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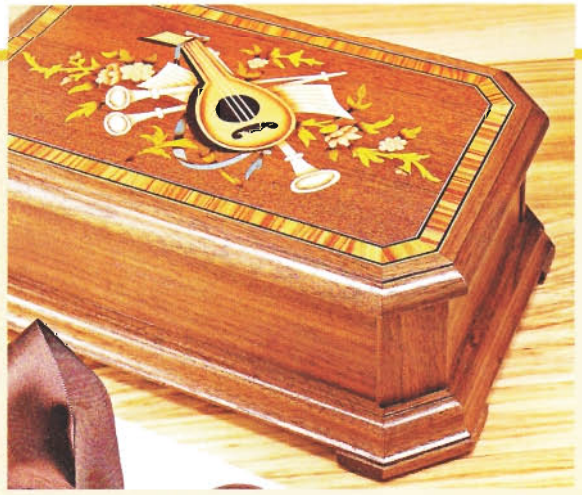
Table of Contents



Music Box page 16

Step-Back Bookcase page 22

editor's note
Sawdust

projects

Greene & Greene Hall Table page 32

The heirloom project featured in this issue of *Woodsmith* is one that I've wanted to build for a long time. It's a hall table inspired by the designs of Charles and Henry Greene. In case you're not familiar with their work, the Greene brothers worked together as architects in California during the early 20th century. They designed several bungalows and pioneered their own version of the Craftsman style. Some hallmarks of their furniture are rails and stretchers that incorporate "cloud-lift" curves, offset surfaces, as well as wood pegs that are softly rounded for a pillowy appearance. We've incorporated all of these elements in our own table.

But I'll be honest. This table is a fairly challenging project. With multiple through mortise and tenon joints, it will surely test your skills and broaden your woodworking abilities. But it's also a project that will provide a great sense of accomplishment. It's worthy of your time and effort, and in the end you'll have an heirloom project you can be proud of.

If you're looking for a project that's a bit less time-consuming, but just as satisfying, check out the music box. It packs a lot of woodworking in a small package. Plus, you'll learn to work with small parts safely and accurately. The end result is a beautiful project for someone special in your life.

Bryan

STATEMENT OF OWNERSHIP, MANAGEMENT, AND CIRCULATION
(Required by 39 U.S.C. 3685)

1. Publication Title: Woodsmith. 2. Publication No.: 0164-4114 3. Filing Date: August 28, 2012. 4. Issue Frequency: Bimonthly. 5. No. of issues published annually: 6 (six). 6. Annual subscription price: $24.95. 7. Complete mailing address of known office of publication: 2200 Grand Avenue, Des Moines, (Polk County), Iowa 50312-5306. 8. Complete mailing address of the headquarters or general business offices of the publisher: 2200 Grand Avenue, Des Moines, (Polk County), Iowa 50312-5306. 9. Full names and complete mailing addresses of publisher, editor, and managing editor: Publisher: Donald B. Peschke, 2200 Grand Avenue, Des Moines, Iowa 50312; Editor: Bryan Nelson, 2200 Grand Avenue, Des Moines, Iowa 50312; Managing Editor: Vincent Ancona, 2200 Grand Avenue, Des Moines, Iowa 50312. 10. Owner: August Home Publishing Company, 2200 Grand Avenue, Des Moines, Iowa 50312; Donald B. Peschke, 2200 Grand Avenue, Des Moines, Iowa 50312. 11. Known bondholders, mortgagees, and other security holders owning 1 percent or more of total amount of bonds, mortgages or other securities: None. 12. (Does not apply.) 13. Publication Title: Woodsmith. 14. Issue Date for Circulation Data Below: August/September 2012 15. Extent and nature of circulation:

	Average no. copies each issue during preceding 12 months	Average no. copies of single issue published nearest to filing date
A. Total number of copies (net press run)	225,166	208,724
B. Paid circulation (by mail and outside the mail):		
1. Paid/requested outside-county mail subscriptions stated on PS Form 3541	184,179	173,771
2. Mailed in-county paid subscriptions stated on PS Form 3541	0	0
3. Paid distrib. outside the mails (sales through dealers/carriers, street vendors, counter sales, and other paid distrib. outside USPS)	12,443	8,516
4. Paid distribution by other classes of mail through the USPS	0	0
C. Total paid distribution	196,622	182,287
D. Free or nominal rate distribution (by mail and outside the mail)		
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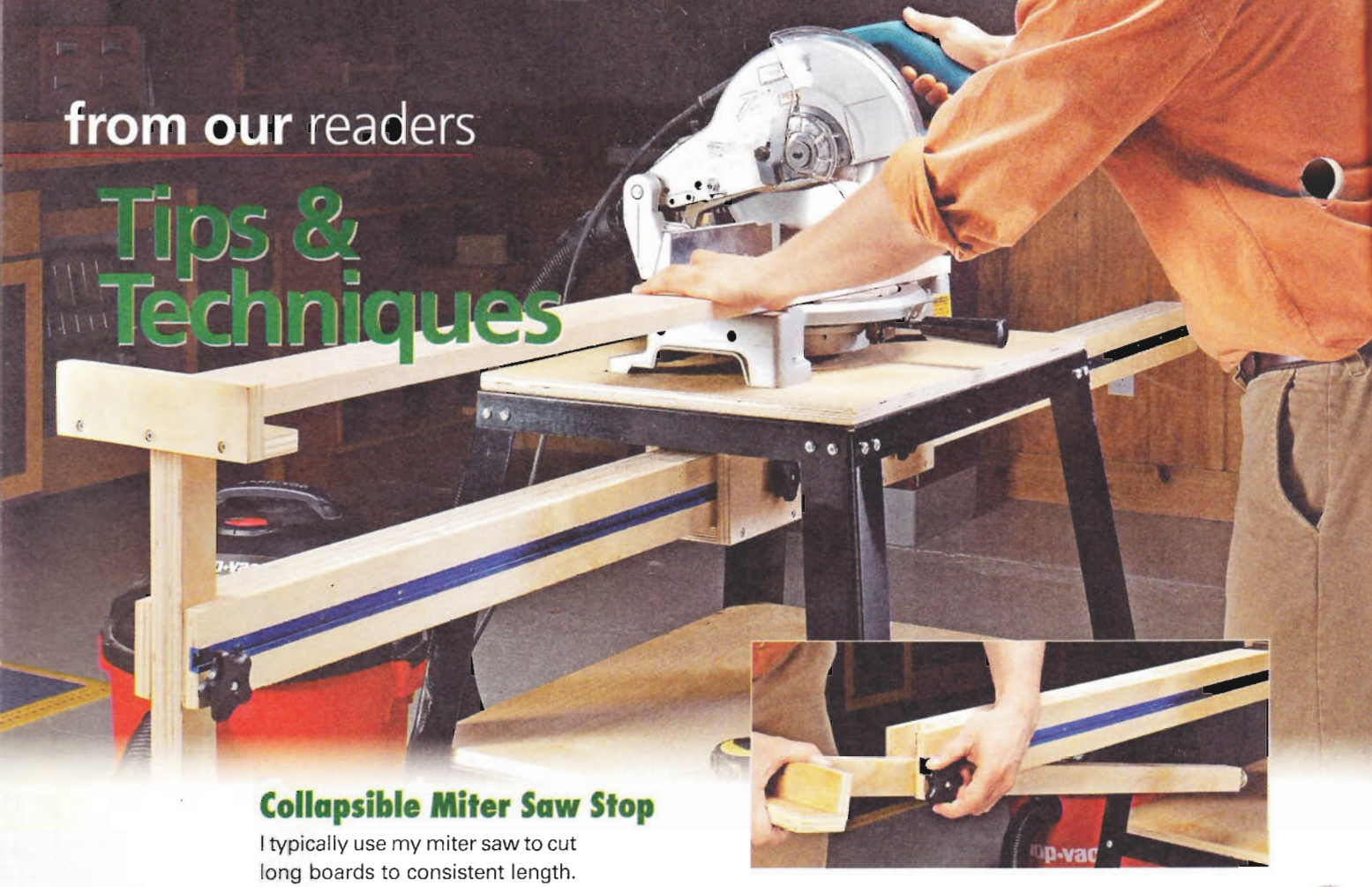
4. Free or nominal rate distribution outside the mail (carriers or other means)	0	0
E. Total free or nominal rate distribution	117	115
F. Total distribution	196,739	182,402
G. Copies not distributed	28,427	26,322
H. Total	225,166	208,724
I. Percentage Paid and/or requested circulation	99.94%	99.94%

16. Publication of Statement of Ownership. Will be printed in the Jan. 2013 (#204) issue of this publication.
17. I certify that all information furnished on this form is true and complete. (signed) Bryan Nelson, Editor

Tips & Techniques



Collapsible Miter Saw Stop

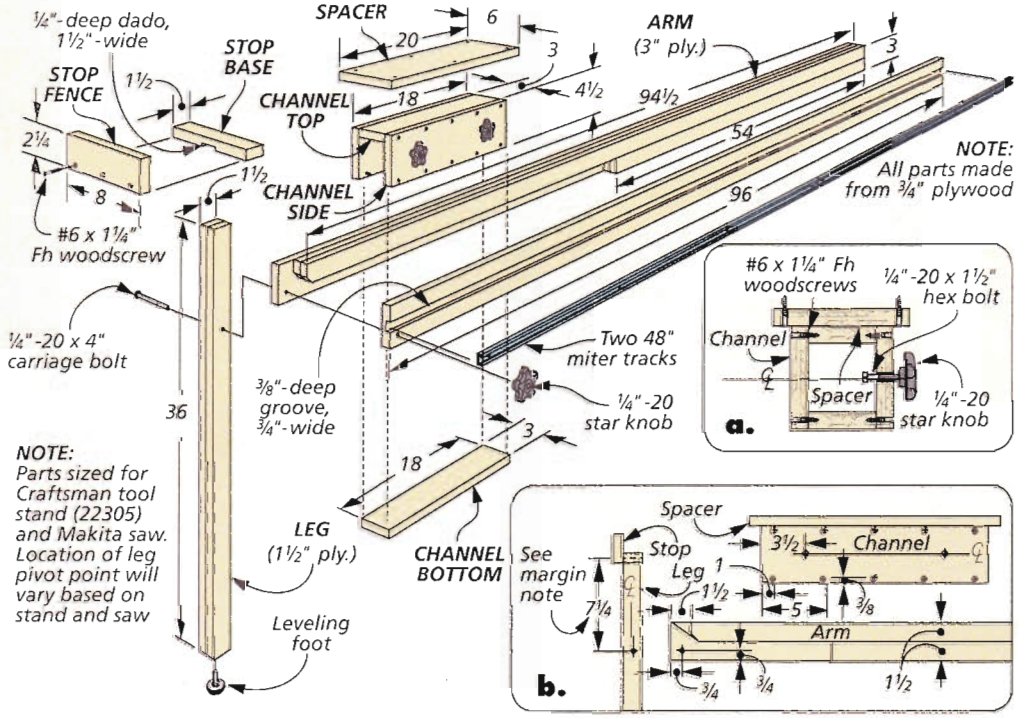
I typically use my miter saw to cut long boards to consistent length. Of course, doing so accurately can require an expensive aftermarket stand with a stop. To avoid this, I came up with my own miter saw stop system. It's made from plywood and attaches to an inexpensive tool stand.

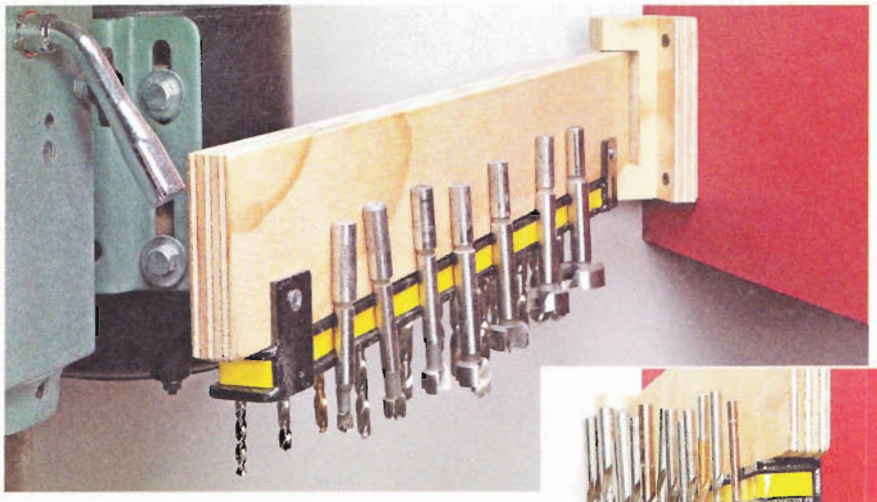
SYSTEM ANATOMY. The main component of the system is an arm that slides in a channel under the miter saw stand. The other key part is a leg that swings down from inside the arm to rest on the shop floor (inset photo). This leg has an L-shaped stop block on top. So when you're ready to cut, you simply position the arm and leg and lock both in place with the knobs shown.

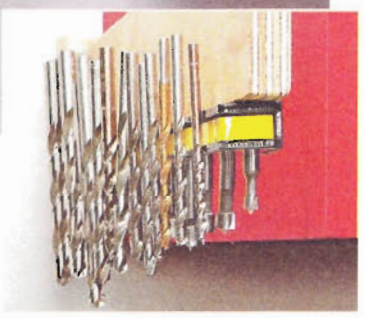
BUILD THE SYSTEM. As you can see at left, the arm and leg are made from plywood parts that are glued together. The stop is screwed together and glued to the top of the leg. Finish the leg by adding a leveling foot at the bottom. Now cut a groove and add the T-track to one side of the arm. Then lay out and drill a hole to connect the arm and leg to one another with a knob and carriage bolt.

Finally, make the channel assembly to fit around the arm, and attach it to the underside of your tool stand. (You'll likely need the plywood spacer shown to clear the frame.) Drill holes for bolts in one of the channel sides, and then slide the T-track on the arm over the bolts. Screw on the knobs to lock the arm in position before making a cut.

Brandon Spun
Pleasant View, Tennessee



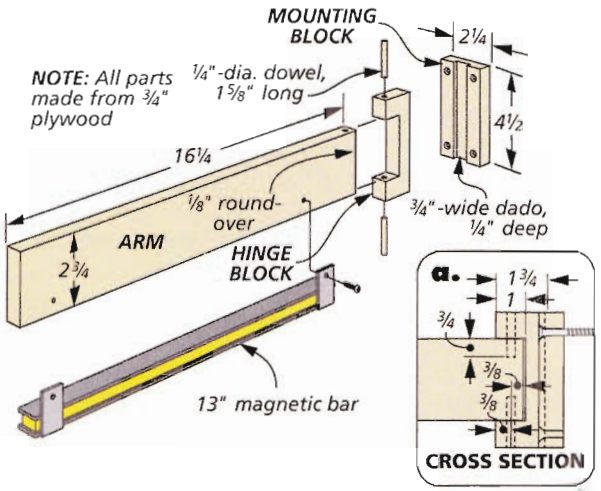




Swing-Out Magnetic Bar

A magnetic bar is a handy place to store tools around the shop. But simply mounting it to the wall means you're sacrificing half the magnet's usable space.

To make the most of the magnet, I created an arm that swings out from the wall, allowing me to store tools on both the front and back.



As you can see in the illustration, there isn't much to the assembly. It's just a mounting block, a notched hinge block, and an arm. The hinge block is attached to the arm with short lengths of dowel.

After it's assembled, just mount the magnetic bar to the bottom edge, and then attach it in your shop wherever you desire. I mounted it next to my drill press to keep all of my drill bits close at hand.

Serge Duclos
Delson, Quebec

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No. 204 December/January 2013

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Woodsmith® (ISSN 0164-4114) is published bimonthly by August Home Publishing Company, 2200 Grand Ave, Des Moines, IA 50312.

Subscriptions: Single copy: $4.95.
Canadian Subscriptions: Canada Post Agreement No. 40038201. Send change of address information to PO Box 881, Station Main, Markham, ON L3P 8M6.
Canada BN 84597 5473 RT
Periodicals Postage Paid at Des Moines, IA, and at additional offices.
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EDITORIAL
Woodsmith Magazine
2200 Grand Avenue
Des Moines, IA 50312
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AUGUST HOME PUBLISHING COMPANY

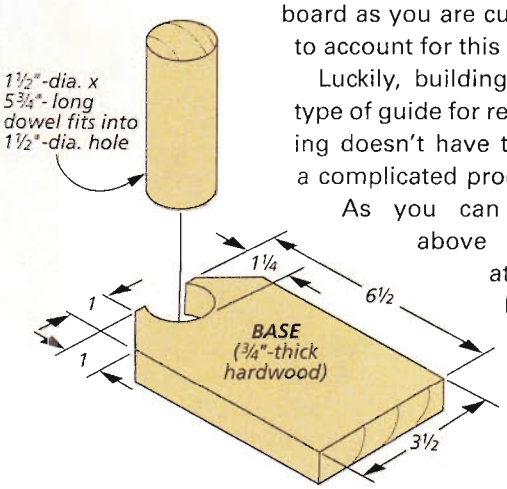
Printed in U.S.A.

Resaw Rescue

One of the best ways to turn thick boards into thin workpieces is by resawing them at the band saw. But if you've ever tried to resaw using a fence to guide the board, you know that the blade can sometimes drift, leaving you with an uneven cut.

That's why it's better to steer the board with a resaw guide that makes contact with the wood at a single point. This way, you can pivot the board as you are cutting to account for this drift.

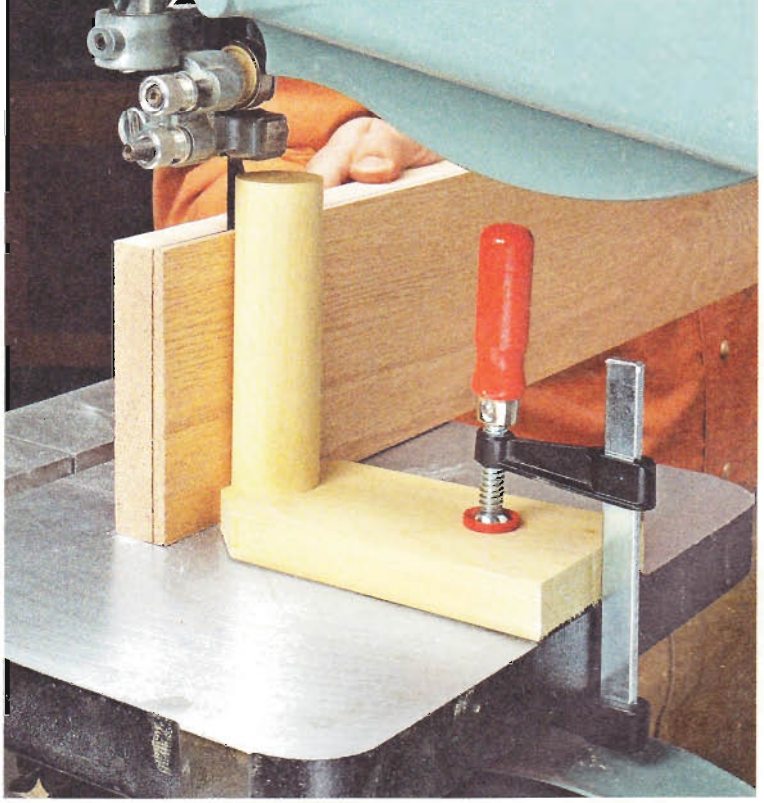
Luckily, building this type of guide for resawing doesn't have to be a complicated process. As you can see above and at the left, I made one out of a single board and a large dowel.



To make it, just drill a hole to fit the dowel on the centerline of a board. Then trim the end of the board, cutting through the hole. That way, the dowel extends slightly beyond the beveled end of the board. Finally, glue the board and dowel together.

To use the resaw guide, first lay out the cut on the workpiece. Then set the guide in place to match the desired thickness, aligned with the cutting edge of the band saw blade. Clamp it down, and you're ready to resaw (main photo).

Don Radke
Snowflake, Arizona



Simple Workbench Hold-Downs

Clamps and hold-downs that fit in the dog holes of a workbench are great shop helpers. They come in handy for all kinds of benchtop operations like sanding, routing, or planing boards.

The only problem is that these dog hole accessories can get pretty pricey. Then it dawned on me that I could use some clamps that I already own as workbench hold-downs.

My *Irwin Quick-Grip* clamps have a removable jaw on one end (see the inset photo). Ordinarily, you flip this jaw around in order to use the clamp as a spreader. But I simply remove this jaw, stick the clamp bar down through the dog hole of my workbench, and then reattach the jaw on the underside of the benchtop. Now I have a simple, easy-to-adjust clamp that's "built" right into my benchtop (main photo).

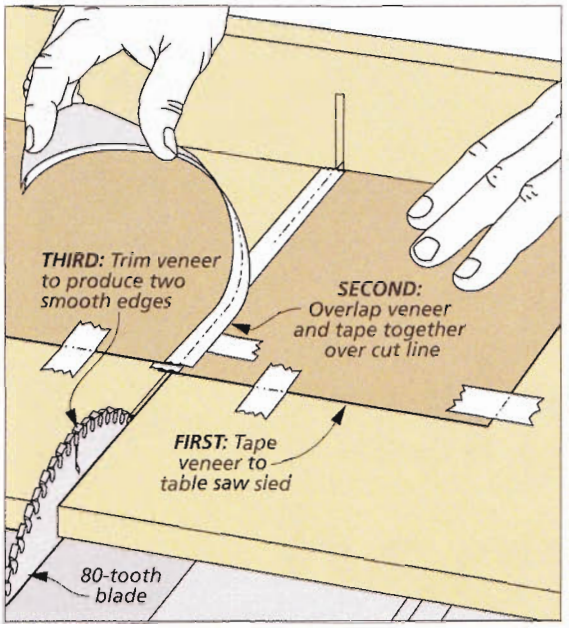
Les Booth
Stretham, Cambridge, UK

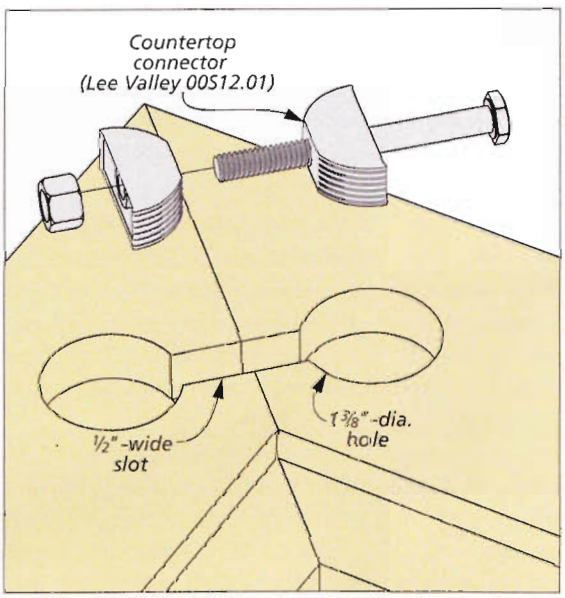
Seamless Veneer

I like to apply veneer over plywood for a lot of my cabinetry. But one of the tricky aspects of working with veneer is getting the edges to fit together seamlessly.

I found a way to achieve this using my table saw. I just tape the two mating pieces of veneer on a table saw sled with the edges overlapped. Then I tape them to each other where the blade will pass through them. Finally, I make a pass over the blade to create a pair of smooth, even edges that will be seamless once I apply them to a project.

Bill Wells
Olympia, Washington





Reinforced Miters

Miter joints are an old standby for project parts like picture frames or table edging, but they're not exactly known for their strength.

If you're building a project with wide miters, here's a sure-fire way to keep them together. Just install countertop connectors in the backside of the miter joints (illustration at left).

These simple connectors are typically used to hold the miter joint of a countertop. But I've found the hardware works just as well for wood frames.

Graham Lavers
Bedford, Nova Scotia

Quick Tips

EASY ARC MAKER

Large arcs are difficult to lay out with a compass. That's why *J. David Carlson* of Cary, North Carolina, uses a parallel jaw clamp to hold a thin strip of wood at the desired radius.

COMPACT HOSE STORAGE

Vacuum hoses are a notorious shop tripping hazard. To prevent this, *David Smith* of Vancouver, Washington, drilled a hole in a five-gallon bucket and then coiled up the hose inside.

WIN THIS PORTER CABLE COMBO ROUTER

Simply send us your favorite shop tips. If your tip or technique is selected as the featured reader's tip, you'll win a *Porter Cable* combo router kit just like the one shown here. To submit your tip or technique, just go online to *Woodsmith.com* and click on the link, "SUBMIT A TIP." You can submit your tip and upload your photos for consideration.

The Winner!

Congratulations to Brandon Spun, the winner of this Porter Cable router. To find out how you can win this router kit, check out the information on the left.

choosing Premium Plywood

Not all plywood is created equal. Consider one of these high-end options for your special projects.

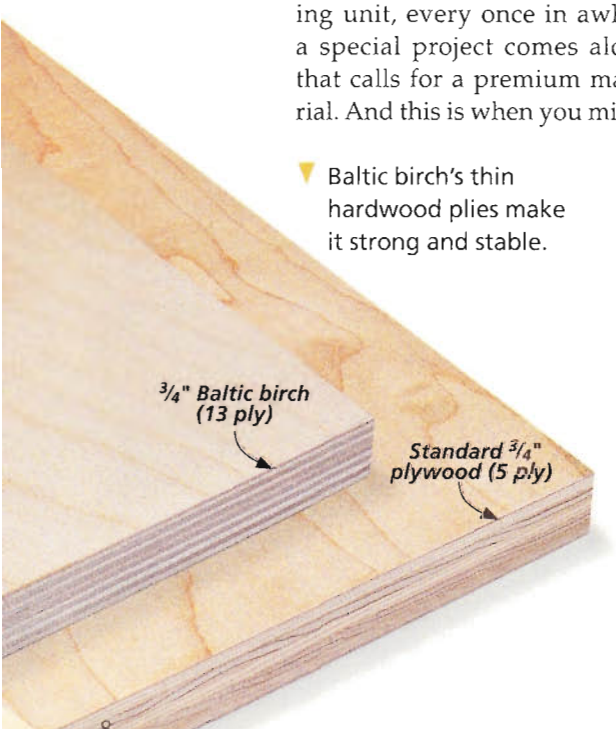
Woodworkers today have come to know plywood pretty well. When it comes to building projects like bookcases and cabinets, this flat, stable material is tough to beat.

While most of the off-the-rack home center plywood sheets might be suitable for your typical storage cabinet or shelving unit, every once in awhile a special project comes along that calls for a premium material. And this is when you might want to take a closer look at the "*Cadillacs*" of plywood.

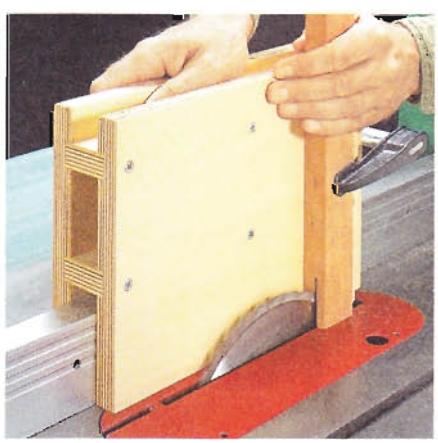
AN INSIDE LOOK AT PLYWOOD. In order to truly understand the difference between standard and premium plywood, it helps to take a closer look inside. Your standard ¾" plywood offering may have a nice face veneer, but the inside typically consists of five layers made of a softwood. Premium plywood, on the other hand, has 13 core plies made of a hardwood, usually birch (photo, far left). This means that premium plywood sheets are often flatter, stronger, more stable, and hold screws and other fasteners better than your run-of-the-mill plywood.

Another advantage of premium plywood is that, unlike its cheaper counterpart, the cut edges of the plywood are virtually void-free. So if you want to experiment and try your hand at a project with exposed plywood edges (main photo, above), the look can be an interesting design feature. This also makes the plywood a good choice for shop projects like table saw jigs and other fixtures where you may not want to add any solid-wood edging (photo, left).

BALTIC BIRCH PLYWOOD. When it comes to the types of premium plywood, the one woodworkers often think of first is Baltic birch (far left photo). It's readily available at many lumberyards and even some home centers. Though it's important to note that not all birch plywood is Baltic birch,



▼ Baltic birch's thin hardwood plies make it strong and stable.



▲ The high strength and stability of Baltic birch plywood make it a great choice for shop jigs and fixtures.

so check the edges first or make sure it specifies "Baltic birch" if you're buying online.

Traditionally, Baltic birch plywood was available in 5' x 5' sheets (as opposed to the usual 4' x 8' plywood sheet). But now many suppliers are offering standard 4' x 8' sheets of Baltic birch, too. It's available in thicknesses ranging from $\frac{1}{8}$" to $\frac{3}{4}$".

APPLEPLY & EUROPLY. If there's one drawback to Baltic birch plywood, it's that it doesn't give you many choices when it comes to the appearance of the face veneer. Baltic birch plywood comes with a birch face veneer, so if you want a different look, you'll need to search elsewhere.

Luckily, there are a few options available that offer the strength and stability of Baltic birch but the look of a different type of wood. Two products worth considering are *ApplePly* from *States Industries* and *Europly* from *Columbia Forest Products*.

On the inside, these products are nearly identical to Baltic birch plywood. Both have core layers made from birch that are roughly $\frac{1}{16}$" thick. That means you get the same strength, stability, and fastener hold as you'd get from Baltic birch plywood.

The difference, of course, is on the faces. Both *ApplePly* and *Europly* give you the option of choosing this high-quality plywood with virtually any face veneer that you desire. Just a few of the many options available from *Europly* are shown above, and *ApplePly* has a similar variety of face veneers available. In fact, you can even get these products with different wood veneers on the front and back. Both products also come in a number of thicknesses, just like standard plywood.

Both *ApplePly* and *Europly* are specialty products with regional dealers. (You can find dealer locators on their websites. See Sources on page 51.) You'll typically need to place an order for the type of plywood that you want, though many regional dealers keep some of the different types of plywood in stock.

THE LAST WORD ON PLYWOOD. When it comes to choosing high-end plywood like Baltic birch, *ApplePly*, or *Europly*, the quality of the product is clearly a step above the standard off-the-shelf plywood sheets you usually find. And not surprisingly, if there's any drawback to these products, it's that the cost is significantly higher, as well.

Though the price range varies, you can expect to pay at least twice as much for a sheet of premium plywood as you would for standard plywood. However, if the jig, fixture, or project you have in mind calls for the best plywood available, then you might just find it's worth the extra cost. W

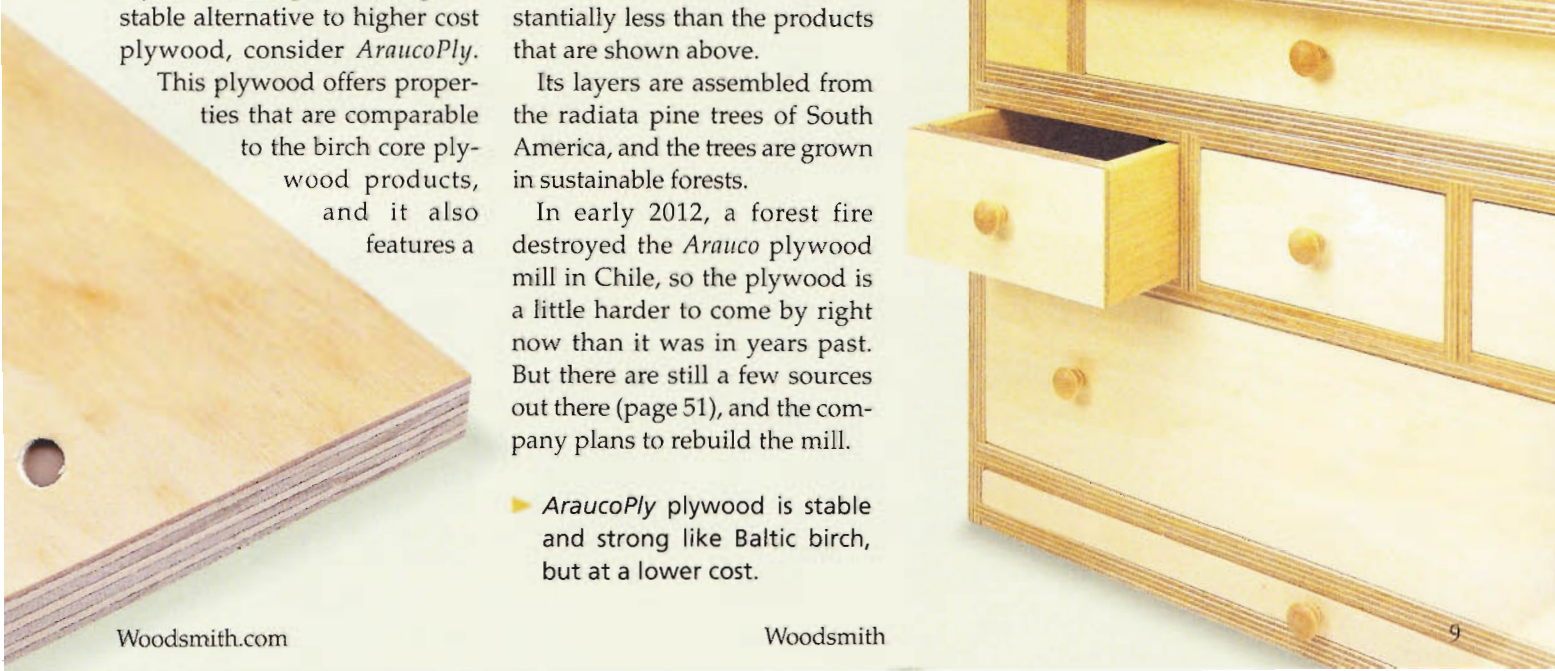
▲ *Europly* has thin core plies with virtually any face veneer you desire.

