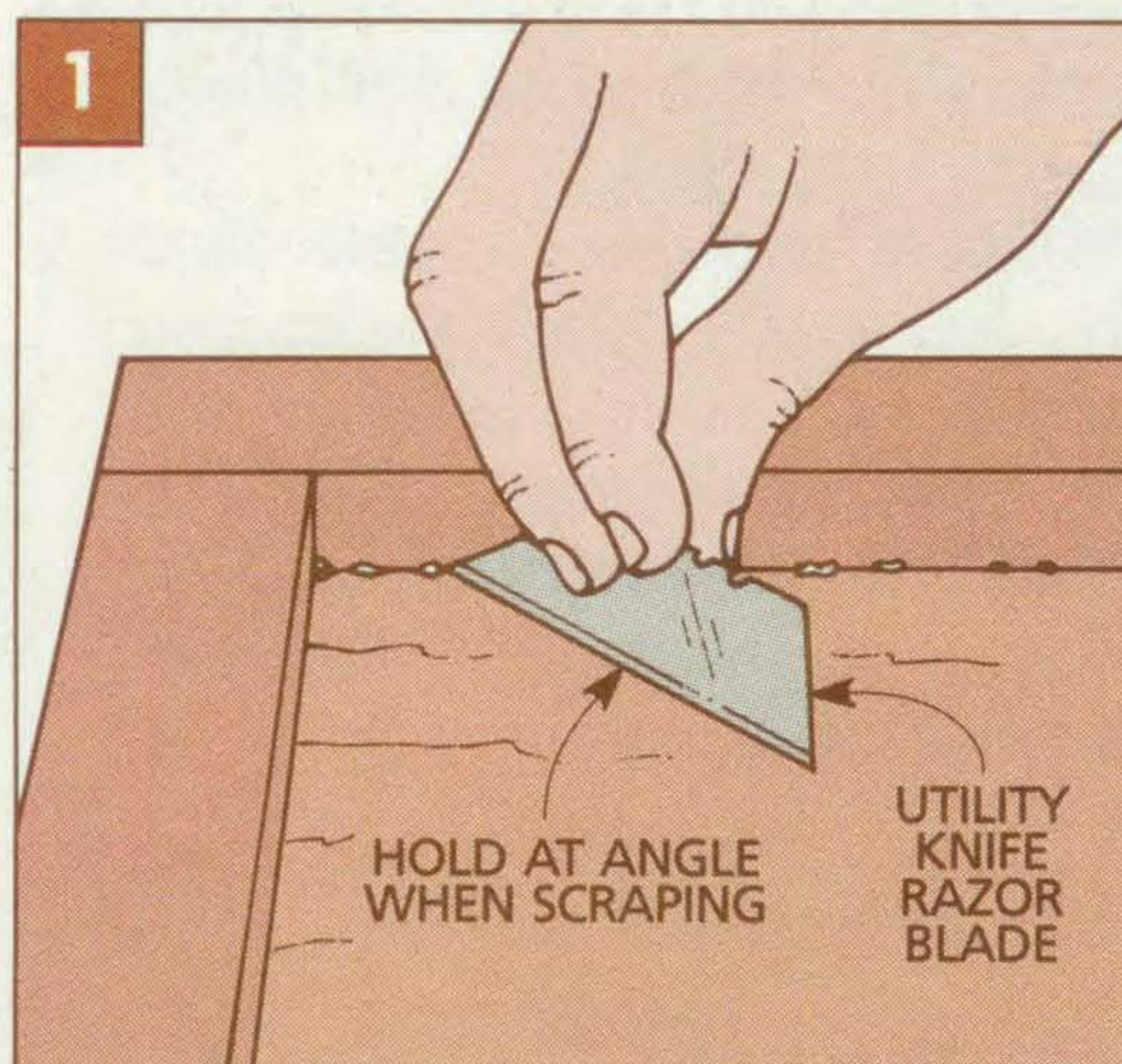
Razor Blade — To scrape out a corner, I use a razor blade from a utility knife (*Fig. 1*). It works great for scraping away glue smudges and dried beads of glue.

To use the razor blade, hold it at an angle and push or pull it with the grain of the wood — just like a hand scraper. Never scrape across the grain. And

always push or pull the blade in the direction it's angled. (This way it won't cut into the workpiece.)

Beveled Block — To sand a corner,

I make a sanding block with beveled ends and beveled sides (*Fig. 2*). The pointed ends allow me to get the sandpaper right up against the corner.

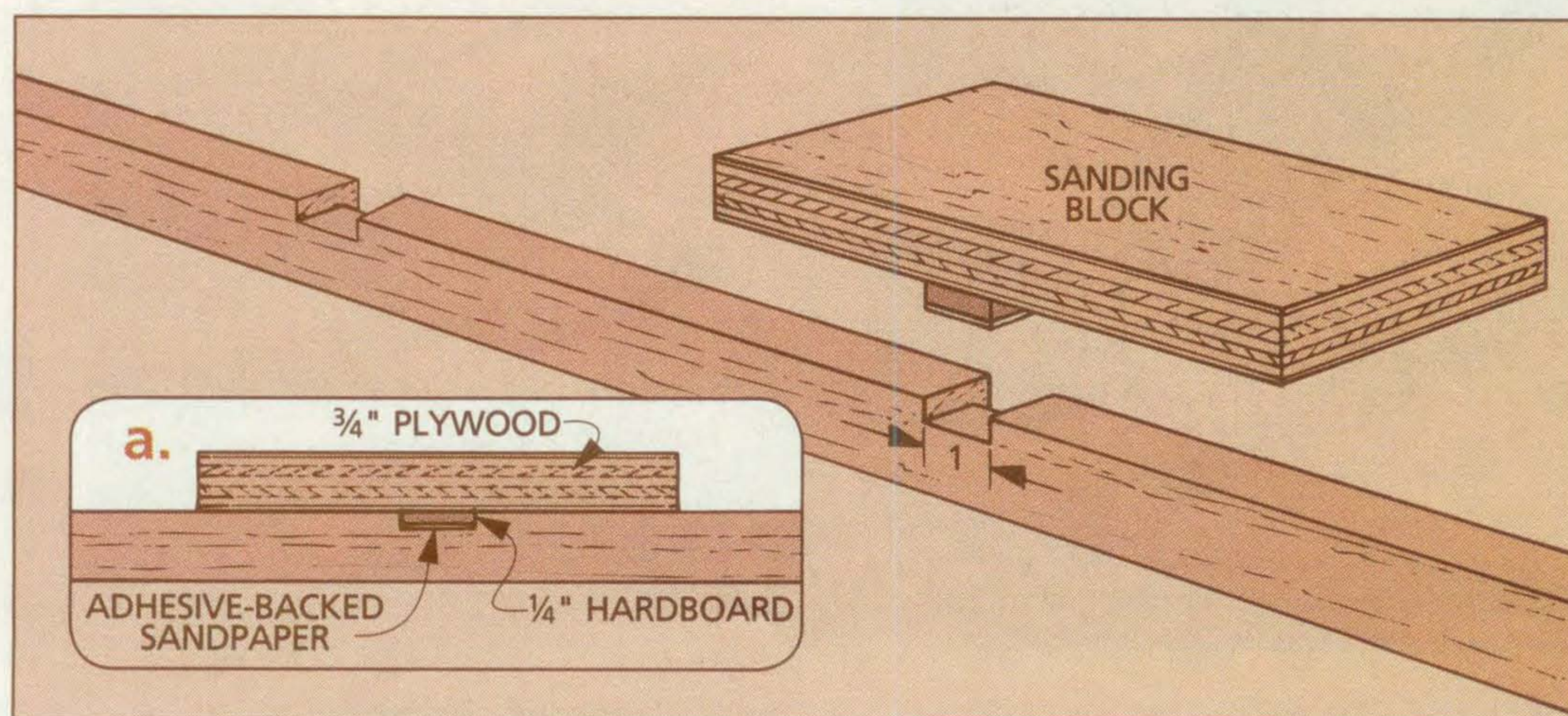


Special Sanding Block

I usually try to avoid having exposed dado joinery on any of my furniture projects. If the notches aren't smooth and flat, you'll notice it when the pieces are glued together later.

But sometimes exposed dados can't be avoided, so I created a simple sanding block out of plywood and a piece of 1/4" hardboard (*see drawing*).

Just make sure the "handle" of the sanding block spans the notches so their depth stays consistent and their edges aren't rounded over.



Simple Tips for Successful Sanding

When you're sanding a project, sometimes what you "don't" do is just as important as what you do.

Even Strokes – First, don't sand wood like you scrub the floor. Use long, even strokes. This way, you sand in a straight line *with* the grain, not going sideways across the grain.

Pre-Sand – Also, you should sand glued-up panels (and large pieces) before cutting them to size. This keeps the thickness more consistent around the edges, which could tend to end up a little thinner.

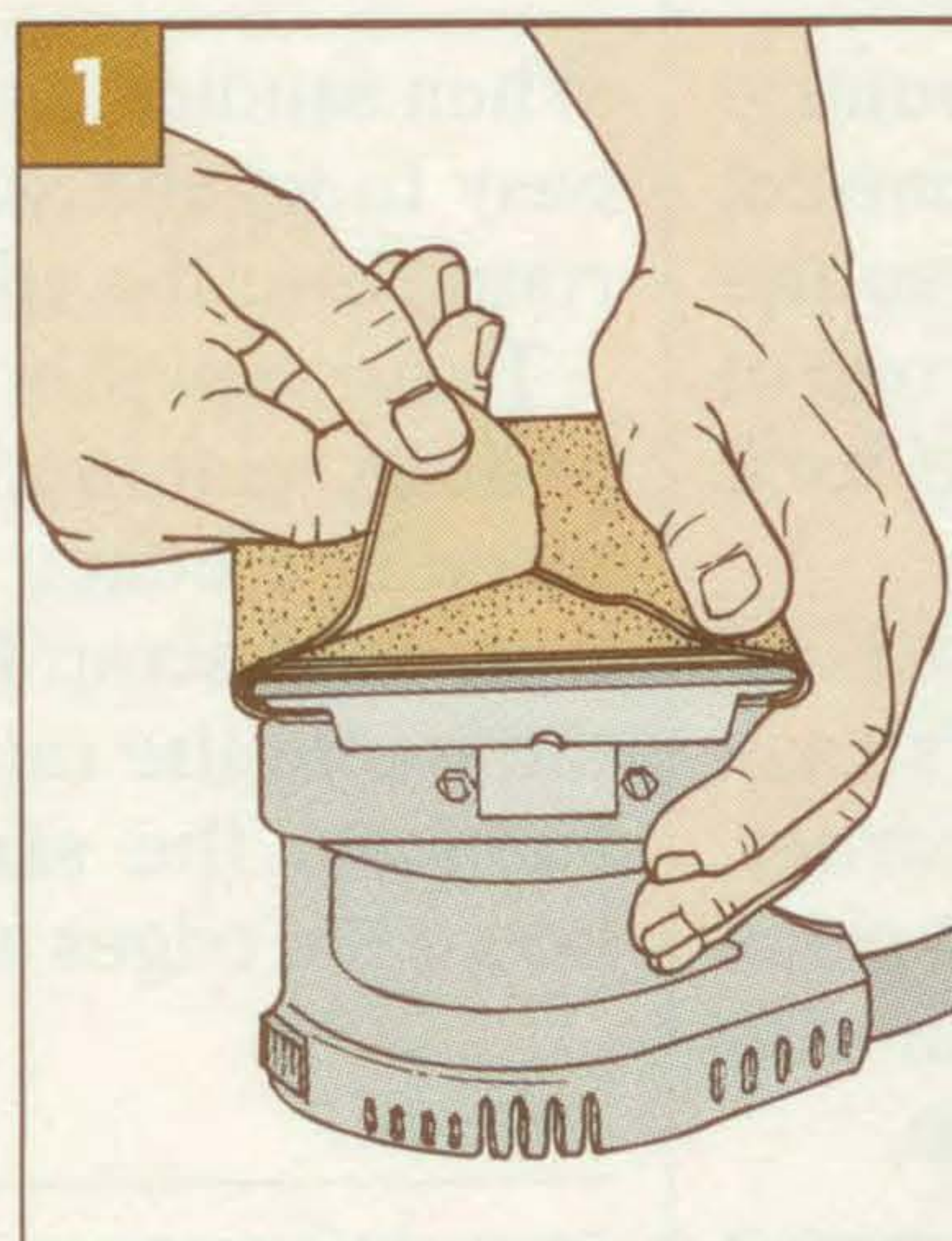
Avoid sanding up to the edges of a board with

a power sander (unless you want to round them slightly). Instead, use a sanding block.

