NO. 62 NOTES FROM THE SHOP

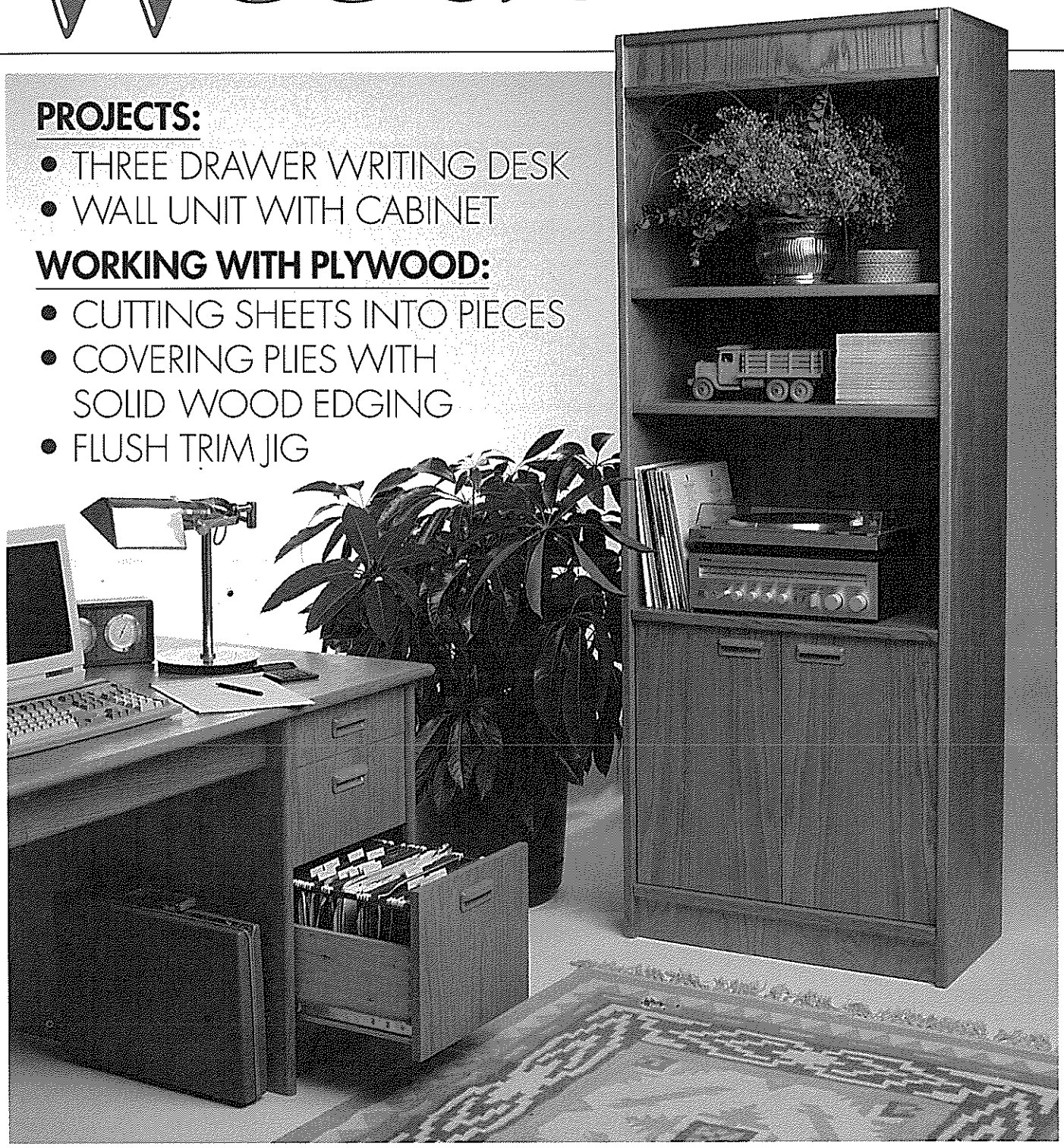
Woodsmith®

PROJECTS:

- THREE DRAWER WRITING DESK
- WALL UNIT WITH CABINET

WORKING WITH PLYWOOD:

- CUTTING SHEETS INTO PIECES
- COVERING PLIES WITH SOLID WOOD EDGING
- FLUSH TRIM JIG



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Woodsmith

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EDITOR'S COLUMN

Sawdust

In the last issue of *Woodsmith* we introduced our new graphic style — the new way the art and text are laid out on a page. I was both excited and nervous about making these changes. For ten years we've always received very nice compliments about the look of *Woodsmith*. So, my feeling was: don't change a good thing.

But the changes we've made are intended to be *improvements* in the way the articles are presented. Now that we have two issues under our belts, I've been very happy with all the changes. They let us present the projects in a step-by-step format that's easier to read. And I think it's easier to see the process of how each project is built.

Most of the changes I talked about in the last issue had to do with the graphics of the articles. But there are several other changes we've made — particularly in the way we present woodworking techniques associated with the projects.

Every project has a few interesting techniques or some tips that apply to many other projects as well. In the past, we've presented these techniques right along with all the other details about building each particular project.

That approach is okay — the information is in the issue. But it's usually buried in the article. And, to be honest about it, if you're not particularly interested in that project, there's not much point in reading through it just to see if there's a good tip or two buried in there somewhere.

Anyway, we felt that there were a lot of good tips being missed. So, we decided to highlight these tips so they're easier to find. Actually, we're doing that in two ways.

SHOP NOTES. First, we've added a regular feature called Shop Notes. Although this page has appeared in a few previous issues, it was never the *regular* feature we intended it to be.

The idea behind Shop Notes is to serve as a collection of tips from the *Woodsmith* shop. As we're building the projects for an issue, there always seems to be a few good general tips we want to show.

For instance, in this issue we've included four tips that could be used on a variety of projects. How to install recessed wooden drawer pulls. How to make a simple jig that helps align a router to cut a dado. How to mount false drawer fronts and get them aligned. And how to rip thin strips of wood to be used for edging plywood.

That's quite a collection. In the past, these tips might have been buried in the project article, but could have been easily missed. Now we're putting them in Shop Notes to highlight them a little more.

TIP BOXES. Another approach we're experimenting with is the use of what we call a Tip Box. If we have a special tip for building a project, but it also has general applications, we will try to highlight it in a Tip Box in the article.

For example, when we were assembling the Wall Unit shown on page 4, we had to glue and clamp large plywood sides to the plywood shelves. To get even pressure along the length of the joint, I used tapered clamping blocks. These blocks are a nice idea, so we put this tip in a tinted box to highlight it a little, see page 7.