Worth a Look: AraucoPly

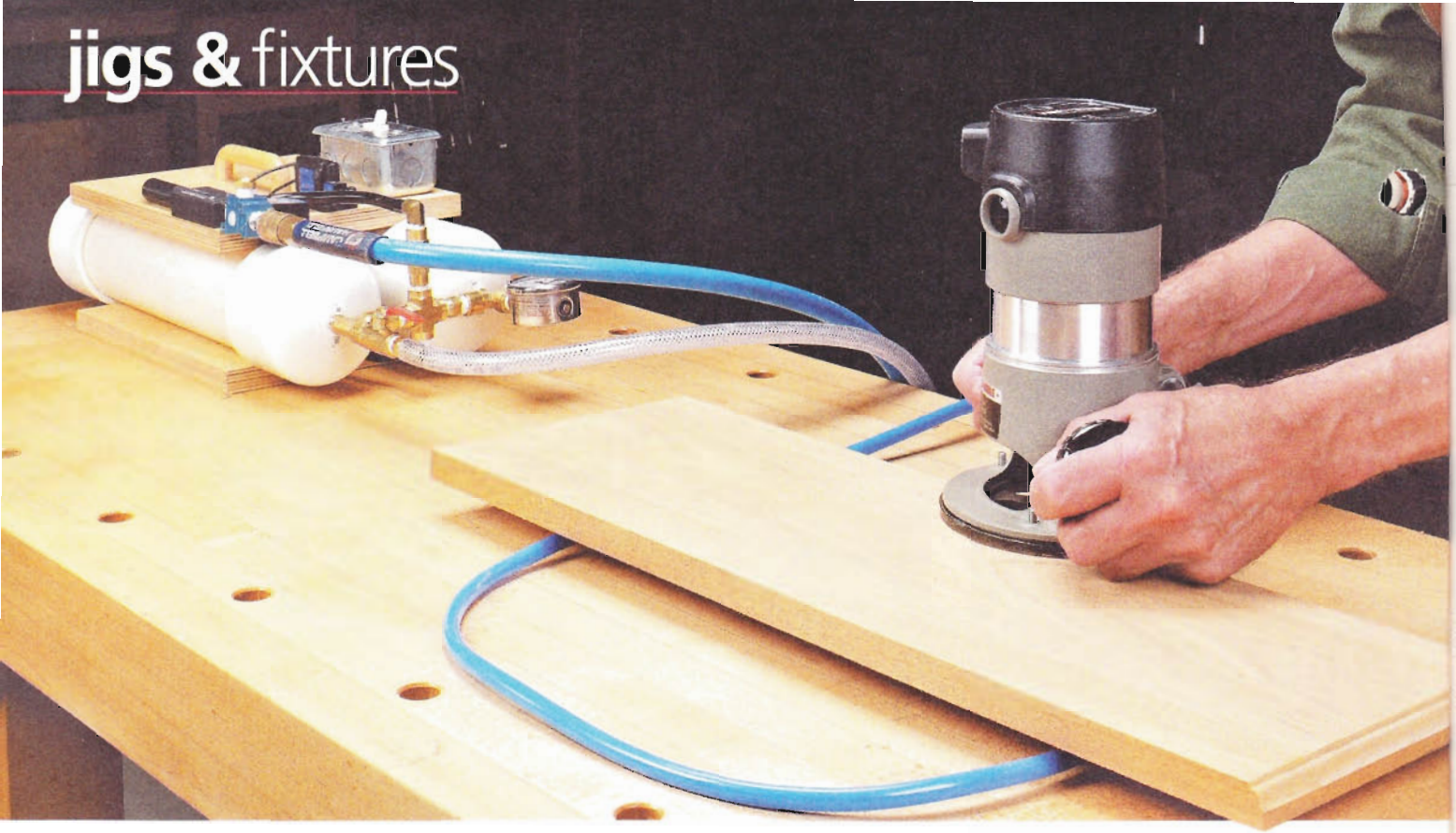
If you're looking for a strong and stable alternative to higher cost plywood, consider *AraucoPly*. This plywood offers properties that are comparable to the birch core plywood products, and it also features a void-free core. Plus, it costs substantially less than the products that are shown above.

Its layers are assembled from the radiata pine trees of South America, and the trees are grown in sustainable forests.

In early 2012, a forest fire destroyed the *Arauco* plywood mill in Chile, so the plywood is a little harder to come by right now than it was in years past. But there are still a few sources out there (page 51), and the company plans to rebuild the mill.



▶ *AraucoPly* plywood is stable and strong like Baltic birch, but at a lower cost.



powerful Vacuum Press

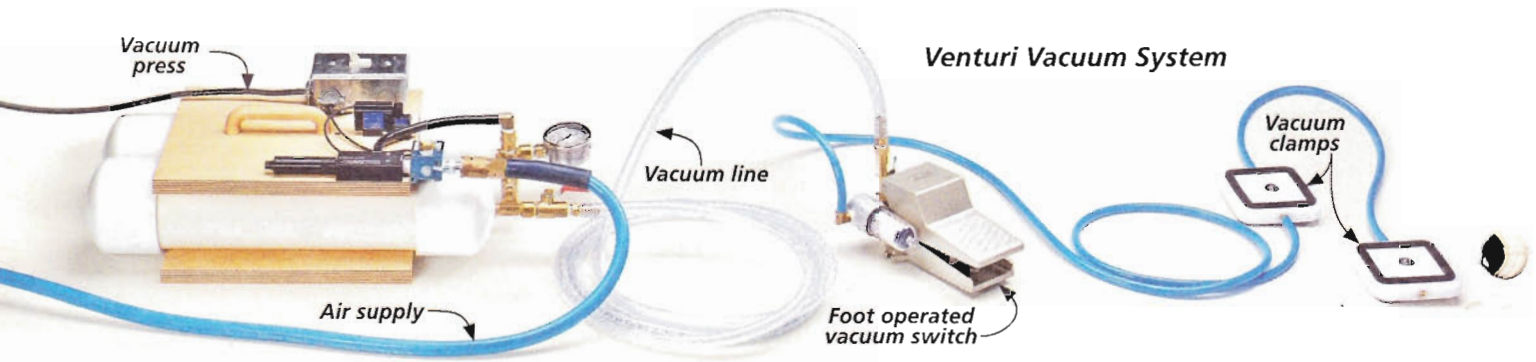
You don't have to spend a fortune on a vacuum pump to put the power of vacuum pressure to work in your shop.

A vacuum clamping system allows you to clamp a workpiece just by stepping on a foot switch.

A while back I visited the shop of an amazing craftsman whose work I had long admired. Of course he had all the great tools I expected. But he also had a setup I'd never even considered for my shop — a vacuum clamping system.

He relied on vacuum clamping at every workstation throughout the shop. There were vacuum clamps to hold pieces in place during a glueup. He used vacuum bags to clamp veneer to the substrate. He even used the clamps to hold a workpiece while he carved, routed, or planed it. All he had to do was step on a foot switch and *whoosh* — it was held tight. The only problem was the expense of setting up such a system. In his setup, the vacuum pump alone was somewhere north of $1000.

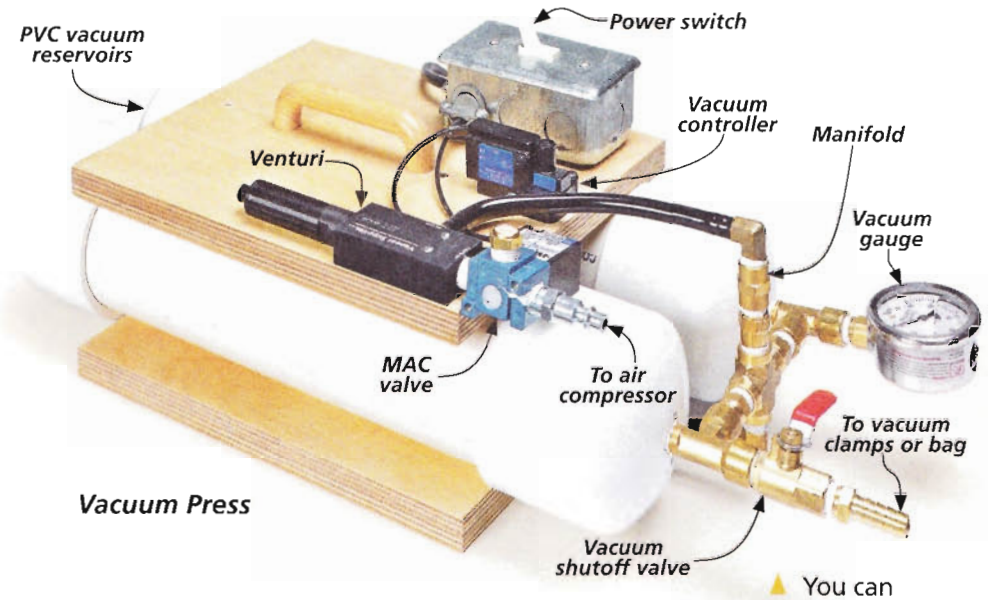
VENTURI VALVE. While the cost of that system was out of reach for my shop, I didn't give up on the idea. I researched alternate ways of creating the vacuum. One possibility emerged — a Venturi-based system. With this, your air compressor generates the vacuum. From there, you can add clamps and build a system like the one shown in the photo below.



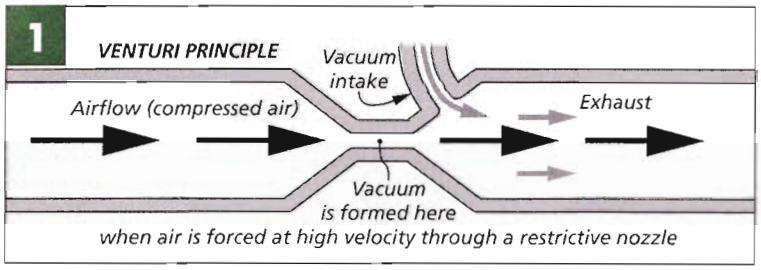
The principle is not intuitive, but it works great. Fast-moving compressed air is channeled through a specially designed valve, creating a low-pressure zone behind the airflow (Figure 1). This creates enough suction to pull the air out of an enclosed space like a vacuum bag or clamp.

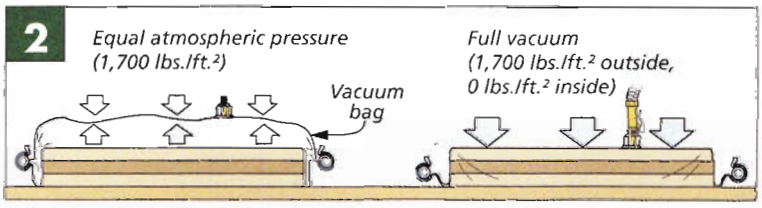
ATMOSPHERIC PRESSURE. Before going any further, it's worth taking a minute to look at why the whole thing works. The key is all around us — air pressure. When the air is removed from any enclosure, air presses down on the object with around 1700 lbs. per square foot (Figure 2).

BUILDING A SYSTEM. As I got more serious about building a system, I found myself returning to one information source over and over again: *veneersupplies.com* (see sources on page 51 for details). This site offers kits for just about any application you can imagine. Best of all, it provides detailed explanations and instruction for assembly and use, including plenty of photos that make building a system almost foolproof.



You can assemble the Venturi vacuum press in a couple of hours.





In addition to the kit, you'll need some plywood, 3" PVC, an electrical box, and a switch. For around $200, you can build a nice set of auto-cycling Venturi clamps. And the auto-cycling part is the key. Without this feature, your compressor will run non-stop. The system I assembled is shown in the photo above.

Two PVC vacuum reservoirs are connected to a brass manifold. Once the pump has evacuated the air from the reservoirs, the vacuum inside acts as a buffer for the system. This allows your compressor to cycle on less often.

The manifold channels the airflow. On one side you have a vacuum pressure gauge that measures the vacuum in the tanks. On the opposite side of the manifold, a shutoff valve lets you close the system to lock the vacuum in a veneer bag or a clamp. But the *MAC* valve and vacuum controller are the heart of the system. The controller allows you to regulate the pressure for a specific task. The *MAC* valve turns the system on or off based on the pressure reading.

OPTIONS. You also have the option of a dedicated vacuum pump to power the clamps and bag. The box at left gives you an idea of what's involved.

No matter how you generate the vacuum, it's the applications that make it worthwhile. For more on those, turn the page.

Option: Vacuum Pump

Vacuum pumps can make clamping and veneering even easier. These pumps have the advantage of being very quiet. But this comes with a price. New pumps start at around $300 (see Sources on page 51).

The newer models are also very low maintenance. Look for a piston pump rather than rotary for best performance and durability.

APPLICATIONS

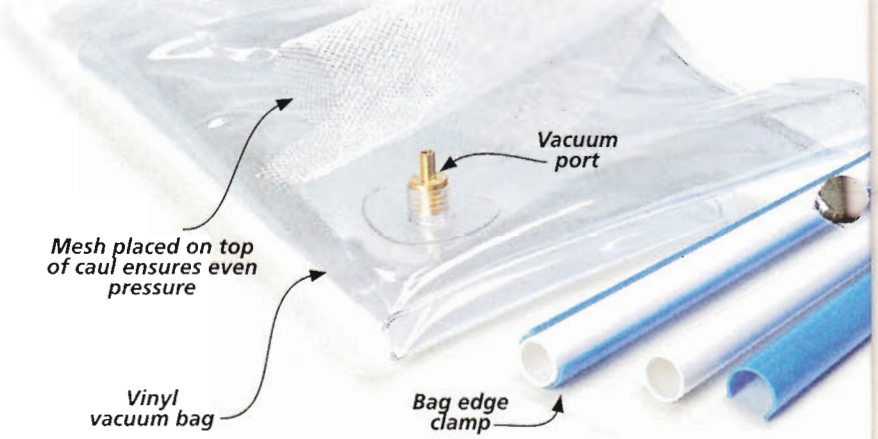
After building a vacuum press, you're ready to put it to work in the shop. But before I get into the applications, it's worth taking a minute to talk about how to measure vacuum power. Like any machine that moves air, the airflow of a vacuum press is measured in cubic feet per minute (CFM).

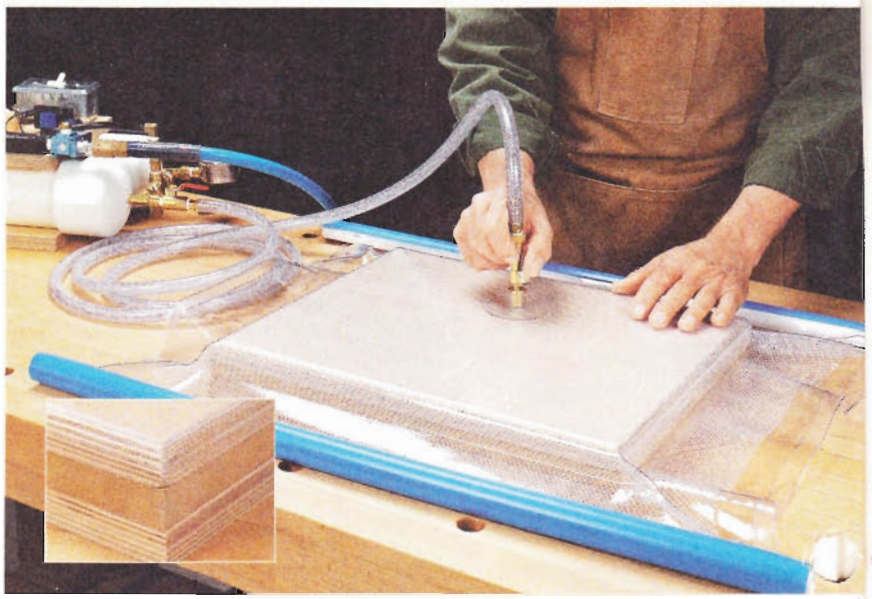
But more than airflow, the measure you're most concerned with is the strength or pressure that's applied to the system. This pressure is measured in inches of mercury, just like barometric pressure in the air around us. The shop-made system shown here can pull up to 25 inches of mercury.

That's plenty of pressure for most shop applications. The two applications to start with are a vacuum bag system for veneering and a set of vacuum clamps.

VACUUM BAG. Whenever I take on a veneer project, the first thing I think about is how to clamp the veneer after gluing it to the substrate. The veneer has a tendency to slip and slide around.

But a vacuum bag solves the problem. The way it works is simple. You place a veneered panel between two flat cauls and add a little tape to stop things from moving around. Then you add a piece of plastic mesh on top of the package to allow air to flow freely in the bag. Now slide the whole sandwich into the bag, seal the ends, and turn on the vacuum. Air pressure does the rest.

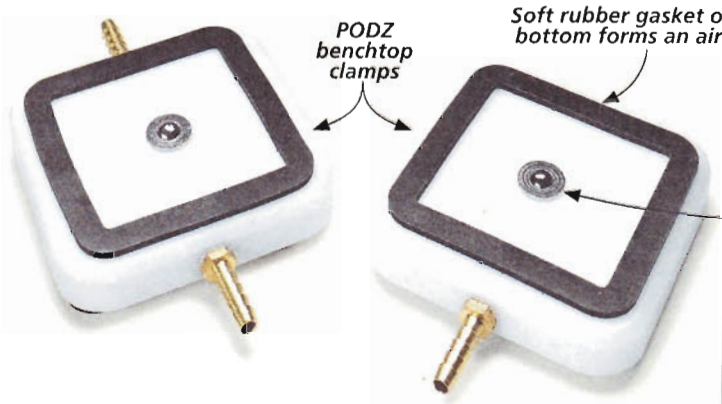




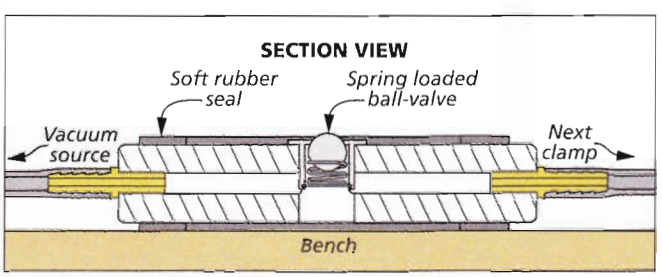
▲ A vacuum bag makes veneering a breeze. Just sandwich the veneered panel between two plywood clamping cauls and add a layer of breathing mesh to allow the air to escape.

Armed with my vacuum press and a vacuum bag, I'm no longer worried about curved parts in my projects. In fact, you don't have to do many veneer projects to appreciate how much time and energy a vacuum bag can save you. On top of that, the pressure on the veneer is evenly distributed which guarantees a smooth glueup on flat or curved surfaces.

The photo at the top of the page shows the components you need for a vacuum bag system. The bag can be either vinyl or polyurethane (slightly more expensive but more durable). You also have plenty of choices for the size of the bag. Typically, the pre-made



▲ The *Podz* clamps are designed to clamp both the benchtop and the workpiece for a grip you can't shake loose.



systems run from 2' x 2' up to 4' x 8'. You can also make a custom-sized bag from either material.

After that, just glue on the vacuum port which connects the bag to the press. To seal the ends of the bag, you'll need a set of edge clamps. With these, all you need to do is wrap the end of the bag over the PVC and then snap on the blue outer clip to seal the bag.

VACUUM CLAMPING. Another benefit of owning a vacuum press is adding a set of vacuum clamps. The *Podz* clamps shown at the bottom of the opposite page and in the photo at right are sure to see a lot of use in any shop.

The advantages of vacuum clamps are apparent when you need to clamp a workpiece for routing, sanding, or planing. The footswitch-activated clamps hold a workpiece tightly enough to allow you to carry out any of those operations quickly and easily without having to constantly stop to reposition clamps. The photo and drawing at the bottom of the opposite page show you how they work.

OTHER APPLICATIONS. With a little creativity, you can come up with other uses for a vacuum system.

▲ Vacuum clamps grip the bench and the workpiece. All it takes is a tap on the footswitch to position or move a workpiece.

For example, if you turn bowls on a lathe, you might consider building a vacuum chuck. This allows you to mount the bowl blank for turning the outside. The box below shows you how it works.

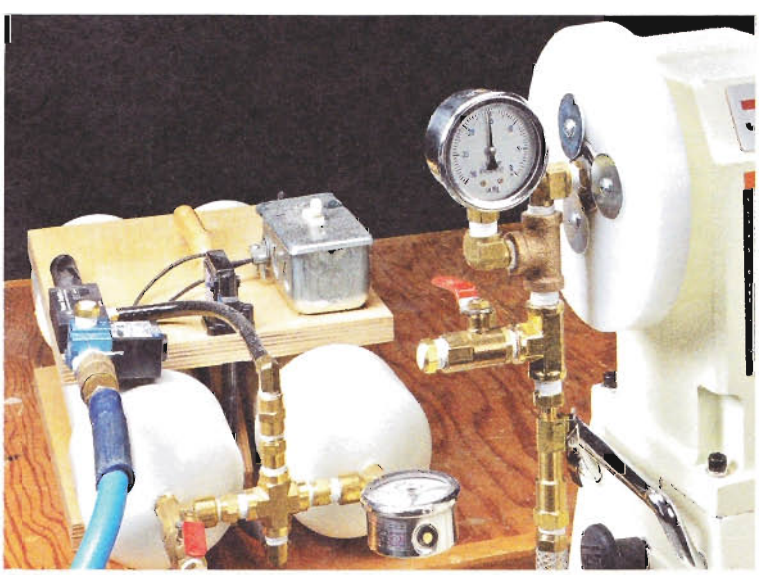
No matter what kind of woodworking you do in your shop, there's one thing I can guarantee: The investment you make in building a vacuum system will pay off big in no time. W

Worth a Look: Vacuum Lathe Chuck

If you've ever turned a bowl, then you've encountered the problem of repositioning the blank for turning the bottom.

A vacuum chuck solves the problem. The photo at left shows the chuck hardware in place on the outboard side of the lathe. It pulls air through the hollow center of the lathe spindle, creating a vacuum on the inboard side.

You can make chucks in any size to accommodate your work by turning a solid hardwood blank to the size you need, drilling through the center to reach the vacuum, and lining the edges with rubber vacuum tape. Now, all you need to do is set the blank in place and switch on the vacuum.



▲ The vacuum press connects to the manifold of the lathe chuck. A bearing in the HDPE wheel allows the manifold to remain stable, providing vacuum while the wheel turns with the lathe.

creating a Through Mortise

When the end result of your joinery skills is going to be visible, the challenge level rises. However, attention to detail is all it takes.

Through mortise and tenon joints, like those on the Greene and Greene hall table on page 32, add both exceptional strength and aesthetic detail to a project. But on the flip side, exposing your joinery for all the world to see ups the ante. Creating snug-fitting, attractive, through mortise and tenon joints definitely calls for a higher level of craftsmanship. But as is often the case, the skill required is simply a combination of the right technique and patience.

MORTISE IS THE KEY. As with any mortise and tenon joint, the mortise comes first, followed by a tenon cut to fit. Obviously, the difference here is that the mortise extends through the entire thickness or width of the piece. The exposed side of the mortise needs to be precisely dimensioned and cut with clean, crisp edges. Likewise, the mortise needs to be squarely cut through the thickness of the workpiece. Once an accurate mortise is formed, cutting a tenon to fit isn't difficult.

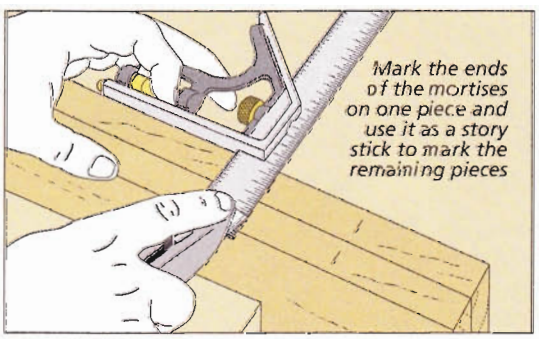
TWO MORTISES. In theory, the technique for cutting a through mortise is not hard to grasp. Rather than laying out and cutting a single mortise clear through the workpiece from one edge, you lay out the mortise on both edges and then work from both sides to the middle. So it's like cutting two mortises. This gives you a much better shot at accurately sizing the mortise and keeping it square to the workpiece surfaces.

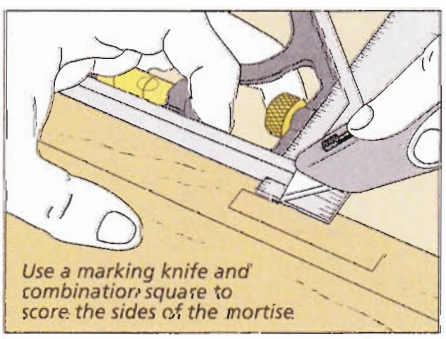
LAYING OUT THE MORTISE. The first step is to lay out the mortise or mortises on both sides of the workpiece. The key here is to mark layouts that are perfectly aligned through the thickness. To do this, I rely on a story stick and a "gauge" rather than measurements. You'll get more consistent results working from one master set of measurements.

When multiples have to be laid out, such as the legs of the hall table, you can simply use one of the workpieces as the story stick. Measure and mark the ends of the mortises on the edge of one piece and then use those marks to transfer the layout to both sides of the other pieces (left drawing). Then work back to mark the layout on the second side of the first piece.

It's best to mark the layouts with a knife rather than a pencil line. You want to create a fine, scored line to use when squaring up the mortise later on. Mark the mortise ends on the outside face carefully so that you don't score beyond the borders of the mortise.

Once the ends are marked, I score a line between them to mark the cheeks (sides) of the mortise (right drawing). Set the blade of a combination square to the proper





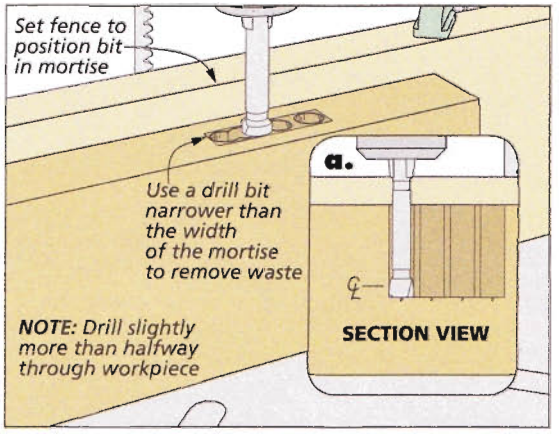
measurement and score a line from both faces. This will ensure that the layout is centered.

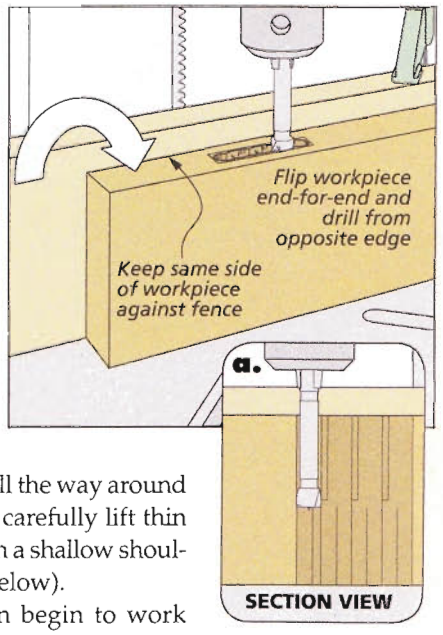
DRILL OUT THE WASTE. With the layout completed, the next step is pretty standard. I take the workpieces to the drill press to remove the bulk of the waste with a series of overlapping holes, as in the upper right drawings.

As with the layout, you'll work from both edges. I like to use a bit that's slightly smaller in diameter than the width of the mortise — for example, a $\frac{7}{16}$"-dia. bit for a $\frac{1}{2}$"-wide mortise. This way my holes don't have to be perfectly centered on the layout. A fence clamped to the drill press table helps locate and align the holes.

Drill slightly more than halfway through from one side and then flip the workpiece end-for-end. Complete the "rough-out" from the opposite edge.

CLEAN & SQUARE. Now, it's back to the bench. The mortise is completed in several steps involving careful handwork with chisels.





And I can't overemphasize the importance of keeping your chisels sharp. This makes the task go easier, faster, and turn out better.

You can position the piece between dogs or simply clamp it in a sturdy vise. I like this second option because it keeps the opposite end of the mortise open as you work. Either way, make sure the piece is secure.

I start by carefully outlining the perimeter of the mortise. Set the chisel's edge in the scored layout lines and give it a light tap. After working all the way around the perimeter, I carefully lift thin chips to establish a shallow shoulder (Step One below).

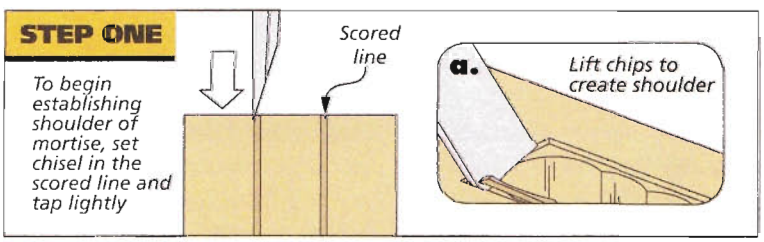
Now you can begin to work more aggressively. The goal is to end up with the sides and ends of the mortise flat, clean, and square to the edges. But you'll accomplish this in stages.

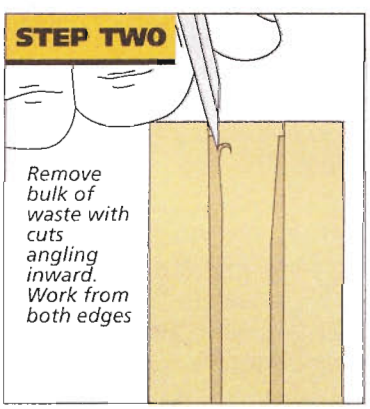
Rather than hold my chisel perfectly perpendicular to the edge and cut straight down, I tilt it back a hair to angle the cuts toward the inside of the mortise, as in Step Two. This makes it easier to remove the majority of the remaining waste. Chop halfway through from one edge removing the chips as you go. Flip the workpiece and repeat the process until the cuts meet in the middle.

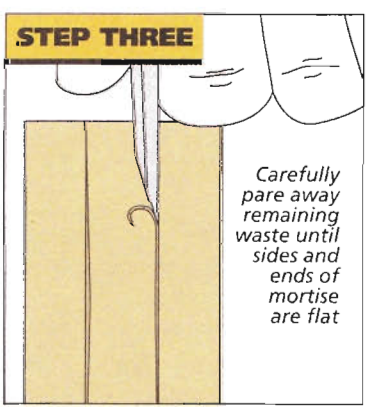
At this point, the sides and ends of the mortise taper inward slightly. So your next assignment is to pare away the remaining waste to flatten the surfaces (Step Three). Patience is the key. I work from both sides, flipping the workpiece often. Use a straightedge or the back of a chisel to test your progress (Step Four).

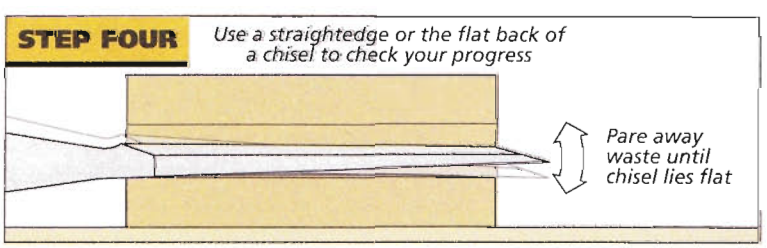
In the later stages, it can be helpful to have a test tenon on hand. This is simply a scrap cut to the final dimensions of the mortise. You know you've reached your goal when the test tenon slides all the way through (margin photo).

You'll find that through mortise and tenon joinery isn't the quickest joinery method. But on a special project, it can be just what the doctor ordered. W









It's helpful to have a test tenon on hand to check your progress.

heirloom Music Box

One chamber inside the box is reserved for the musical works.

It's not often that you can build an heirloom project in such a short time. Especially one that sounds as good as it looks.

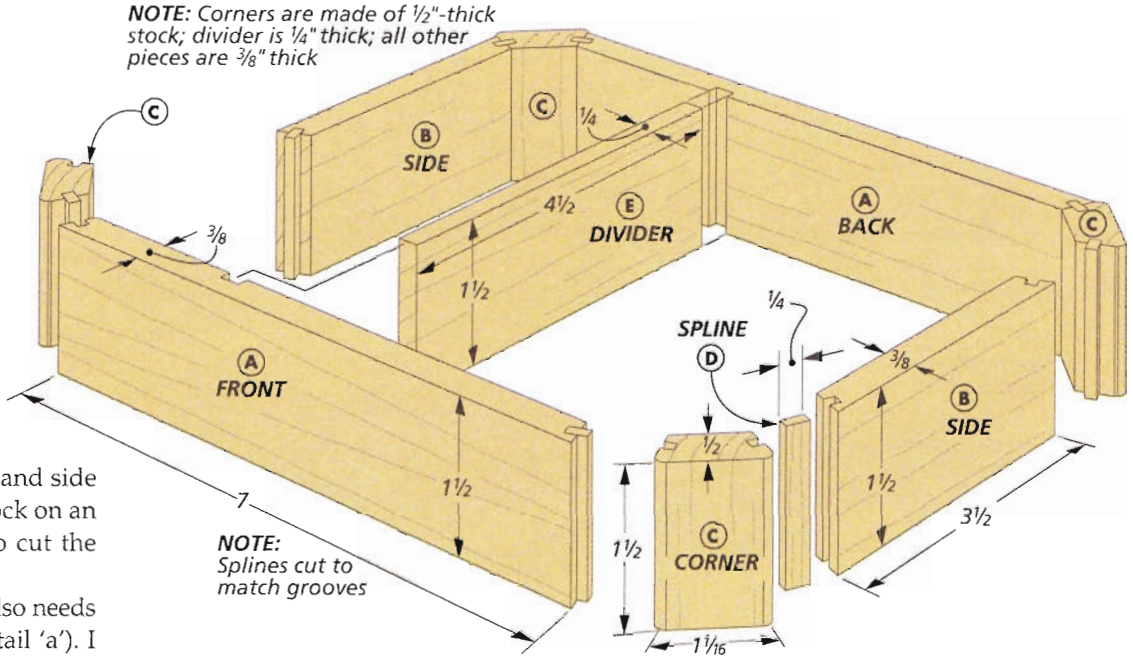
I've met a lot of craftsmen who have a music box on their woodworking bucket list. The pleasant sounds of a music box can calm crying babies and relieve stress in people of any age. Of course, the music is all in the works, so you can choose a melody that takes you to a happy place and time.