The Right Grit – If you're sanding with 150-grit sandpaper and you find a deep scratch, stop and switch to a coarser grit to remove the scratch. Then work back up to 150 and continue.

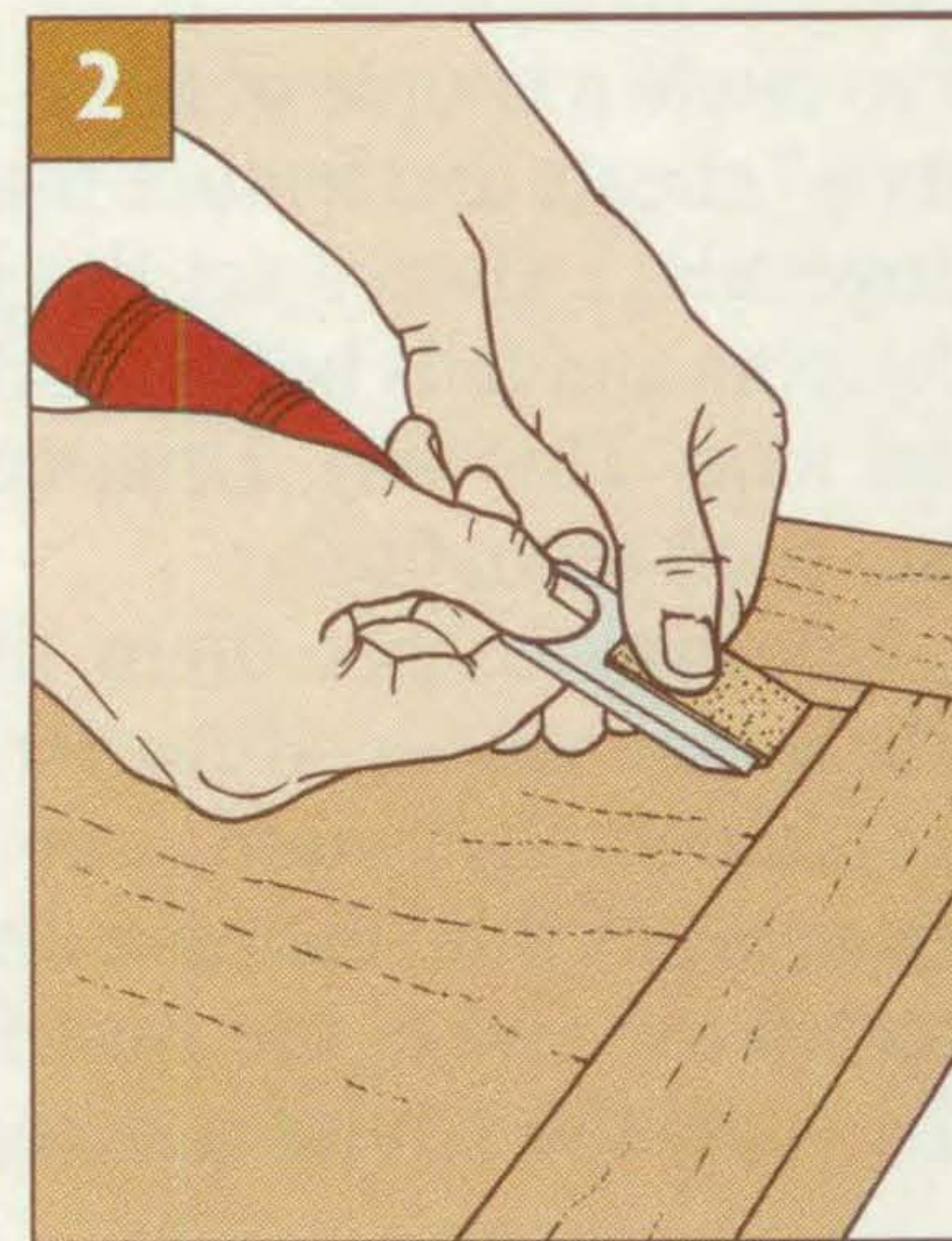
End grain tends to "drink up" more stain, making it darker than the face grain. To get the end grain to accept a stain the same as the face grain, sand the end grain a couple grits finer.

If you've stained a project, be careful when sanding between coats of finish. And



avoid the edges if possible. (Stay about 1/8" away.) It's too easy to cut through the finish and remove the stain.

When using regular sandpaper, put four layers on a sander at the same time.



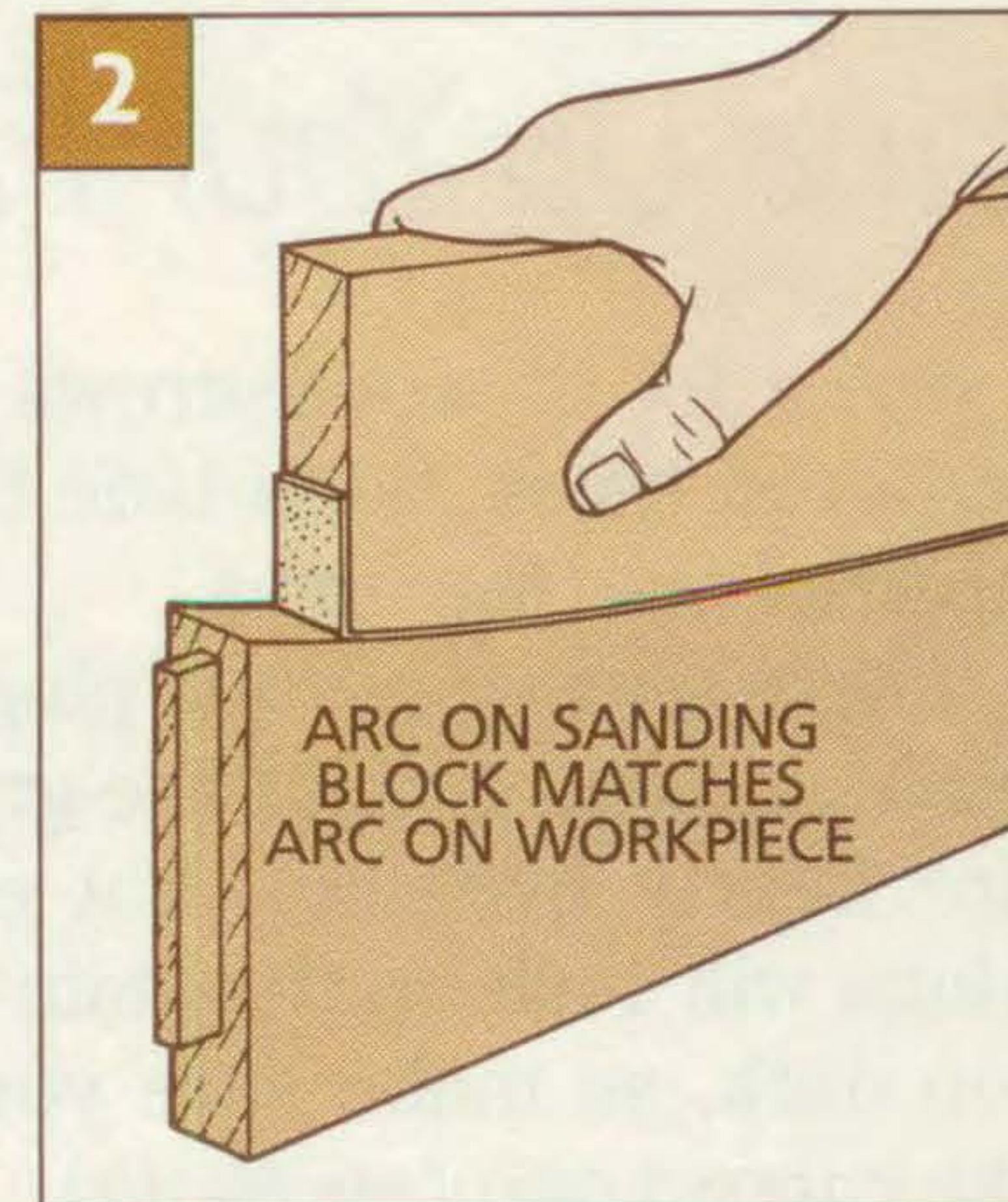
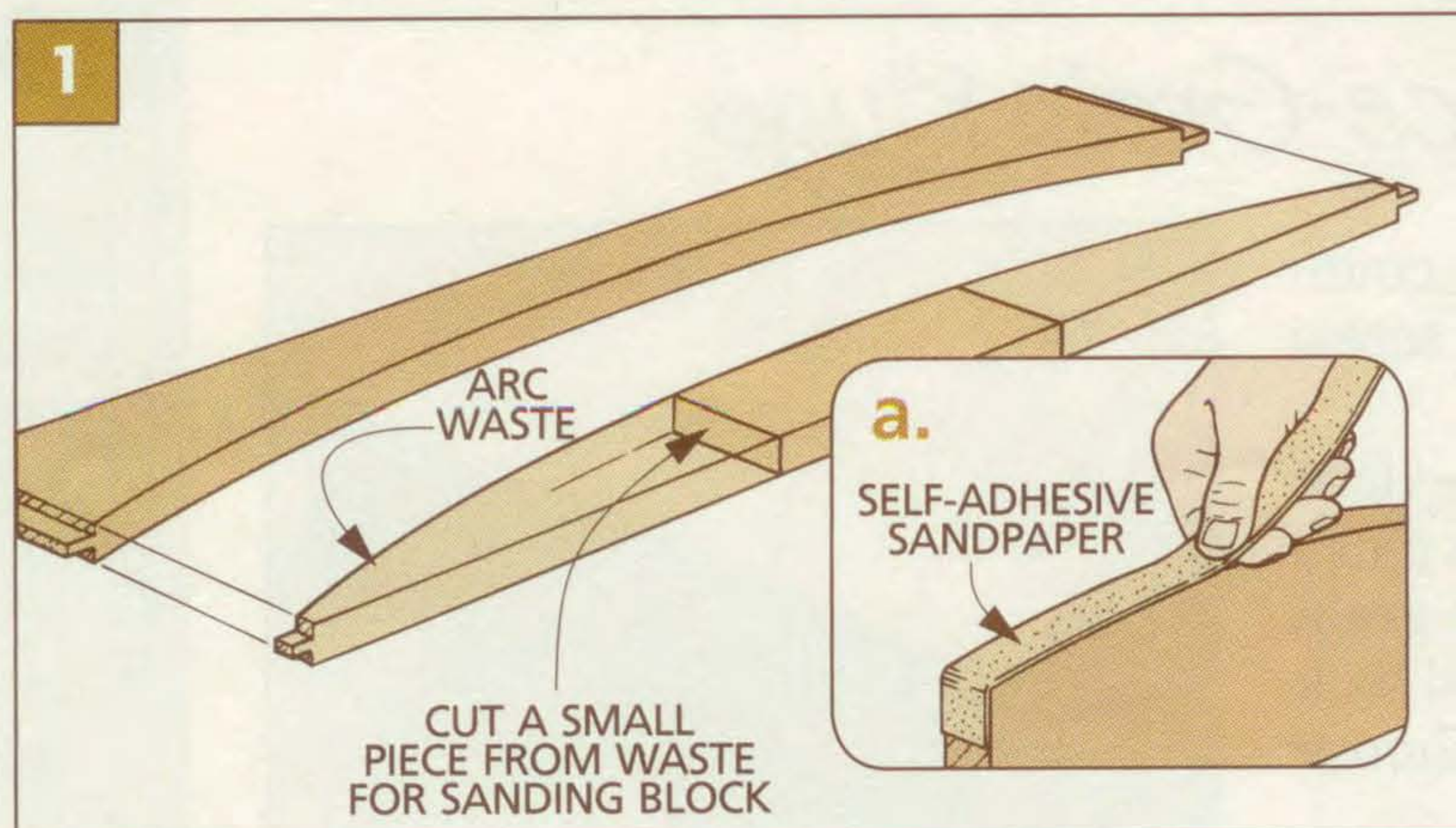
Then rip off the top layer when it's worn (*Fig. 1*).