TECHNIQUE ARTICLES. While I'm on the subject, the one request we've had consistently over the years is to show more techniques on woodworking. In addition to adding Shop Notes as a regular feature and including Tip Boxes, we are also going to put more emphasis on full-length articles on woodworking techniques.

In this issue for example, we've included three articles on the techniques we used to solve some of the problems associated with plywood. How to cut the pieces you need out of a large sheet. How to apply solid-wood edging strips to hide the plies on the edges of the plywood pieces. And a special jig to help trim the edging strips flush with the face of the plywood.

We will continue to present these technique articles in future issues. In fact, we often choose projects just for the techniques that are involved in building them.

SUPPLIES. That takes care of most of the major changes we've made to *Woodsmith* in the past two issues. However, there's one more small addition worth mentioning.

Along with the exploded view of the project, the cutting diagram, and the materials list, we will always try to include an information box on the supplies we used to build the project. Specifically, we want to provide information on the lumber, the hardware, and the finishing supplies.

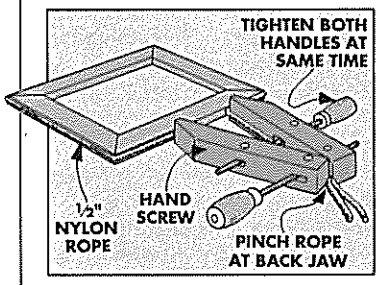
We receive a lot of requests asking how much it costs to build a project — particularly how much the lumber costs. Since lumber prices vary dramatically around the country, we couldn't come up with one easy dollar figure. Instead, we decided to list the number of board feet of lumber we used to build the project. A quick call to your local supplier will tell you the price per board foot.

NEXT ISSUE. The June issue of *Woodsmith* (No. 63) will be mailed during the week of June 26, 1989.

Tips & Techniques

ROPE CLAMP

If you've ever glued up a frame, and found that your web clamp is lost somewhere, do what I do — make a rope clamp. This clamp is made from two readily available items — a hand screw and a length of rope.



To use this clamp, open the front jaws while closing the back jaws so the clamp forms a "V", refer to the drawing. Form a loop with the ends of the rope and lay it on a flat surface. Now, lay the "V" of the clamp over the ends of the rope.

Apply glue to the miters of the frame and assemble the frame. Then place the loop of rope around the frame. Now, while holding the ends of the rope, slide the hand screw up close to the frame.

To keep the ends of the rope from slipping through the clamp, tighten down the back handle so the back jaws pinch the rope. Now, to get the right tension around the frame, slowly close *both* handles on the hand screw simultaneously.

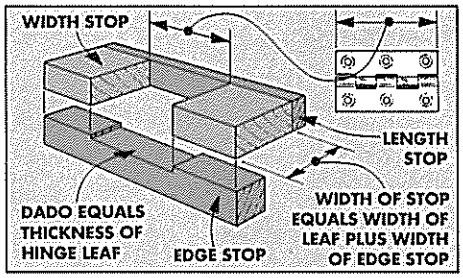
Marty Robbins
Pleasant Grove, Utah

Editor's Note: We tried this rope clamp method using various types of rope. We found ½" nylon rope works the best. And, it's fairly cheap at about 30 cents per foot. Also, ¾"-wide nylon flat webbing works well, too.

GUIDE FOR HINGE MORTISE

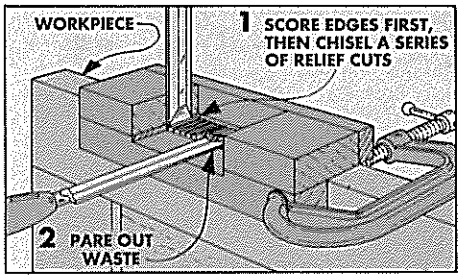
Cutting hinge mortises with a chisel can be difficult. The problem is trying to keep the shoulders of the mortises straight and the bottom flat. To help simplify this task, I built a chisel guide.

The guide is made out of four pieces of ¾"-thick stock. One piece acts as an edge stop against the face of the door or stile. The other three pieces are glued to the top of the edge stop and guide the chisel when cutting the mortise's width and length.



To make the chisel guide, first rip a piece of stock 1"-wide for the edge stop. Cut it to length about 6" longer than the hinge.

Then, I cut a dado in this piece equal to the depth of the hinge I want for the mortise. (A hinge is usually set into a mortise the thickness of one leaf.) The length of this dado must match the length of the hinge.



After the edge stop is finished, next cut the three pieces to form the U-shaped chisel guide. First, two width stops are added to the top of the edge stop. The width of these pieces is critical because this is what determines the width of the hinge mortise.

To determine the width of these two pieces, measure the width of one leaf on the hinge, and add 1" (for the width of the edge stop). Then rip the two width stops to size. Now, glue them to the top of the edge stop so the ends align with the shoulders of the dado.

Finally, cut a piece for the back and glue it to the back edge of the two width stops to create a "window" for the chisel.

To use the chisel guide, mark the location of the hinge. Now look through the "window" in the guide and align the guide to the layout lines. Then, clamp the guide to the workpiece.

To cut the mortise, start by outlining the three sides of the mortise. First, set the chisel against the two width stops, and tap on it to mark the mortise ends. Then, hold the chisel against the length stop and tap down to make a score line along the length of the window.

To remove the waste, chop a series of relief cuts along the length of the window, about every 1/16", refer to drawing at left. Then lay the chisel flat in the dado in the edge stop and pare straight in to remove the waste to the back of the guide.

Roger St-Denis
Ripon, Quebec

QUICK TIPS

• Cut Plywood Easier

Cutting large sheets of plywood on sawhorses or just by yourself can be a real hassle. When I don't have help, and I need to make long cuts on a sheet of plywood, I put the plywood on top of a 4x8 sheet of Styrofoam bead board.

Set the depth of cut on the circular saw so it cuts through the plywood, but barely into the bead board. You don't have to worry about the blade being damaged in the bead board. And, it's easy to crawl along the top of the plywood to make long cuts.

Daniel Malin
Shawnee, Kansas

• Clean Shoulders

Whenever I'm handcutting tenons, I've had problems keeping the shoulders clean. The blade always wants to wander off the scribe line right at the beginning of the first cut.