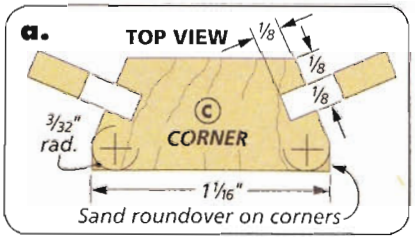
But the box has to be something special to house your favorite tune. This box has everything needed — a beautiful shape, an elegant marquetry panel, and a banded top.

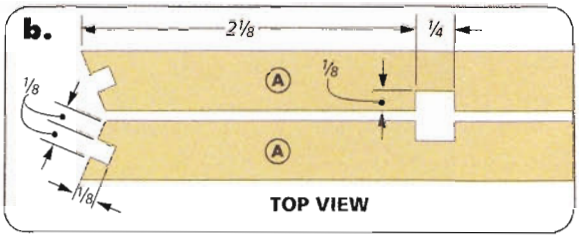
Like all small box projects, the key to a successful build is close attention to detail. I've broken the process down into three stages, the body, top, and bottom, so it's easy to take things step by step and get a great result. It also helps to choose a beautiful wood, like the walnut I used.

IT'S ALL IN THE ANGLES. The front, back, and sides of the box are pretty straightforward. The key is making sure the 22½° miters are correct to get everything to come together. A few test pieces can help you double check your saw setups. It's also worth noting that the grain on the corners runs perpendicular to that of the other pieces. By joining them with splines, they're sure to hold up for a lifetime.

NOTE: Corners are made of ½"-thick stock; divider is ¼" thick; all other pieces are ⅜" thick







FRONT, BACK, & SIDES. As you can see in the lead photo and the main drawing at right, the front, back, and sides all attach to the corners. I began by planing my stock to the correct thicknesses. Then, I tilted my table saw blade to 22½° and cut one end of each of the front, back, and side pieces. I used a stop block on an auxiliary miter fence to cut the pieces to final length.

Each of these pieces also needs a slot for the spline (detail 'a'). I cut the slot by leaving the blade at 22½° and standing the piece on end with the bevel facing the rip fence. A backer board helps keep the pieces stable while you make the cut (left drawing in box below). I installed a dado blade to cut the dadoes in the front and back for the divider.

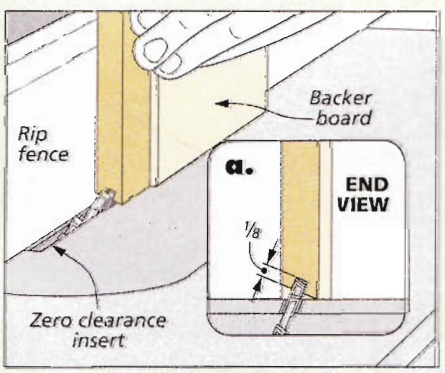
CORNERS. Next up are the corners. Start with an extra-long blank and tilt the saw blade to 22½°. The middle and right drawings below show the rest of the process. To complete the pieces, relieve the edges by sanding a slight roundover. Now, cut the corners to final length.

SPLINES. Now, prepare some stock for use as splines. I resawed a piece of stock on the table saw. To plane the stock, I taped it to a carrier board and planed it to the final thickness (⅛"). Planing also cleans up the saw marks. You can crosscut the splines to 1½" using a crosscut sled on the table saw or a hand saw and miter box.

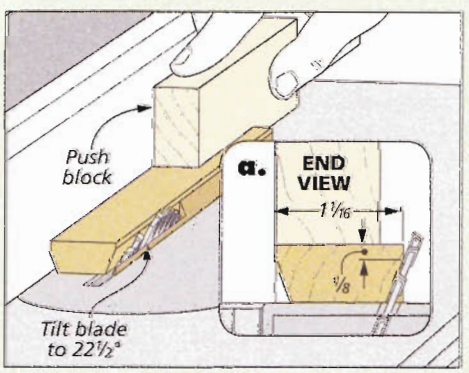
DIVIDER. The last part you need for the body of the box is the divider. Cut it to length, testing the fit between the dadoes on the front and back.

ASSEMBLY. At this point, you're ready to assemble the body of the box. All you need to do is brush glue in the grooves and on the splines and assemble the pieces. Then insert the divider into the dadoes and clamp it up. I used a band clamp to apply pressure to the joints, but conventional clamps will work, as well. Before setting the assembly aside to dry, check it to make sure it's square.

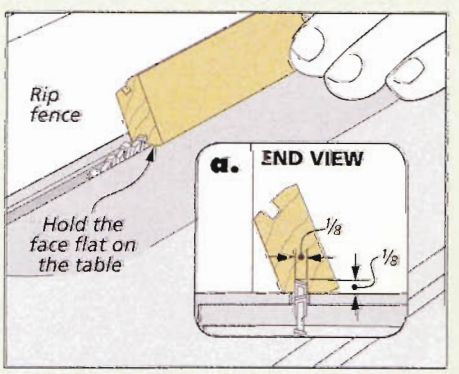
How-To: Make the Frame Pieces



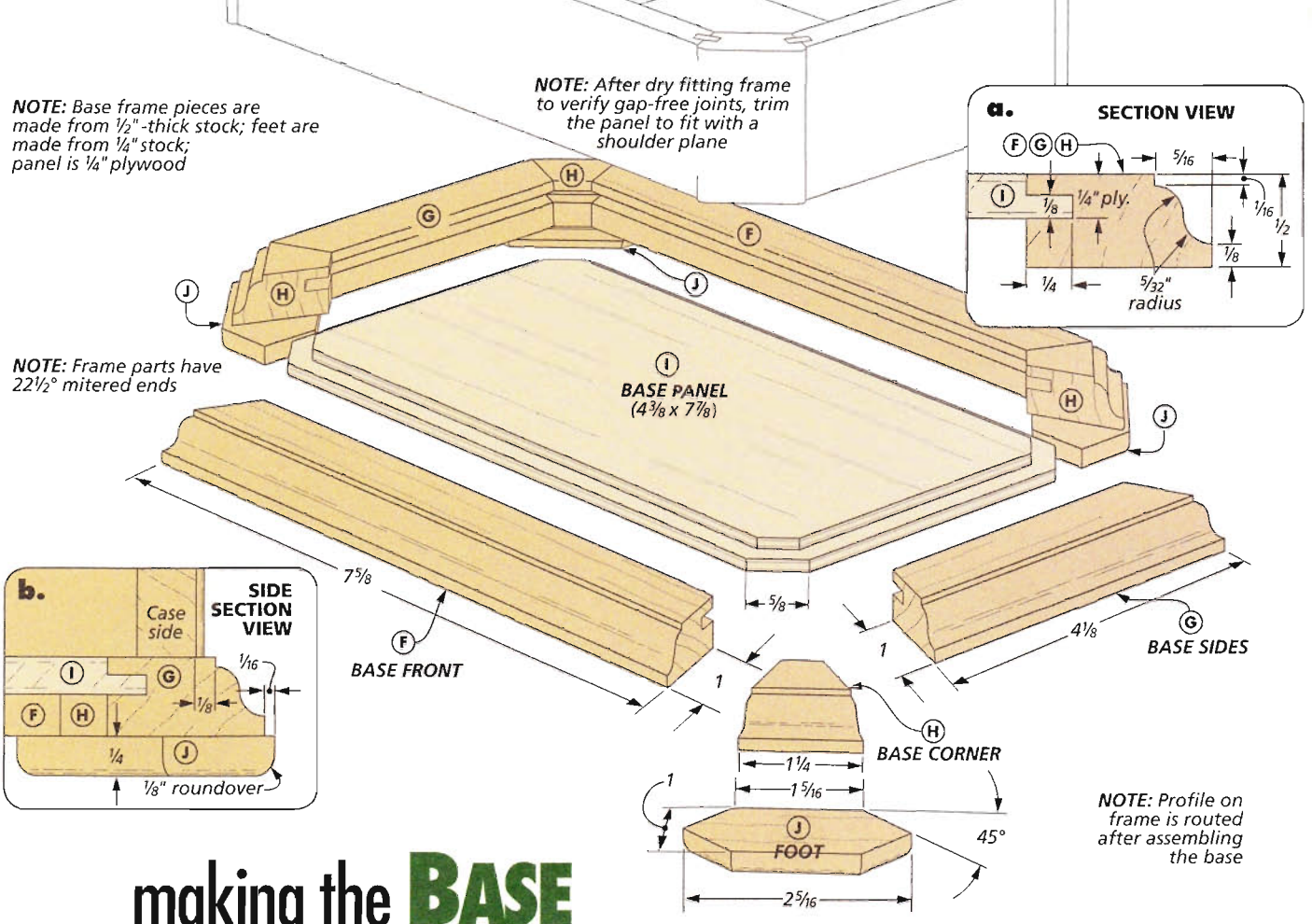
Spline Grooves. *Cutting the groove on the ends isn't difficult if you use a backer board to stabilize the workpiece.*



Bevel. *With the blade set at 22½°, cut a bevel on one edge of a long blank. Then set the fence and cut the blank to final width.*



Groove. *Now set the blade to 90° and hold the bevel face-down to cut the groove on each edge.*



making the BASE

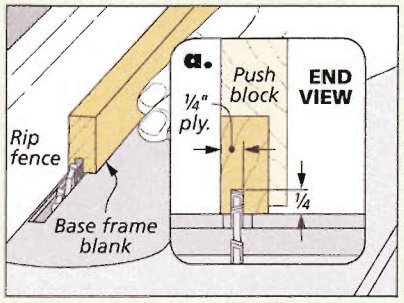
With the body of the box complete, the next step is to make the base. As you can see in the main drawing, the base consists of a hardwood frame surrounding a plywood panel. Grooves in the frame house a tongue on the edges of the plywood. After routing a decorative profile on the assembled base, you'll add four feet to raise it slightly off the surface. It all starts with the frame.

FRAME. For the frame, you'll need to rip some ½"-thick stock to 1" wide. I left the blank for the pieces extra-long to make cutting the groove for the panel easier.

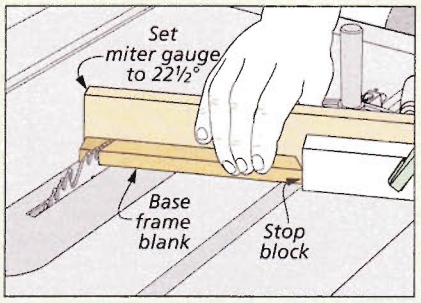
Positioning the groove properly is important to ensure the finished panel is flush with the top edge of the frame. An easy technique for setting the rip fence is to hold the plywood base blank up next to the table saw blade. By moving the fence so that the outside face of the plywood is flush with the outside edge of the blade, you're guaranteed that the groove in the frame will be positioned correctly and the panel will be flush when installed (left drawing below).

The next step is to miter the pieces to length. For this, I turned to an auxiliary miter fence and a stop block. This time, however, you have to set the miter gauge

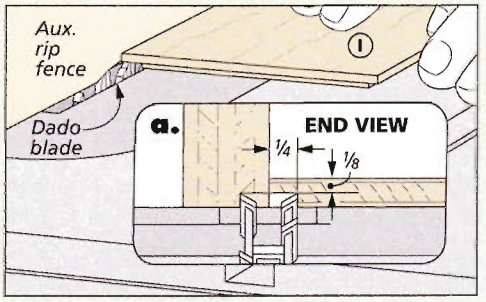
How-To: Make the Base Frame & Panel



Groove. *The groove for the panel is offset so the completed panel sits flush with the frame.*



Cutting Miters. *Use an auxiliary fence on the miter gauge to cut the 22½° miters on the ends of the frame pieces.*



Rabbet. *After cutting the panel to size, bury the dado blade in an auxiliary rip fence and cut a rabbet around all four edges.*

angle to 22½° and make sure the blade is at a perfect 90°. I cut the pieces to rough length, then mitered one end of each piece (center box at the bottom of the opposite page). As before, I used a stop on the auxiliary miter fence to control the length of each piece.

BOTTOM. Now you can turn your attention to the plywood bottom panel. After cutting the panel to size, you'll need to cut the rabbet on all four edges. The right drawing at the bottom of the opposite page shows how I buried part of the blade in an auxiliary rip fence to cut the rabbets. I just used a hand saw to nip off the corners (Figure 1 at right). You can create the rabbet on the upper part of the panel with a chisel as shown in Figure 1a.

In Figure 2, you can see how I used a band clamp again to glue up the base and panel. Then it's time to head to the router table and rout the decorative profile on the base frame (Figure 3).

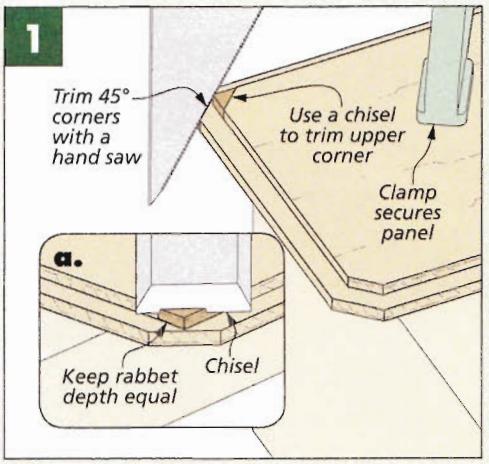
FEET. The hardwood feet are the next parts you need to make. In addition to complementing the design of the base, the feet elevate the box to provide clearance for the music works winding key.

After milling some stock to ¼" thick and cutting the pieces to rough length, cut the miters on each end (Figure 4). Once again, a stop block ensures the feet are all exactly the same length. To complete the feet, round over the bottom edges with sandpaper.

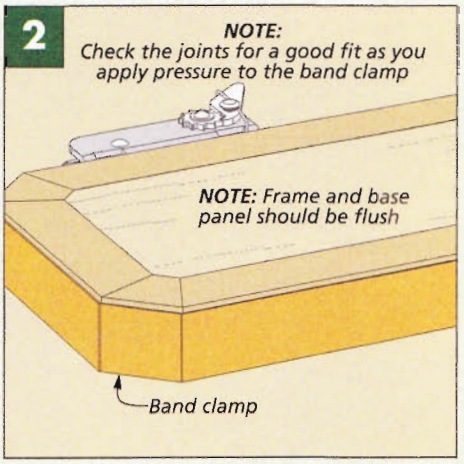
All it takes is a dab of glue on the feet to attach them to the frame. But as you attach the feet, you need to pay attention to the reveal to make sure it's uniform on all the edges (Figure 5a). I used tape to prevent the feet from sliding out of position while the glue dried.

ASSEMBLY. Now you can glue the box body to the base. Figure 6 shows how I used a piece of plywood as a caul on the body. As with the feet, the thing to look for is a consistent reveal on the base. At this point, you're ready to move on to the top.

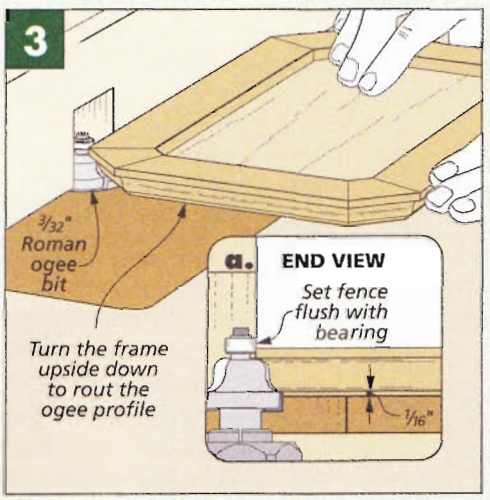
How-To: Complete the Base & Body



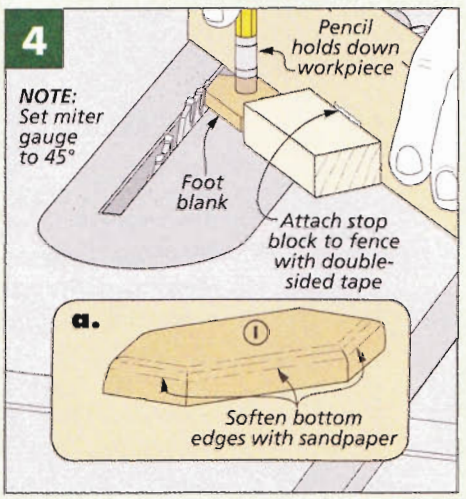
Base Panel. *A hand saw is the perfect tool for mitering the corners of the panel. These edges will be hidden in the grooves in the frame.*



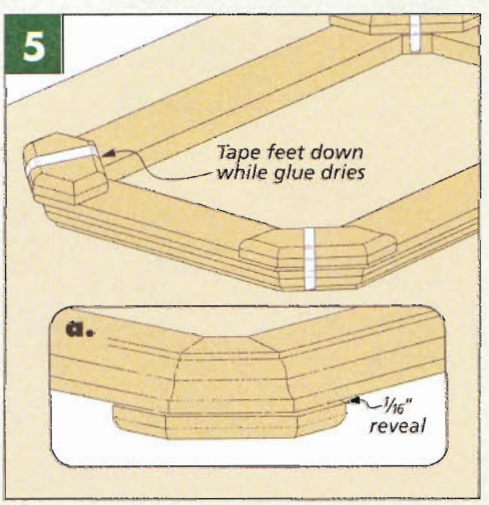
Base Assembly. *After the final trimming of the base, just add glue to the joints and use a band clamp to hold it all together.*



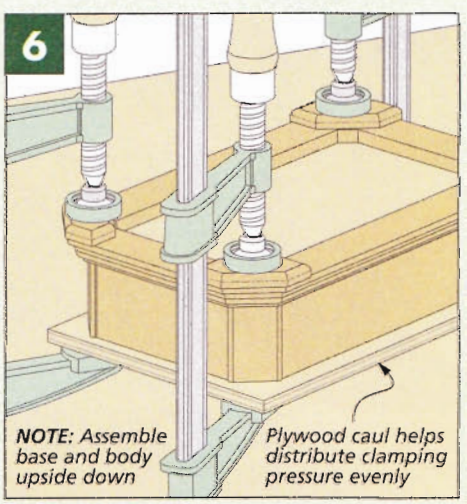
Routing a Profile. *After cleaning up the glue squeezeout from the base, rout the decorative profile on the frame.*



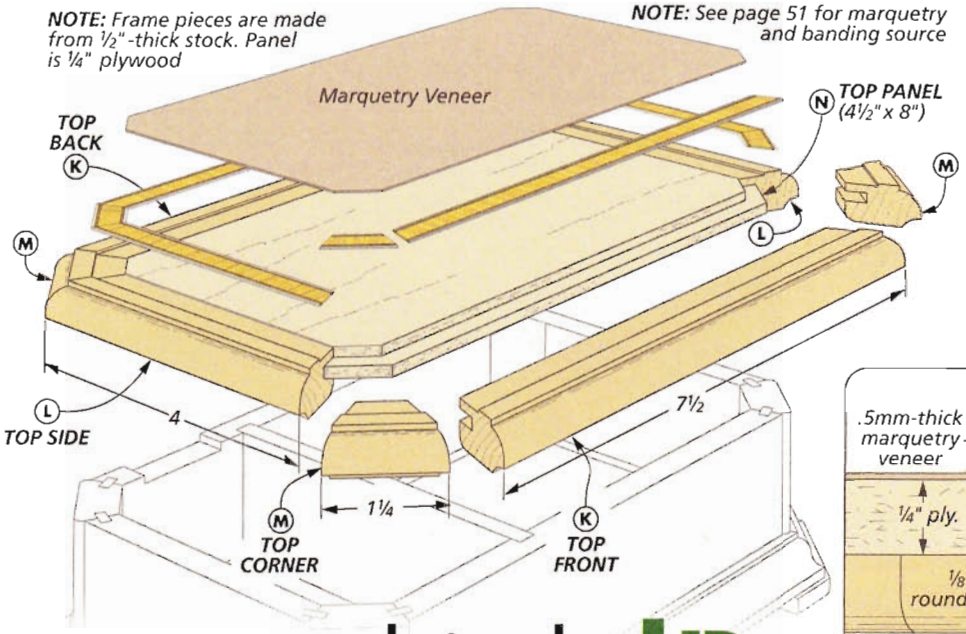
Feet. *Set the miter gauge to 45° to miter the feet. Install a stop block to keep the cuts uniform and the feet sized correctly.*



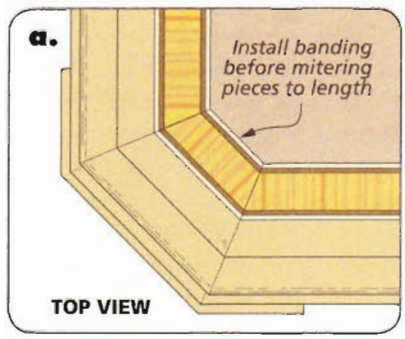
Attach the Feet. *To install the feet on the base, I used a small piece of tape on each one to lock it in position while the glue dried.*

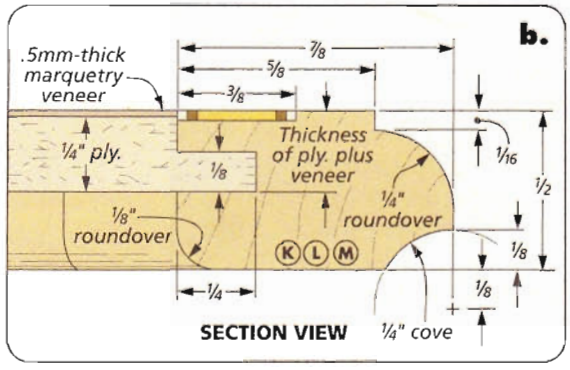


Assembly. *Using a piece of plywood as a clamping caul, a clamp on each corner is all it takes to assemble the body and base.*



completing the LID





To complete the music box, I made a lid that incorporates a purchased piece of marquetry veneer surrounded by decorative banding. The frame and panel lid is built much the same way as the base you just completed, but the dimensions are subtly different.

LID FRAME. To start on the frame, rip some stock to final thickness and width. Leave it long so you'll have some extra for saw setups.

The box below steps you through the process of making the frame. After cutting the panel groove, I cut the very shallow rabbet for the banding. Round over the inside edge and glue the banding into the channel before mitering the pieces to length.

DECORATIVE PANEL. Next up is the plywood top panel. I started by cutting it oversized and gluing the marquetry veneer to it.

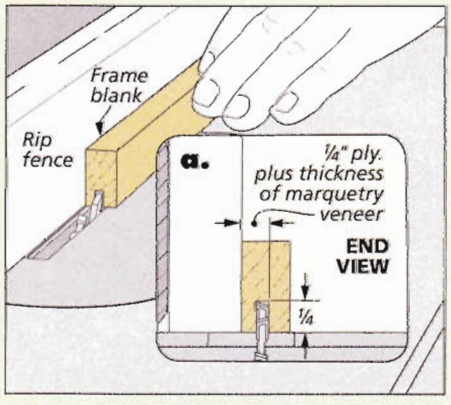
The marquetry I purchased was neatly cut but had some small gaps between the pieces. To avoid glue bleeding through the gaps, I used liquid hide glue. It has the added benefit of providing a little more open time to shift the piece around before it sets up.

After the glue dried, I dry-assembled the frame with a band clamp and used it to mark the panel borders. Then I added ¼" to all the edges (to account for the tongue) and scribed a cutting line before cutting the panel to size.

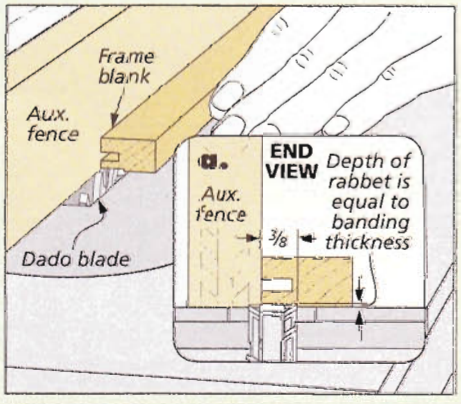
Like the base, the top panel needs a rabbet to form a tongue. For this, I installed a dado blade and buried it in an auxiliary rip fence. Use a chisel to slice away the corners and complete the rabbet.

TEST FIT. Release the band clamp on the frame and check for gaps around the panel. Sneak up on

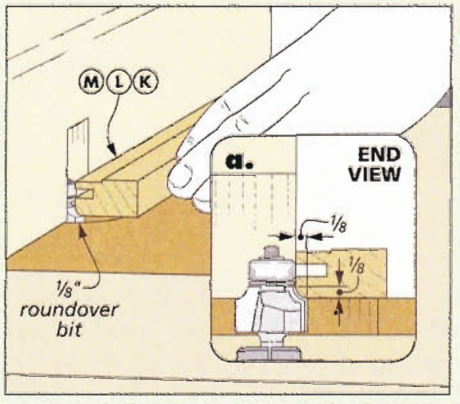
How-To: Groove, Rabbet & Roundover



Off-Center Groove. *The panel groove in the frame is located so that the panel and frame are flush when assembled.*



Shallow Rabbet. *Size the depth of the rabbet for the banding so that it will sit flush with the face of the panel.*



Inside Roundover. *With the rabbeted side facing up, round over the inside edge of the frame blanks at the router table.*

a good fit, fine-tuning it with a shoulder plane. The goal is a seamless joint line for the panel.

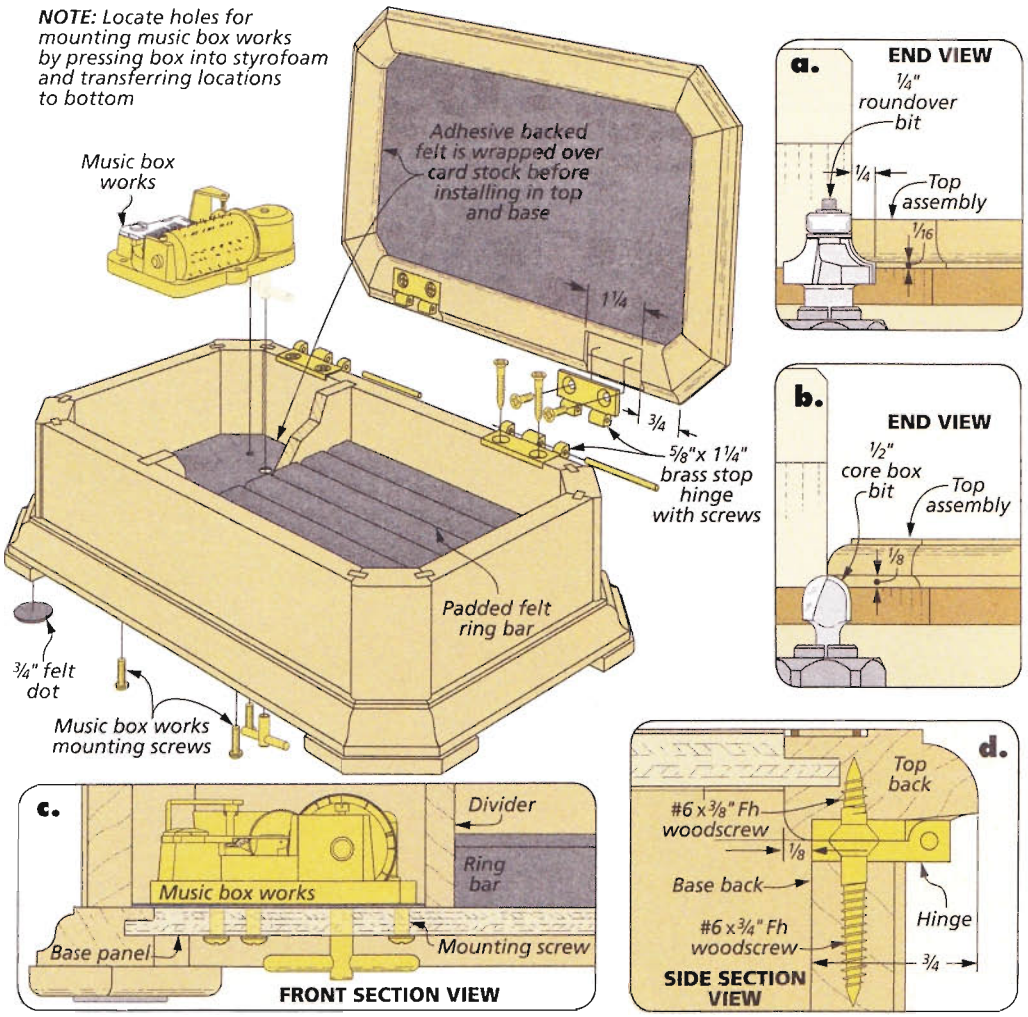
MOLDING PROFILE. Now you can assemble the top and then head over to the router table to rout the edge profile. It consists of a roundover and a cove profile (details 'a' and 'b' at right).

HINGE MORTISES. The next step is to rout the hinge mortises. The box below shows how a router makes short work of removing the bulk of the waste. Square up the corners with a chisel and test the fit. I also used a chisel to remove a little extra material to provide clearance for the hinge barrel. Detail 'd' shows the two different screw lengths used for the hinges.

FINAL DETAILS. Before completing the box, I oiled it and then finished it with several coats of spray lacquer. I also added a felt lining in the base and lid. Felt can be tricky to fit properly, so I first applied it to card stock that was cut to fit the openings.

To install the musical works, you'll need to drill a few holes for the winding and feet (detail 'c'). A trick you can use to lay out those holes is to cut a piece of styrofoam to fit in the opening. Simply press the works into the foam to make an impression of the feet and winding. Then, use the foam as a template to locate and drill the holes in the bottom panel before mounting the works.

You can cut and fit the ring holder and add the felt dots on the feet. All that remains then is to install the hinges. When it's all done, the music box is sure to be an attention-grabber. W

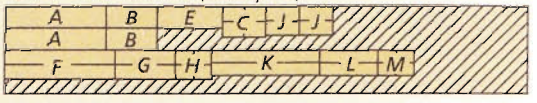


Materials, Supplies, & Cutting Diagram

A	Front/Back (2)	⅜ x 1½ - 7
B	Sides (2)	⅜ x 1½ - 3½
C	Corners (4)	½ x 1 1/16 - 1½
D	Splines (8)	⅛ x ¼ - 1½
E	Divider (1)	¼ x 1½ - 4½
F	Base Front/Back (2)	½ x 1 - 7⅝
G	Base Sides (2)	½ x 1 - 4⅛
H	Base Corners (4)	½ x 1 - 1¼
I	Base Panel (1)	¼ ply. x 4⅜ - 7⅞
J	Feet (4)	¼ x 1 - 2 5/16
K	Top Front/Back (2)	½ x ⅞ - 7½
L	Top Sides (2)	½ x ⅞ - 4
M	Top Corners (4)	½ x ⅞ - 1¼
N	Top Panel (1)	¼ ply. x 4½ - 8

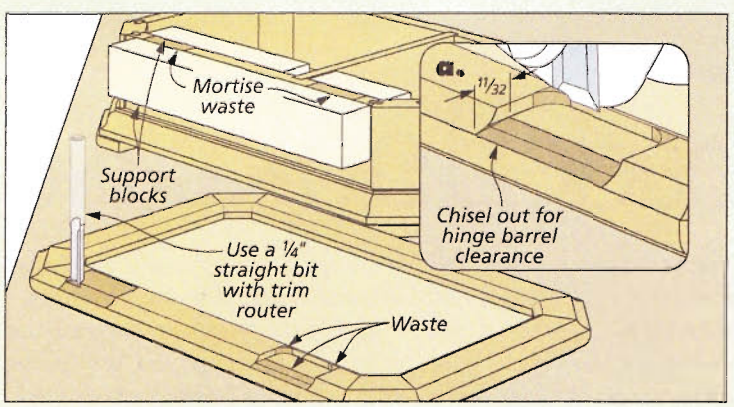
- (1 pr.) 1¼ " x ⅝" Brass Stop Hinges
- (1) Music Box Works
- (1) 4" x 7" Marquetry Veneer
- (1) ⅜" x 36" Banding
- (1) 12" x 24" Adhesive-Backed Felt
- (1) Padded Felt Ring Bar
- (1 Pkg.) ¾" Felt Dots
- (4) #6 x ⅜" Brass Fh Woodscrews
- (4) #6 x ¾" Brass Fh Woodscrews

½"x 6" - 36" Walnut (1.5 Sq. Ft.)