Tight Spots – Finally, to sand in tight to a corner or up to an edge, wrap some sandpaper around a dull chisel or a putty knife (*Fig. 2*).

Block for Sanding Arcs

After cutting out an arc, the waste makes an ideal sanding block for finish sanding the inside edge.

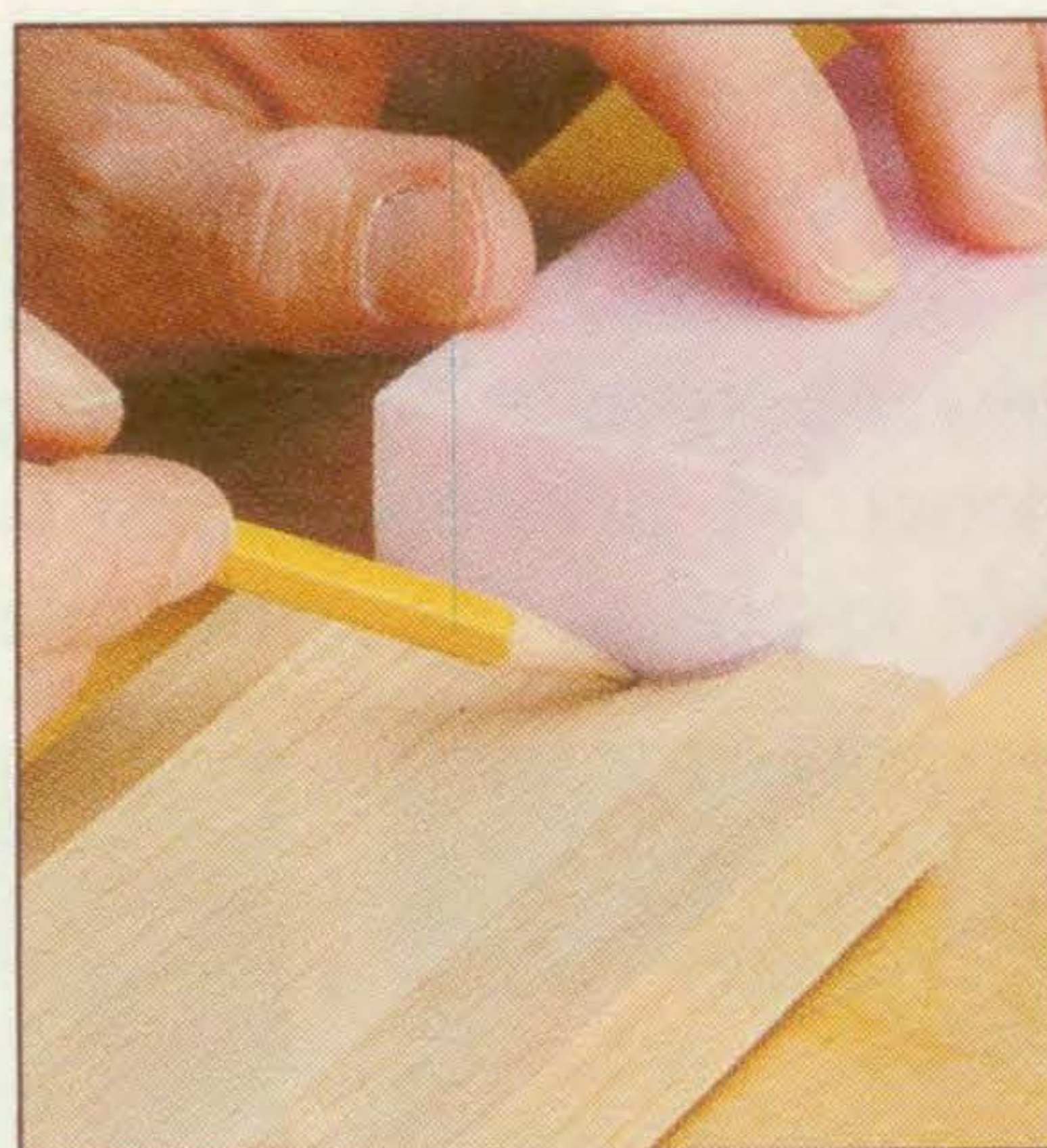
Cut out a small piece to fit comfortably in your hand (*Fig. 1*) and attach a thin strip of self-adhesive sandpaper to the inside edge. The arc follows the cut left by the saw to smooth out any indentations (*Fig. 2*).



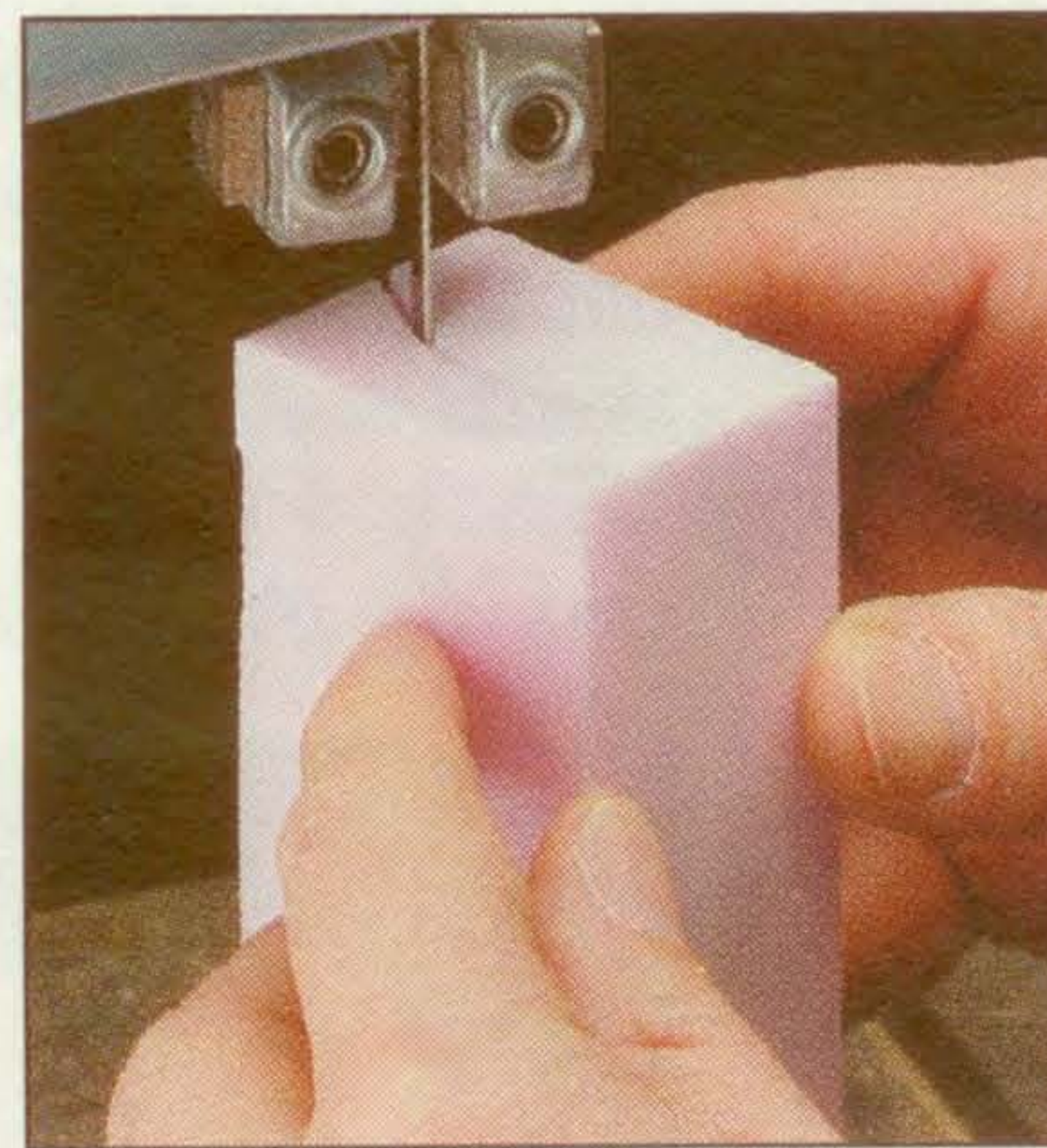
Cove Sanding Block

The best sanding block is one that matches the shape to be sanded. So I make a custom sanding block from rigid foam insulation to sand cove molding.

Make the Block – To make the block, first trace the profile on the end of the foam (*Step 1*). Then cut it to rough shape on the band saw (*Step 2*). Finally, shape the foam to the desired profile using the piece to be sanded (*Step 3*).