To make it easier to start the saw and to help keep the blade in line while cutting, I cut a starting trough with a sharp chisel on the *waste side* of the scribe line. To do this, just pare straight down on the scribe line first. Then, make a second cut, holding the chisel at a 45° angle on the waste side of the score line. This creates a channel for the saw blade so it rides in the score line.

Randall Prestridge
Stuttgart, Germany

• Dowel Centers

Dowel centers are useful for marking matching dowel holes in adjoining pieces — if they don't fall out before making their mark. To prevent this, place a piece of masking tape across the dowel centers. The points will still go through the tape and make their mark.

Richard Dorn
Oelwein, Iowa

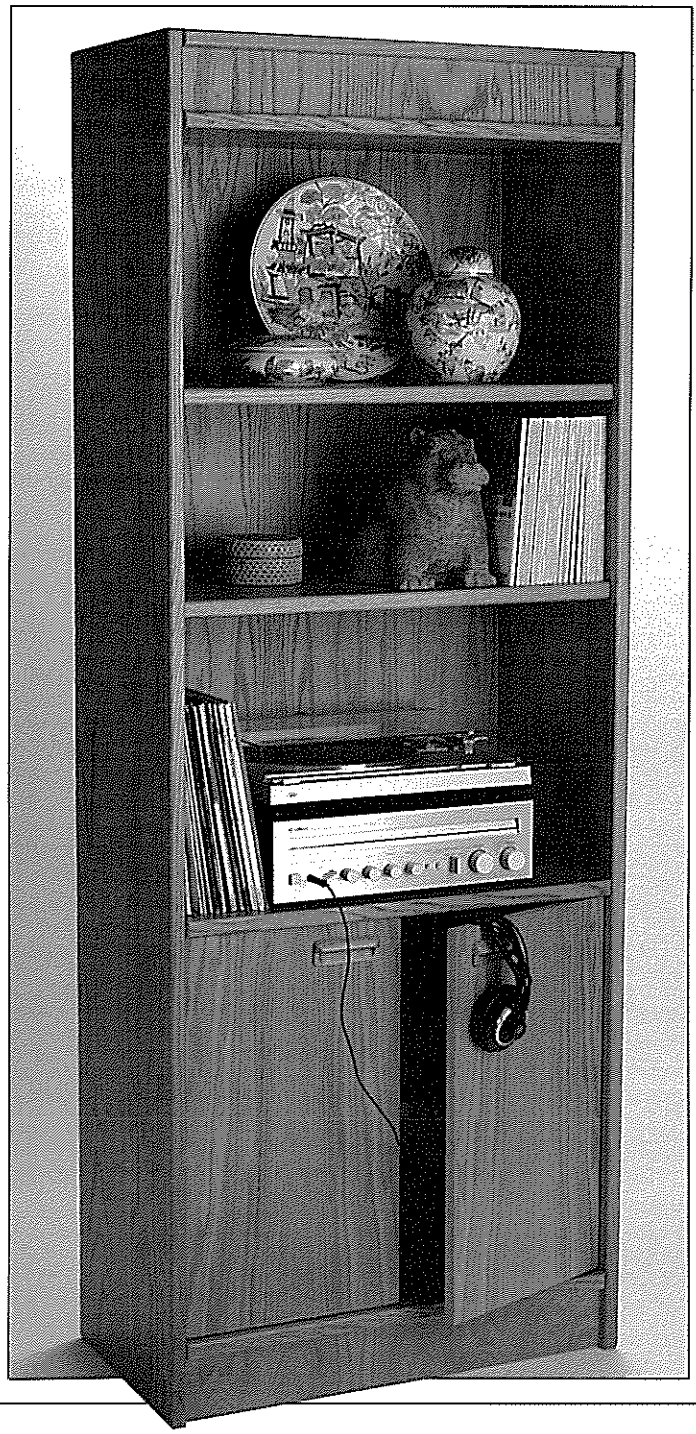
SEND IN YOUR TIPS

If you'd like to share a tip with others, send in your idea to *Woodsmith*, Tips & Techniques, 2200 Grand Ave., Des Moines, Iowa 50312.

We pay $15 for accepted tips. Please send an explanation and a sketch if needed (we'll draw a new one).

Display Wall Unit

With just two and a half sheets of plywood you can build this wall unit. The shelves are deep enough to display stereo equipment. And the doors at the bottom make a nice cabinet to help conceal any clutter.



When you set out to build a large project like this Display Wall Unit, plywood is an ideal material to work with. It's flat, dimensionally stable, and comes in sheets large enough so you don't have to go through the tedious process of edge-gluing a lot of boards together.

However, there are two main disadvantages to plywood. The edges have to be covered in some way to hide the plies. And, the project has to be designed around the fact that plywood comes in 4 x 8 sheets.

To get the most efficient use of each sheet, you have to juggle the size of all the pieces to fit a certain cutting diagram. I also had to watch the grain direction — especially with the doors. Here I tried to arrange the pieces on the sheet to get the nicest grain pattern on the two doors.

JOINERY. After working out the cutting diagram, I had to determine the joinery. I decided to use tongue and groove joints throughout this project, beginning with the primary joint to join the three fixed shelves to the case sides.

To join these pieces, I cut a ¼"-wide dado across the inside face of the sides. Then tongues are cut on the ends of the shelves.

But why cut a ¼"-wide dado? Why not make it ¾" wide to match the thickness of the plywood?

We used ¾" oak plywood, which is rarely exactly ¾"thick — it's usually just slightly less. It can also have slight variations in thickness throughout the sheet (usually due to the final sanding each sheet gets). So, rather than take a chance on a sloppy fit, or on a joint line that looks wavy, I cut a ¼"-wide dado, and then cut a tongue to fit.

EDGING. In addition to using tongue and groove joinery as the primary joint to assemble the case, I also used it to attach edging strips to hide the edges of the case sides and shelves.

Although the edging could be glued on with just a plain butt joint, using a tongue and groove joint helps align the edging. When you're working with long pieces (as on the front of the case), you need all the help you can get to get those long strips glued on — without sliding all over the place.

FINISH. When the case was done, I decided to apply two coats of Minwax golden oak stain. Then I finished the Wall Unit with two coats of McCloskey Heirloom semi-gloss varnish.