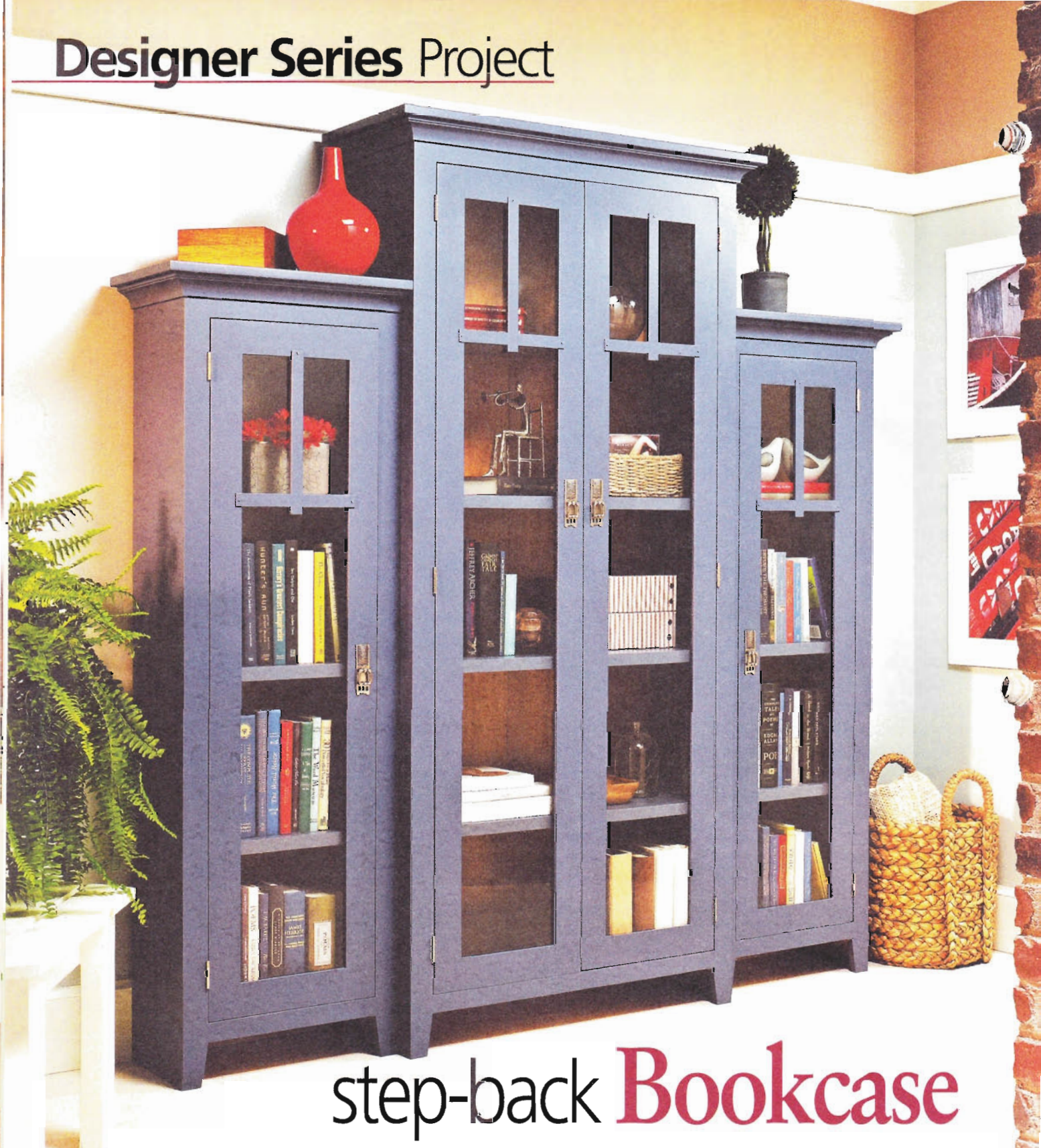


ALSO NEEDED: *One 12"x 12" sheet of ¼" Baltic Birch Plywood*

Hinge Mortises



Hinge Mortises. *Rout the hinge mortises in the lid and back, staying close to the layout lines. To help support the router when routing the mortises in the back, you'll need to use support blocks.*



step-back Bookcase

Most bookcases end up as more of a backdrop than a focal point in a room. It's the books and other items on the shelves that get the attention.

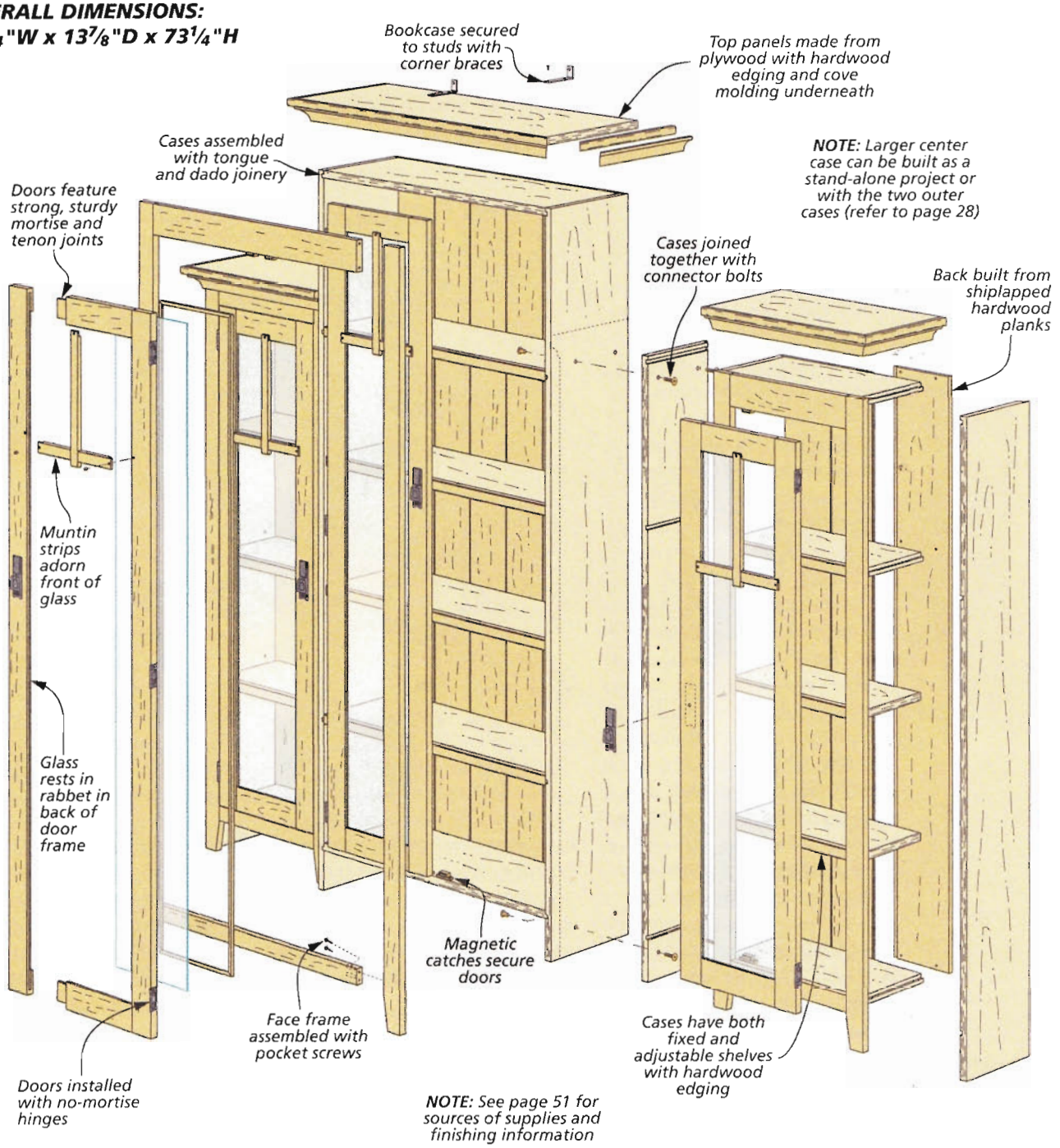
This bookcase is a little different. With its "step-back" construction, glass-panel doors, and bold finish, it begs to be noticed.

Despite its elegant look, there's no need to be intimidated by the project. This bookcase is easy to build. At its essence, it's nothing more than three plywood boxes put together with tongue and dado joints. The fine-furniture feel of the project is provided by solid-wood face frames, hardwood backs, and glass-panel doors adorned with muntin strips.

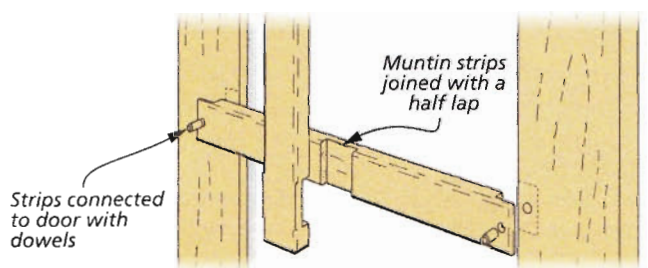
This project also offers you the option of building just the center case, which is a nice piece of furniture all on its own. But I prefer the dramatic look created when all three cases are set side by side.

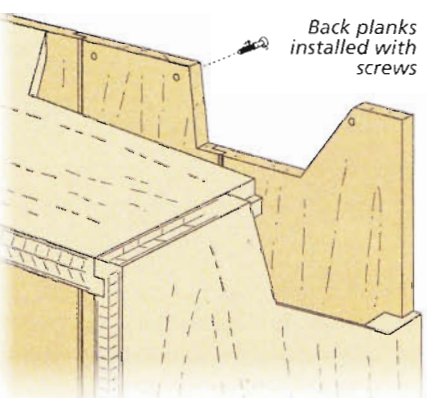
CONSTRUCTION DETAILS

OVERALL DIMENSIONS:
71¾"W x 13⅞"D x 73¼"H



NOTE: See page 51 for sources of supplies and finishing information





build the CASE & FACE FRAME

The logical place to start on this project is with the cases. As you noticed on page 23, the center case is larger than its adjoining outer cases, but the construction details are nearly identical.

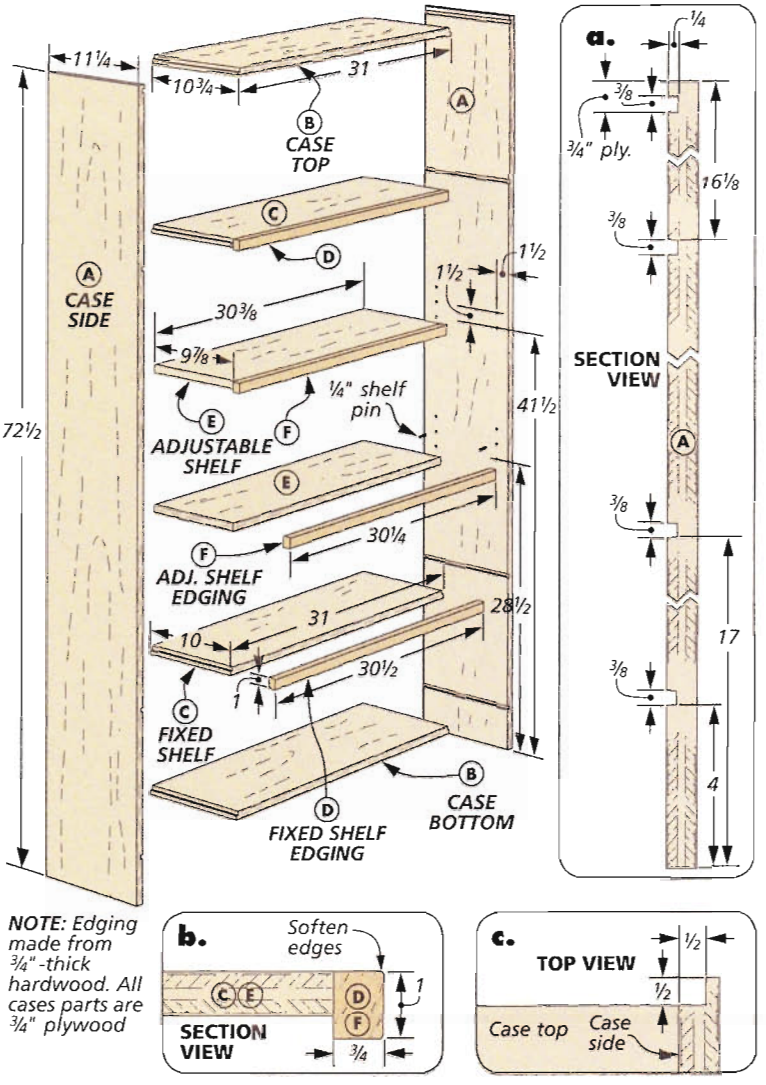
Here, we'll focus on the details of the center case. I'll cover the details for the outer cases later. You may want to consider building all the cases at the same time, though, so that you don't have to repeat machine setups later.

CUT PARTS TO SIZE. With your materials in hand, you can get started by cutting the plywood parts for your case to size. As you can see in the main drawing at right, the top and bottom, fixed shelves, and adjustable shelves are slightly different dimensions, though the parts look similar.

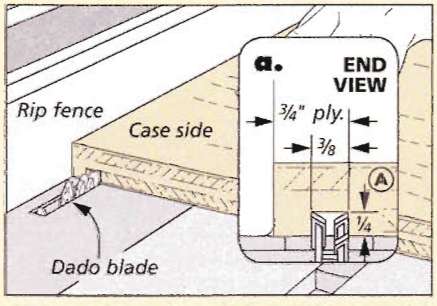
JOINERY. The case sides each have four dadoes that accept tongues on the top, bottom, and fixed shelves. You can cut all these dadoes on the table saw, as shown in the first two drawings below. The case sides are fairly long, so it helps to add a long auxiliary fence to your miter gauge to support the pieces as you cut. It's also a good idea to have some form of outboard support at the side of your table saw.

The mating tongues on the top, bottom, and fixed shelves are the next order of business. For these, "sneak up" on the thickness, and test the fit in the dadoes until you get them snug. Then, each case side receives a rabbet to hold the back planks. This requires a saw setup similar to what you just used for the tongues, as shown below.

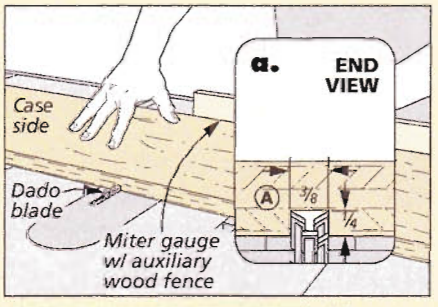
Now is also a good time to lay out and drill the holes for shelf pins in the case sides, as shown in the drawing above.



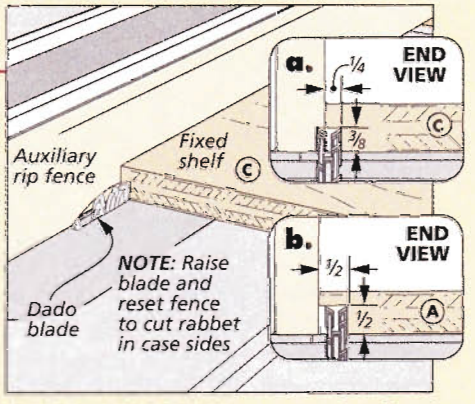
How-To: Make Case Parts



End Dadoes. *Cut the dadoes near the ends of the case sides with a dado blade using the rip fence as a guide.*



Field Dadoes. *For the two "field" dadoes on each case side, you can guide the piece using a miter gauge with a long fence.*



Rabbet. *The tongues on the fixed shelves and the rabbets in the case sides can both be cut with a similar setup.*

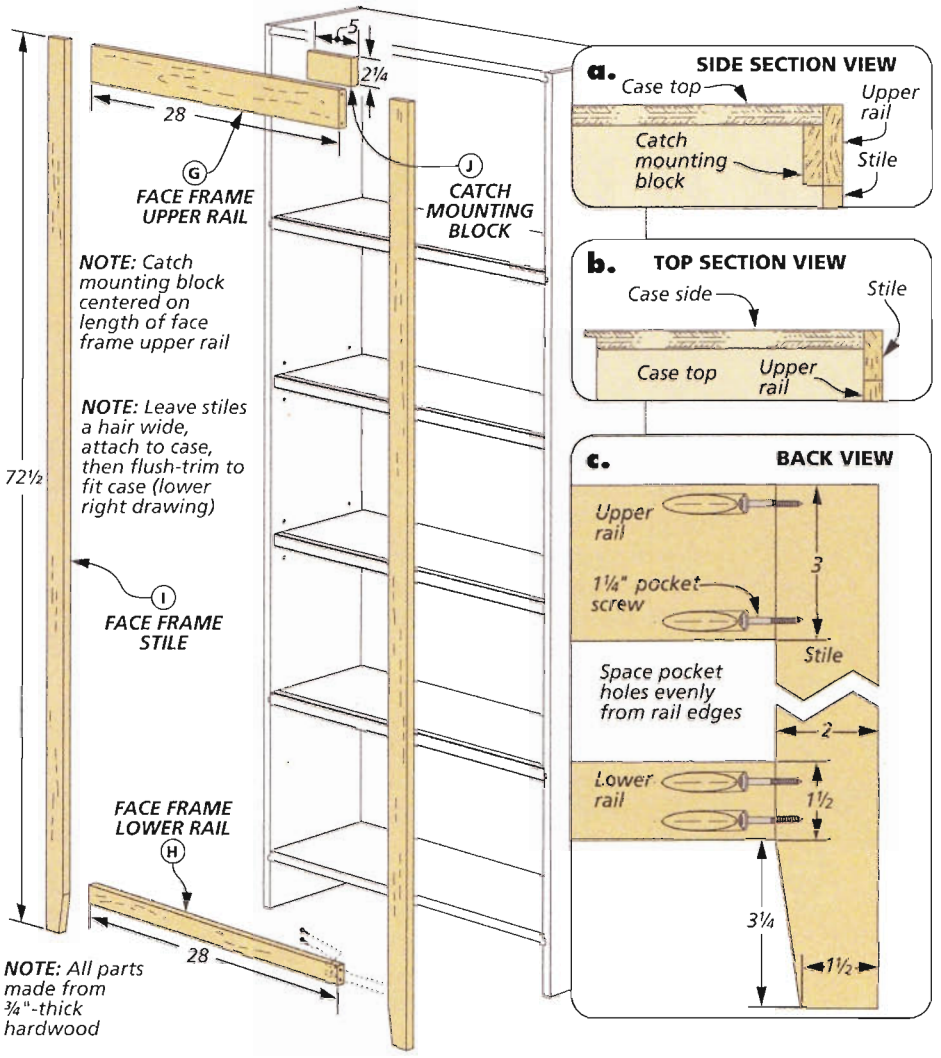
CASE ASSEMBLY. At this point, you can check the fit of all the parts, and then glue and clamp them together. Note that the back edges of the fixed shelves are positioned flush with the rabbet on the case sides, just like the case top and bottom (detail 'c' on the opposite page).

EDGING. This leaves space at the front of the shelves to add hardwood edging. While you're at it, the adjustable shelves get a strip of edging glued to the front, too (detail 'b' on the opposite page). You won't install these shelves until the project is complete.

FACE FRAME. To begin transforming this project from a basic plywood box into a fine piece of furniture, you want to add a face frame. It's made up of hardwood stiles and rails that are joined together with pocket screws. The face frame is then joined to the front of the case using glue and clamps.

Though in theory the face frame should be the same outside dimensions as the case, it's often difficult to get an exact fit when you glue them together. So what I like to do is leave my stiles a hair wider than the final dimensions shown at right (about 1/16").

Then, after gluing and clamping the face frame to the case, I use a router and flush-trim bit to trim the stiles of the face frame for a perfect fit with the case, as shown in the lower right drawing.

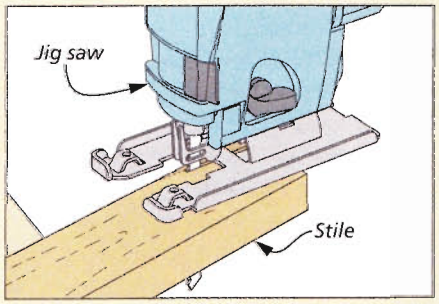


Once you've cut the face frame parts to size, there's one detail to add before assembling them. That's a subtle taper at the bottom of the stiles. Because of the length of the stiles, I found this cut easier to make with a jig saw (lower left drawing).

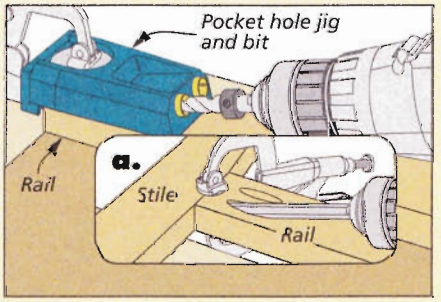
Next, get out your pocket hole jig to drill all the holes in the frame rails and join the frames together with pocket screws. Detail 'c' above and the middle drawing below will walk you through this process.

CATCH BLOCK. One final part of the face frame is a block attached to the upper rail. Later on, this block holds magnetic catches to keep the doors closed. You can just cut this block to size and stick it in place with glue and a clamp.

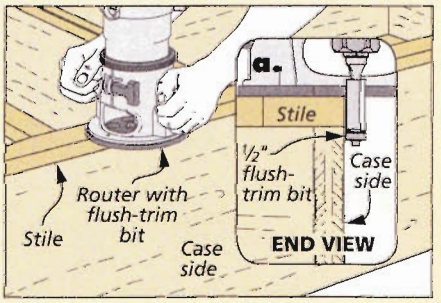
Add the Face Frame



Taper. *Lay out the subtle taper on the face frame stiles, cut it with a jig saw, and sand the surface smooth.*

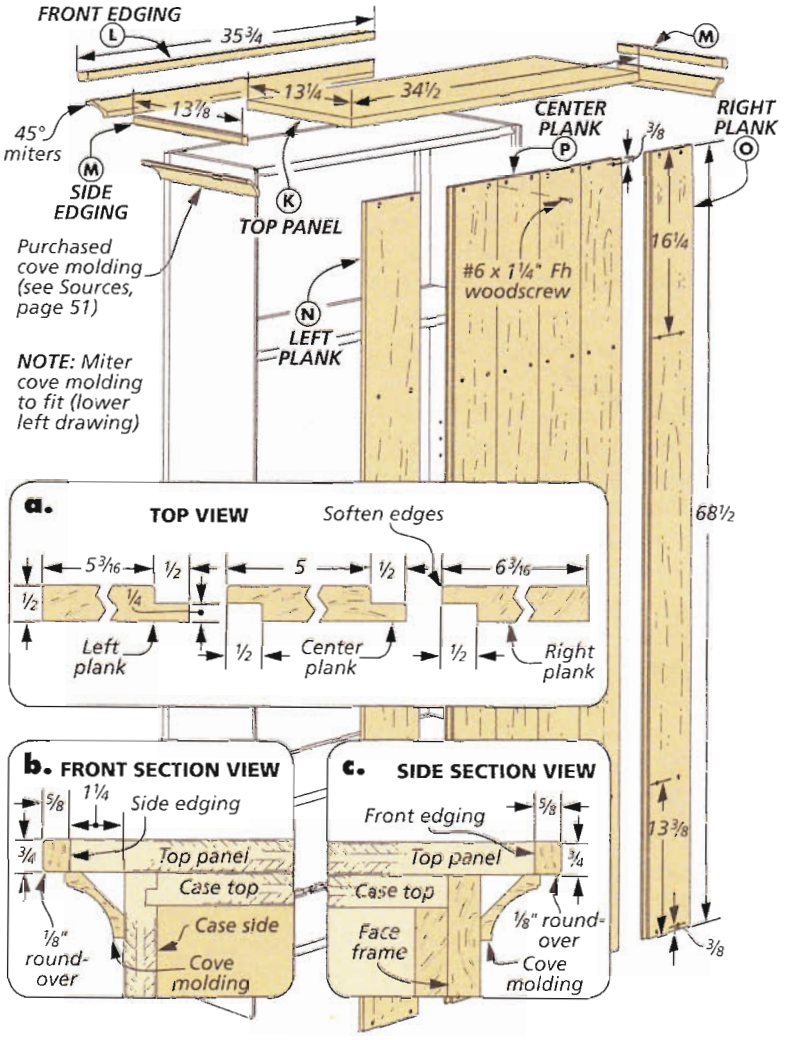


Pocket Screws. *A pocket hole jig will make quick work of the joinery used to connect the rails and stiles.*



Rout Flush. *After gluing and clamping the face frame to the case, use a flush-trim bit to make the edges flush.*

add the top, BACK & DOORS



With the case complete, you can turn your attention to the features that really dress it up. Those include the top, the hardwood back, and the glass-panel doors.

START AT THE TOP. The top is a plywood panel wrapped with hardwood edging. After cutting the panel to size, you can miter, glue, and clamp the edging strips to the top panel as shown in the drawing at right.

The edging gets a subtle roundover on the top and bottom. Then the top is attached to the case flush with the back and with an equal overhang on each side, as shown in details 'b' and 'c.'

COVE MOLDING. What really dresses up the top is cove molding that is fitted to the underside. The molding is also mitered at the corners to wrap around the top of the case, as shown in the lower left drawing. Once the pieces are cut, they can be glued in place using spring clamps.

PAINT. At this stage, it's time to prime and paint the case components. That's because the next part you'll add is the back, which features a contrasting natural finish.

BACK PLANKS. I made the back out of red alder planks (a right plank, a left plank, and four center planks). The planks are each rabbeted along the edges to fit together with a slight gap between them (detail 'a'). You can cut the rabbets as shown in the lower right drawing. Note that the end planks have one rabbet, and the center planks have two.

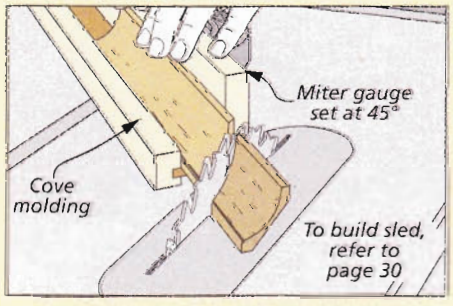
To highlight the wood tone, I applied lacquer to the planks. When it dries, they're ready to go in place in the cabinet. There's a slight gap between each, and playing cards make great shims to establish the correct spacing. Then drill countersunk holes in the planks and secure them from the back with screws.

DOORS. The final detail that really completes this bookcase is a pair of glass-panel doors. The door frames are constructed with mortise and tenon joints, and the glass rests in a rabbet routed in the back of the frame. Decorative muntin strips adorn the glass.

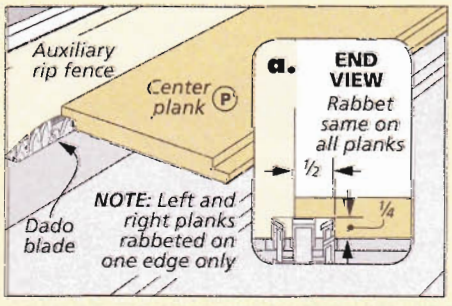
MORTISES & TENONS. Start making the doors by cutting the rails and stiles to size. Then lay out and drill the mortises near each end of the stiles on the drill press. Clean them up and square up the ends with a chisel. You'll get all the dimensions you need in detail 'a' on the opposite page.

Now you can cut the tenons (detail 'b'). This is best done at the

How-To: Add Cove Molding & Back



Miter Molding. *The easiest way to miter cove molding is to position it at its mounted angle. This sled (page 30) makes it easy.*



Rabbet Back. *All the rabbets on the back planks are the same. They can be made with a dado blade buried in an auxiliary fence.*

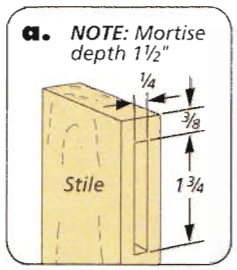
table saw with a dado blade. Once you're done, assemble the doors with glue and clamps.

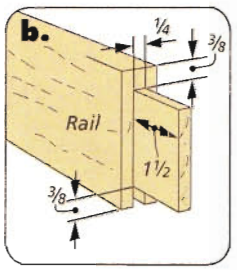
RABBET FOR GLASS. When the glue dries, rout a rabbet around the inside perimeter of the back of each door using a rabbeting bit, as shown in detail 'd.' Then chisel the corners square.

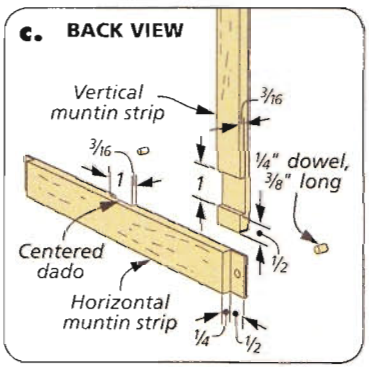
MUNTIN STRIPS. The muntin strips on the front of the doors are up next. A half lap between the strips provides a secure connection, and rabbets on the ends will overlap the door frame (detail 'c.') Dowels and glue connect the strips to the door in a secure way that adds a decorative touch to the doors.

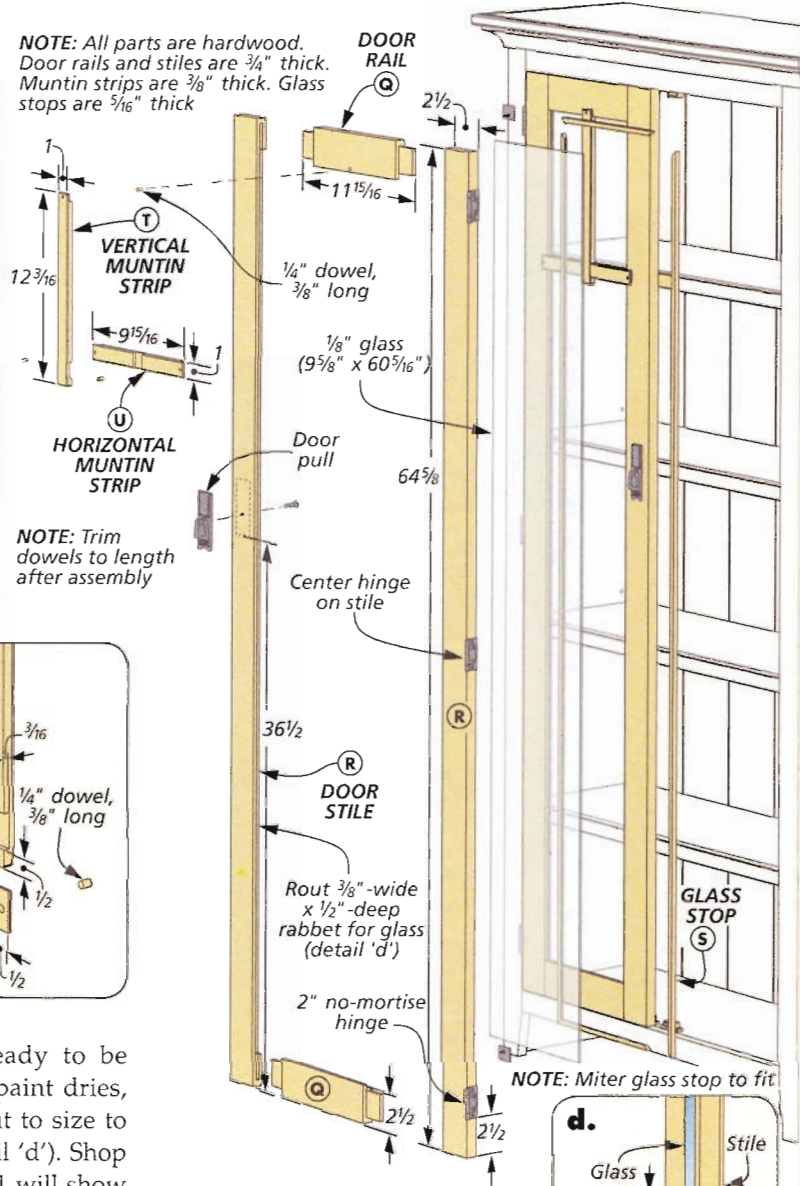
The first thing to do on the muntin strips is drill the holes for the dowels (lower left drawing). Next, you can cut all the rabbets on the ends using a dado blade (two on the horizontal strip; one on the vertical strip). Adjust the dado blade, and cut the half laps where the strips intersect (lower middle drawing). Finally, join the strips with glue and a clamp.

At this point, the muntin strips are ready to be attached to the doors. Set them in place, and use the holes in the muntin strips as guides to drill holes in the doors (lower right drawing). Glue in short lengths of dowel. Then trim and sand them so they stand just proud of the muntin strips. (The dowels will have a final length of approximately 3/8".)



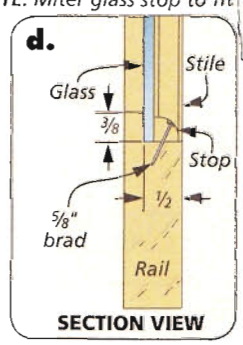




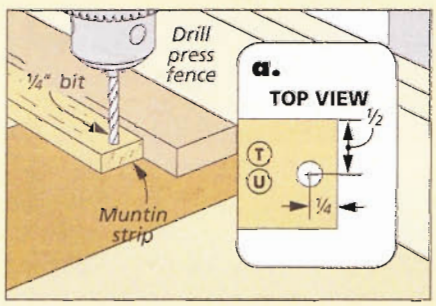


The doors are ready to be painted. While the paint dries, you can get glass cut to size to fit inside them (detail 'd'). Shop Notebook on page 31 will show you how to make the glass stop. Paint the glass stop to match the doors, then secure the glass by nailing the glass stops in place.