1 Trace the rough outline of the cove onto a small block of thick rigid foam insulation.



2 Next, use a band saw (or a hand saw and a file) to cut the profile to rough shape.

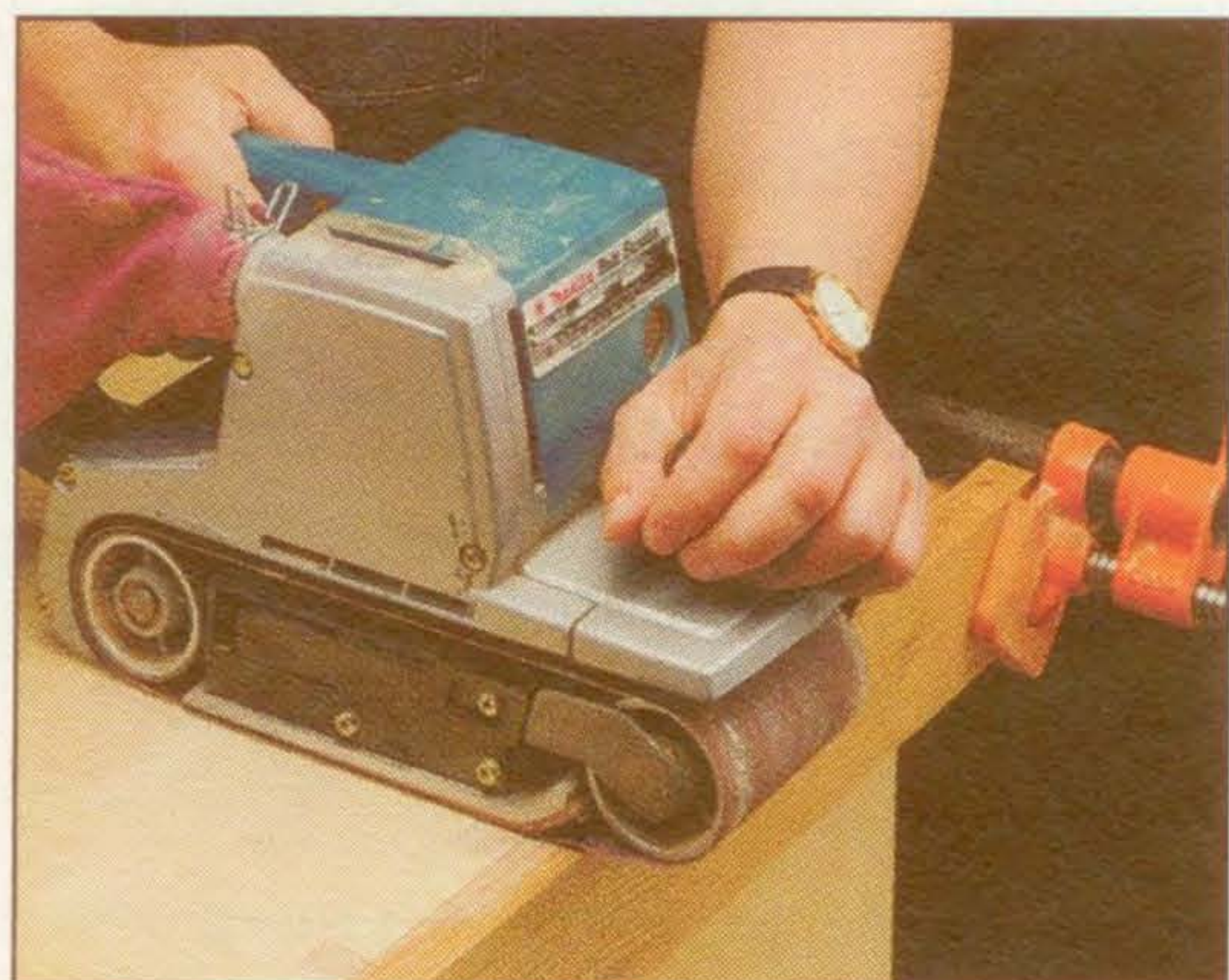


3 Smooth the profile by rubbing it across a piece of sandpaper stuck to the cove portion of the piece.

Sanding Flush

I've made a couple of large "country-style" chests that feature machine-cut dovetails. I always set the jig so the pins and tails both stand proud of the side. This way, I can come back and sand them flush.

One way to get them flush is to use a belt sander. However, it's easy to accidentally round over a corner. To prevent this, clamp a scrap piece across the end of the case flush with the panel the sander is riding on.



Sanding Those Rascally Rabbits

When sanding a rabbet, it's easy to tip the sander and round over the edge.

To prevent this from happening, clamp the workpiece in a bench vise with a piece of scrap flush with the top of the rabbet. This supports the sander and keeps the edges square.



Protect Your Hands for "Free"

If you don't protect your hands when staining, they'll end up the same color as the project.

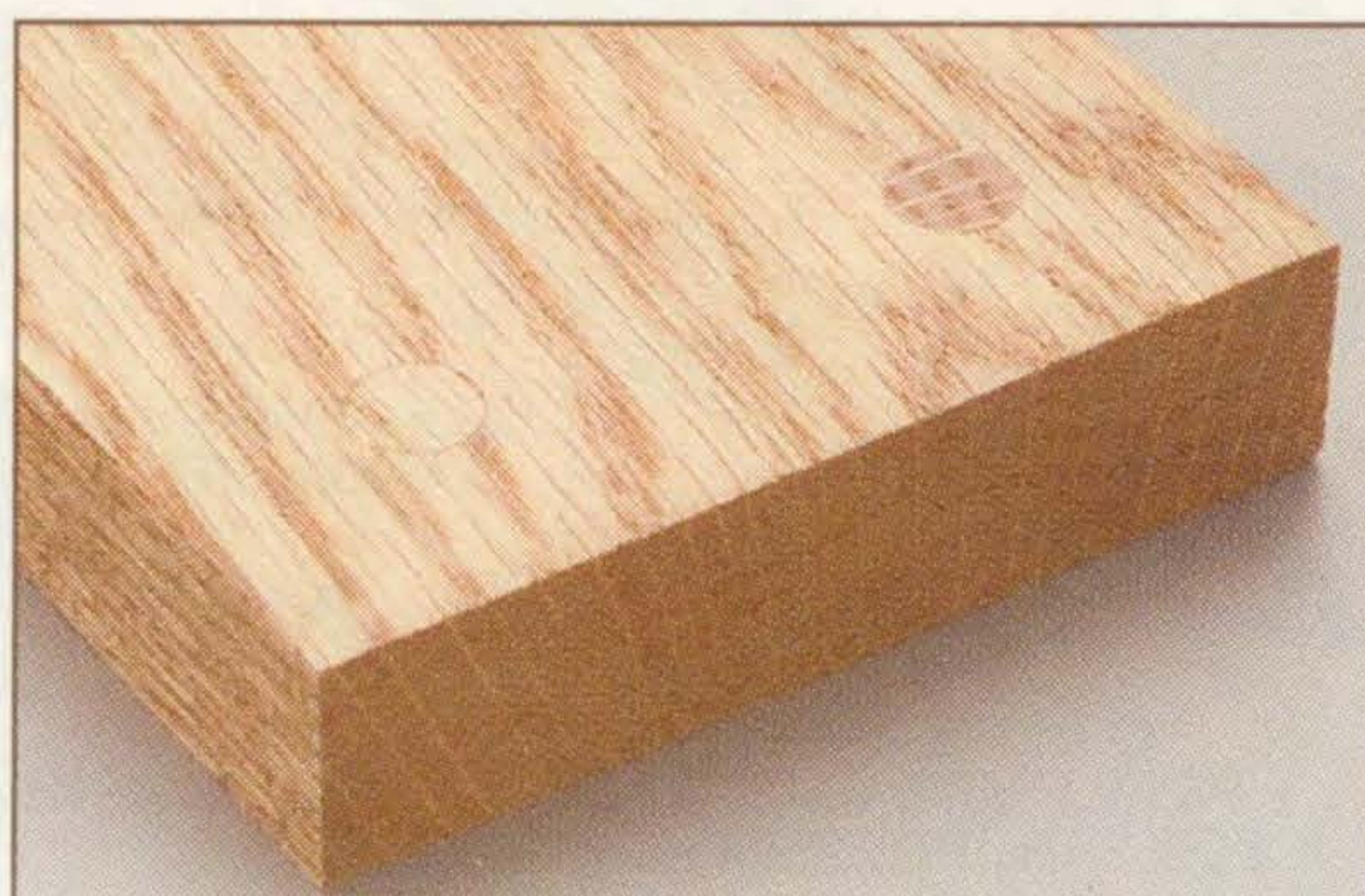
Although plastic gloves keep your hands clean, they aren't free. But my "gloves" don't cost a penny. I just slip my hand into the plastic bag that the newspaper came in (see photo).



Line Up Your Face-Grain Plugs

I use a lot of woodscrews in counterbored holes. So to hide the screw heads, I plug the holes.

There are two types of plugs — face grain and end grain. Face-grain plugs are nearly invisible, but end-grain plugs will soak up the stain and look too dark, so make sure you choose the correct one (see photo).



Shop Tip

Shop Brush— I keep a brush in my shop commonly used by a draftsman. The bristles on this brush are longer and softer than most shop brushes so it cleans up sawdust around equipment and down in cracks and corners easily.

Touch Up MDF Before Spray Painting

When I make a project out of medium-density fiberboard (MDF) it's usually one that will take a lot of abuse. When that's the case, I give it a durable finish with enamel spray paint.

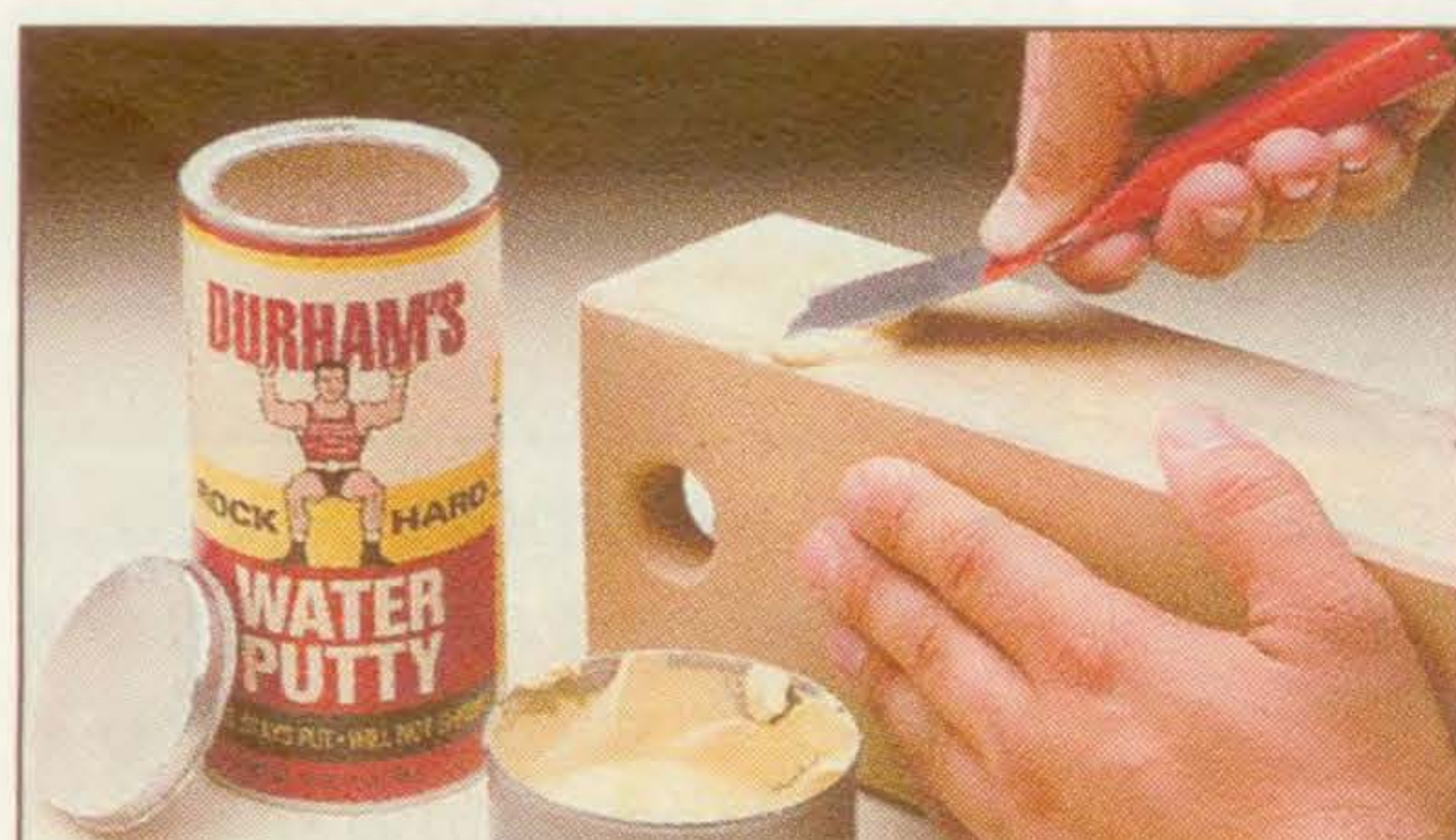
Since the edges of MDF are

quite porous, they'll wick up paint like a sponge. So I fill them with a hardening putty first (left photo). It's available at most hardware stores.