SUPPLIES

LUMBER

- 1½ Sheets ¾"-thick oak plywood
- 5 Board feet ¾"-thick solid oak
- 1 Sheet ¼"-thick oak plywood

HARDWARE

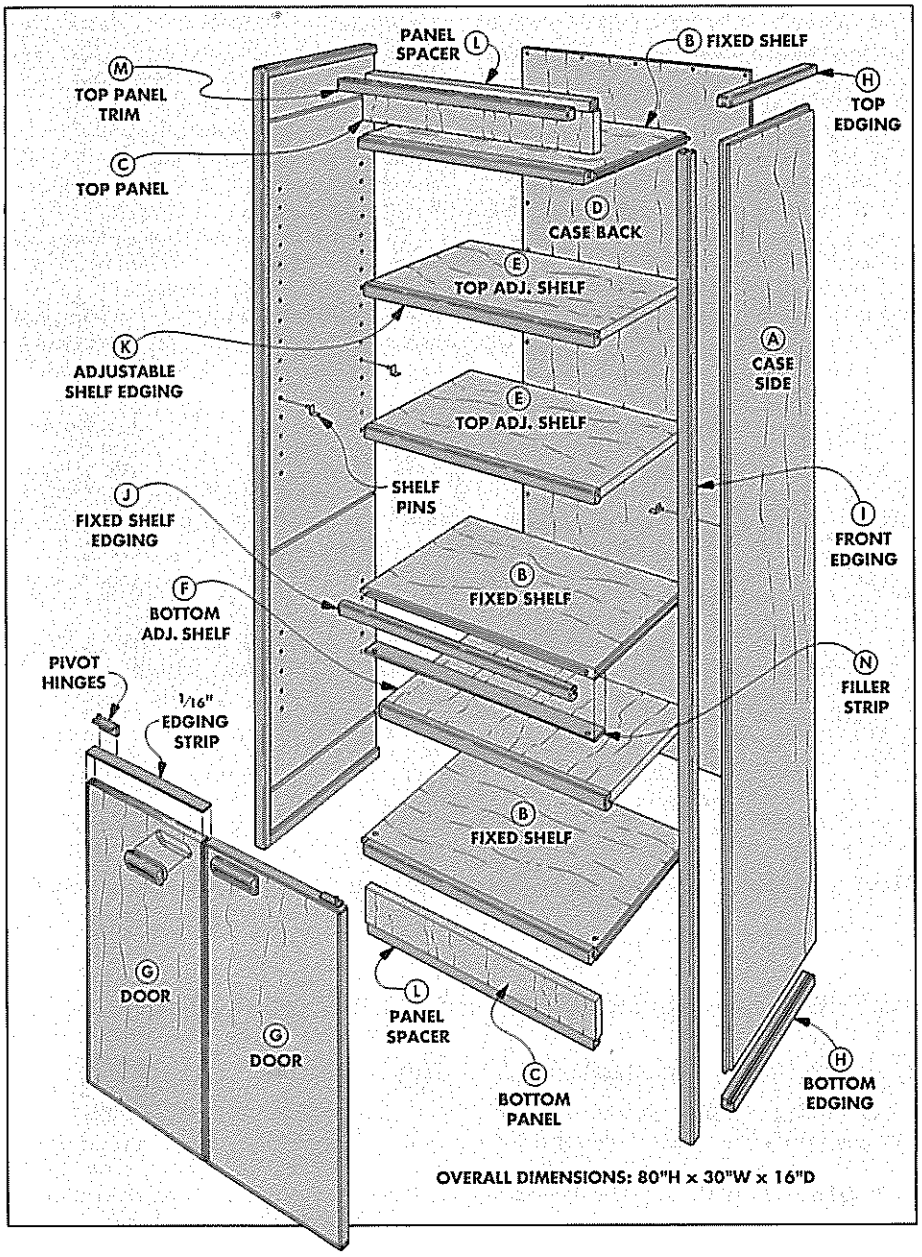
(See page 24 for kit)

- 2 Recessed red oak door pulls
- 2 Pair pivot hinges
- 12 Brass shelf supports
- 2 Adjustable levelers
- 1 Double plate magnetic catch

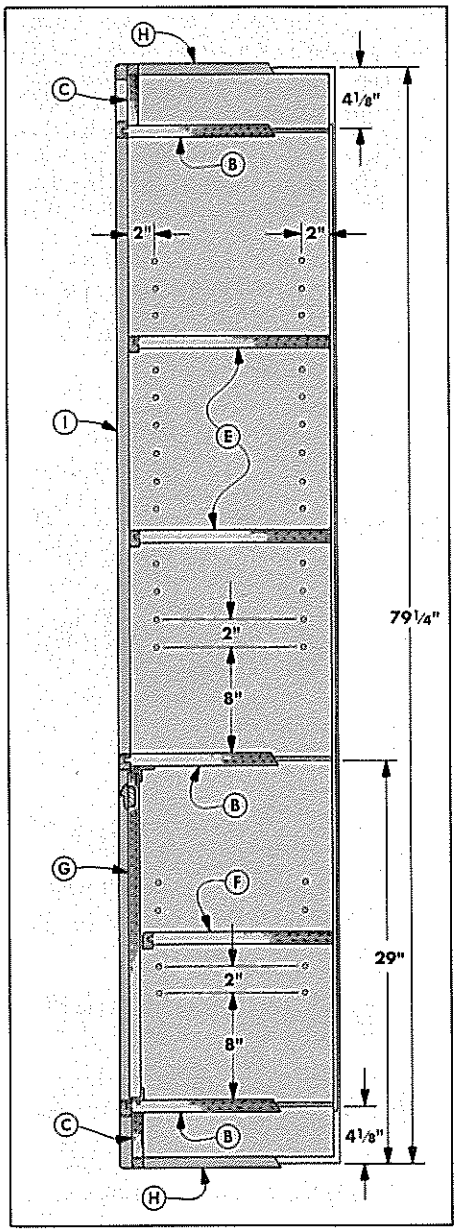
FINISH

- Stain: Minwax golden oak
- Varnish: McCloskey Heirloom clear semi-gloss varnish