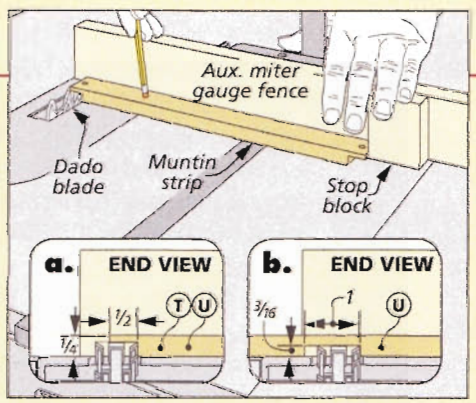
MOUNT THE DOORS. The doors are mounted to the face frame stiles with no-mortise hinges. For a tip on properly installing these hinges, refer to page 30. Magnetic catches added to the top and bottom of the doors keep them closed. And a door pull is screwed to the front of each door as the final touch.



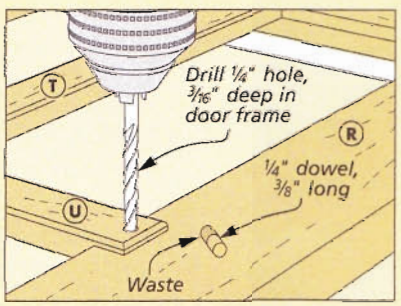
Make Muntins



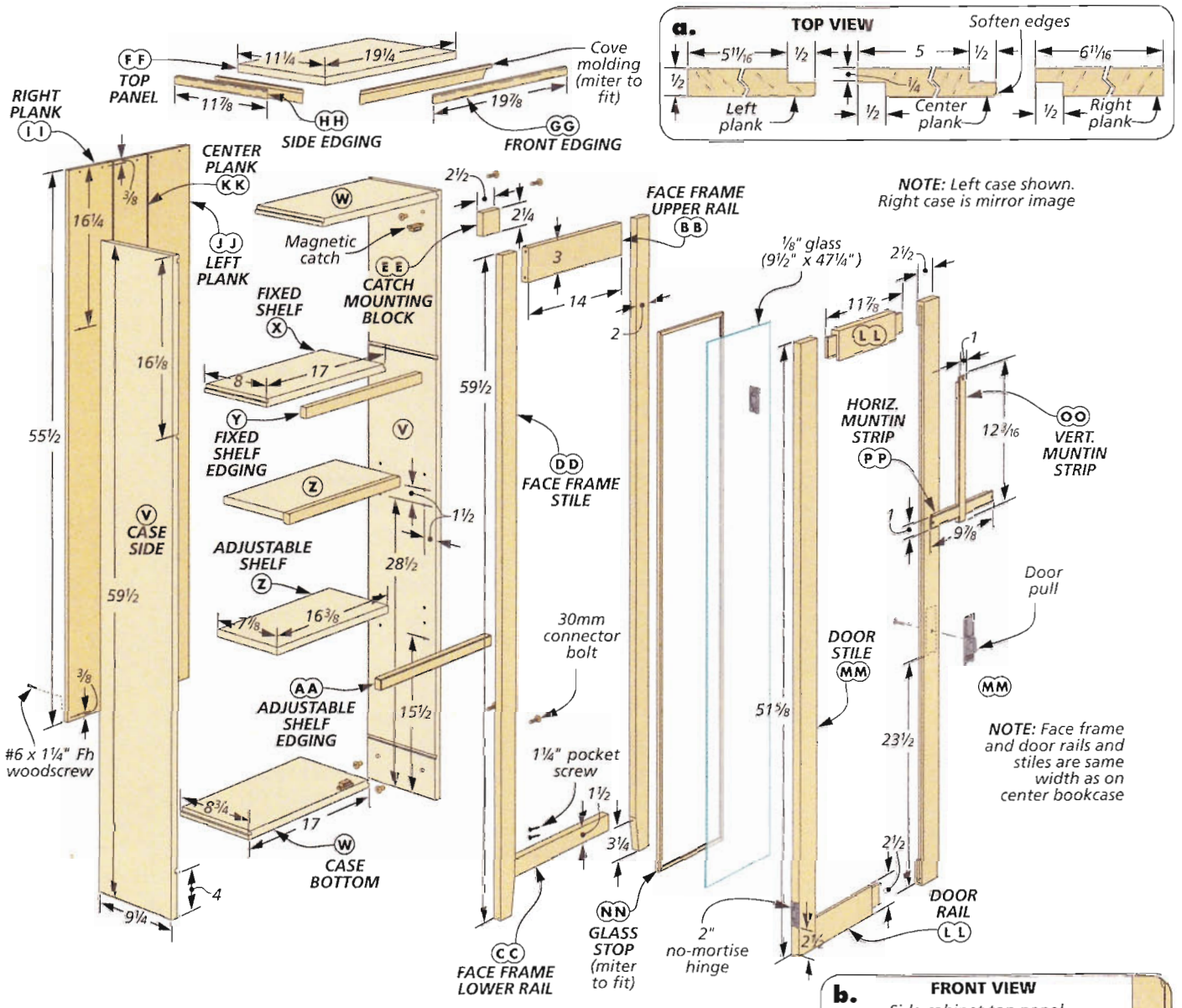
Drill Holes. *The muntin strips are drilled to accept dowels. Use a drill press fence to ensure consistent spacing.*



Rabbets & Half Laps. *The rabbets and half laps on the muntin strips can all be made using a dado blade.*



Attach Muntin Strips. *Position the muntin strips, transfer the holes to the door, and glue in the dowels.*



making the OUTER CASES

Once you've built the center case, you won't find constructing the outer cases to be too difficult. Though the dimensions are different, the construction details of these cases are virtually the same. There are a few differences on the outer cases that I want to point out, though.

BUILDING THE OUTER CASES. The first distinction has to do with the shelves in the outer cases. Specifically, each outer case only has one fixed shelf, located near the top, while the center case has two fixed shelves.

The top of the outer case is a little bit different, as well. On the center case, the top panel is centered above the case, and the edging and cove molding wrap all the way around the sides. Here, the top is mounted flush on one side to butt against the center case (detail 'b'). The edging and cove molding wrap around one side and the front of the case. They end at a 90° angle flush with the edge of the top where it meets the center case.

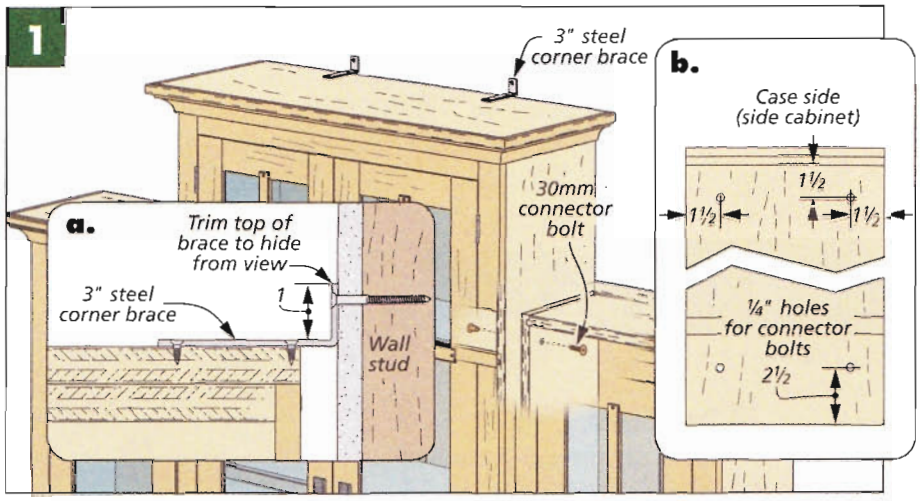
The back of the outer case is similar, but instead of six planks, it only features three. And each outer case only has one door rather than two. Because of this, the catch mounting block is smaller than the one on the center case. It's also attached to the case side, rather than centered in the case.

INSTALLING THE BOOKCASE. Once the cases are all painted and finished, there are a few small components that you'll want to add in order to install them safely and prevent them from tipping.

When you get the bookcases moved into position on the wall, it's a good idea to connect them to one another with connector bolts. This requires drilling holes in the case sides and adding the bolts, as you can see in the main drawing and in detail 'b' on the opposite page.

As another safety measure, secure the cases to the wall to prevent them from tipping. To do this, I made a couple of wall brackets out of steel corner braces. First, trim the top of the brace with a hacksaw, so it won't be visible above the bookcase (detail 'a'). Then align each bracket with a wall stud. Finally, screw them to the top of the case and the studs as shown at right.

Your step-back bookcase is now complete. And you're sure to find it to be an eye-pleasing step up from the average bookcase, as well as a fine piece of furniture for your home. W



Safe Installation. *To provide more stability, it's a good idea to attach the cabinets to one another with connector bolts (detail 'b'). Then, use steel corner braces to attach the center cabinet to wall studs, as shown in detail 'a.'*

Materials, Supplies & Cutting Diagram

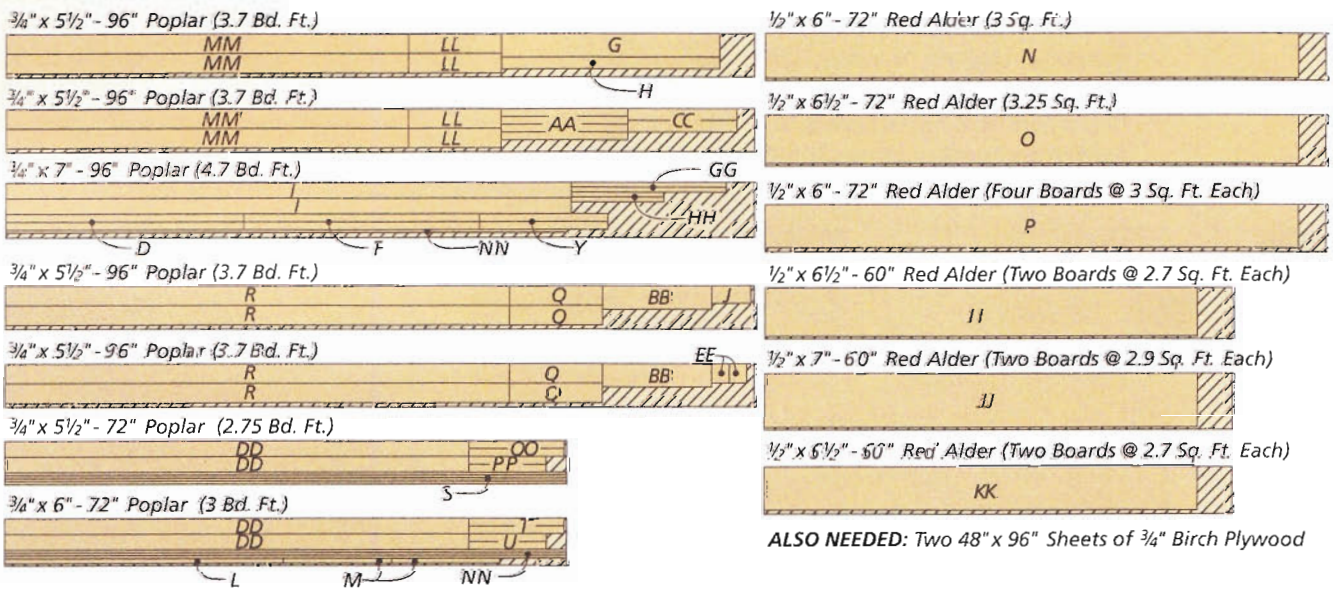
Center Case

A	Case Sides (2)	¾ ply. - 11¼ x 72½
B	Case Top/Bottom (2)	¾ ply. - 10¾ x 31
C	Fixed Shelves (2)	¾ ply. - 10 x 31
D	Fixed Shelf Edging (2)	¾ x 1 - 30½
E	Adj. Shelves (2)	¾ ply. - 9⅞ x 30⅜
F	Adj. Shelf Edging (2)	¾ x 1 - 30⅜
G	Face Frame Upper Rail (1)	¾ x 3 - 28
H	Face Frame Lower Rail (1)	¾ x 1½ - 28
I	Face Frame Stiles (2)	¾ x 2 - 72½
J	Catch Mounting Block (1)	¾ x 2¼ - 5
K	Top Panel (1)	¾ ply. - 13¼ x 34½
L	Front Edging (1)	⅝ x ¾ - 35¾
M	Side Edging (2)	⅝ x ¾ - 13⅞
N	Left Plank (1)	½ x 5¹¹⁄₁₆ - 68½
O	Right Plank (1)	½ x 6³⁄₁₆ - 68½
P	Center Planks (4)	½ x 5½ - 68½
Q	Door Rails (4)	¾ x 2½ - 11¹⁵⁄₁₆
R	Door Stiles (4)	¾ x 2½ - 64⅝
S	Glass Stop	⅝ x ⅝ - 290 rgh.
T	Vertical Muntins (2)	⅜ x 1 - 12³⁄₁₆
U	Horizontal Muntins (2)	⅜ x 1 - 9¹⁵⁄₁₆

Side Cases

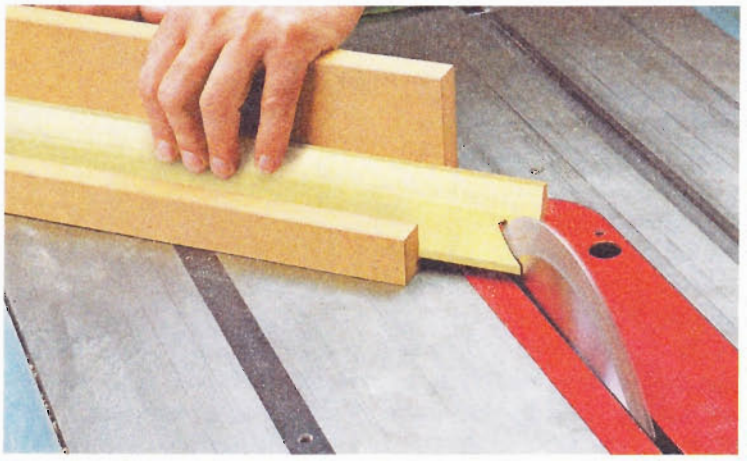
V	Case Sides (4)	¾ ply. - 9¼ x 59½
W	Case Top/Bottom (4)	¾ ply. - 8¾ x 17
X	Fixed Shelves (2)	¾ ply. - 8 x 17
Y	Fixed Shelf Edging (2)	¾ x 1 - 16½
Z	Adj. Shelves (4)	¾ ply. - 7⅞ x 16⅜
AA	Adj. Shelf Edging (4)	¾ x 1 - 16⅜
BB	Face Frame Upper Rails (2)	¾ x 3 - 14
CC	Face Frame Lower Rails (2)	¾ x 1½ - 14
DD	Face Frame Stiles (4)	¾ x 2 - 59½
EE	Catch Mtng. Blocks (2)	¾ x 2¼ - 2½
FF	Top Panels (2)	¾ ply. - 11¼ x 19¼
GG	Front Edging (2)	⅝ x ¾ - 19⅞
HH	Side Edging (2)	⅝ x ¾ - 11⅞
II	Left Planks (2)	½ x 6³⁄₁₆ - 55½
JJ	Right Planks (2)	½ x 6¹¹⁄₁₆ - 55½
KK	Center Planks (2)	½ x 5½ - 55½
LL	Door Rails (4)	¾ x 2½ - 11⅞
MM	Door Stiles (4)	¾ x 2½ - 51⅝
NN	Glass Stop	⅝ x ⅝ - 240 rgh.
OO	Vertical Muntins (2)	⅜ x 1 - 12³⁄₁₆
PP	Horizontal Muntins (2)	⅜ x 1 - 9⅞

- (24) ¼" Shelf Pins
- (8) Magnetic Catches
- (60) ⅝" Brads
- (11 lin. ft.) ⁹⁄₁₆" x 2" Cove Molding
- (4) Door Pulls
- (1) ¼"-dia. Dowel, 12" long
- (84) #6 x 1¼" Fh Woodscrews
- (8) 30mm Connector Bolts & Caps
- (3) 3" Steel Corner Braces
- (5 pr.) 2" No-Mortise Hinges
- (3) ⅛"-thick Glass Panels (two sizes)



ALSO NEEDED: *Two 48"x 96" Sheets of ¾" Birch Plywood*

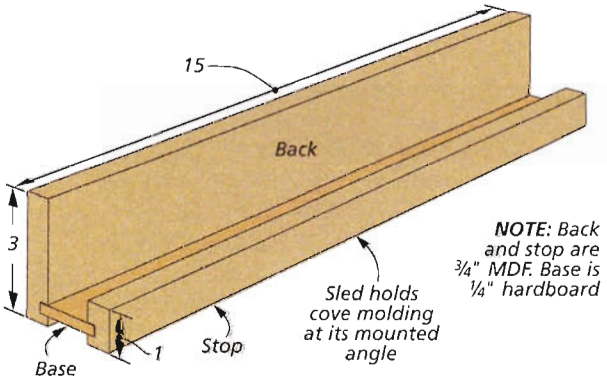
SHOP NOTEBOOK

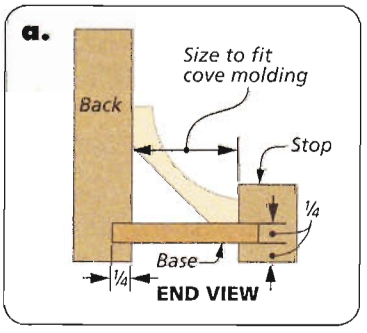


Miter Sled

The cove molding at the top of the step-back bookcase (page 22) is mitered to meet at the corners. Of course, because cove molding is installed at an angle, cutting an accurate miter often requires a tricky compound cut where you both tilt the table saw's blade and angle the miter gauge.

MITER SLED. An easier way to miter the molding is shown in the photo above and the illustrations below. You simply make a sled for your miter gauge to hold the molding at the same angle it will rest at when mounted on the bookcase. That way, all you have to do is set the miter gauge at 45° in order to cut the miter.





BUILD THE SLED. As you can see at left, there isn't much to building the miter sled. It features a back and a stop that are grooved to accept a hardboard base. The distance between the two parts matches the width of the cove molding at its mounted angle.

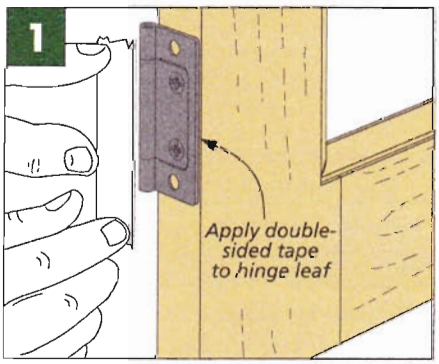
After cutting the parts to size, make the grooves in the back and stop. Then glue the sled together and screw it to the miter gauge. Now you're ready to miter your molding safely and accurately.

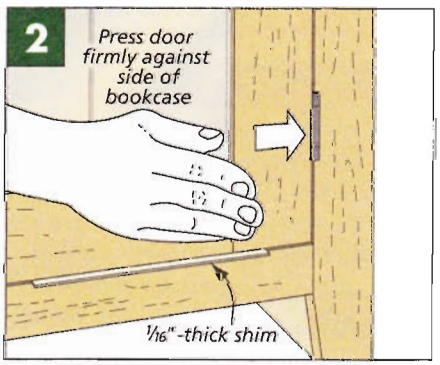
No-Mortise Hinges

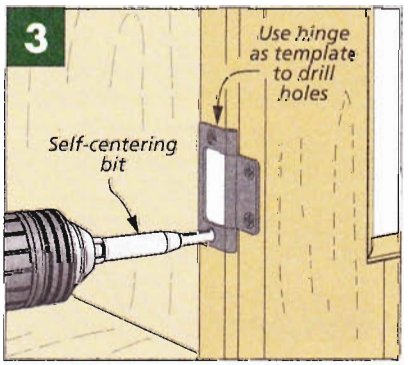
The doors of the step-back bookcase are mounted on no-mortise hinges. I installed the hinges on the doors first. They're simply positioned on the edge of each door and then screwed directly in place.

To locate the hinges on the face frame of the bookcase, place a piece of double-sided tape on each hinge (Figure 1). Then press the door against the side of the cabinet, using a 1/16"-thick shim to create a gap, as shown in Figure 2.

With the hinges taped in place, carefully open the door and use the hinge as a template to drill the screw holes (Figure 3). Finally, it's just a matter of removing the tape and screwing the hinges to the sides of the cabinet.







Wenge Plugs

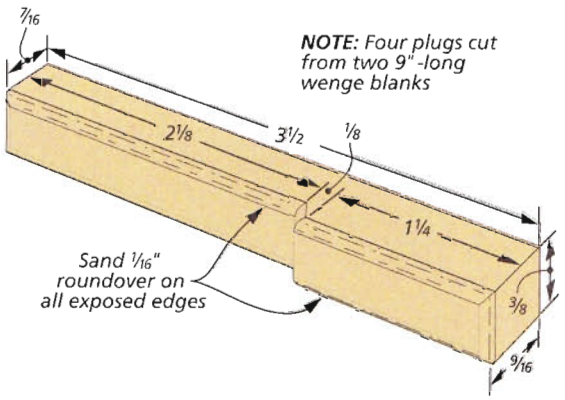
The profiled plugs installed on the on the top of hall table on page 32 are a distinctive feature of Greene and Greene furniture design. As well as being decorative, they hide the tongue and groove joinery and help disguise the inevitable wood movement between the top panel and breadboard ends.

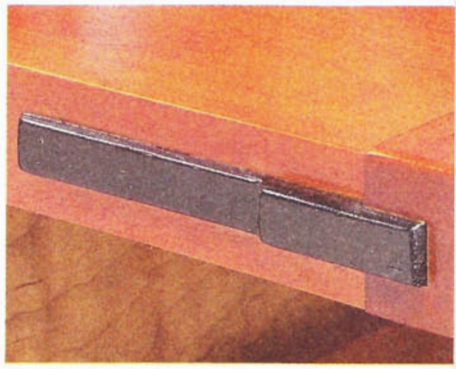
LONG BLANKS. I started making the four plugs by cutting a pair of extra-long blanks to thickness and width. The thickness should match the width of the groove in the breadboard end. You'll make two plugs from each blank.

Next, I switched to a dado blade to form the ⅛"-deep relieved area on each plug. Simply nibble away the waste at the end of each blank, as shown in Figure 1. When the relief cuts are completed, smooth the surfaces using adhesive-backed sandpaper attached to the saw's table (Figure 2).

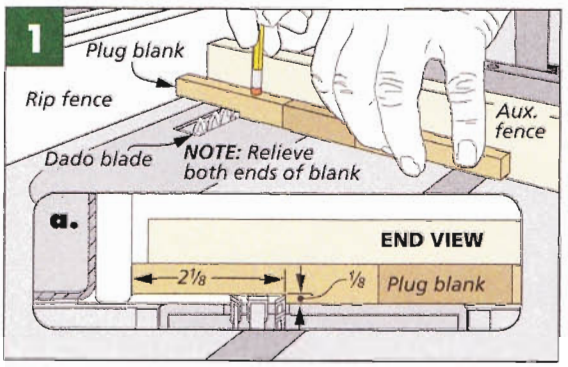
A short bevel forms a transition between the two sections of the plug. To create the bevel, I first marked an end line across the raised section. Then I carefully pared away the waste (Figure 3).

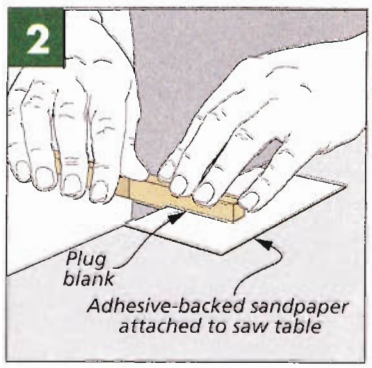
Now you can cut the plugs to length from the blanks, as shown in Figure 4. And finally, I softened all the exposed edges by sanding a 1/16" roundover.

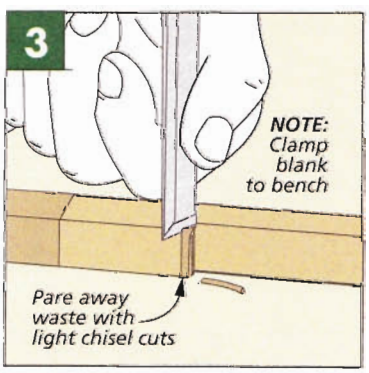


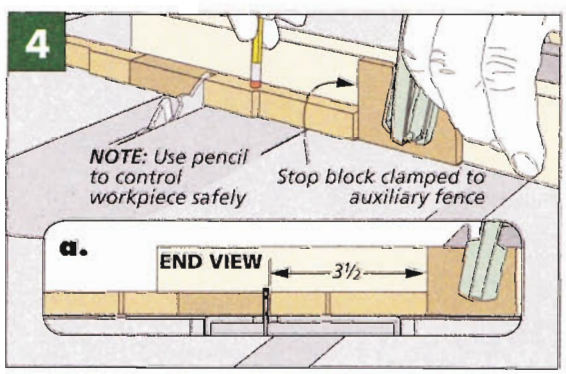


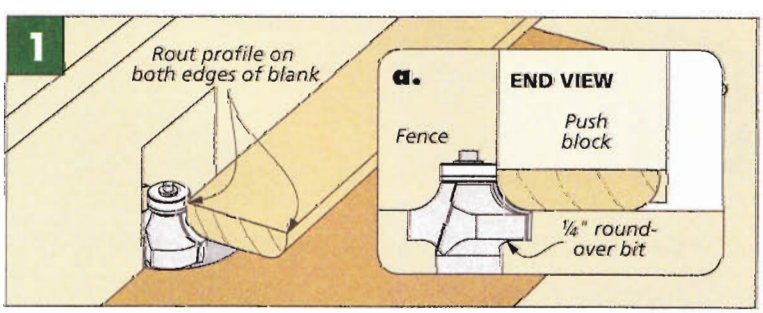
Contrasting wood and offset surfaces make the plugs a visual focal point.

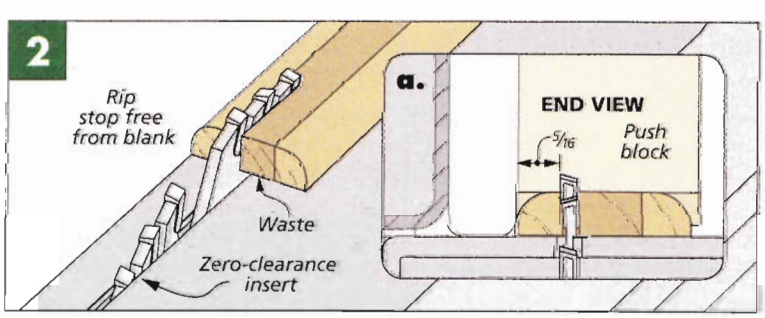












Glass Stop

The glass panels in the doors of the bookcase on page 22 are held in place with quarter-round stop. To make this glass stop, I began by planing a wide blank to final thickness (5/16"). Once this was done, I routed a roundover on both edges of the blank, as you see in Figure 1 at left.

To complete the glass stop, simply rip it free from both edges of the blank at the table saw (Figure 2). A push block helps to safely guide the workpiece past the blade. All that's left after this is to miter the pieces to length and install them into the door frames. W

greene & greene-style Hall Table

The classic design of this project along with a generous helping of your woodworking skill, will make it the focal point of any room.

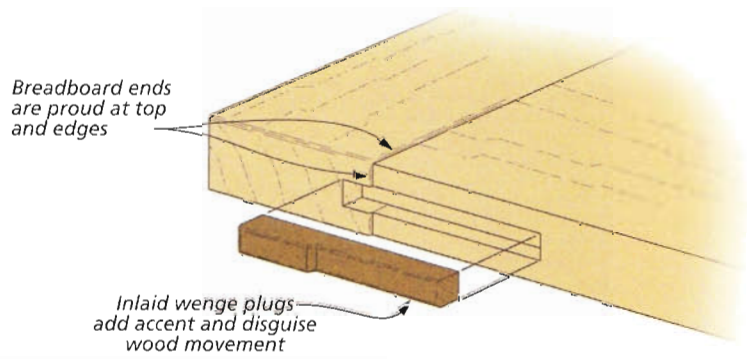
Charles and Henry Greene were two of the most influential and renowned furniture designers and architects of the Craftsman period. Their style is easily recognized by its use of subtle curves, offset surfaces, exposed joinery, and contrasting accents. The impression is distinctly Asian. As you can see, the hall table above brings all of these elements together into a very striking, yet tasteful piece of furniture.

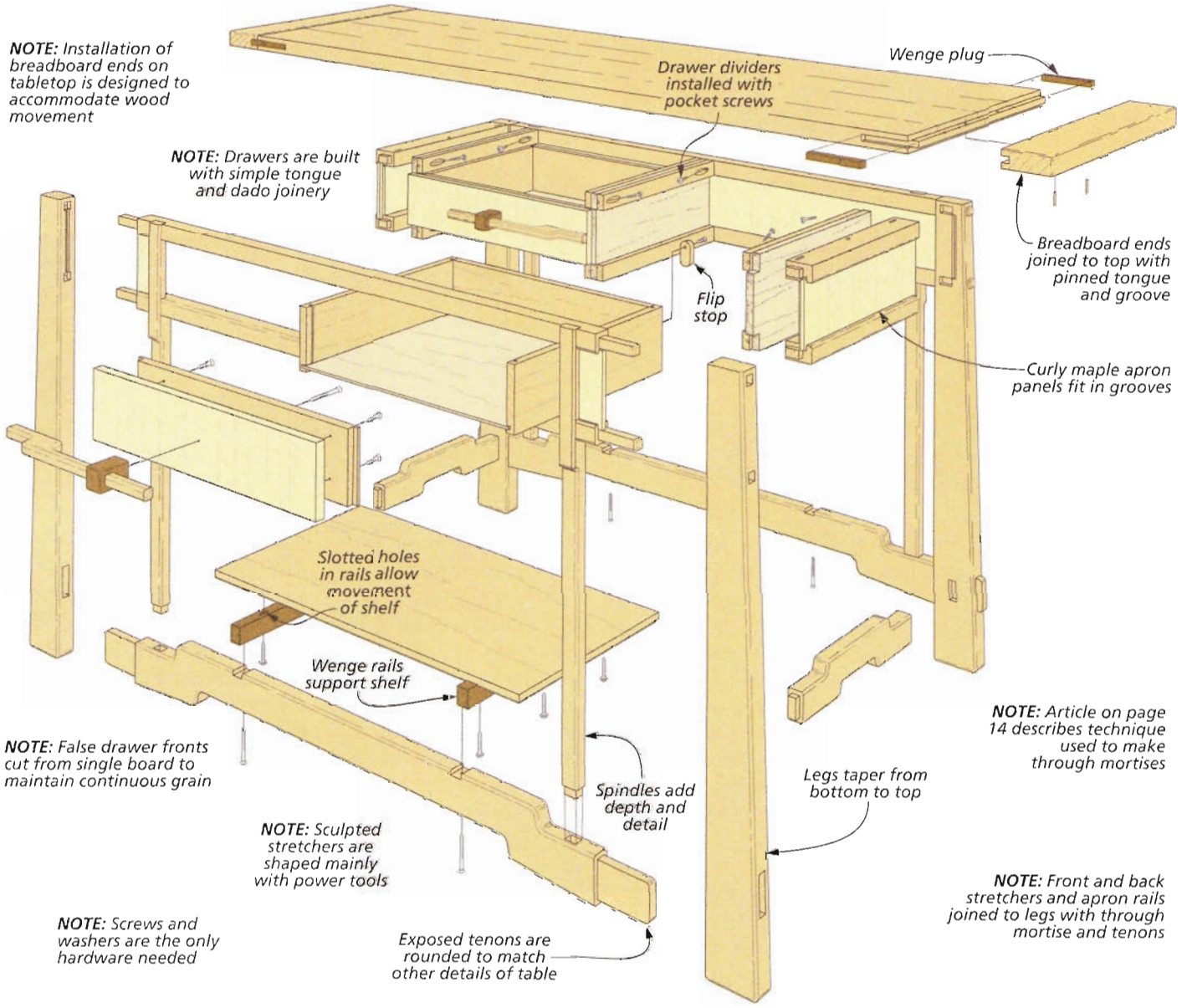
However, the end result may be secondary. If you're like me and enjoy the experience of building a project with loads of challenging, yet fairly traditional joinery, this table will get your juices flowing. The pieces go together almost like a jigsaw puzzle, or maybe more accurately, a Chinese puzzle.

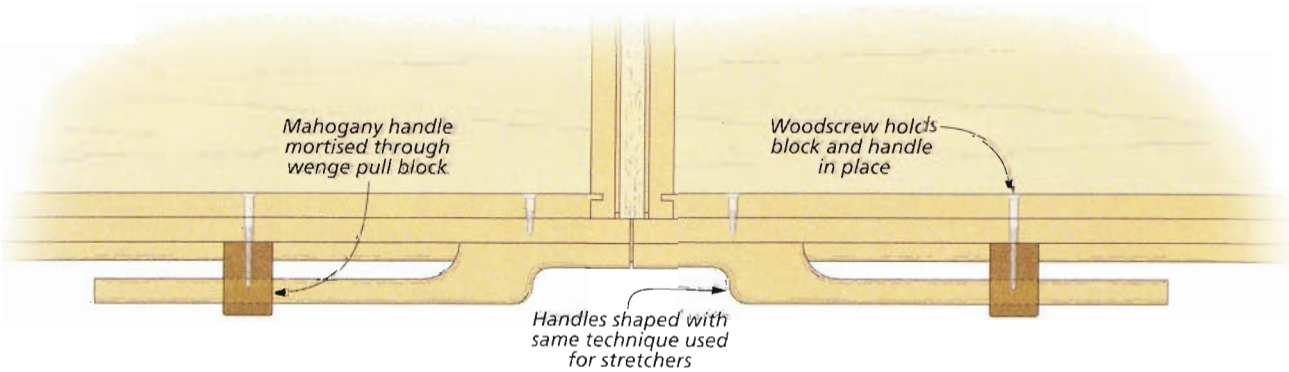
On the other hand, you'll find that the building is firmly rooted in the Craftsman tradition. Just put one foot in front of the other and you'll get the job done easily.