Then I apply a coat of primer (middle photo) before applying the

color coats (right photo).

The thing to be aware of is that subsequent coats either need to be sprayed on within the hour (when the paint is still tacky) or after 48 hours (when it's completely dry).



Choosing the Best Outdoor Finish

When it's time to apply a finish on an outdoor project like this garden bench (*see photo*), you have several options from which to choose. It all depends on what kind of wood you use to build the project.

Show Off the Grain – If I'd wanted to let the grain of the wood stand out as much as possible, I could have used an oil finish formulated for outdoor use. This is a good choice with a more expensive wood, like redwood or teak. But there's one drawback to this type of finish — you'll want to renew it every year or so by applying an additional coat of oil.

Maximum Protection – Another option is to paint the bench with an

alkyd primer and a couple of coats of a quality latex paint. This, of course, covers up all that beautiful wood grain. But the plus side is paint will protect the wood better (and longer) than any other finishing option.

Best Alternative – When it comes right down to it, I usually can't bring myself to paint outdoor projects. But I was willing to sacrifice a little of the wood grain for more protection. So instead of paint, I applied a semi-transparent stain (*see photo*). These stains are made from an oil/alkyd resin formula that also needs to be renewed, but only about every three to five years.

You'll want to follow the instructions for the stain you pick out. But I



found that when it comes to staining the vertical sections of a project (like the legs) a dry foam brush was helpful for removing the excess so I didn't end up with any runs.

Finishing Baster

On finishing jobs, I needed a way to mix precise amounts of finish to get just the right color.

So I bought an inexpensive turkey baster at the grocery store. Be sure to get one that has 1/4 oz. graduation marks.



Shop Tip

Hand Rubbed Look – If you want to give a semi-gloss finish that “hand-rubbed” look all you need is a brown paper bag (the kind you find in the grocery store). The paper is slightly abrasive so it buffs the finish without actually cutting through it.

Know Where It's Going Before Finishing a Cabinet

Simple changes to a project can make it look completely different. That's the case with this cabinet. The finish can effect the look of a project as well.

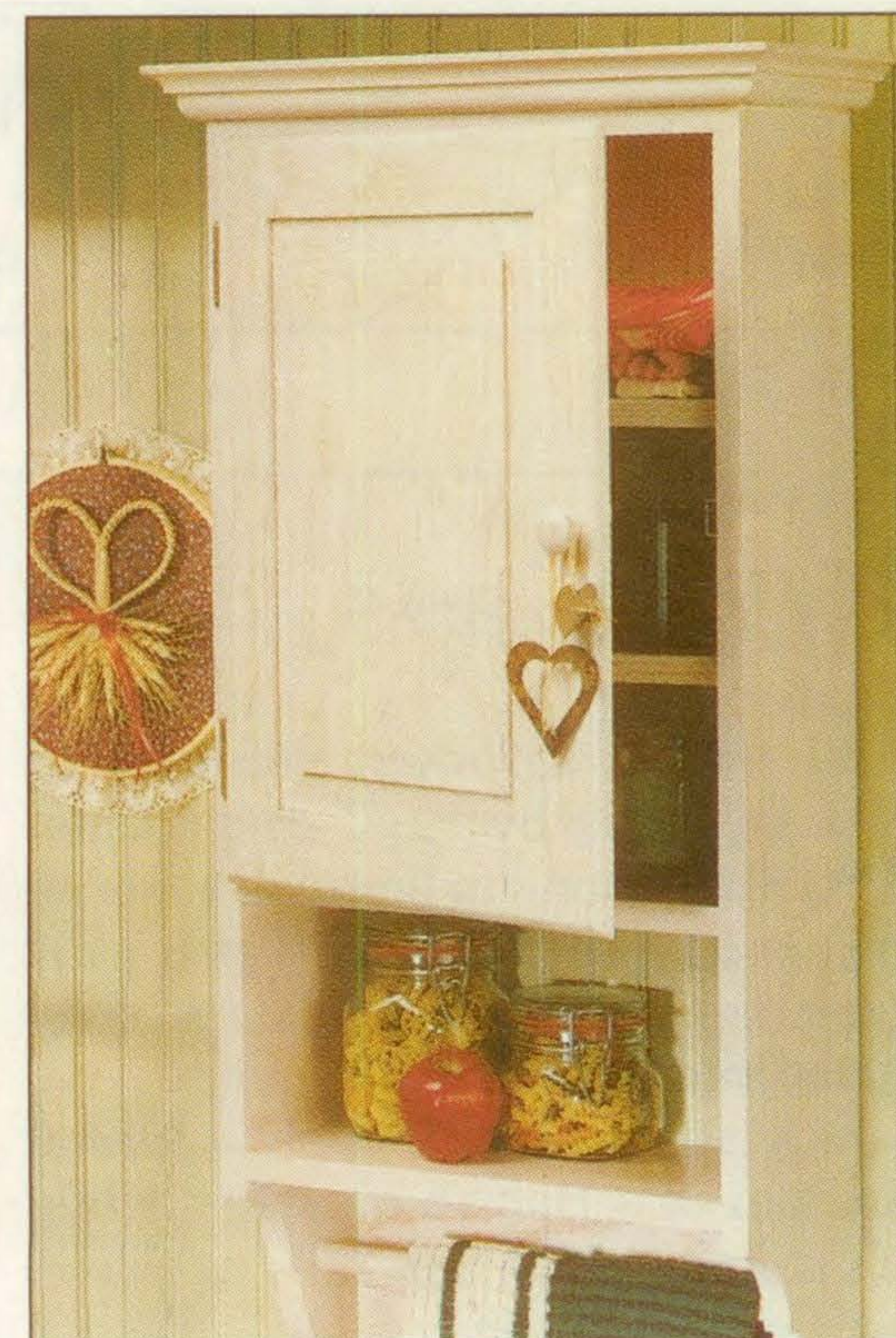
For example, a towel rack makes the cabinet perfect for an informal bath (*photo far right*). But, by replacing the towel rack with Shaker pegs and staining it with a few coats of oil/urethane finish, it would look fine in a more formal setting. That's why I always consider the style *and* the final location of a project before I finish it.

Antiquing – If you're after an informal look, I suggest giving it an old-fashioned antique finish. It's easy to do without actually distressing it with nicks, dings, and scratches. To do this, I take advantage of the wood's open pores. (In this case, I used oak.)

First, wipe on three coats of a white

pigmented stain. This makes the surface of the cabinet white without completely filling the pores.

Now, to simulate years of wear just “dirty” it up. To do this, highlight the pores by wiping on a coat of dark stain over the entire surface and then immediately wiping it off (*see photo bottom left*). This leaves the stain just in the pores, so the cabinet instantly looks much older than it really is.



Preventing Blotchy Stain In Pine

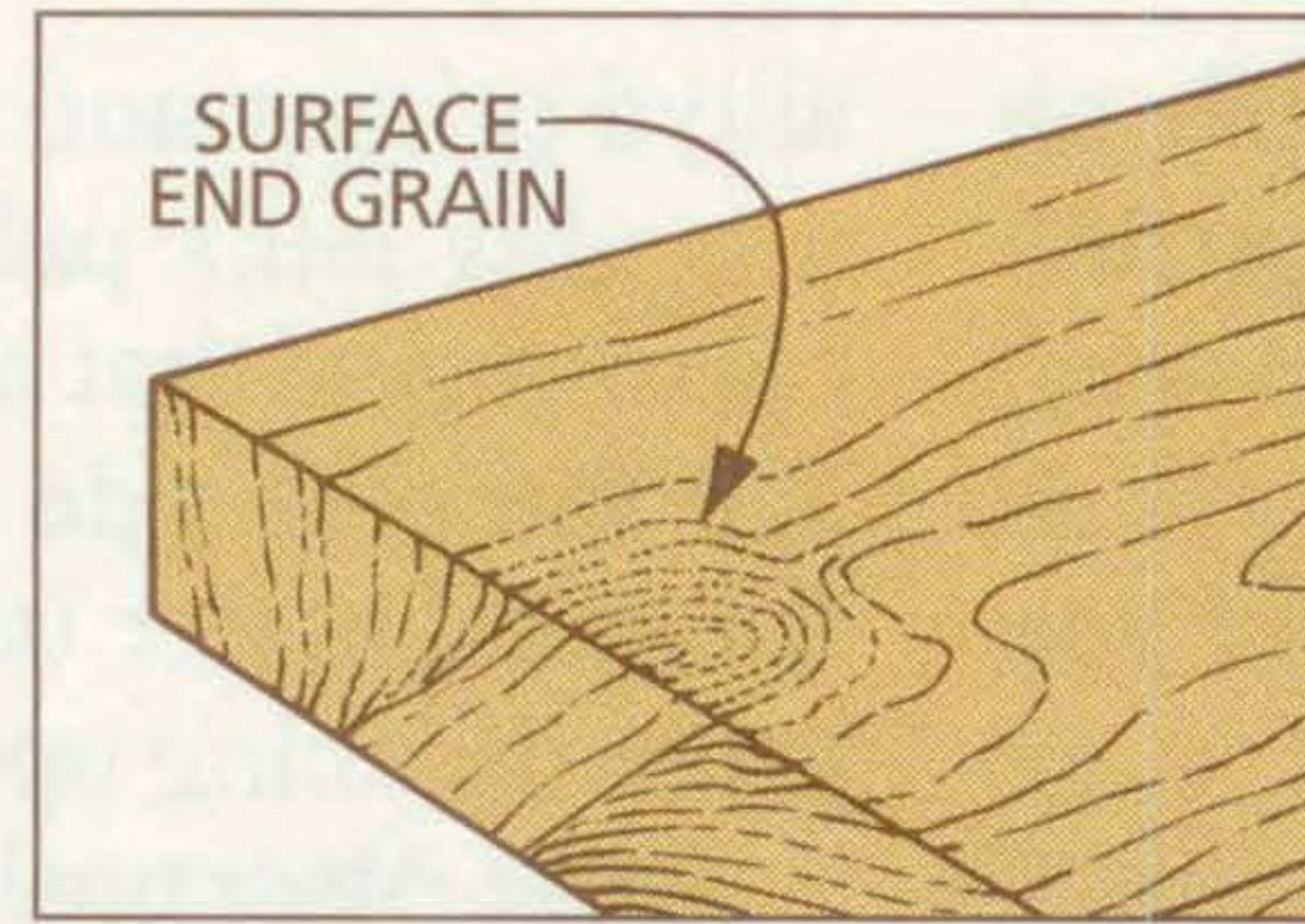
Pine can be a stubborn wood to stain. On a single piece of pine the pores can alternate from large and open to small and dense. The grain often swirls around so that you find end grain where you don't expect it — on the surface of the board (*see drawing*).