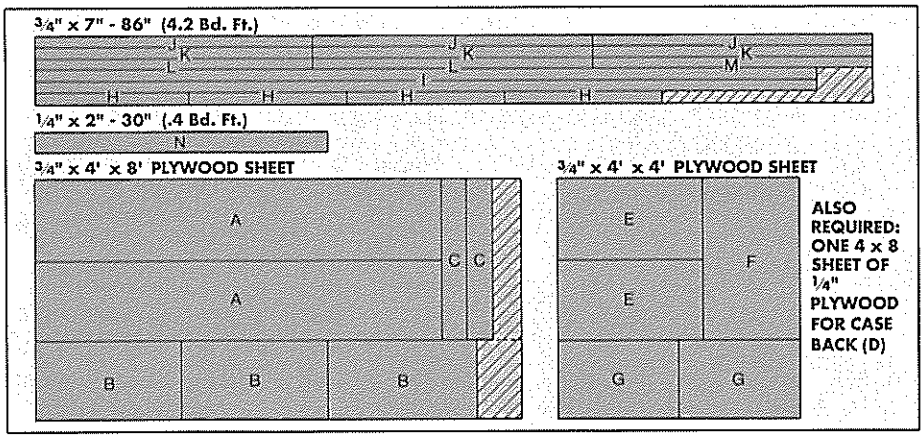
EXPLODED VIEW



CROSS SECTION



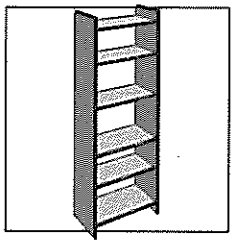
CUTTING DIAGRAM



MATERIALS LIST

A	Case Sides (2)	¾"ply - 15⅝ x 79¼
B	Fixed Shelves (3)	¾" ply - 15⅜ x 29¼
C	Top/Btm. Pnl. (2)	¾" ply - 28½ x 3½
D	Case Back (1)	¼" ply - 29½ x 70¾
E	Top Adj. Shelves (2)	¾" ply - 14⅜ x 28⅜
F	Bottom Shelf (1)	¾" ply - 28⅜ x 13½
G	Doors (2)	¾" ply -13 1/16 x 23½
SOLID TRIM EDGING		
H	Top/Bottom (4)	¾ x 1 - 15¼
I	Front Sides (2)	¾ x 1 - 80
J	Fixed Shelves(3)	¾ x 1 - 28
K	Adj. Shelves (3)	¾ x 1 - 28⅜
L	Panel Spacers (2)	¾ x ¾ - 28
M	Top Panel Trim (1)	¾ x 1 - 28
N	Filler Strip (1)	¼ x 1½ - 28½

THE CASE SIDES



I started work on this Wall Unit by making two **case sides (A)**. Although the sides are just two pieces of plywood, they present a problem. Each side has three sets of dadoes for the fixed shelves (B) — and these dadoes have to be perfectly aligned so the shelves lay flat. The trick is to cut the dadoes across one blank of plywood, then cut the blank in half to get two identical pieces, see Fig. 1.

CUT TO SIZE. To make the sides, first cut a large blank to a rough width of 32", and a finished length of 79¼", see Fig.1. (See page 10 for cutting plywood.)

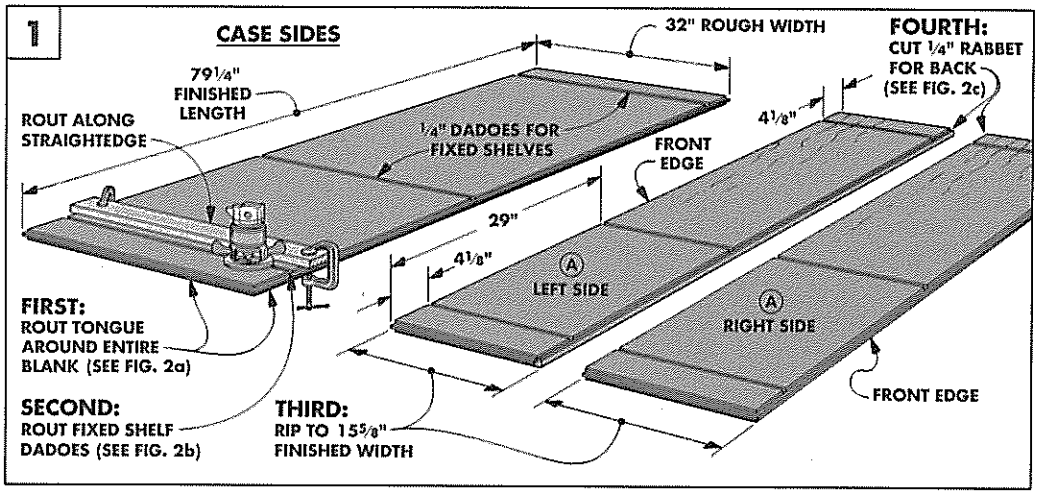
TONGUES. After the blank is cut to size, tongues are cut on all four edges. Tongues are used to attach hardwood edging, refer to Fig. 6. (Beginning on page 20, there's an article about adding edging to plywood with tongue and groove joints.)

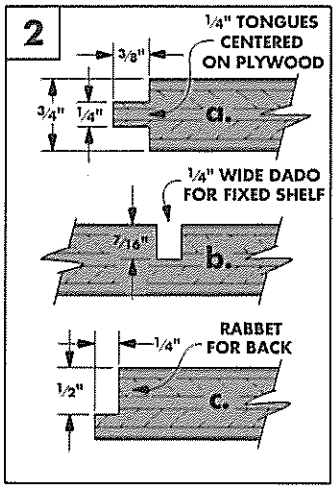
Procedural Note: When I had the router set up to rout the tongues, I went ahead and routed the same tongues on the six shelves (B, E and F). (See the section below.)

DADOES FOR SHELVES. After cutting all the tongues, I cut three dadoes for the fixed shelves (B) across the large blank. First, mark the location of the three dadoes, see Fig. 1. Then clamp a straightedge fence to the plywood blank and rout each dado. (In Shop Notes on page 12, we show a simple gauge to help align the fence.)

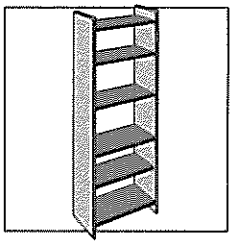
CUT CASE SIDES. Now to get the two **case sides (A)**, I ripped the plywood blank into two pieces, each 15⅝" wide.

BACK PANEL RABBET. The last thing is to rout a rabbet on the back edge on each case side to attach the case back (D), see Fig. 2c.