CONSTRUCTION DETAILS

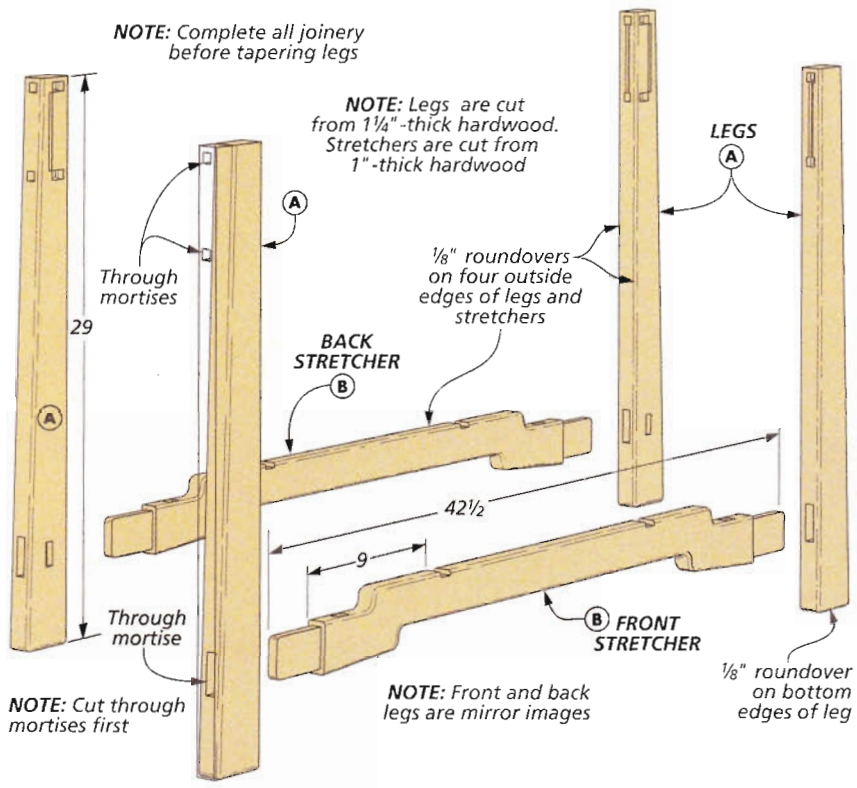
OVERALL DIMENSIONS: 16⅞"D x 60"W x 30 1/16"H

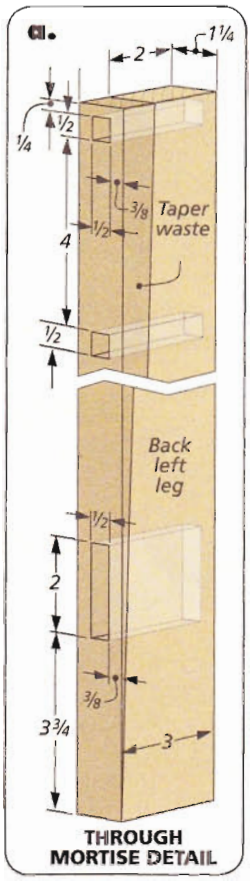


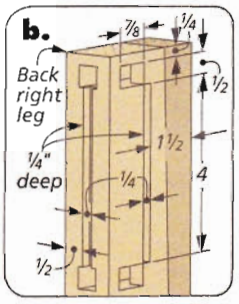


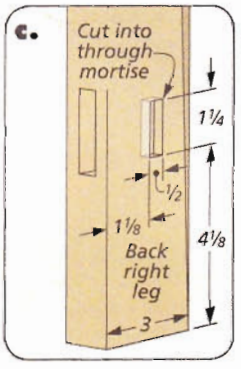


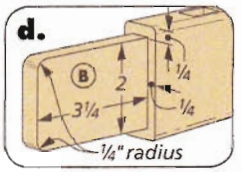
TOP SECTION VIEW











starting the BASE

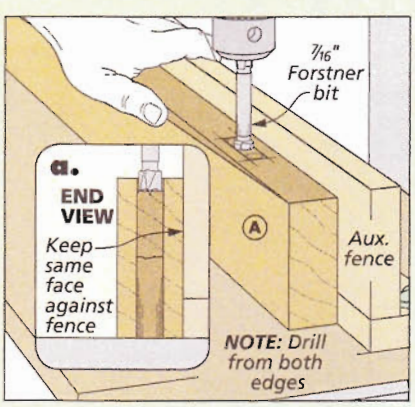
In its most basic form, the table is constructed the same as any other. You'll build a base and then add a top, a pair of drawers, and a lower shelf. However, in this case, it's the details that make the difference. And there are too many to mention right off the bat. So I'll just fill you in along the way.

LEGS & STRETCHER. Building the base starts by assembling the two frames that form the front and back. The foundation of each frame consists of two tapered legs, a profiled stretcher, and a pair of apron rails. For now, you'll concentrate on making the four legs and the stretchers.

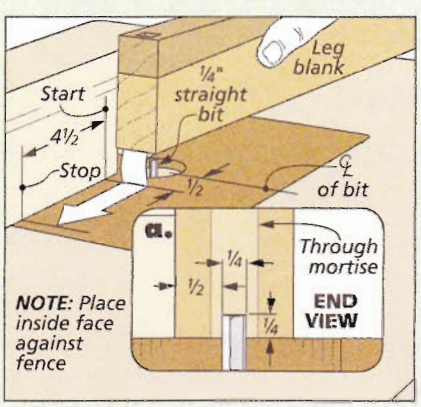
FOUR LEGS. You'll need two pairs of mirror-image legs. So the first thing I did was cut four blanks to overall size and then mark them.

MORTISES. The two upper rails and the stretcher are joined to the legs with through mortise and tenon joints. The end rails and stretchers that will connect the front and back frames are attached with blind tenons. So your next task is to lay out and cut a series of mortises in each leg, as dimensioned in the detail drawings above.

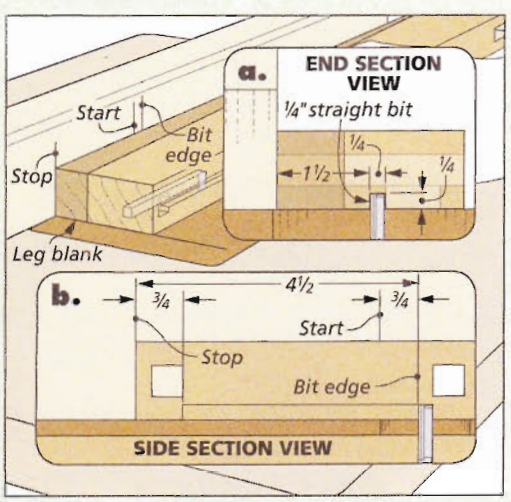
How-To: Leg Details



Through Mortises. *The main difference in cutting a through mortise is that you'll work from both edges.*



Edge Grooves. *With the mortise positioned over the bit, lower the leg to the table, and rout from mortise to mortise.*



Face Grooves. *You'll need to start this set of grooves with plunge cuts. I marked start and stop lines on the fence for reference.*

The through mortises are the big test and a good first step. Since the end result will be seen, the mortises need to be laid out accurately and cut cleanly. This will give you the best shot at fitting snug tenons. An article on page 14 guides you through the process of cutting these mortises.

BLIND MORTISES. With the through mortises completed, you can lay out and cut the shallow mortises on the inside faces of the legs. Compared to the through mortises, this will be a breeze. The only catch is that these mortises intersect the through mortises you cut earlier. So in order to avoid blowout when I drilled out and cleaned up the mortises, I inserted temporary plugs in the through mortises.

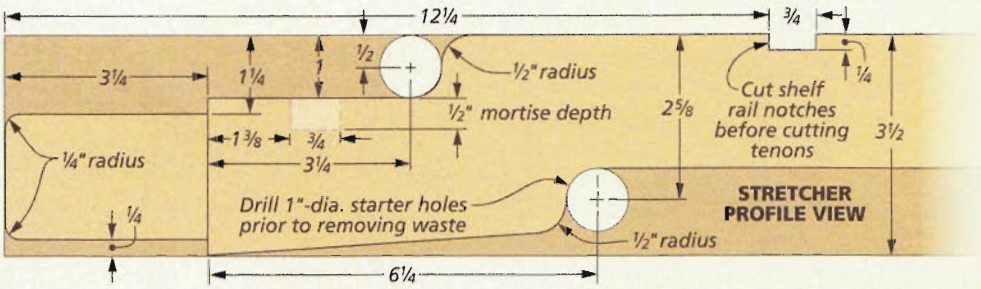
PANEL GROOVES. Later, after making the apron rails, you'll fit curly maple panels between them. At this point, all you need to do is rout the stopped grooves in the legs that hold the ends of the panels. The box on the opposite page shows how this can be done.

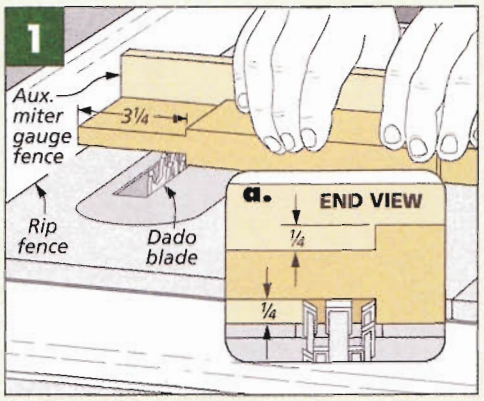
TAPERS & ROUNDOVERS. With the joinery completed, you're ready to cut the tapers. A simple table saw jig made from ¼" hardboard and a few cleats will handle the job. Just make certain you taper the outside edges from bottom to top. Finally, at the router table, I routed a ⅛" roundover on all the edges except for the tops.

STRETCHERS. Now, you can begin work on the identical front and back stretchers. The How-To box at right illustrates the correct order of the main steps.

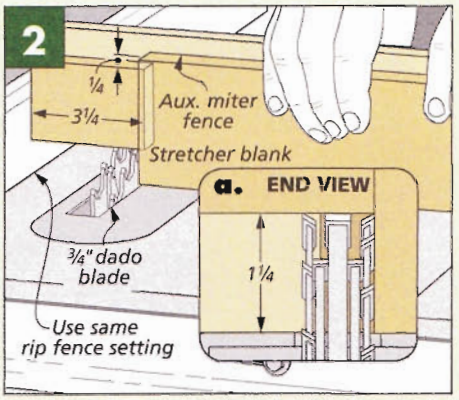
I found that the trick is to shape the sculpted stretchers in stages. Once the tenons and the notches that hold the shelf rails are cut, you'll shape only the upper edges. This way, you'll still have a square bottom edge to help with the next step — forming mortises in the relieved sections to hold pairs of decorative spindles. Once these mortises are completed, you can shape the bottom edge and finally, round over all the long edges.

How-To: Make the Stretchers

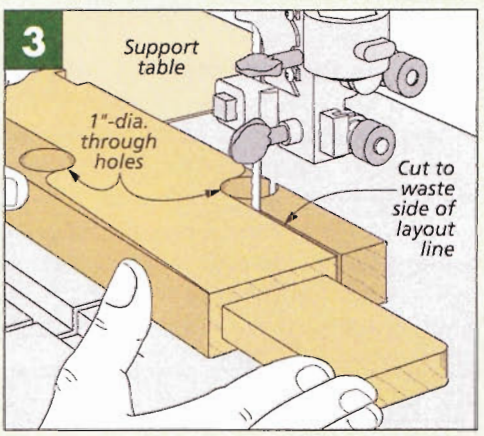




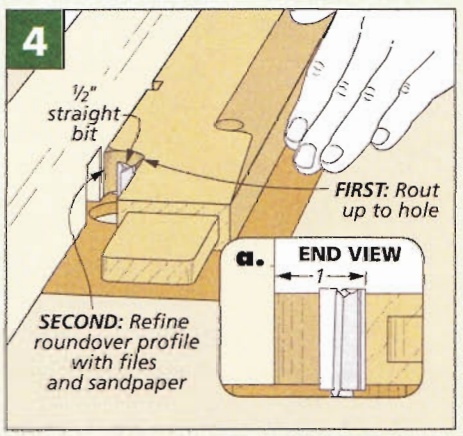
Tenon Cheeks. *Start by cutting the tenon cheeks for a snug fit in the leg mortises. You want the visible ends to be crisp and smooth.*



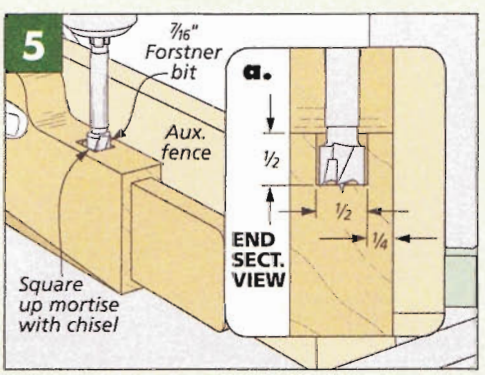
Edge Shoulders. *Since the stretcher has not been shaped, you'll cut the edge shoulders to different heights.*



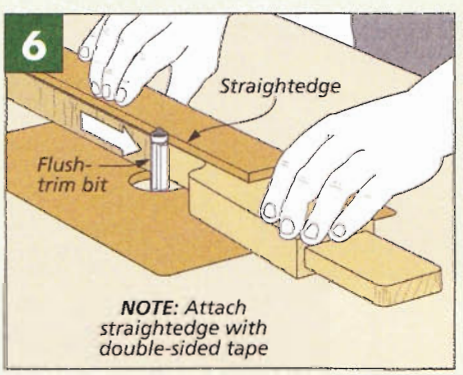
Upper Profile. *Begin shaping the upper edges by drilling holes to form the inside curves. Remove the waste at the band saw.*



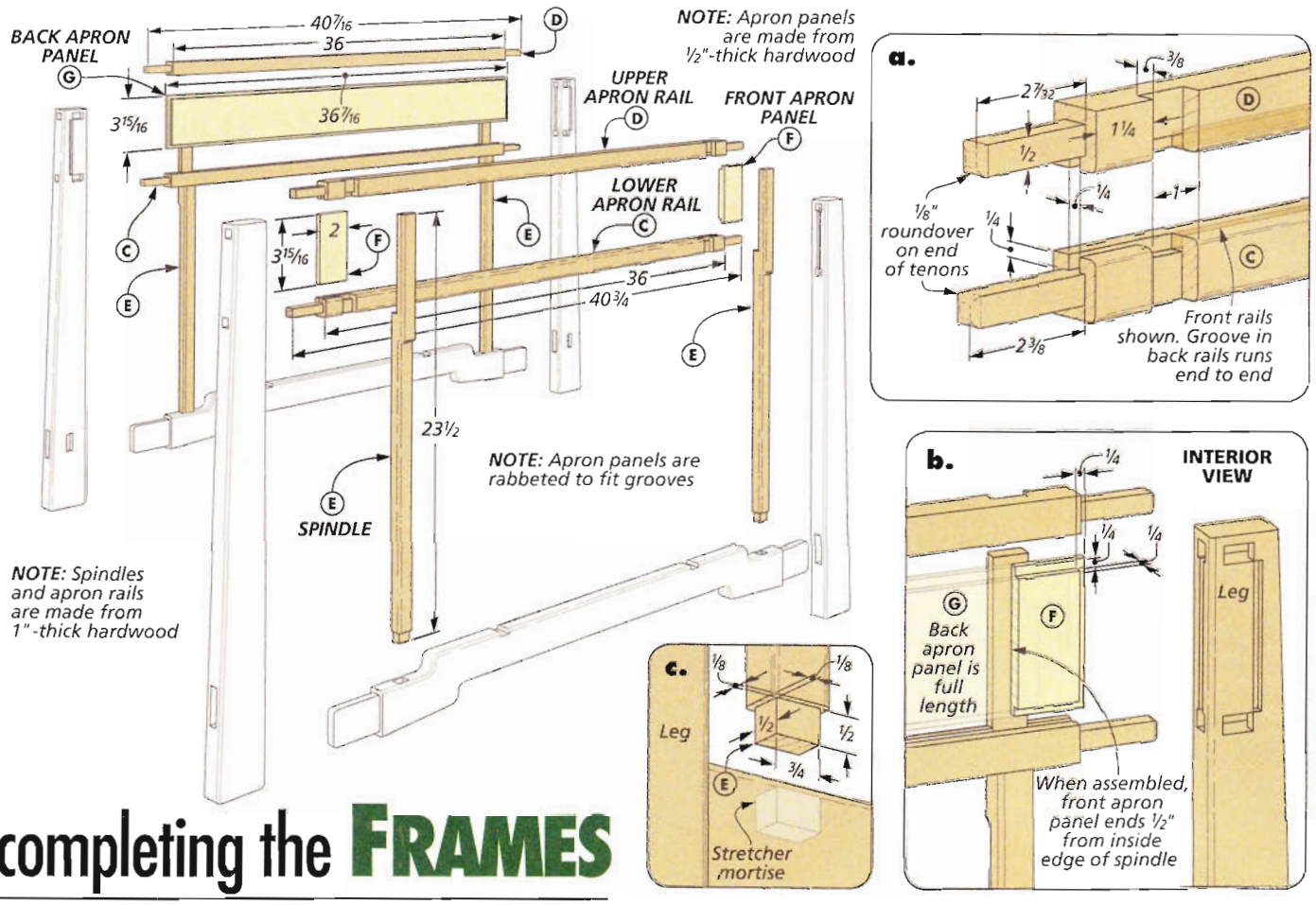
Fine Tune. *I smoothed the saw cut with a straight bit in the router table, then used files and sandpaper to refine the profile.*



Spindle Mortise. *With the upper profile completed, you can lay out and cut shallow mortises for the decorative spindles.*



Flush Trim. *The straight sections of the lower profile can be smoothed with a hardboard straightedge and a flush-trim bit.*



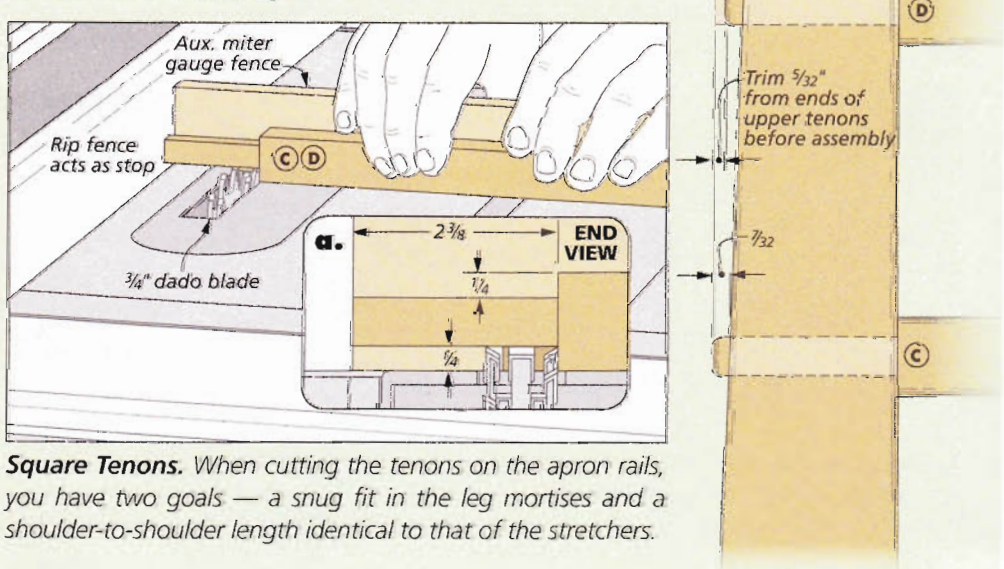
completing the FRAMES

You now have a good start on the two frames. The next step is to add the upper and lower apron rails. These parts are all similar, but not identical. I'll point out the differences as they come up.

I began by cutting the four rails to identical overall size. The two upper rails will be trimmed in length after all the joinery is completed. However, you'll want to decide which rail goes where and then label them clearly now.

TENONS. First up are the square, through tenons. The How-To box below shows the details. Take your time with this to get a good fit in the mortises in the legs.

How-To: Apron Rail Tenons



Square Tenons. *When cutting the tenons on the apron rails, you have two goals — a snug fit in the leg mortises and a shoulder-to-shoulder length identical to that of the stretchers.*

SPINDLE NOTCHES. As you can see in the main drawing and detail 'a,' the decorative spindles are captured in notches cut into the front face of all four apron rails. The How-To box on the opposite page illustrates this step. Just make sure the notches are aligned with the spindle mortises you cut in the stretcher.

PANEL GROOVES. As I mentioned earlier, curly maple panels are installed between the apron rails. So now you need to rout grooves to hold them. And here you'll find the first difference. The grooves in the back rails run from shoulder to shoulder while those in the front rails stop at the inside edge of the spindle notches, as in the box on the opposite page.

Like those in the legs, the best way to form these grooves is with a straight bit in the router table. The goal is to align them with the grooves in the legs. Once you're set up, it's easy to rout the full-length grooves. Figures 2 and 3 in the How-To opposite show how to rout the stopped grooves.

Before you leave the router table, swap out the straight bit for a ⅛" roundover bit. The lower outside edge of the upper rails and both outside edges of the lower rails need to be eased. Finally, trim the upper rail tenons and round over all the tenon ends.

SPINDLES. The four, identical spindles are up next. As you can tell from the margin drawing, they require a bit of work.

To get started, you'll need four 1"-square blanks cut to overall length. First, the blanks need tenons to fit the mortises in the stretchers. A minor catch is that these tenons are not centered from front-to-back. Figure 4 shows you how to handle the job.

With the tenons completed, you can form the front profile. The technique is similar to that used to shape the stretchers. After forming the rough profile (Figure 5), I used a flush-trim bit and straightedge to smooth the cuts, and then rounded the outside corners.

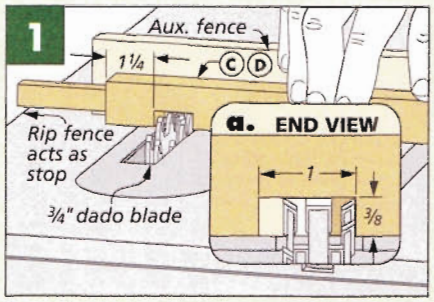
NOTCHES. The long notch on the back face of each spindle mates with the notches in the apron rails. The spindles will sit just ⅛" proud. This is a quick job with a dado blade (Figure 6). Finally, roundovers on the exposed edges complete the spindles.

PANELS. Before the frames are assembled, the panels need to be fit. The back panel runs full length. However, the small front panels that help frame the drawer opening are sized to fit ½" from the inside edge of the spindles (detail 'b,' opposite page).

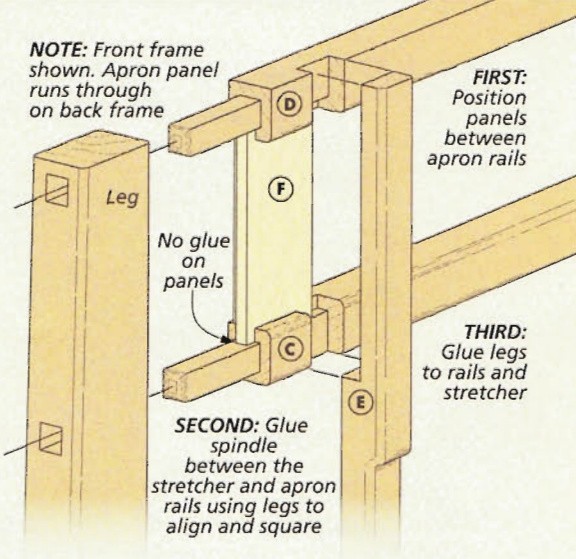
The panels are cut from ½"-thick stock. So as you might guess, they're rabbeted on the back side to fit the grooves (Figure 7). But note that the inside edges of the front panels don't need rabbets.

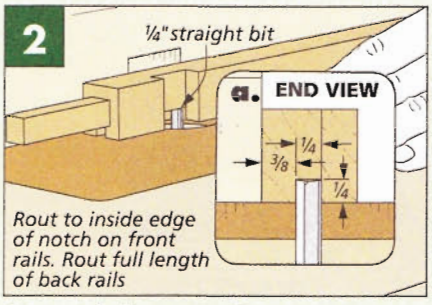
ASSEMBLY. The frames are ready for assembly (top, right drawing). With the panels in place (no glue), I glued the spindles between the stretcher and apron rails using the legs to align and square the assembly. Then you can add the legs, one at a time.

How-To: Joinery

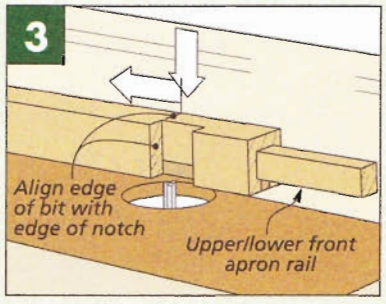


Notches. *You'll have to cut the spindle notches in the rails in two passes. Use the rip fence to locate the cuts.*

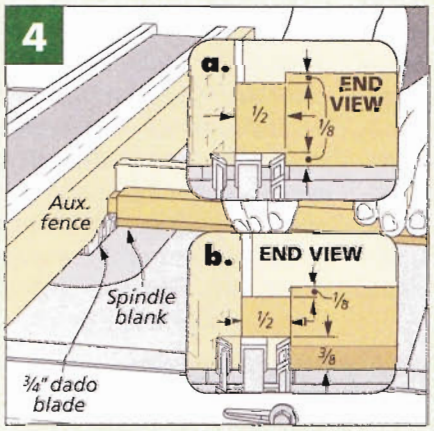




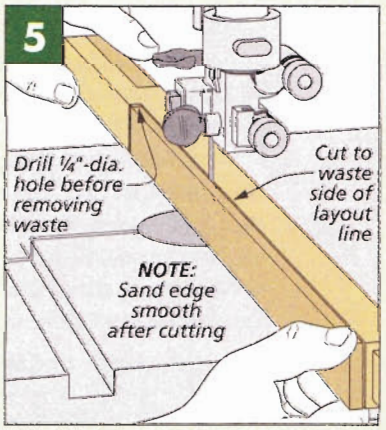
Stopped Grooves. *Rout one groove entering the rail from the end. Stop short of the notches' inside shoulder.*



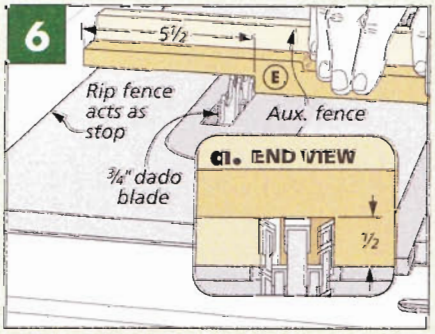
Plunge Cut. *With the same face against the fence, start the opposite groove with a plunge cut.*



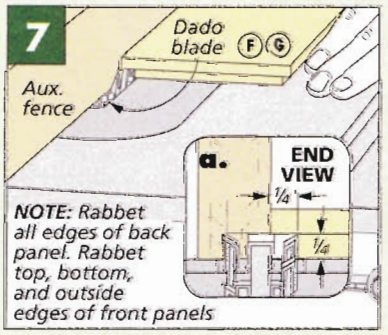
Spindle Tenons. *Use one blade setting to cut the back cheek and edge shoulders. Raise the blade for the front cheek.*



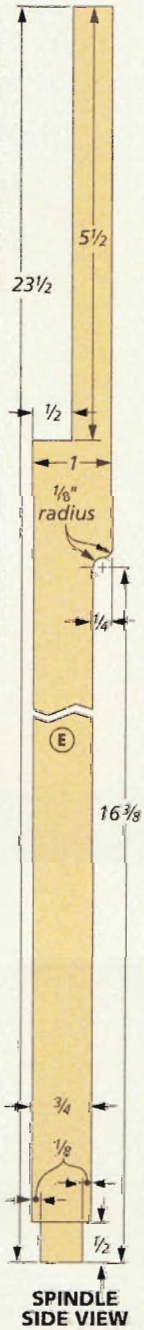
Spindle Profile. *After drilling a hole to form the inside curve, remove the waste at the band saw.*

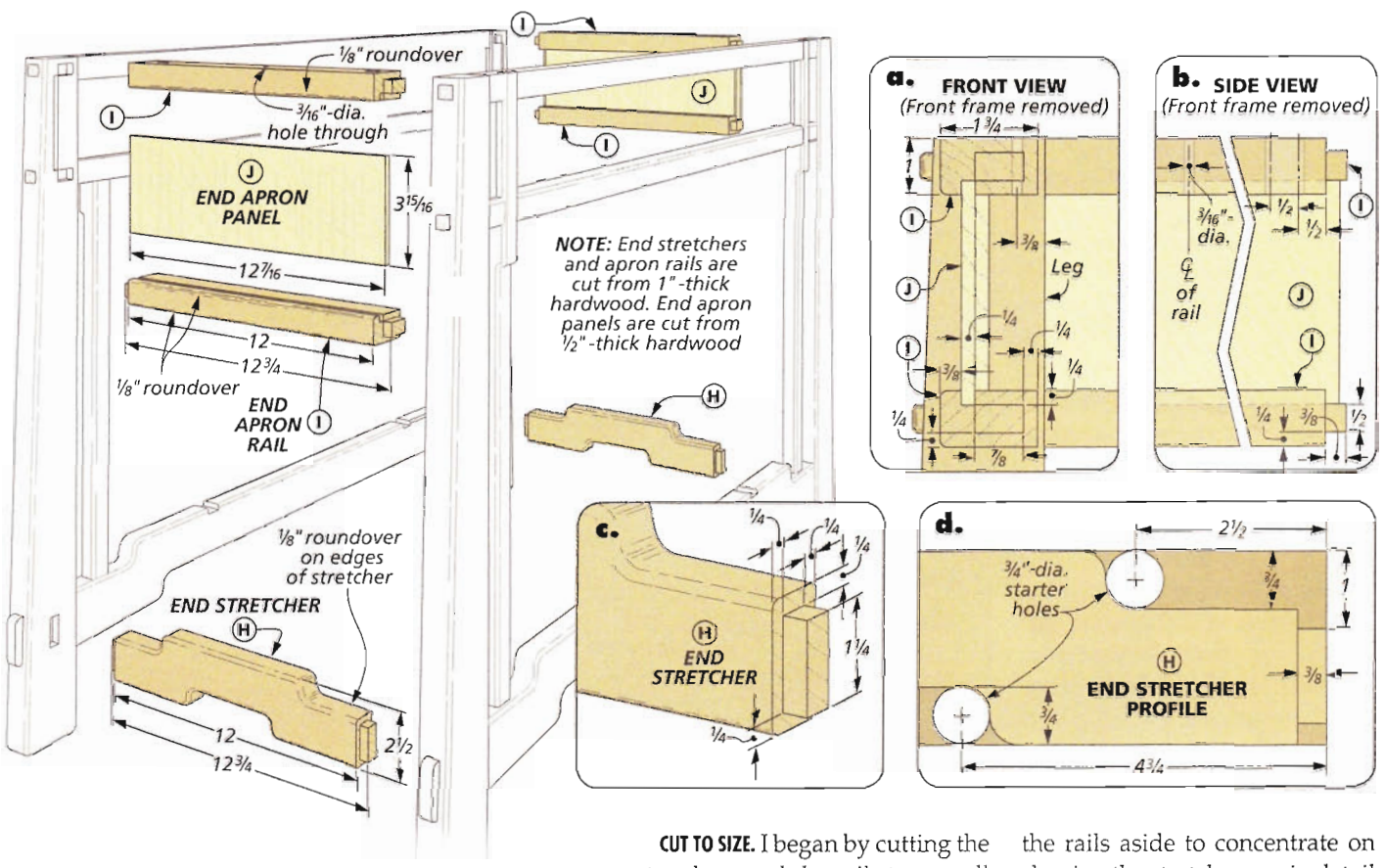


Upper Notches. *Sneak up on the length of the notch by checking the fit to the dry assembled frames.*



Panel Tongues. *Raise the blade between cuts to sneak up on a snug fit to the panel grooves.*





completing the BASE

With the front and back frames assembled, you've cleared a major hurdle. You'll find the next few steps considerably less challenging. To complete the basic structure of the table's base, you just need to make the end stretchers, apron rails, and panels.

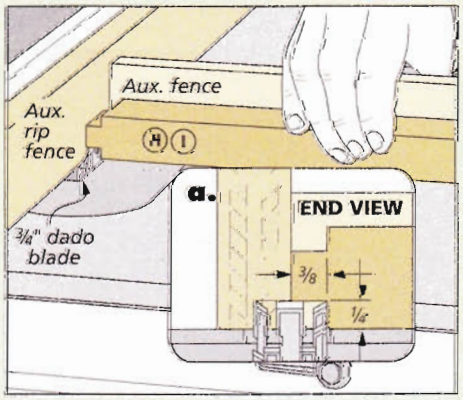
CUT TO SIZE. I began by cutting the stretchers and the rails to overall size. Note that the wider end rails are oriented horizontally. Then be sure to label all the pieces. You want to end up with identical pairs of each part.

TENONS. Since the pieces all have the same overall and shoulder-to-shoulder lengths, you can set up the saw to cut all the tenons at one time. The How-To box below guides you through the steps.