These variations in the grain affect the way the stain is absorbed into the wood. The pigments in the stain settle in the pores, and the deeper the pore, the more stain it holds. So some areas hold more pigment than others. This can result in a series of light and dark blotches (*see left side of the board in the photo*).

There are steps you can take to control blotching.

First, be selective in the boards you use. Look at the edge of the board for a tight and straight grain pattern. Avoid boards with swirling or unusual grain patterns.

Second, always sand the project thoroughly, working through progressively smoother grits of sandpaper. Areas with large scratches left behind by coarse-grit sandpaper trap more pigment and stain darker. If you want to



end up with a lighter color, use a finer grit (180) sandpaper as this will seal up the larger pores.

Next, once you're through sanding the entire surface, go back and sand any end

grain a little more with the next higher grit. This will fill in the pores of the end grain with fine dust. Then when the stain is applied, it won't penetrate these areas as deeply.

Finally, brush on a stain controller before applying the stain. The controller partially seals up the large pores so they won't hold as much pigment. The result is a more even stain (*see the right side of the photo*).

Then, you can begin applying the stain right away — before the stain controller has had time to dry completely.

Note: Be sure to stir the stain frequently to keep the pigments in suspension and ensure consistent color.



▲ **Blotches.** Applying an oil stain to this piece creates a series of light and dark blotches (*left side above*). But using a stain controller first helps even out the color (*right side*).

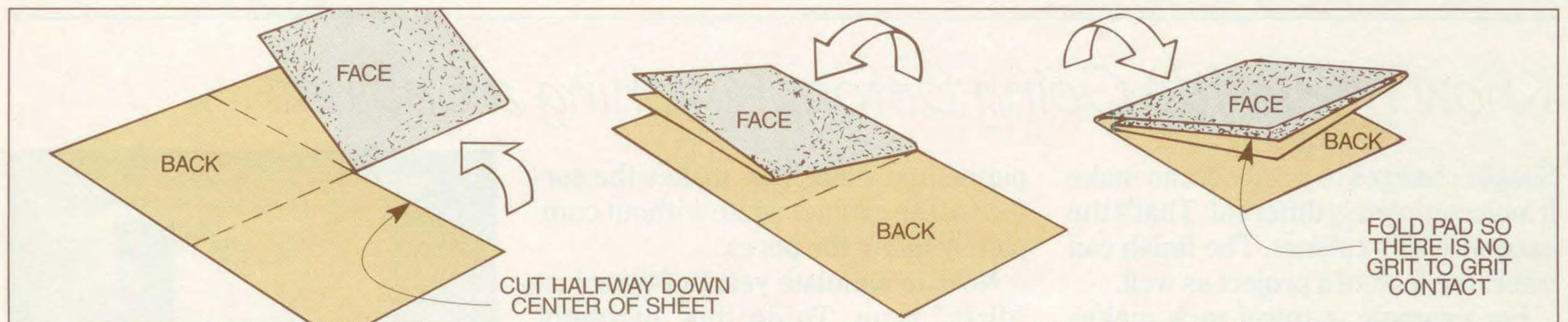
Sanding Pad

I like to fold a quarter sheet of sandpaper into a pad that eliminates the usual grit-to-grit contact. This way, the unexposed surfaces won't wear

as you sand with the outer surface.

The pad is also nice when sanding on the lathe. With four layers of insulation, my fingers don't get as hot.

To fold the pad, first make a single cut to the center of the sheet. Then follow the steps shown. To expose a new surface, simply refold the pad.



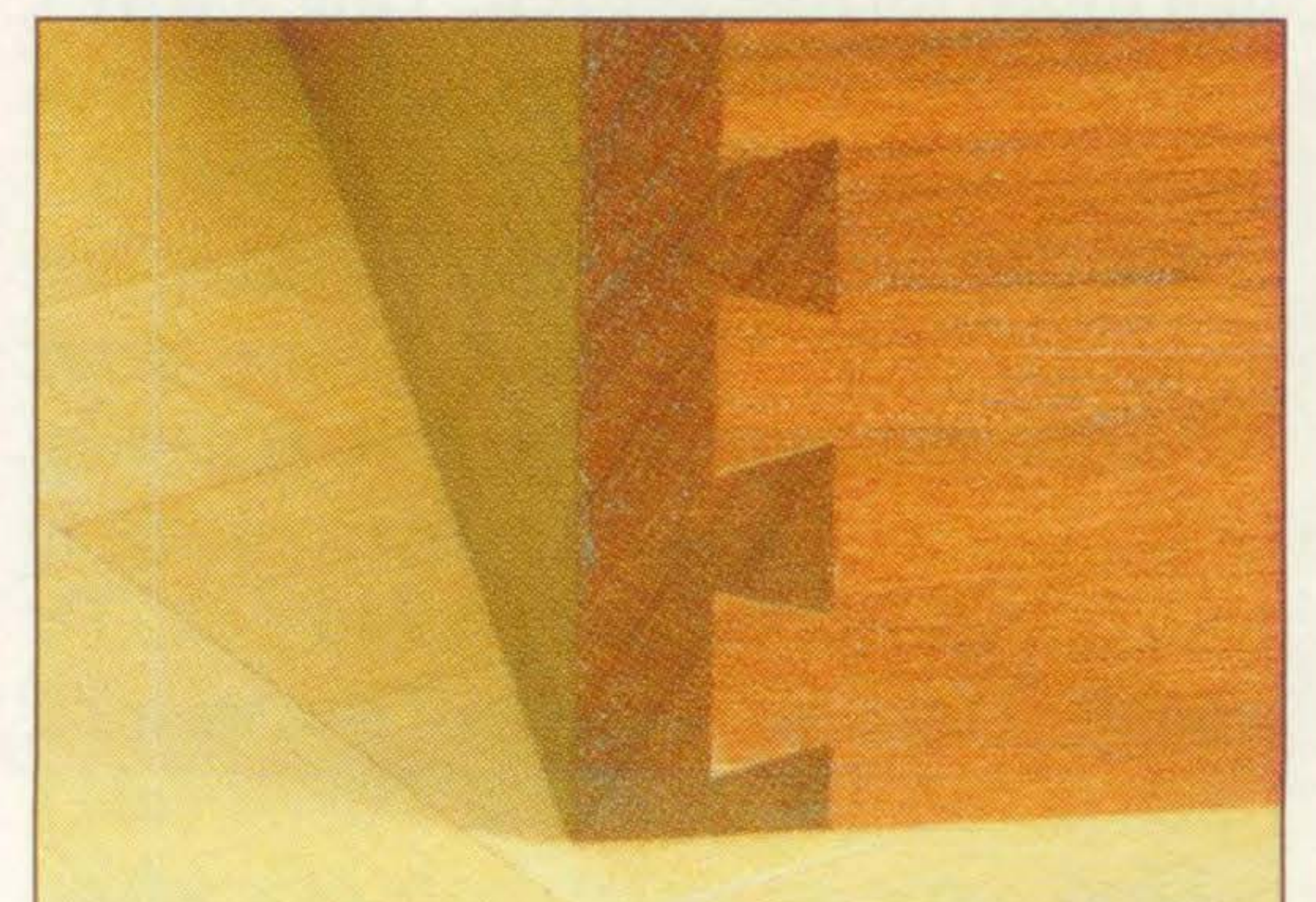
Filling Gaps

Very few woodworkers can cut perfect dovetails by hand every time. There are bound to be small voids no matter how hard you try. The trick is to somehow fill these voids so they blend into the rest of the joint.

One solution is to apply a liberal amount of a Danish oil. Then while it's still wet, sand with 220-grit silicon carbide sandpaper.

Slurry – While you sand, you'll create a slurry of sawdust and oil. As it accumulates, work this slurry into the gaps in the joint. Keep sanding until there's enough to fill the voids between the pins and tails.

Dries Hard – The mixture will dry very hard, and it matches the end grain of the pins and tails almost perfectly filling the gaps.



Using Shellac for an “Aged” Look

To give a project a warm, “aged” color, I like to use an old-fashioned form of finish — three coats of shellac.

One Coat of Orange – The first coat of finish I use is an orange shellac. This gives the wood a nice, warm color — and it doesn’t blotch like a pigment-based stain will.

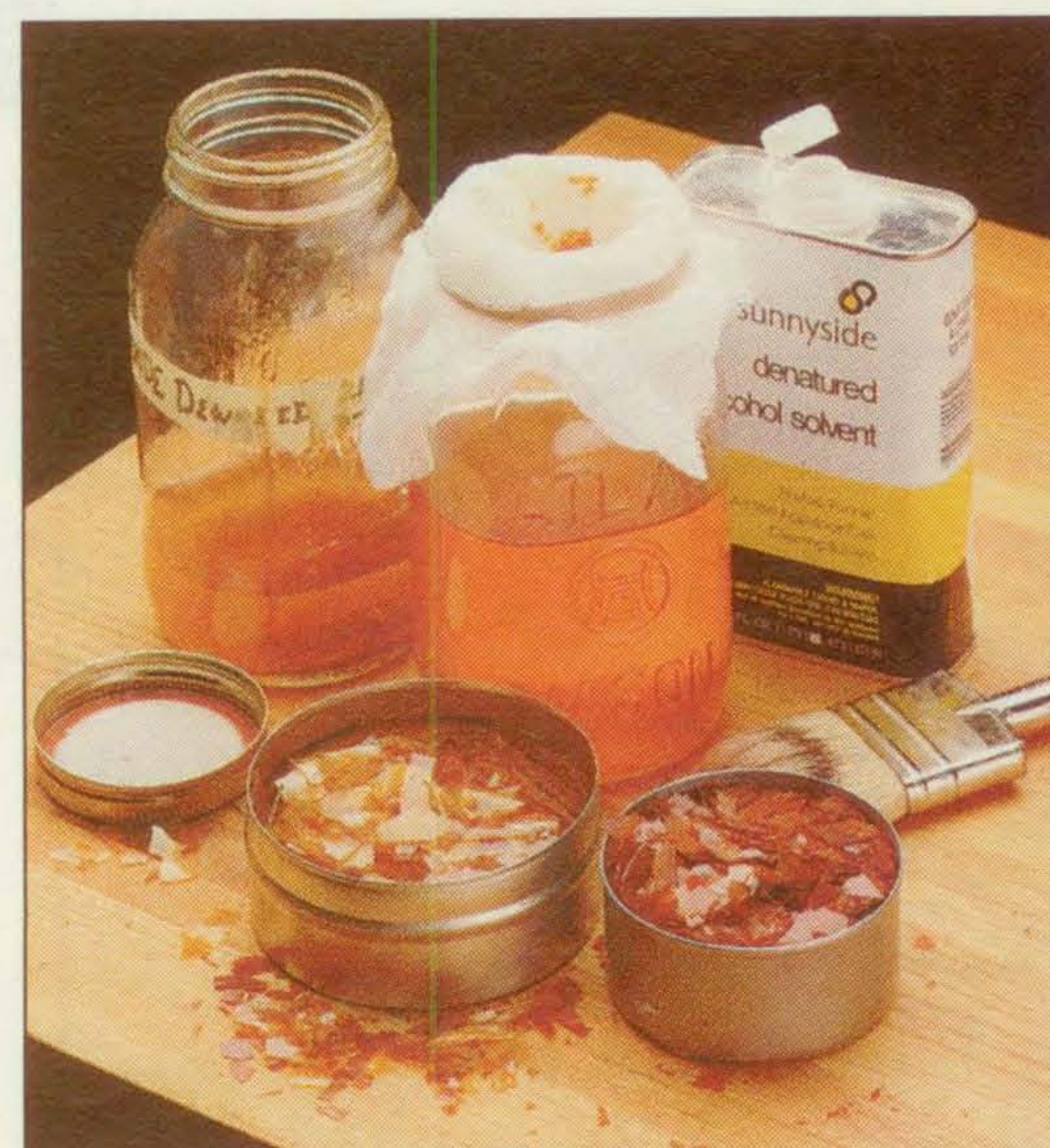
Two Coats of Blonde – Then to keep the color light, but still add even more protection, I apply two coats of blonde shellac.