THE SHELVES



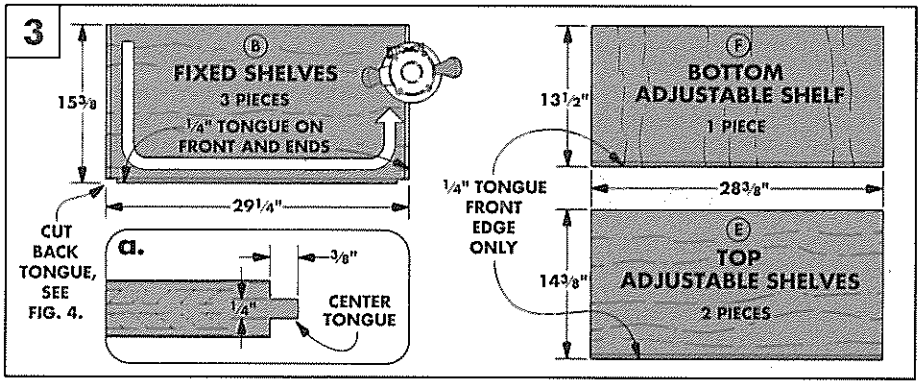
After the case sides are finished, work can begin on the shelves. There are three **fixed shelves (B)**, two **top adjustable shelves (E)**, and one **bottom adjustable shelf (F)**. I started by cutting all six of these shelves to size, see Fig. 3.

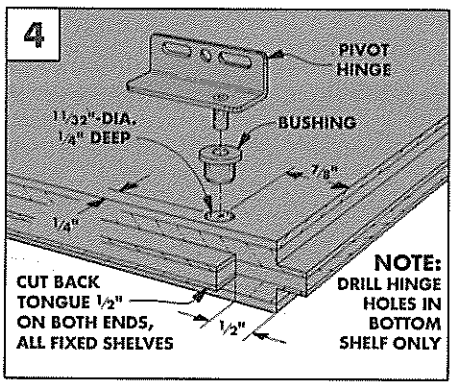
TONGUES. After the shelves are cut to size, tongues are routed on the *front edges* of *all* the shelves for the edging strips, see Fig 3. Next, rout tongues on both *ends* of the fixed shelves (B) only. These tongues fit into the dadoes in the case sides, see Fig. 1.

TRIM TONGUES BACK. There's one more step on the tongues. The tongues on the front edge of the fixed shelves have to be trimmed back to allow space for the edging when it's applied to the case sides. Trim the tongues back ½" on both ends, see Fig. 4.

HOLES FOR PIVOT HINGE. Later, when the doors are mounted, I used pivot hinges to mount them, refer to Fig. 4. The only problem with these hinges is that you have to drill the holes in the bottom fixed shelf (B) *before* the case is assembled. If you don't drill these holes now, you can't get the drill close enough to the corner after assembly.

Also, these holes must be drilled in the right location for the doors to swing properly, see Fig. 4. Mark the centerpoint of the holes ⅞" from the *end shoulder* of the bottom shelf and ¼" from the front shoulder. After marking the location, drill the holes at both ends of the shelf to accept the bushings for the hinge, see Fig. 4.





ASSEMBLE THE CASE

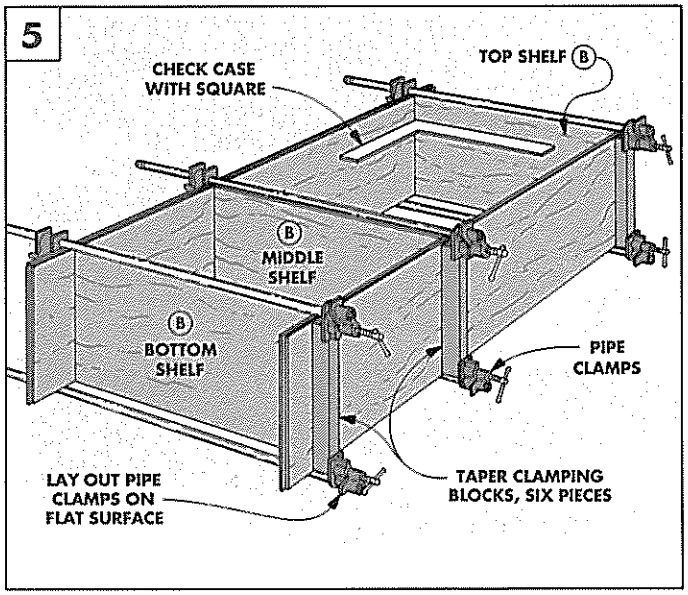
Once the shelves were made, I began to assemble the case. I started by getting three clamps in position on the floor, spacing them so they would be in line with the dadoes. Then stand the sides on edge with the fixed shelves (B) loosely in place.

TAPERED BLOCKS. When you're clamping wide pieces like these case sides, the clamps tend to apply pressure only at the top and bottom of the joint, but not along the middle. To get even clamping pressure across the whole joint, I made some tapered clamping blocks. (For more information, see the box at right.)

Shop Tip. When using these blocks, I put a small piece of double-sided carpet tape on the clamp heads to hold the blocks in place.

When the clamps and tapered blocks are in place, remove one shelf and apply glue in the dado. Then clamp the shelf in place, checking for square against the sides with a framing square. Clamp the other two fixed shelves using the same procedure.

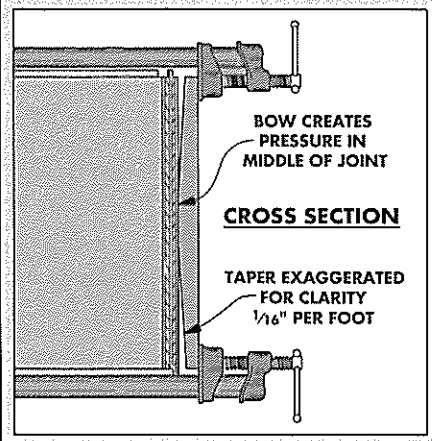
As the clamps are tightened, make sure the front shoulders of the tongues on the shelves are flush with the shoulders of the tongues on the case sides.



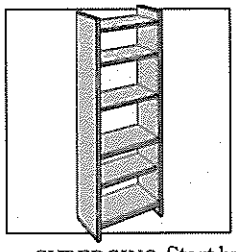
TAPERED BLOCKS

To get even pressure on the entire length of the tongue and dado joint, I made tapered clamping blocks. The tapered blocks are nothing more than lengths of 2 x 2 scrap. Usually you can find some that are already slightly warped and form a natural bow.

If not, use a plane or belt sander to create a bowed shape from the middle of the 2 x 2 out to the ends. You don't have to work too hard — about 1/16" per foot is enough. It just has to bow enough so the middle touches before the ends.



CUT EDGING



While the case was drying, I cut 12 edging strips: four strips for the **top and bottom case edges (H)**, two for the **front edges (I)**, and six for the **shelf edging (J,K)**.