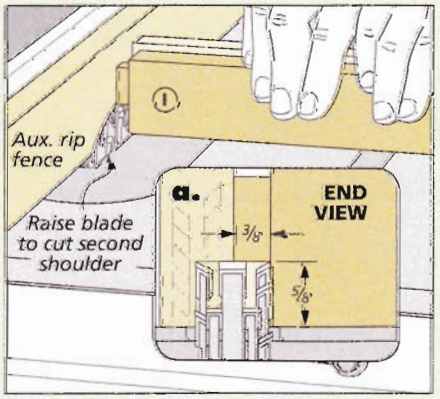
SHAPE THE STRETCHERS. With the tenons completed, you can set the rails aside to concentrate on shaping the stretchers, as in detail 'd.' You'll follow a pretty familiar routine. The differences here are that you can work on both the upper and lower profiles at the same time and all the flush trimming can be done using only the router table fence as your guide.

PANEL GROOVES. Next, I picked up work on the apron rails. The details here are mostly familiar. First, you'll need to cut grooves for the panels and then round over some of the edges (detail

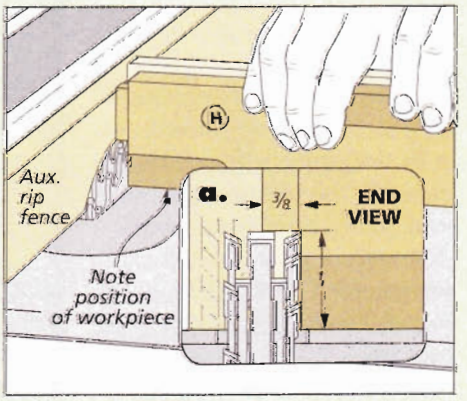
How-To: Stretcher & Apron Rail Tenons



Tenon Cheeks. *First, I set up the saw to cut the tenon cheeks on all the parts. Shoot for a snug fit in the mortises.*



Edges. *After cutting one edge shoulder on each piece, raise the blade to cut the second shoulder on the apron rails.*



Stretchers. *Finally, raise the blade further to make the deep cuts for the edge shoulders on the end stretchers.*

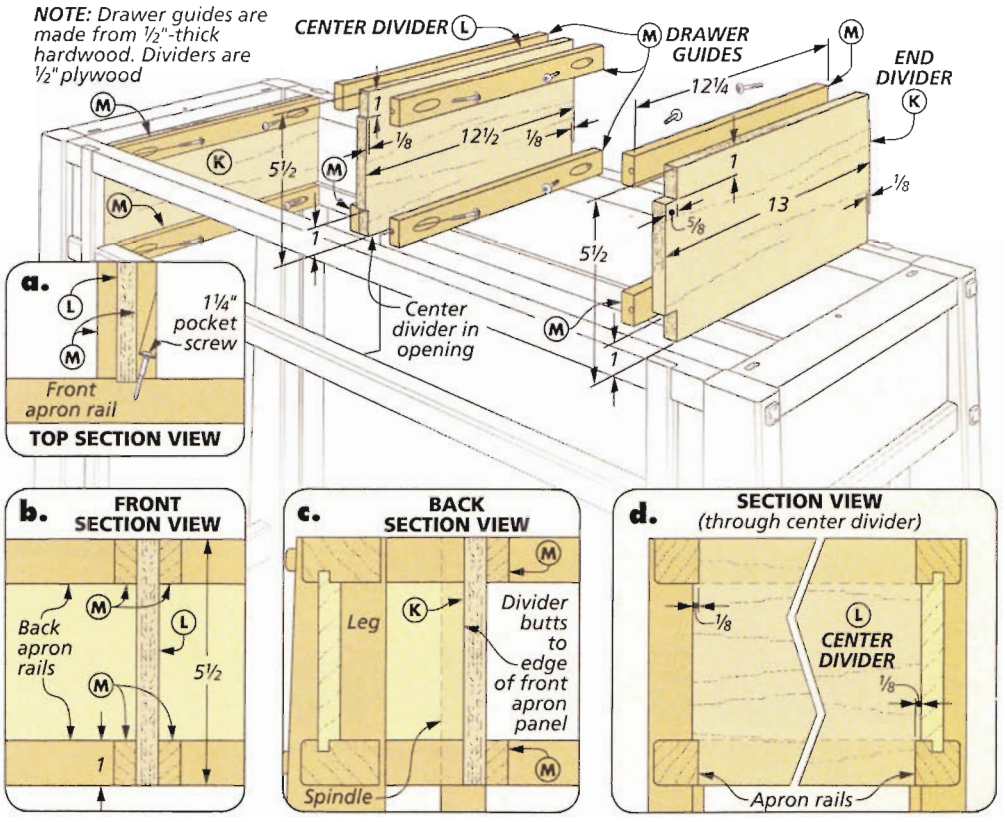
'a,' opposite page). Lastly, you'll need to form a pair of slotted screw holes in each upper rail used later to attach the top (detail 'b,' opposite page).

PANELS, THEN ASSEMBLY. Once the panels are fit, the assembly of the base can be completed. To begin the job, I placed one frame flat across sawhorses, and then added glue and all the stretchers, rails, and panels. Top it off with the second frame and apply the clamps. I set the base upright on a flat surface before checking it for true and square.

DRAWER DIVIDERS & GUIDES. As you know, the base holds a pair of drawers. So your next job is to add the dividers and guides that support the drawers.

The drawer dividers and guides are installed as individual assemblies. Each consists of a plywood divider panel with hardwood guides attached to "box in" the drawers. The mirror-image side dividers have a single pair of guides while the center divider has guides glued to both faces (details 'b' and 'c').

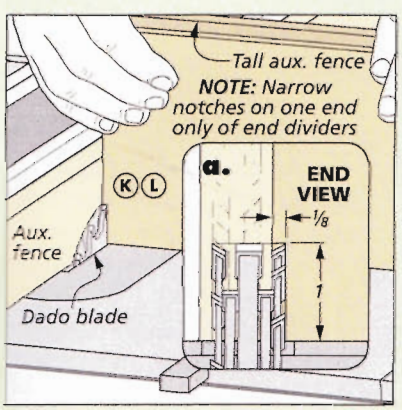
I'll just give you the highlights on this easy task. The side dividers extend from the back apron panel into the recess created by the front panel and spindle. The center divider is shorter to accommodate the false drawer fronts (detail 'd'). This arrangement means all of the dividers are notched to fit between the apron rails. The box below shows how to perform this operation.



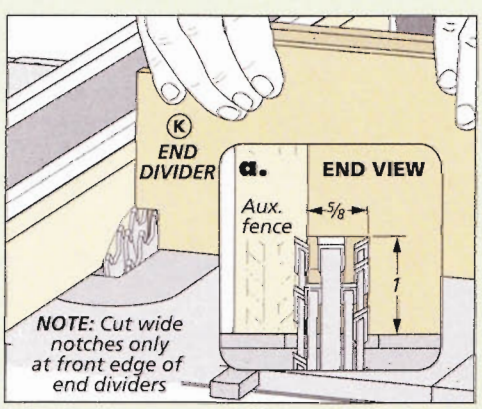
GUIDES. Along with supporting the drawer, the guides hold the pocket screws used to install the assemblies in the base. So before gluing the guides to the dividers, I drilled pocket screw holes, as shown in the drawing below. Only one set of the center guides needs these holes.

INSTALLATION. The side assemblies should be installed first. You'll have to angle them into the base near the center and then slide them into position. After squaring the back end to back apron, I pinched the assembly firmly in place with a pair of clamps while I added the pocket screws. Finally, install the center assembly in the same way. Carefully center it in the opening and then clamp it between the aprons while you install the screws.

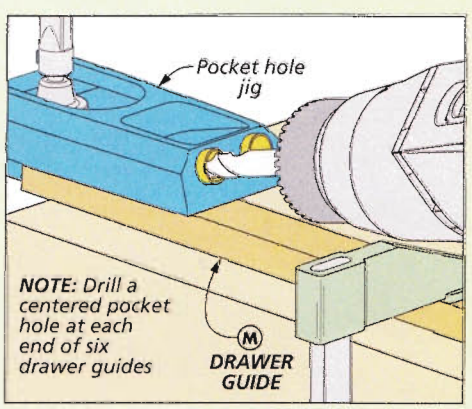
Divider Notches & Pocket Screw Holes



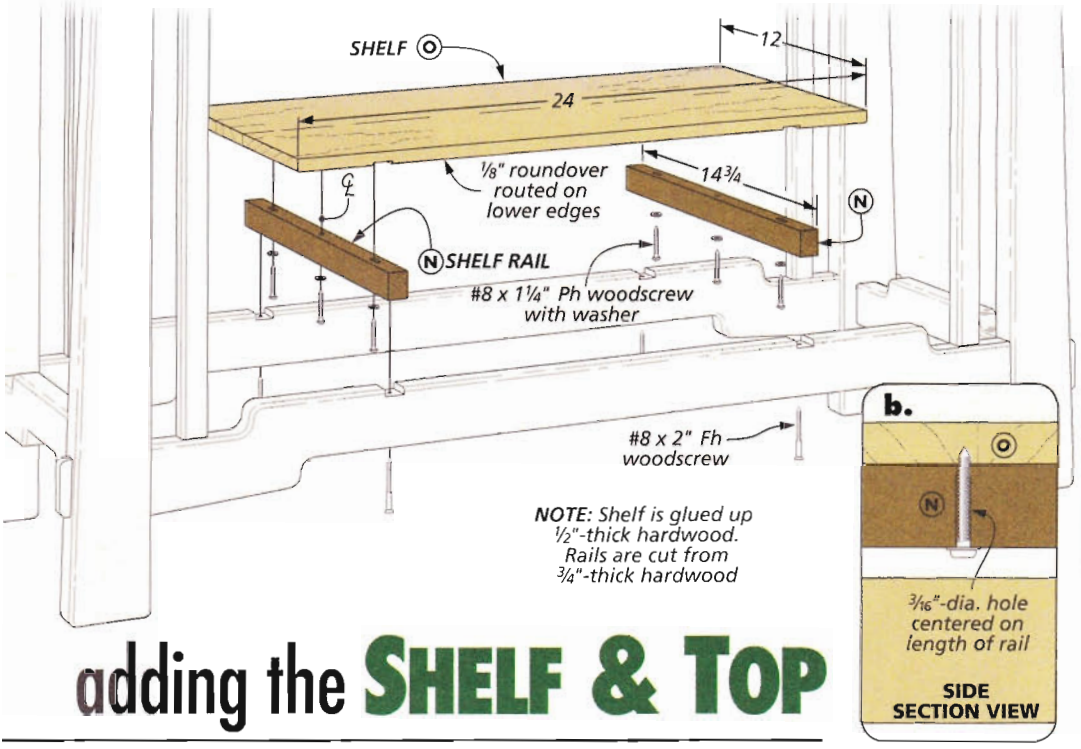
Narrow Notches. *A tall auxiliary miter gauge fence helps you control the divider during the cut.*

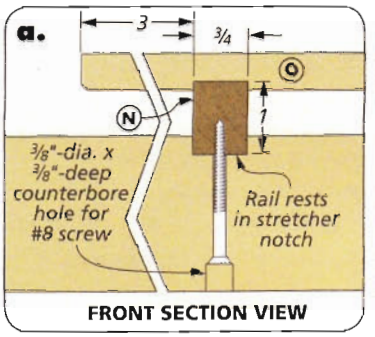


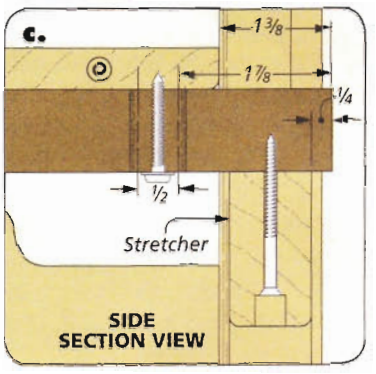
Wide Notches. *You can use the same setup to cut the wide notches. Just adjust the rip fence to expose more of the dado blade.*



Pocket Screw Holes. *Drill a single, centered pocket hole at each end of six of the guides before gluing them to the dividers.*







adding the SHELF & TOP

Adding the lower shelf is not too taxing. Once this is done, you can tackle the more demanding task of making a top for the table.

SHELF RAILS. The mahogany shelf is supported by two wenge shelf rails that are captured in the notches cut into the stretchers. So to get started, you can cut the rails to size, as shown above. Note that they'll overhang the stretchers at the front and back.

Next, I added a way to attach the shelf while still allowing wood movement. I formed a slotted screw hole at each end of the rails and also drilled a centered screw hole (details 'b' and 'c').

The rails are screwed to the stretchers. So before attaching them, you'll need to drill countersunk screw holes from the underside of the stretchers (detail 'c').

THE SHELF. The shelf is simply a panel glued up from ½"-thick stock. However, there is one detail that requires some careful work. You'll cut dadoes into the underside of the shelf to mate with the shelf rails (detail 'a').

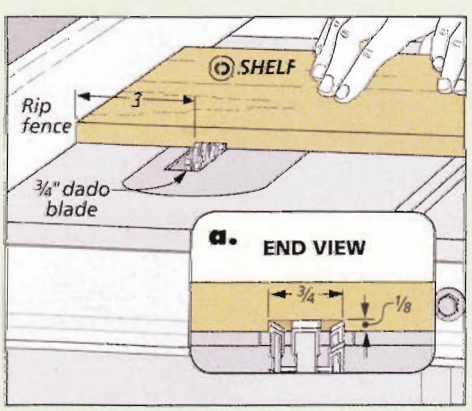
DADOES. Sizing and spacing the dadoes in the underside of the panel isn't as difficult as you may think. I began by installing a dado blade in the table saw sized to match the thickness of the rails. The box below shows how to proceed from there. With a little care, you'll get a perfect fit.

Before attaching the shelf, I took it to the router table and eased the lower edge with a ⅛" roundover. Finally, position the shelf on the rails and add the screws.

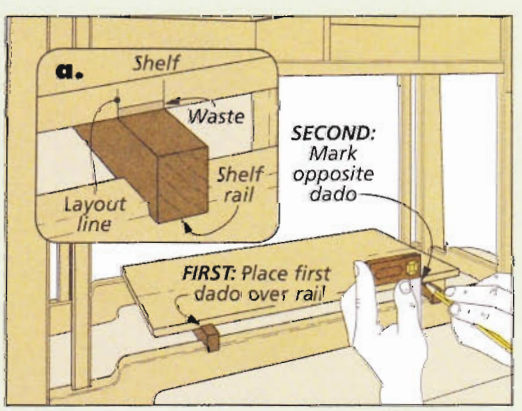
THE TOP

Making a top for the table takes a little longer. The classic Greene

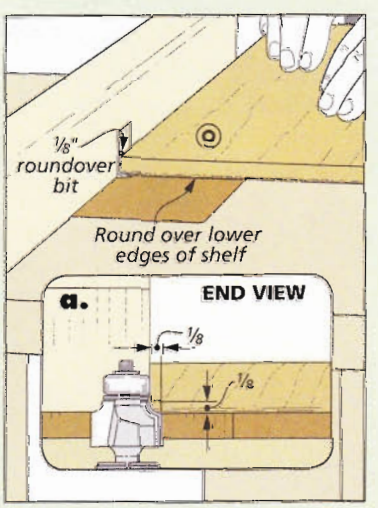
How-To: Shelf Details



First Dado. *Before cutting the first dado in the shelf panel, fine-tune the width of the dado blade with a few test cuts.*



Mark & Cut. *To mark the location of the second dado, place the shelf on the base with the first dado in position over the shelf rail.*



Ease the Edges. *Before installing the shelf, rout a small roundover on all the lower edges.*

and Greene-style top features a wide overhang at the sides, breadboard ends that stand proud, and contrasting plugs hiding the joinery.

TOP PANEL. Once the 1"-thick top panel is glued up and cut to final size, you can start work on the details. The breadboard ends are attached with a tongue and groove. The tongue is formed on the top panel (detail 'b'), so this is your next job. Just take a look at the How-To box at right.

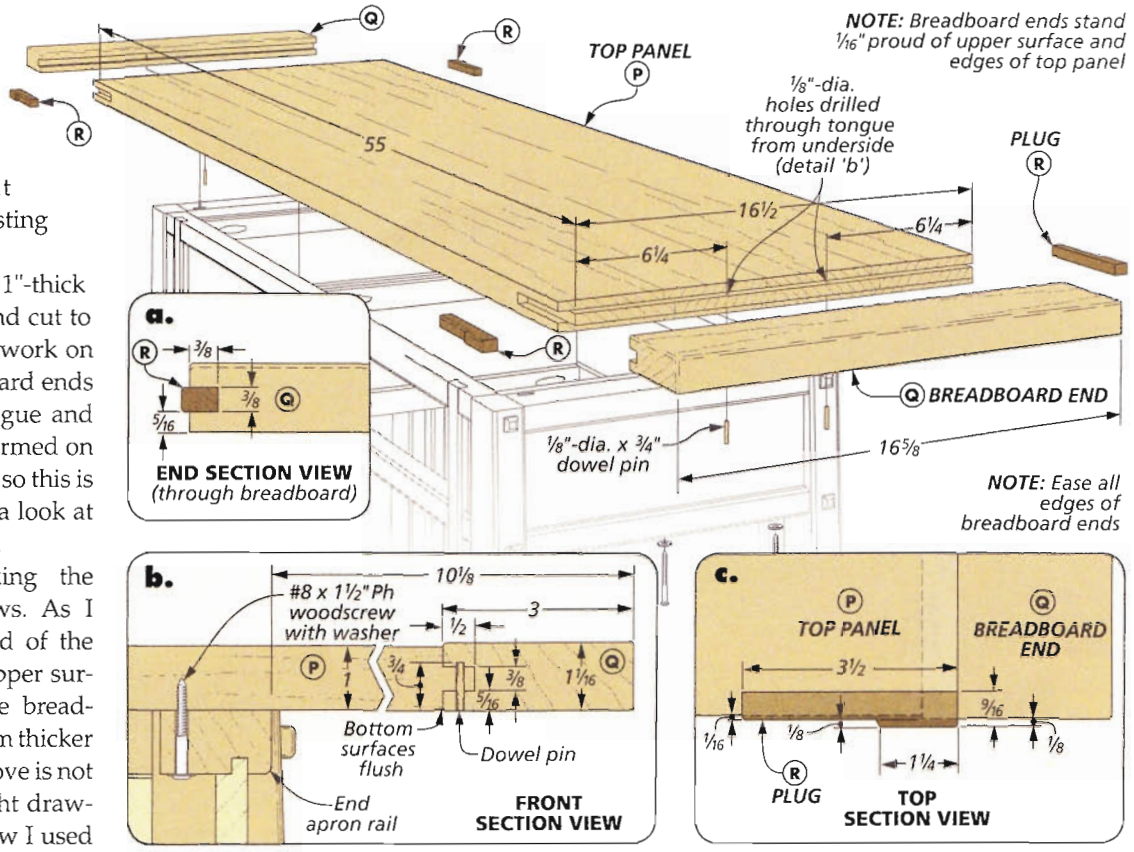
BREADBOARD ENDS. Making the breadboard ends follows. As I noted, they stand proud of the top panel — both the upper surface and edges. So, the breadboard ends are made from thicker stock (1 1/16") and the groove is not centered. The upper right drawing in the box shows how I used a 1/4" dado blade to position the groove and size it accurately.

PLUGS. Before attaching the breadboard ends, you need to make and fit the wenge plugs. As well as being decorative, they serve to disguise expansion and contraction of the top panel. The plugs are let into the edges of the top and extend into the groove in the breadboard ends (right photo). You'll find details on making them on page 31.

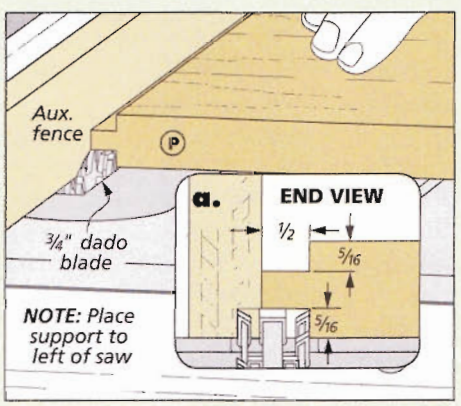
RECESSES. With the plugs in hand, you can use them to lay out the recesses on the top panel's edges. Then I used a trim router to carefully rough out the waste, as shown at right. Finally, square up the recesses with chisels.

ASSEMBLY. Now you can put the pieces together. To avoid wood movement problems, the breadboard ends shouldn't be attached too rigidly. I glued only the center third of the joints and then installed a couple of dowels from the underside (detail 'b').

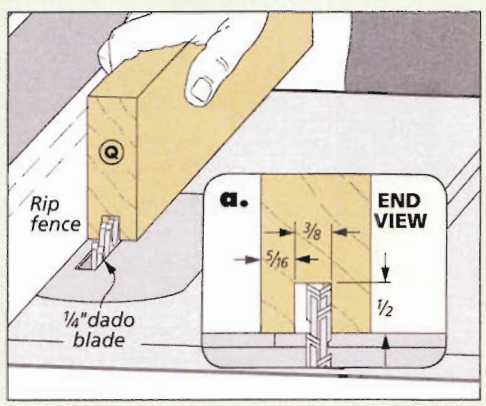
The plugs should be glued to the top but not the breadboard ends. And when the assembly is completed, center the top on the base and install screws through the end apron rails (detail 'b').



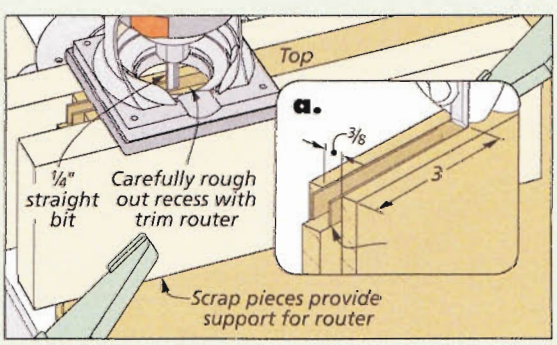
How-To: Breadboard Ends



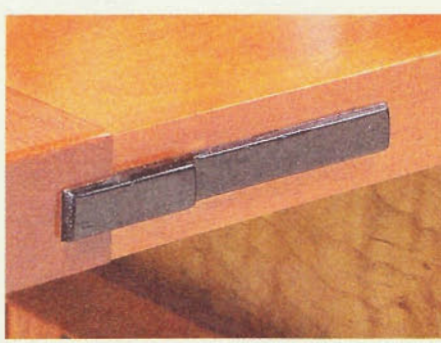
Centered Tongue. *When cutting the tongues on the long panel, I added some outboard support to the saw's setup.*



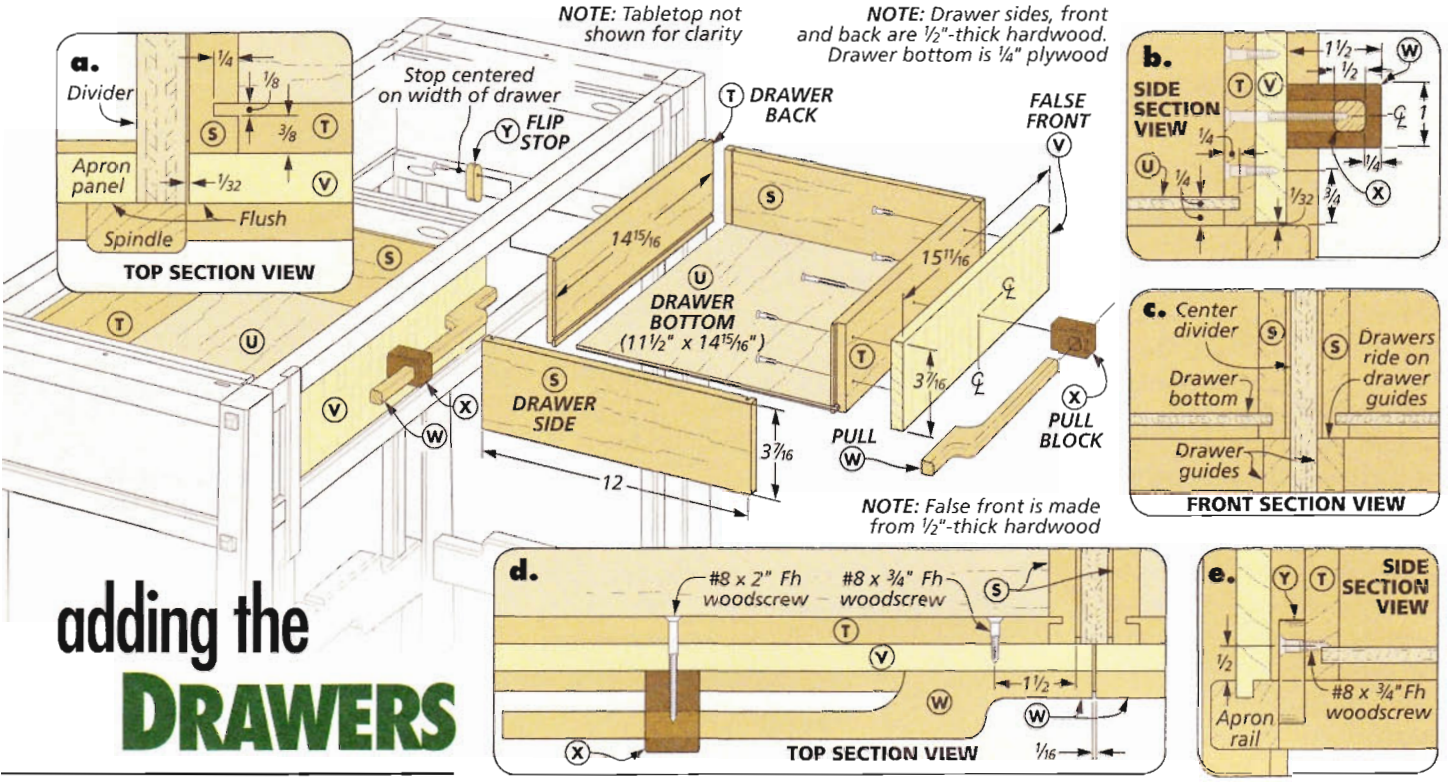
Off-Center Groove. *Start by carefully locating the lower shoulder, then "work up" until the groove is a snug fit to the tongue.*



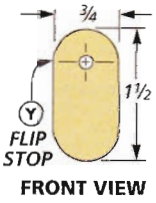
Plug Recesses. *When forming the recesses, I clamped scrap pieces flush to the edge of the top to provide a stable surface for the trim router.*



▲ The technique for making the contrasting wenge plugs can be found on page 31.



adding the DRAWERS



The addition of the two drawers will wrap things up. Building the drawers is a breeze. However, you'll find the unique pulls offer a more interesting challenge.

FIRST, THE BOXES. Making the mirror-image drawers will go quickly. The identical boxes are constructed with standard tongue and dado joints. They're sized to fit the openings with 1/16" overall side-to-side clearance and 1/16" overall top-to-bottom clearance. False fronts are installed to create a clean, seamless look.

After cutting the fronts, backs, and sides to size from ½"-thick stock, I stayed at the saw to complete the joinery. First, I cut ⅛"-wide dadoes in the sides. Then I switched to a dado blade and rabbeted the ends of the fronts and backs to form tongues, as in detail 'a.' Once the grooves for the ¼" plywood bottoms are cut and the bottoms cut to size, the boxes can be assembled.

FLIP STOPS. One more minor chore and you can start on the false fronts. I installed a flip stop on the back of each drawer to keep them from being pulled out too far (margin and detail 'e').

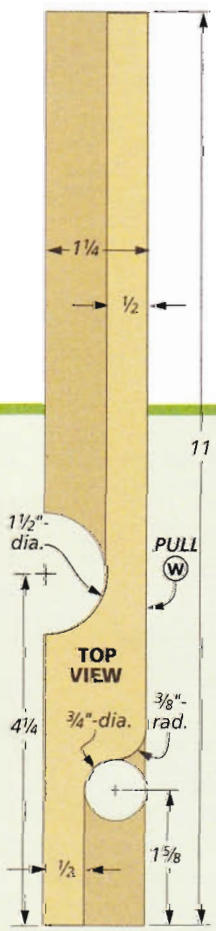
FALSE FRONTS. Adding the false fronts is easy. First, I cut the two fronts to final size from a single board of ½"-thick curly maple. The width matches the width of the drawer boxes. The combined length of the fronts is ⅛" less than the overall length of the opening.

The fronts are attached off center. They should be flush with the outside edges of the drawer boxes and overhang the inside edges, as shown in detail 'd.' And I raised them 1/32" above the lower edge of the boxes to create an even top and bottom gap (detail 'b'). You can clamp them in place while installing the screws.

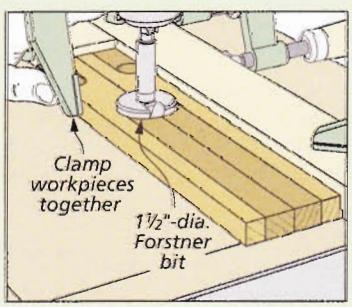
PULLS. All you have left to do is make and install the pulls. Each pull is made up of a sculpted mahogany handle and a wenge support block. The block is mortised to allow the handle to pass through, as in detail 'd.'

You'll need the handles in hand when you mortise the blocks, so this is where to get started. The handles may look difficult to shape, but I made the job easy by borrowing the technique used to shape the stretchers.

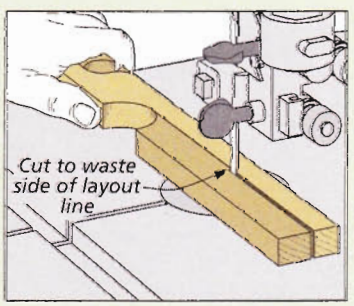
After cutting blanks to size from ½"-thick stock, I laid out the profiles, as in the left margin drawing. Then, I took the blanks to the drill press to form the inside curves (How-To box at left).



How-To: Pull Handle



Inside Curve. *Clamp the blanks back to back to drill the large hole that forms the inside curve.*



Final Shape. *Remove the waste at the band saw, then smooth the cuts with a sanding block.*

A trip to the band saw comes next followed by patient sanding to complete the profile. Finally, I rounded over (⅛") all but the edge that mounts to the drawer.

PULL BLOCKS. The box at right shows how I made the pull blocks. The key is forming through mortises that match the size and shape of the handles. I began with an extra-long 1" square blank. Then I laid out the overall size of the mortises based on the shape of my handles.

Now, at the drill press, carefully drill a ¼"-dia. hole in each corner of the mortise layout. A single ⅜"- dia. centered hole will remove most of the remaining waste.

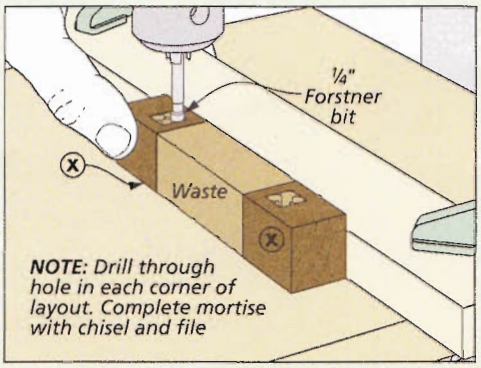
Patient handwork with chisels and files will complete the job. I worked slowly from both sides of the block testing the fit of the handle frequently. Don't force it or you may split the block. Snug, but not too snug, is the goal.

When you're satisfied with the mortises, the blocks can be cut to final length. To complete the blocks, I simply eased all the exposed sharp corners.

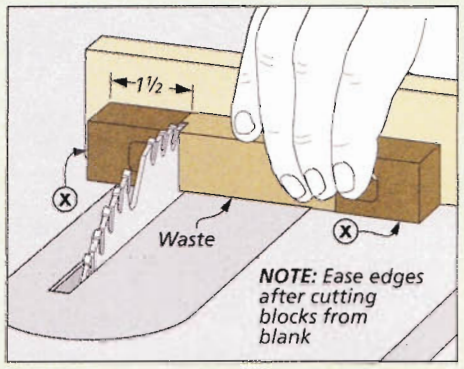
END-TO-END. The handles are aligned end-to-end across the false fronts (detail 'd,' opposite). The short mounting surface of the handle is glued to the false front while the block and raised end are fixed with a long screw.