Shellac comes ready-to-use or in flakes that must be dissolved in alcohol. Once dissolved, it begins to

slowly deteriorate. So that I know it’s fresh, I mix my own from flakes.

Shellac is mixed in “pound cuts” — the number of pounds of flakes to a gallon of alcohol. I used a 2 lb. cut. But I only mixed up a pint at a time (which requires 4 ounces of shellac flakes). Don’t worry about being precise. Just get it in the ballpark.

Use the Right Brush – To apply shellac, I use a natural bristle brush. Don’t work the finish too much with the brush. The shellac dries fast, so you can sand lightly after about three hours and apply another coat.



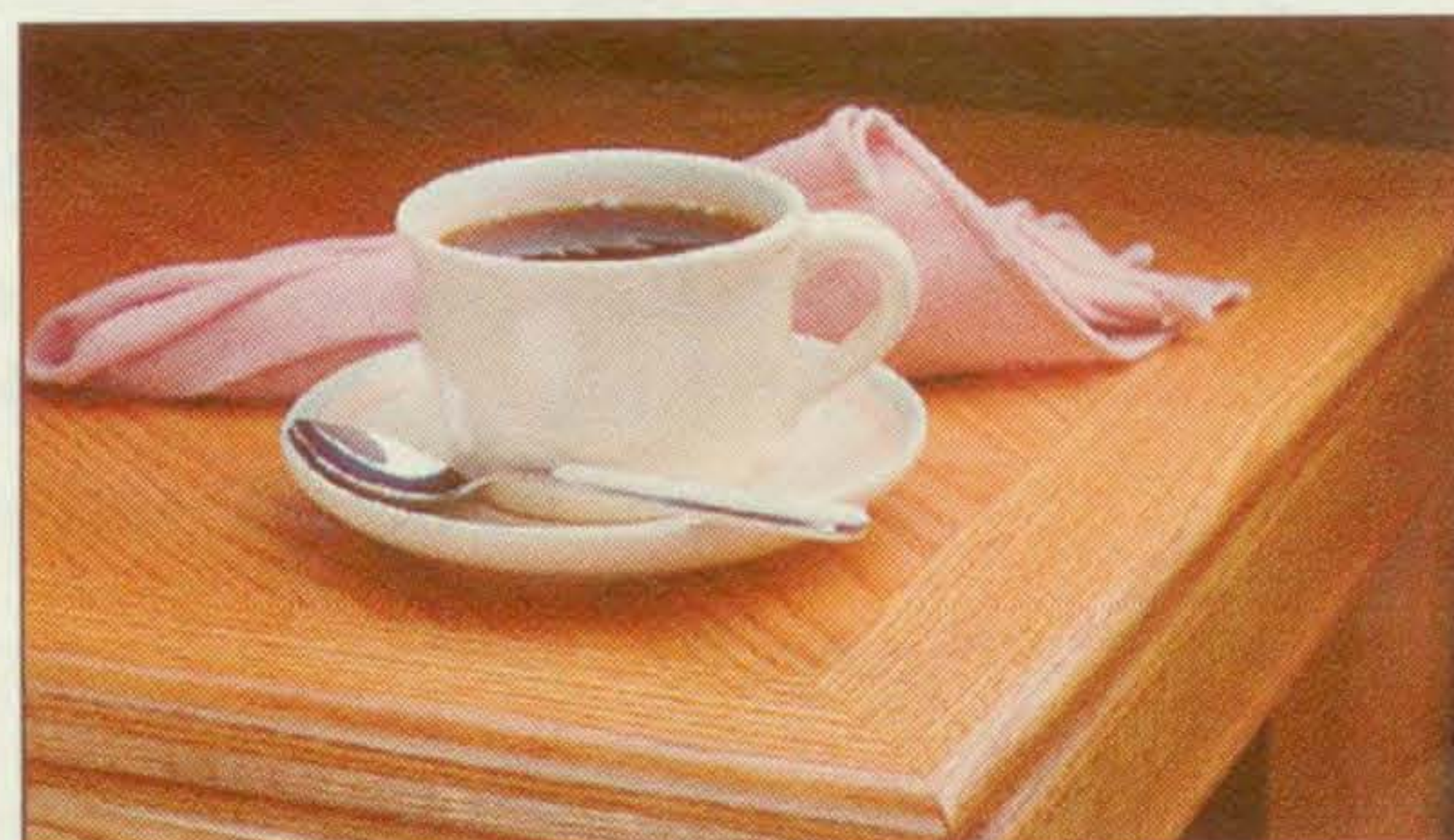
Make Your Own Custom Oil Finish

I sometimes want to bring out just a bit of color when I finish a project, so I stain them using a homemade stain. To make the stain, I mix a teaspoon of burnt umber artists’ oil color into a quart of boiled linseed oil (BLO).

For projects that take a lot of abuse, I’ll also use a finish that can be built up, such as polyurethane.

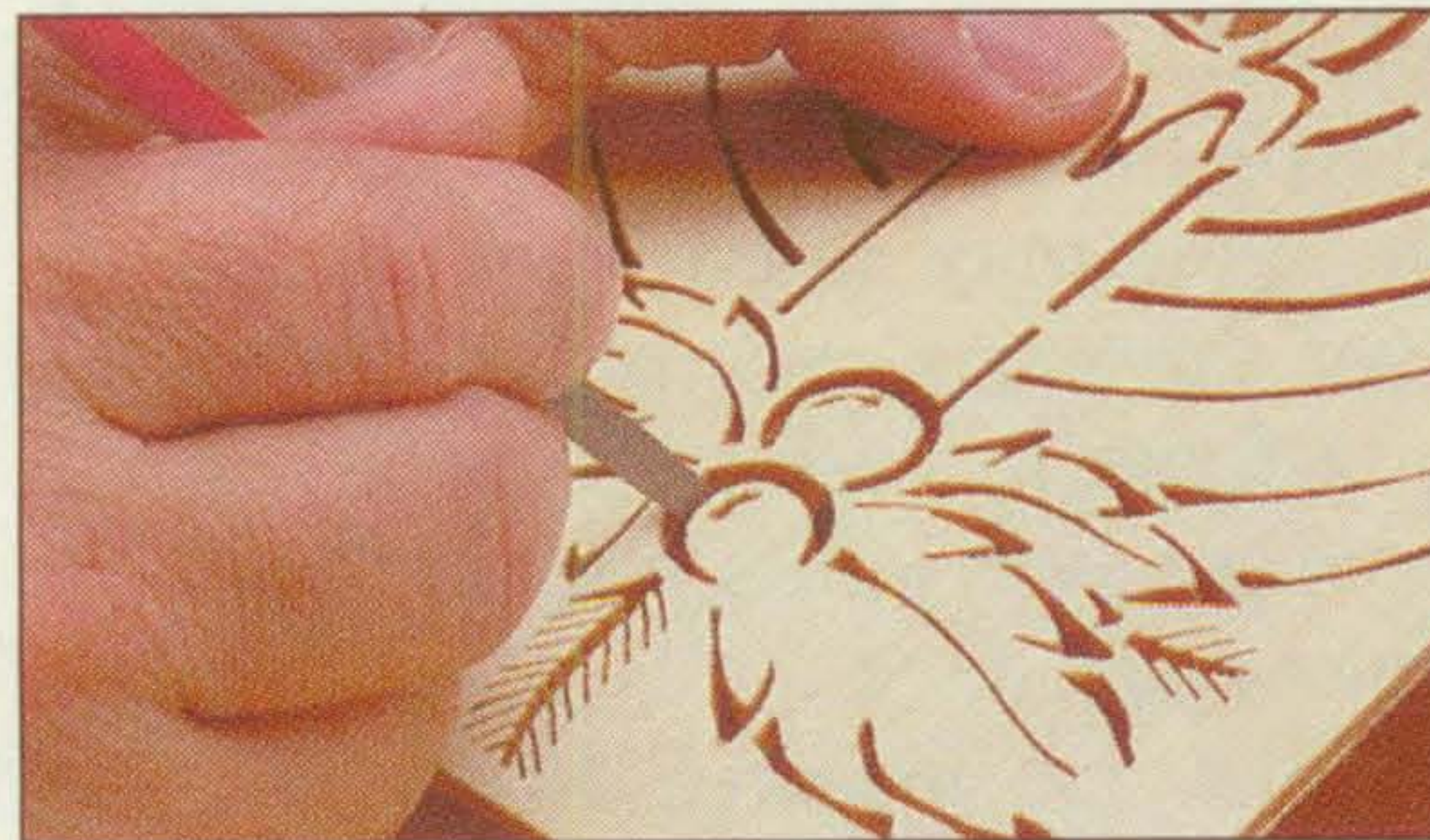
Three Coats – I brush on at least three coats of finish to all surfaces of the tables and allow it to dry fully. Lightly sanding with 320-grit sandpaper between coats.

Paste Wax – Finally, I like to top things off with a coat of paste wax applied with 0000 steel wool and buffed with a clean rag. This smoothes the surface and protects it.



Fine Sanding

A small file or emery board can be used to smooth out any rough edges left behind after scroll sawing is complete. It takes a little time to do this, but the end result is well worth it.



When and Where to Use Aniline Dye

When you choose a piece of highly-figured wood for a project, you usually want that figure to “pop out.” The solution that I like best is to use an aniline dye. It produces a deep, rich color that won’t obscure the grain.

Powder – The type of aniline dye I use is a powder that dissolves in hot water. And, because it’s water-based, it will raise the grain of the wood a bit after it’s applied. But there’s a simple trick to keep this “fuzz” to a minimum.

Just dampen the wood

slightly *before* applying the dye. Then lightly sand off the “whiskers” that rise.

Note: I use sandpaper that’s one grit finer than that used on the project.

A rag or brush is all that’s needed to apply the dye. To avoid lap marks, keep the workpiece surface wet and wipe off the excess before it dries.

Top-Coat – Be aware the dye will appear chalky or dull when it dries. Applying a top-coat will restore the vivid color. Just be sure it’s oil-based — water will redissolve the dye.



Choosing & Using Glues

Standing in front of a shelf at the woodworking store, I counted twelve different kinds of glues. It made me think back to when I started woodworking and there were about three choices for assembling a joint: hide glue, yellow glue, or a couple of nails. So does anyone really need all these different adhesives?