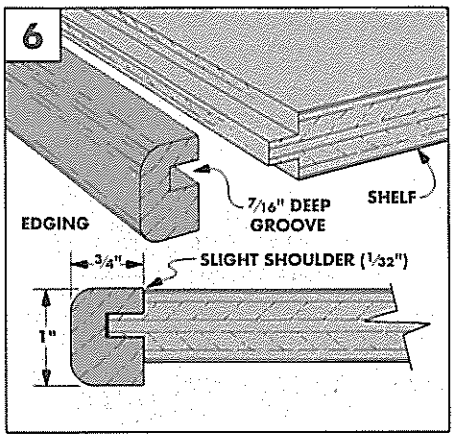
CUT EDGING. Start by ripping 1" wide edging strips from 3/4"-thick stock. Then cut the twelve pieces needed to rough length.

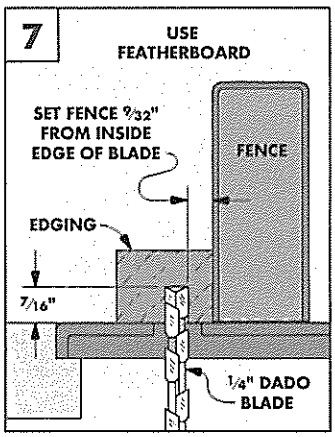
OFF-CENTER GROOVE. Next, I cut grooves in each strip to fit over the tongues on the case sides and shelves, see Fig. 6. Since the edging is 1" wide and the plywood is only 3/4" thick, the grooves are cut slightly off-center. This produces a lip on the inside edge of the case sides and on the bottom of the shelves.

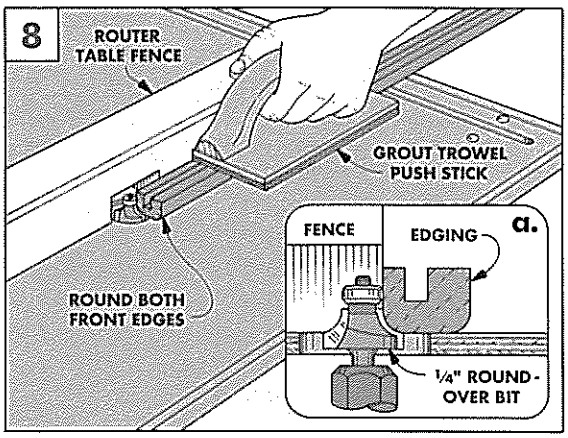
To cut the offset groove, I used a 1/4" dado blade on the table saw set 7/16" deep, see Fig. 7. (The groove is 1/16" deeper than the tongue to allow a glue relief.) Position the groove so the edging will stick just a hair above the face of the plywood (about 1/32") when it's glued in place, see Fig. 6. Later, you can trim this slight lip flush with the plywood. (I used a flush trim jig, see page 22.)

PROFILE EDGES. After the grooves are cut, round over the front edges of all the edging strips with a 1/4" round-over bit on the router table, see Fig. 8.

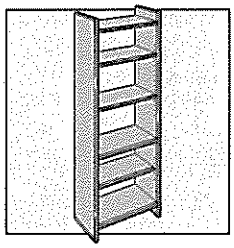
Shop Note. Since these edging strips are fairly narrow, I used a grout trowel to push them through the round-over bit, see Fig. 8. Although the round-over bit has a ball-bearing pilot, I used the fence to guide the long strips. Align the fence with the edge of the pilot, then push the strips along the fence.







EDGING CONTINUED



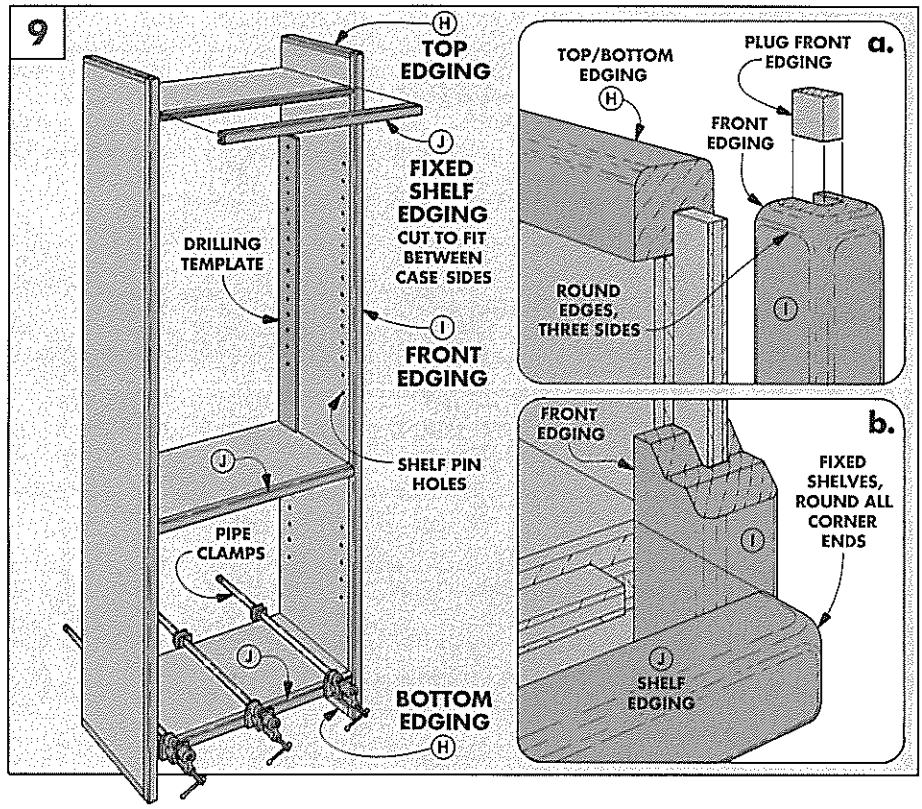
After making the edging strips, I cut them all to length. First cut the **top and bottom strips (H)** so the ends align with the shoulders of the tongues on the sides, see Fig. 9a.

Next, cut the **front strips (I)** that go on the front edges of the sides, and round over the ends. Also, since the groove in this strip extends through the top end, cut a filler plug to fit this hole, see Fig. 9a.

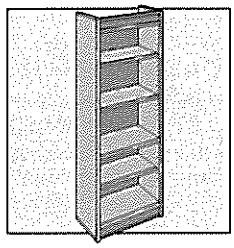
Now, cut the **shelf edging (J and K)** to length, round over the ends, and glue it onto the shelves. When gluing the fixed shelf strips on, the lip on the top shelf faces up. The lips on the middle and bottom shelves face down.