And like all the other details, I concentrated on getting this final piece right. I'd come too far to start cutting corners. W

How-To: Pull Blocks



Rounded Corners. *Make sure the four holes that form the rounded corners of each mortise are located accurately.*

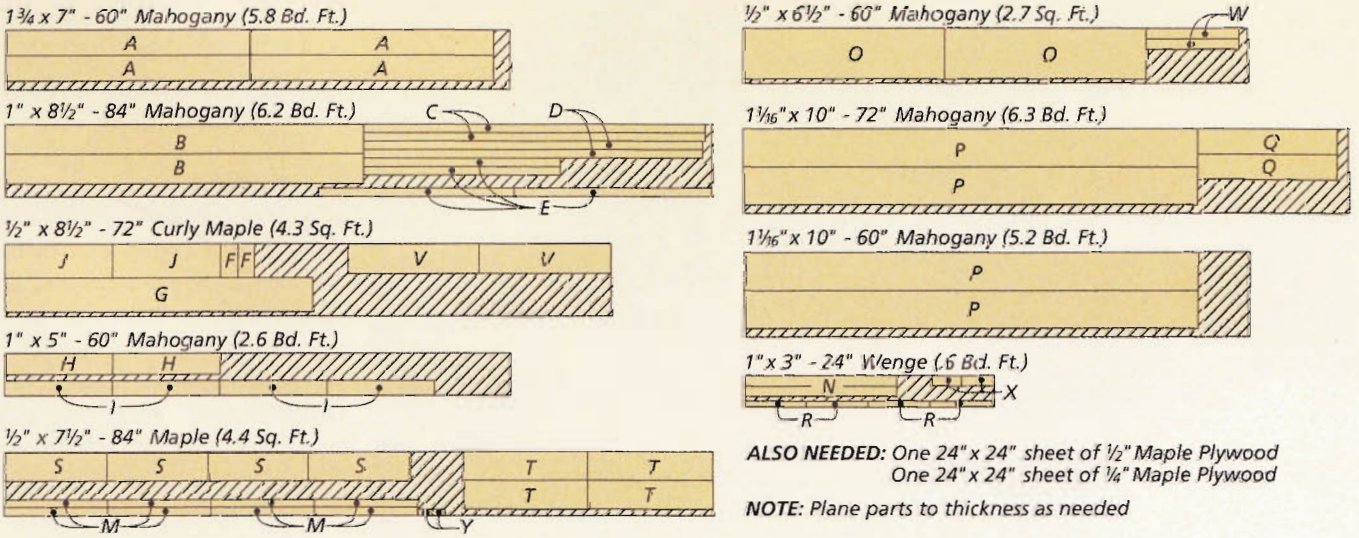


Cut to Length. *Once you've completed the through mortises, cut the blocks to final length from the blank.*

Materials, Supplies, & Cutting Diagram

A	Legs (4)	1¼ x 3 - 29	L	Center Divider (1)	½ ply. - 5½ x 12½	W	Drawer Pulls (2)	½ x 1¼ - 11
B	Front/Back Stretcher (2)	1 x 3½ - 42½	M	Drawer Guides (8)	½ x 1 - 12¼	X	Pull Blocks (2)	1 x 1 - 1½
C	Lower Apron Rails (2)	1 x 1 - 40¾	N	Shelf Rails (2)	¾ x 1 - 14¾	Y	Flip Stops (2)	½ x ¾ - 1½
D	Upper Apron Rails (2)	1 x 1 - 40 7/16	O	Shelf (1)	½ x 12 - 24			
E	Spindles (4)	1 x 1 - 23½	P	Top Panel (1)	1 x 16½ - 55			
F	Front Apron Panels (2)	½ x 3 15/16 - 2	Q	Breadboard Ends (2)	1 1/16 x 3 - 16⅝			
G	Back Apron Panel (1)	½ x 3 15/16 - 36 7/16	R	Plugs (4)	⅜ x 9/16 - 3½			
H	End Stretchers (2)	1 x 2½ - 12¾	S	Dwr. Sides (4)	½ x 3 7/16 - 12			
I	End Apron Rails (4)	1 x 1¾ - 12¾	T	Dwr. Front/Back (4)	½ x 3 7/16 - 14 15/16			
J	End Apron Panels (2)	½ x 3 15/16 - 12 7/16	U	Dwr. Bottoms (2)	¼ ply. - 11½ x 14 15/16			
K	End Dividers (2)	½ ply. - 5½ x 13	V	Dwr. False Fronts (2)	½ x 3 7/16 - 15 11/16			

- (6) #8 x 2" Fh Woodscrews
- (8) #8 x ¾" Fh Woodscrews
- (6) #8 x 1¼" Ph Woodscrews
- (6) #8 x 1½" Ph Woodscrews
- (12) 1¼" Pocket Screws
- (12) 3/16" Flat Washers



ALSO NEEDED: *One 24" x 24" sheet of ½" Maple Plywood*
One 24" x 24" sheet of ¼" Maple Plywood

NOTE: *Plane parts to thickness as needed*

7 great tips for Small Parts

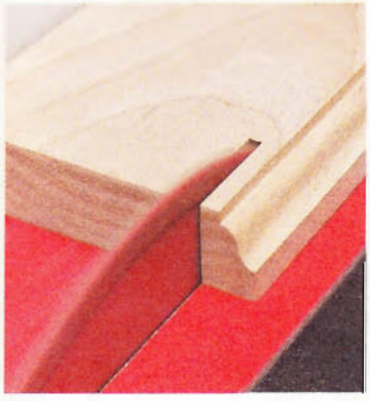
Just because the part you're making is small doesn't mean you have to skimp on the quality or sacrifice safety in the process.

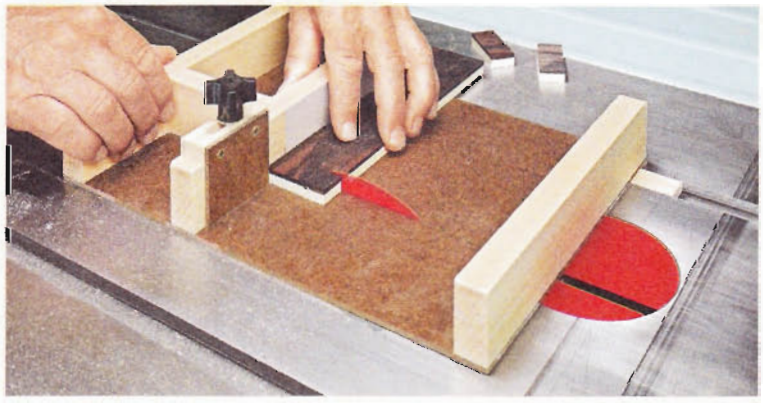
Even a large piece of furniture can have a few small pieces and parts. And if you're making small projects, those pieces can be an extra hassle to make safely.

I've gathered up a few of my favorite tips and tricks for small-scale work. They're all time-tested and sure to help you get the job done right the first time.

1 Keep It Large

The first principle in small-scale work is to keep the parts large for as long as possible. For example, start with a long or large blank when edge-routing a profile for a thinner piece (right). Then cut the part away from the blank (far right). This way, you have much better control and the piece is far less likely to be pulled from your grip by the router or saw.



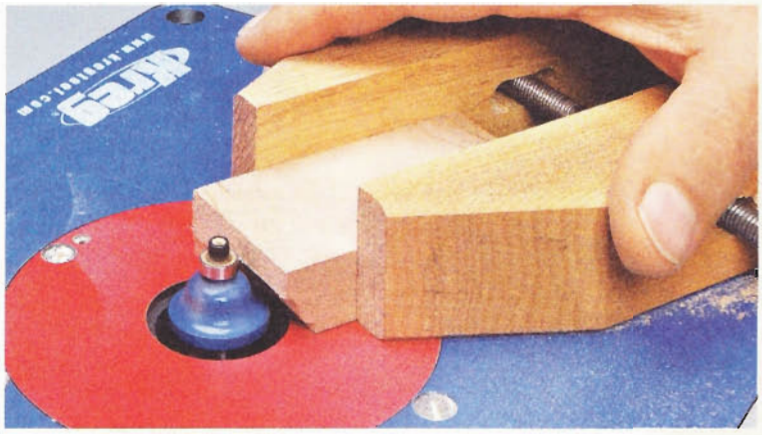


2 Make a Sled

One of my go-to jigs is a small parts crosscutting sled. As you can see in the photo at left, this handy jig is made from cutoffs of hardboard and hardwood. The sled incorporates a fence to keep the workpiece square, a stop for repeatable-length cuts, and a brace for the fence that acts as a blade guard. With this sled, you can easily trim small pieces to length.

3 Small Tools

Another helpful idea for small jobs is to use a smaller tool. For me, this usually means reaching for my rotary tool and one of the many small-scale attachments available (main photo on the opposite page). It's tough to match the performance of these tools and all their accessories for getting into tight spaces.



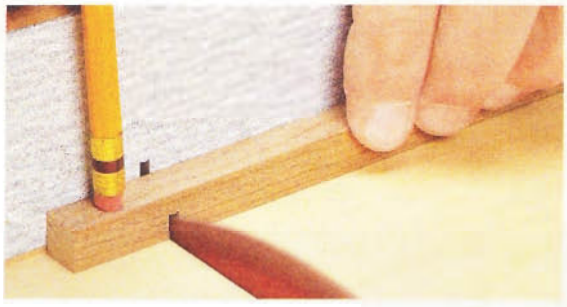
4 Handscrews

Unless the part is really tiny, a handscrew can usually get a bite on it and hold it securely. I often reach for one when routing a small workpiece (photo at left). The big advantage these have over other clamps is their ability to hold irregular shapes. By skewing the jaws, you can grip almost any part. For an even more secure grip, attach some adhesive-backed sandpaper to the jaws.

5 Pencil Hold-Down

There's nothing worse than having a small piece grabbed by a blade and shot out from the saw. It can ruin the workpiece and your day. Quite often, a shop-made jig just needs a simple hold-down to keep your fingers safely out of the way of a blade or bit.

For this task, many woodworkers rely on the humble pencil eraser. The rubber tip provides plenty of friction to hold a small piece in place during a cut. The photo at right shows you what I mean. Best of all, you probably already have several in your shop.



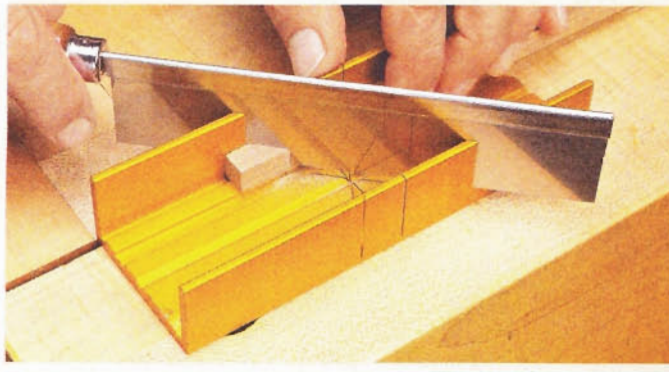
6 Carrier Board

When it comes to planing very thin pieces (⅛" thick or less), an easy and safe method is to attach the blank to a carrier board with double-sided tape. This allows you to use your planer without bottoming out the cutterhead. For the best results, make sure the plywood or MDF carrier board is completely flat.

7 Small Miter Box

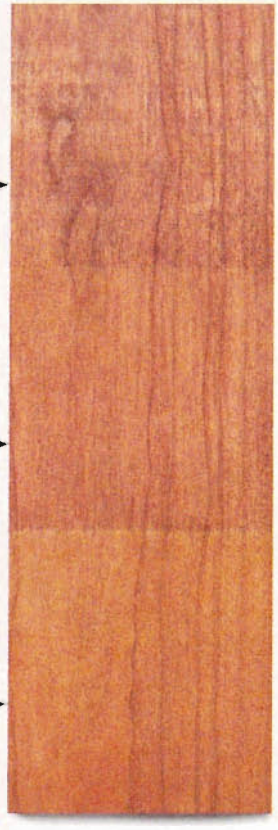
An inexpensive tool that's become a favorite of mine is the small miter box and saw shown in the photo at right. The box has very accurate 22.5°, 45°, and 90° slots that guarantee your joints and parts will fit perfectly. And the anodized aluminum construction is tough as nails, so it won't easily bend or distort with use.

Included is a high-quality back saw with super-fine teeth (35 TPI). The high tooth count of this saw leaves the freshly cut surface smooth as glass. The combination of the box and saw allows you to stay away from power tools when making small parts. To find out where to get this set of tools, see Sources on page 51. W



using Oil Stains

Easy to apply and nearly foolproof, these old standbys still offer a great option for bringing out the best in a project.



In the sample below, you clearly see how surface preparation affects stain penetration.

There are a number of ways to enhance or add color to the wood of a project. However, the most common and reliable is to use an off-the-shelf oil stain. These are the canned stains you'll find at the paint store or hardware store — brands such as *Minwax, Old Masters, Varathane, Zar*, and a host of others. In general, oil stains are pretty foolproof and produce consistent results.

But even a user-friendly product such as oil stain requires a basic understanding and the proper approach in order to guarantee success. I've relied on oil stains for many years, so I'll share some of the wisdom I've picked up the hard way.

WHAT'S AN OIL STAIN? First, let's clarify a few things about the nature of oil stains. The term "oil stain" is somewhat generic and the composition can vary quite a bit. But in general, they have three ingredients: pigments to provide color, solvent (often called a vehicle) to hold the pigments in suspension, and a binder to lock down the pigments. (Oil stains are also referred to as pigment stains.) The vehicle is generally a mild solvent such as mineral spirits while the standard binder is linseed oil.

The pigments in an oil stain will settle to the bottom of the can and need to be remixed before application.

HOW THEY WORK. Oil stains can be thin and watery or thick and viscous. (Gel stains are a type of oil stain.) But they all work in more or less the same way. The vehicle carries the pigments onto the surface of the wood where they become lodged in the pores and among the wood fibers. The binder acts like a very light sealer to lock the pigments to the wood and prevent the finish from lifting them.

SURFACE PREP. This mechanism is why thorough surface preparation is so important before applying an oil stain. The condition of the surface determines how the stain penetrates and how much pigment will be retained. To put it simply, a rough surface will often stain "deeper" than a smooth surface (left margin photo). And a surface that's not consistent will not stain evenly. This also explains why some woods take an oil stain easier than others. It can be difficult to get a deep color on hard, fine-grained woods like maple. Woods with uneven figure may look blotchy.

The moral is to sand all the parts of a project thoroughly, consistently, and to

the same grit. This is especially important with end grain. Rough, porous end grain will soak up stain like a sponge, so you may want to sand it to an even finer grit than the face grain.

STIR, SHAKE, & TEST. When a can of stain sits on the shelf, the pigments sink to the bottom. So the stain should be remixed in order to obtain a true color (bottom photo, opposite page).

First, I open the can and use a stick to scoop the pigments off the bottom and stir them back into suspension. Then I close the can and shake it vigorously.

Finally, it's always a good idea to test the stain color on a board that matches the wood in the project. A fresh, wet stain will give you a pretty good approximation of the woods appearance once a topcoat is applied.

APPLICATION. Oil stain can be applied with a rag, a foam brush, or even by spraying. My preference is a cotton, T-shirt rag. A rag allows you to cover more surface area in less time and still get into the nooks and crannies.

The trick is to simply apply a thorough, wet coat of stain and then wipe off the excess before it starts to dry (left photo above). Neatness doesn't count. You can work the stain into the surface in any manner or direction. The only goal is complete coverage.

▲ The only goal when applying oil stain is complete coverage. You can wipe onto the surface in any direction.

Once you've applied the stain to the surface, you can immediately begin to wipe off the excess (upper right photo). The wood will only take up so much stain and leaving it on the surface longer won't produce a darker color.

If you allow a stain to tack up, it will be difficult to wipe down and you can end up with a streaky look. So try to limit the application to a manageable area.

Use a clean rag or rags to wipe off the excess stain. Work fast, but be thorough. You want to get down into all the cracks and crevices, corners, molded edges, and joints. It's important to wipe down the surface completely to produce an even color.

Again, technique isn't important. Initially, I don't wipe in any particular direction. However, it's a good idea to make a final pass with the grain (lower right photo above). This way any streaks on the surface will be less noticeable.

You'll get little if any change with a second coat. This is why it's important to test the color ahead of time. However, when you get it right and the topcoats reveal the rich, even color you were after, you'll give thanks for the simple convenience of oil stains. W

▲ Use a clean rag to remove the excess stain (upper photo). Make a final pass with the grain (lower photo).

How-To: Control Blotching

One of the few problems you may encounter when using oil stains is that they sometimes produce an unattractive, blotchy appearance. Blotching is generally only a concern on certain types of woods such as pine, cherry, or maple. This effect is caused by uneven penetration of the stain.

Besides extra attention to surface preparation, there are a couple of measures you can take to avoid blotching. The key is to control absorption of the stain.

You might try sealing the wood prior to staining with a very thin washcoat of shellac (a ½ lb. cut), as in the left photo. Another option is to use a thick, gel stain (right photo). You'll get less surface penetration and consequently, reduced blotching. But again, always test before you commit.

▶ The blotchy look of the board at right can be avoided with the techniques shown below.

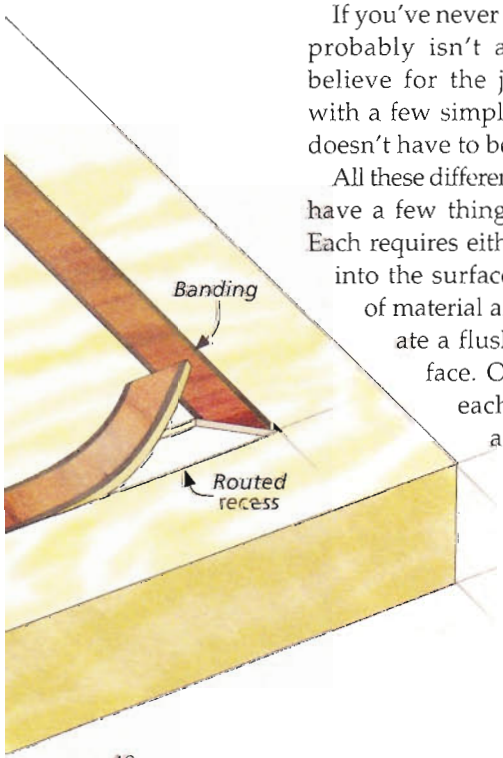
installing Inlays, Banding & Marquetry

Incorporating decorative details into your projects isn't difficult. All it takes is a little patience and a few easy-to-learn techniques.

The music box on page 16 is a good example of how adding a marquetry panel to your project can really change the character of the finished piece. But that's just one option. Banding and free-form inlay can also liven up an otherwise conventional piece.

If you've never done it, "easy" probably isn't a word you'd believe for the job. However, with a few simple guidelines it doesn't have to be difficult.

All these different types of inlay have a few things in common. Each requires either a recess cut into the surface or a buildup of material around it to create a flush finished surface. On top of that, each one calls for a glueup and some method for clamping the material in place. But most of all, each one requires some patience.



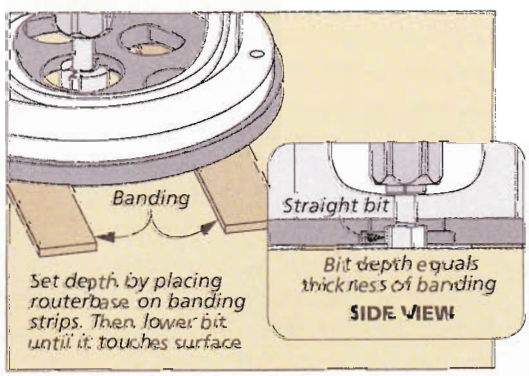
BANDING

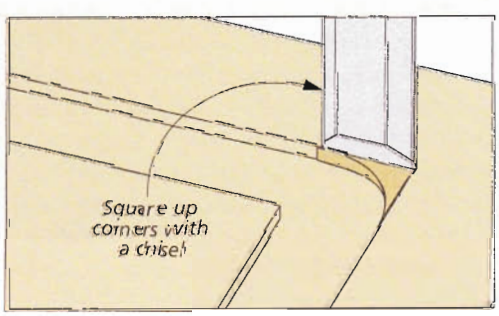
For centuries, craftsmen have relied on inlaid banding to decorate the edges of a table or box. Relatively inexpensive, thin (less than 1/32") strips of repeating wood patterns can be purchased to suit just about any style of furniture. The margin drawing shows how it works. As an alternative, you can make your own banding strips.

No matter what size or style of banding you choose, the first step is to cut a recess for it to fit in.

CUTTING A RECESS. For banding, cutting a channel is pretty straightforward. A router with an edge guide gets the job done quickly. The top drawing at right shows an easy and foolproof way to set the bit depth by using the banding. All you have to do afterwards is square up the rounded corners with a chisel (lower drawing).

At this point, you can install the banding. For certain patterns and projects, you'll need to match the design elements in the corners to get the best look.





FREE-FORM INLAY

Free-form inlay can run the gamut from different colors and textures of wood to colorful shells, like abalone or mother of pearl, arranged to form a shape or word. Even a bead of colored epoxy in a routed channel can change the character of a piece of furniture.

ROUTING. Here, a palm router or rotary tool is the tool of choice for creating the recess. If you're using a repeating pattern, you can save some time by using a template and a guide bushing or an inlay kit for cutting both the recess and a perfect-fitting inlay.

For most free-form inlay patterns, however, you'll need to cut your inlay pieces first. This way, you can lay out the pieces to determine placement. Then use a craft knife to define the outline (Figure 1). After that, remove the bulk of the waste in the pattern with the router, and complete it with a knife. Figures 2 through 4 below show you the process. No matter which method you use, the goal is a snug fit for the inlay.

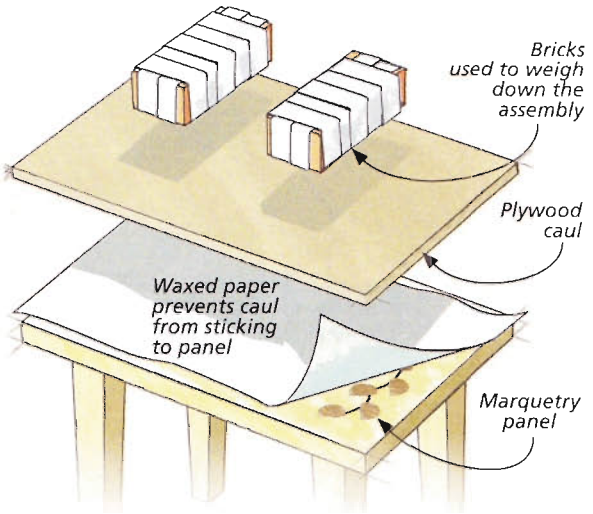
FITTING THE INLAY. A dry fit of the inlay can be difficult. With a properly cut recess, it can be tricky to fit the inlay and get it out again. I try to match up one side of the piece, then check the opposite side for a good fit.

MARQUETRY PANELS

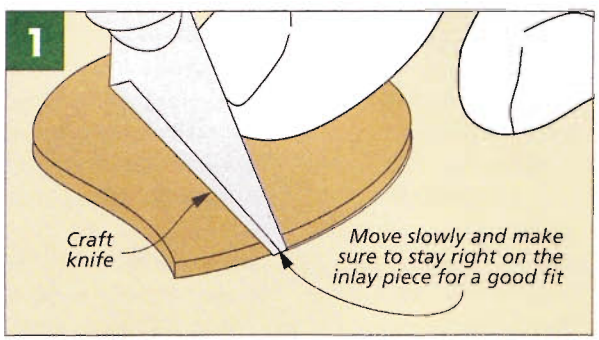
The top panel of the music box on page 16 shows how much marquetry can add to the appearance of a project. I purchased this pattern of laser-cut pieces and simply installed it on the lid. These panels are less than 1/32" thick and are supplied with veneer tape holding everything together.

NO ROUTING REQUIRED. When installing marquetry veneer panels, I skip routing a recess. Instead, I square up the veneer and attach it to the substrate, then build up the surrounding materials to match the height (see page 20).

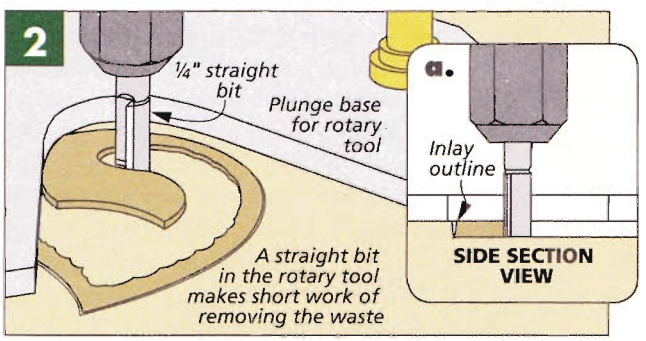
When gluing the marquetry, the side with the veneer tape should be face up. You'll remove it later. It can be tough to clamp the marquetry. The drawing above shows how you can ensure a good glue bond. Just cover it with waxed paper, a flat caul, and a little bit of weight on top (I use a few bricks as weights). I like to give the glue 24 hours to cure.



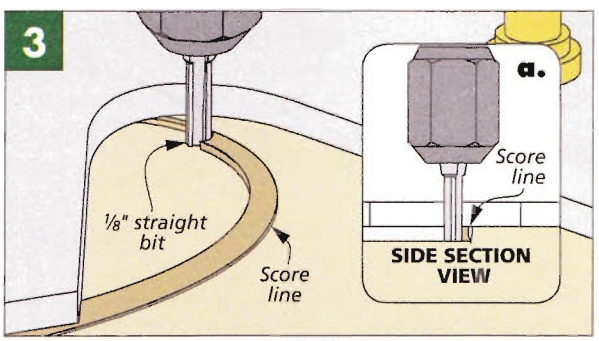
You can remove the veneer tape by moistening a small section at a time and scraping it off, as shown in the main drawing on the opposite page. When it's dry, use 220 up to 320-grit sandpaper to sand the piece. Now you're ready to add a finish. W



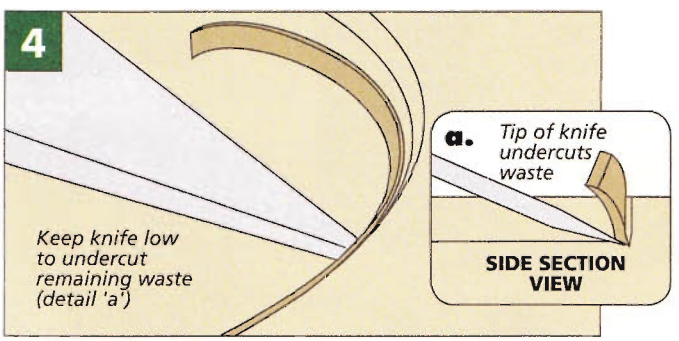
Outline. *Using the completed inlay piece as a guide, trace the outline with a sharp knife. Make several passes to attain the depth necessary for the inlay.*



Routing. *With a straight bit in the rotary tool, remove as much of the waste as you can from the interior while still staying safely away from the perimeter.*



Fine Cleanup. *Switch to a smaller bit in the rotary tool to clean up the remaining waste near the edge. With this bit, you can easily rout to within 1/16" of the perimeter.*



Final Cleanup. *Use a knife to remove the remaining waste. Detail 'a' shows the proper technique. Stay low to preserve the original outline on top.*

Questions & Answers

Simple Chair Repair

Q ***Some chairs I built a few years ago are feeling a bit wobbly. Is there any method for fixing them that doesn't involve taking the chairs apart?***

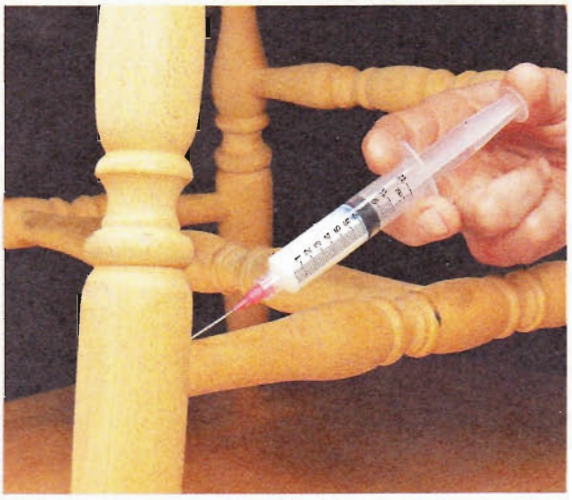
Michael Watters
Vancouver, Washington

A Disassembling the chairs, removing any glue residue, and then reassembling them is likely the best approach to the problem. But there's a risk of inflicting damage to the chairs if some of the joints are loose, but the others are not.

A SIMPLER SOLUTION. A better approach, then, is to just focus on the loose joints. *Veritas* offers a glue kit known as *Chair Doctor Pro* that I've had very good luck with.

The *Chair Doctor Pro* kit comes with glue, a syringe, and needles of three different diameters (see Sources on page 51). You can also get a less expensive *Chair Doctor* kit that comes with a small bottle of glue and one needle. But there's a little more going on with this kit than meets the eye.

For starters, the glue has lower viscosity than your average wood glue. Once injected into a mortise, it flows out and fills any gaps between the chair mortise and tenon.



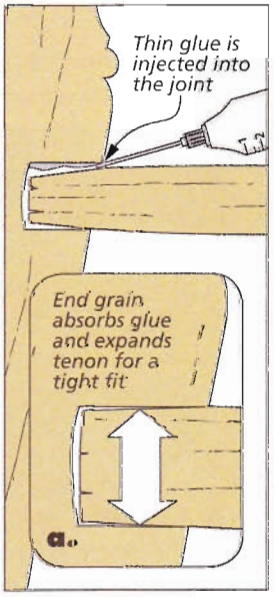
▲ If the joint is loose enough that you can insert a needle into the mortise, you can apply glue that way. For tighter tenons, drill a small access hole.

Next, the thin glue soaks into the end grain and causes it to swell. This makes a previously under-sized tenon large enough to fit the mortise tightly. The glue also dries quickly, essentially "freezing" the tenon in this expanded state and preventing future contraction (see the illustration at left).

The other nice thing about the *Chair Doctor* kit is that the needles allow you to keep the repair hidden. In fact, if a chair tenon is loose enough that you can insert the needle directly into the gap between the mortise and tenon, that's the best way to apply the glue to the loose joint (main photo above).

In other instances, however, you may not be able to get access to the mortise that easily. For these situations, *Veritas* recommends drilling a small pilot hole with a twist bit either underneath or behind the mortise.

FINISHING TOUCHES. After applying glue to the joint with the *Chair Doctor* syringe and needle, I recommend clamping the joint until the glue sets. I've used the kit on a few old chairs of my own, and I've found it to be a good, simple solution that's a lot less work than completely disassembling the chair. W



▼ The *Veritas Chair Doctor Pro* kit comes with all of the items you need to repair a loose joint.

hardware & supplies

Sources

Many of the materials and supplies you'll need to build the projects are available at hardware stores or home centers. For specific products or hard-to-find items, take a look at the sources listed here. You'll find each part number listed by the company name. See the right margin for contact information.

The *Woodsmith Store*, in Des Moines, Iowa, is an authorized *Rockler* dealer. They carry many of the hardware items used in our projects. And they ship nationwide. Their customer service representatives are available for your calls from 8am – 5pm Central Time, Monday through Friday.

PREMIUM PLYWOOD *(p.8)*

Baltic birch and *AraucoPly* can usually be found at most home centers. *Europly* and *ApplePly* are a little more difficult to find. To locate a dealer, see the sources listed in the margin at right.

VACUUM CLAMPING *(p.10)*

- **Veneer Supplies**
  - *V2 Venturi Kit* BLDKITV2
  - *Vac. Clamp w/Podz* . . CLAMPKIT
  - *Vinyl Vacuum Bag* . . DMVBG2x4
  - *Breather Mesh* VACMESH5
  - *Vacuum Chuck* . . . . CHUCKKIT
  - *Vacuum Pump* . . . . GASTPUMP

In addition to the hardware kits, *Veneer Supplies* provides easy-to-follow instructions with photos and tips for a successful vacuum project.

MUSIC BOX *(p.16)*

- **Rockler**
  - *Brusso Stop Hinge* 62125
  - *Music Movement* 32856
  - *Felt* 22822
  - *Padded Ring Bar* 35248
  - *Felt Dots* 26351
- **Whiteside Machine Co.**
  - *5/32" R. Ogee Bit* 2200/2202
- **Inlay Product World**
  - *Marquetry* 309M-SDK
  - *Inlay Strip* 397

To finish the music box, I started with a coat of *General Finishes' Seal-a-Cell*. After letting that dry for a couple of days, I sprayed the box with two coats of lacquer.

BOOKCASE *(p.22)*

- **Lee Valley**
  - *Door Pulls* 01A23.75
  - *No-Mortise Hinges* 00H51.32
  - *Connector Bolts* 00N16.30
  - *Connector Bolt Caps* . . . 00N20.12
- **Rockler**
  - *Magnetic Catches* 26559
  - *Shelf Pins* 22773

The cove molding used on the bookcase is *Ferche F606*. There's a dealer locator on the web site listed at right. The bookcase is painted with *Benjamin Moore* "Andes Summit." The back planks are finished with three coats of lacquer.

HALL TABLE *(p.32)*

The only hardware needed to build the hall table is an assortment of screws and washers. The table was finished with a coat of *General Finishes' Seal-a-Cell* followed by two coats of satin spray lacquer.

SMALL PARTS *(p.44)*

- **Rockler**
  - *Mini Miter Saw Set* 22481

CHAIR REPAIR *(p.50)*

- **Lee Valley**
  - *Chair Doctor Pro* 05K99.04
  - *Chair Doctor* 05K99.01

MAIL ORDER SOURCES

Woodsmith Store
800-444-7527

Rockler
800-279-4441
rockler.com

ApplePly
800-626-1981
appleply.com

AraucoPly
770-330-1627
araucoply.com

Benjamin Moore
855-724-6802
benjaminmoore.com

Europly
800-637-1609
columbiaforest
products.com

Ferche Millwork
800-328-7867
ferche.com

Inlay Product World
877-464-6529
inlays.com

Lee Valley
800-871-8158
leevalley.com

Veneer Supplies
veneersupplies.com

Whiteside Machine Co.
whitesiderouterbits.com

Woodcraft
800-535-4482
woodcraft.com

looking inside
Final Details

▼ *Music Box.* Beneath the attractive lid of this music box, you'll find a musical movement and a compartment perfect for storing jewelry or other small items. Complete plans begin on page 16.

▲ *Step-Back Bookcase.* Designed as three separate units, this step-back bookcase can be built to suit a range of living room sizes. Glass panel doors make it ideal not only for books, but for displaying a special collection, as well. The construction is surprisingly straightforward and we'll give you all the info you need. Check out page 22 to get started.

► *Hall Table.* A tasteful blend of fine details and eye-catching materials make this table a project you'll admire every time you walk past it. We'll guide you step-by-step through the entire construction, starting on page 32.