Just like you choose the right wood for a project, you also should pick a glue that fits the needs of the joint. On some jobs you need a glue that dries within seconds. The next time, you may need 10 minutes to get the parts assembled. Some joints have to resist the weather. There are even joints you may want to take apart later.

No one glue does it all, so knowing the strengths and characteristics of each type will help you choose the right glue. That's why we are providing you with this handy reference chart. This way, when you find a glue that works, you'll know enough to stick with it.



Glue Application Chart

Glue	Applications	Working Temp	Water Resist
Regular Yellow	Indoor projects	50° +	Poor
Type II Yellow	Indoor or outdoor projects	50° - 85°	Excellent
Type III Yellow	Waterproof joints	47°	Excellent - Waterproof
White	Indoor projects where longer open time is desired	60° +	Poor
Liquid Hide	Indoor projects where longer open time is desired, joints that may need to be disassembled	70° - 90°	Poor
Hot Hide	Indoor projects, restoration of furniture originally assembled with hide glue, joints that may need to be disassembled	140° - 212°	Poor
Polyurethane	Indoor projects, outdoor projects	50° +	Excellent
Epoxy	Bonding dissimilar materials (i.e. metal or glass to wood), bonding oily woods, and for waterproof bonds	35° + depending on formula	Excellent - Waterproof
Contact Cement	Plastic laminates and veneers to substrates	65° +	Fair
Spray Adhesive	Paper patterns and fabrics to workpieces	50° +	Poor
Super Glue	Repairing small cracks, chips, securing inlays	50° +	Very Good
Hot Melt Glue	Temporary bonds that need easy removal	240° - 400°	Fair

	Open Time	Clamp Time	Notes	Cautions (Refer to product labels for more information)
	5 Min.	30 Min.	Widely available, inexpensive, strong bond.	Freezing can ruin glue.
	5 Min.	1 Hr.	Same as above, plus water resistant.	Freezing can ruin glue.
	10 Min.	30 Min. to 1 Hr.	Useful for outdoor applications in cooler temps, water clean up, solvent free.	
	8 Min.	1 Hr.	Bond is not as strong as yellow glue.	Freezing can ruin glue.
	10 Min.	12 Hr.	Joint can be disassembled with steam/heat.	
	< 1 Min.	2 Hr.	Sold as granules that must be dissolved in water and heated. Joint can be disassembled with steam/heat.	
	20 Min.	4 Hr.	Needs moisture to cure. Foams as it cures.	Can react with moisture in skin. Wear gloves.
	5 Min. to 90 Min. depending on formula	Varies with open time	Two-part system that must be mixed before use.	Repeated exposure can cause sensitization. Avoid skin contact, wear respirator and goggles.
	10 Min. to 60 Min.	Apply pressure with roller	Solvent-based open time shorter than water-based open time.	Vapors can be extremely flammable. Do not use near open flames.
	30 Sec. to 1 Min.	None	May need to mask off surrounding areas to avoid overspray.	Do not use around open flame.
	15 Sec. to 5 Min.	None	Accelerator available to speed cure times.	Bonds skin instantly. Fumes may be irritating to eyes.
	5 Sec.	None	Glue sticks must be heated in glue gun.	Hot glue dripped on skin can cause burns.

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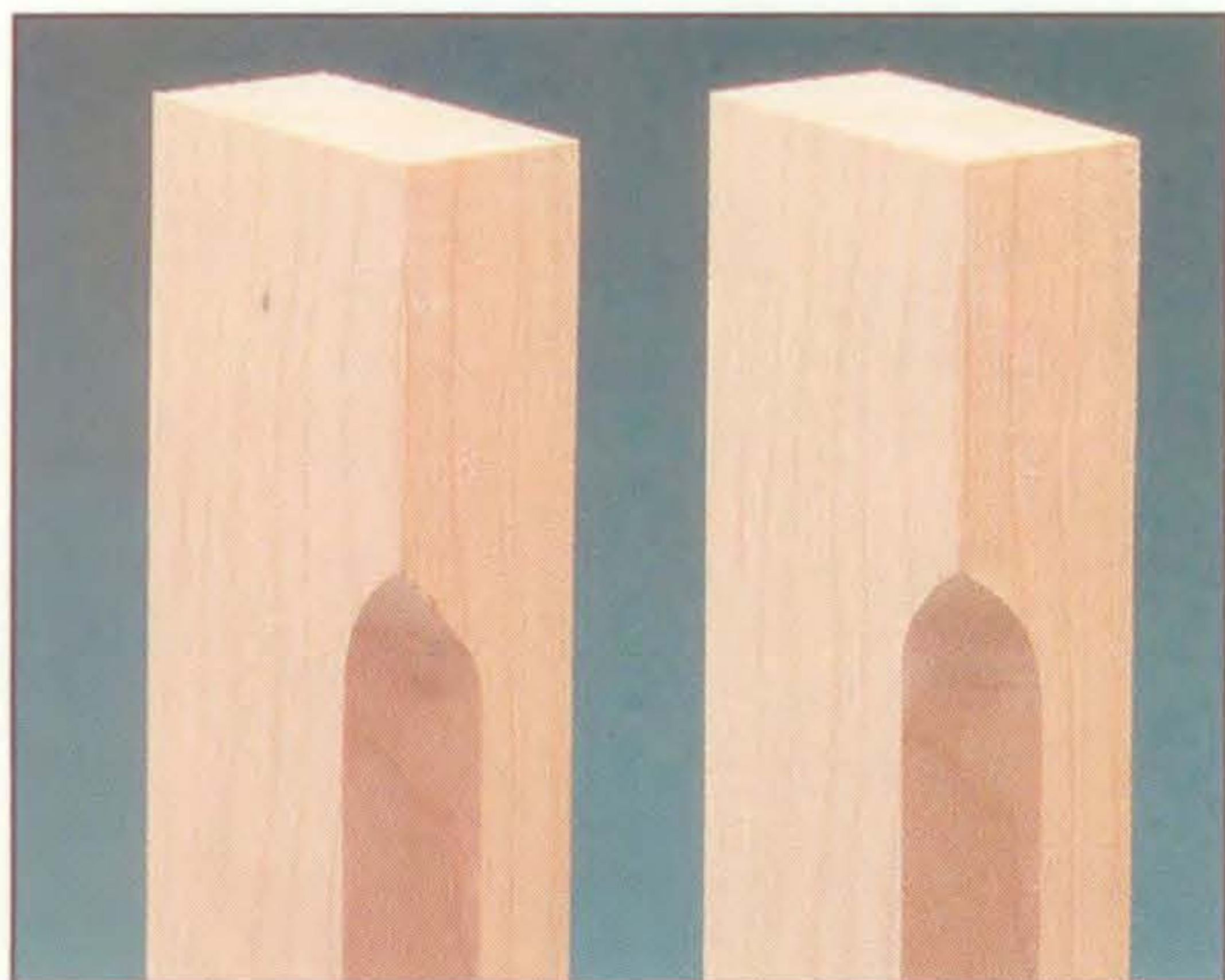
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Cleaning Up Chamfers

How do you clean up a stopped routed chamfer to create an even profile? See page 56.



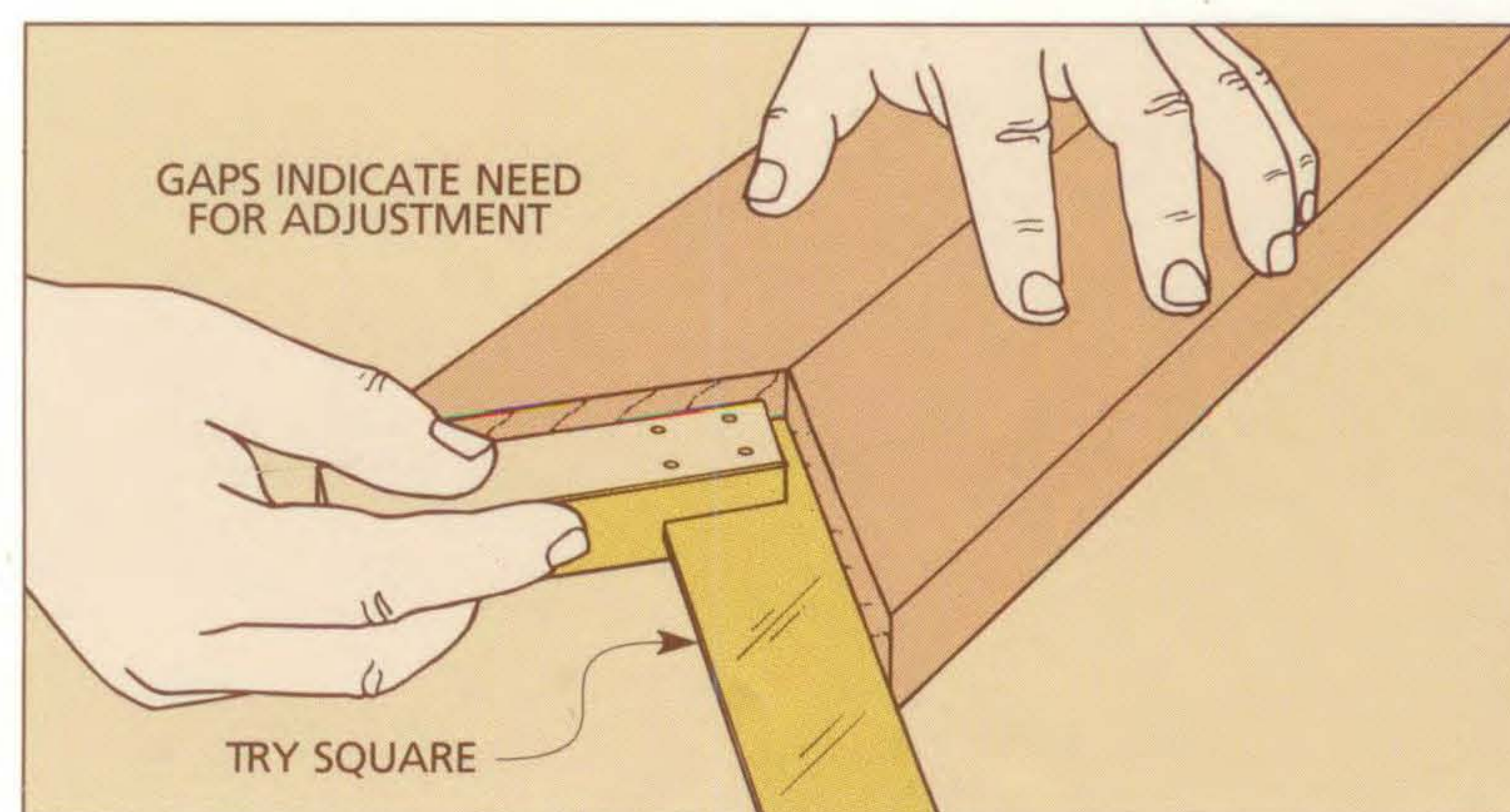
Shop Tip

Are you wondering what's the best way to locate hinge screws? Want some advice on choosing just the right outdoor finish? Then you've come to the right place.

Inside *120+ Tips and Techniques*, you'll find over 64 pages of the very best information we can offer to solve the problems you face in your shop every day.

Checking Miters

Why are we checking the inside of this miter joint instead of the outside? Turn to page 25 for the answer.



A Handy Layout Tool

How will this unusual-looking shop-built layout tool help you space screws on the back panel of your next project? See page 6.