DRILLING TEMPLATE. After attaching the edging strips, I drilled holes for the pin supports used to mount the top adjustable shelves (E). To position the holes, I cut a drilling template to fit between the top and middle shelves. Then drill ¼" holes, spaced as shown in the Cross Section, page 5.

After using this template to drill the holes in the upper section of the Wall Unit, trim it down to drill the holes in the lower section.



TOP AND BASE



The basic cabinet is completed by adding the case back and the top and bottom panels.

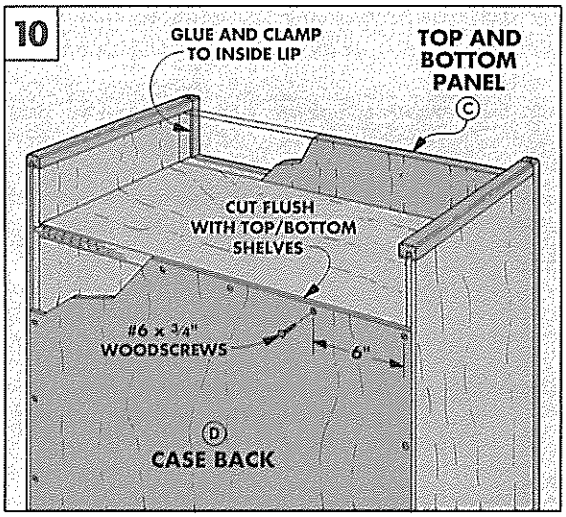
Cut the **case back (D)** out of ¼" plywood so it fits snugly between the rabbets on back of the case sides, and between the top and bottom fixed shelves, see Fig. 10. Then screw it into the rabbets.

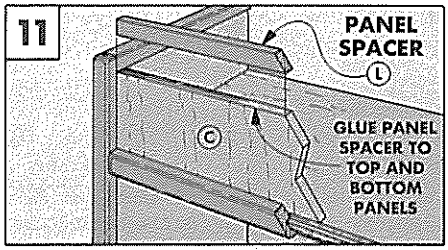
TOP AND BOTTOM PANELS. After attaching the case back, I added the **top and bottom panels (C)**. The top panel is cut to fit behind the lips of the edging strips above the top shelf, see Fig. 10. Be sure to note the grain direction — this panel is only 3½" *long* because the grain direction runs vertically. It's cut wide enough to fit behind the lips of the front edging strips (I) on the sides. The panel on the bottom is cut to fit the same way.

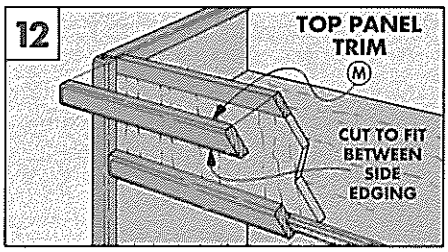
After cutting the panels to size, glue them in place behind the lips of the edging strips.

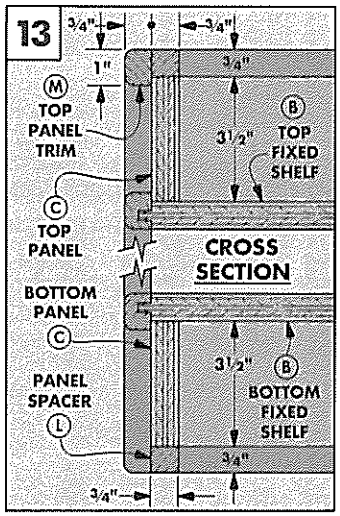
SPACERS. To complete these panels, I added edging pieces made to look like all the other edging. To do this, first add a **spacer (L)** to the top edge of the top panel, see Fig. 11. Cut another spacer to fit on the bottom edge of the bottom panel, see Fig. 13.

Now, on the top panel only, cut a **top panel trim strip (M)** 1" wide (to duplicate the look of the edging) and round over the front edges and ends with a ¼" round-over bit. Then glue this trim strip to the front of the spacer (L), see Fig. 12.

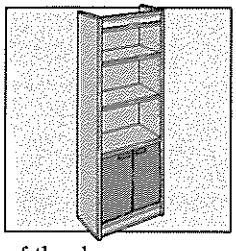








THE DOORS



The cabinet is really complete at this point and could be used as it is. However, I added **doors (G)** to the bottom section.

DOOR SIZES. To determine the height of the doors, measure between the *edging strips* on the two lower shelves. Then subtract ¼" for the ⅛" space above and below the doors, and subtract another ⅛" for the 1/16"-thick edging strips that trim the doors.

To get the width of the doors, measure between the edging strips on the case sides, subtract ⅜" (for the ⅛" spaces on each side of the doors and the one between the doors), and subtract ¼" for the edging strips. Then divide by two and cut the doors to width.

EDGING STRIPS. After cutting the doors to size, I cut 1/16"-thick edging strips to cover all four edges of the doors. (Refer to Shop Notes on page 13 on how to cut these strips.)

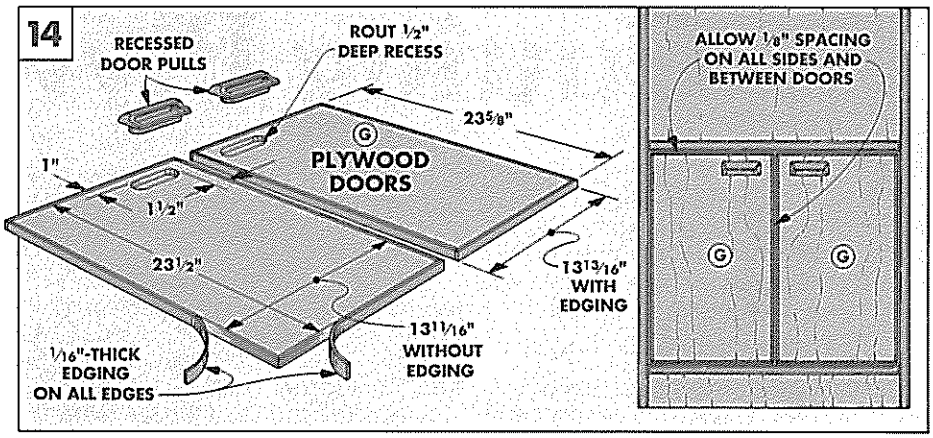
After the strips are cut, glue and clamp the strips on the side edges of the doors first. Then add the strips on the top and bottom edges. Finally, trim the edges flush with the faces of the doors.

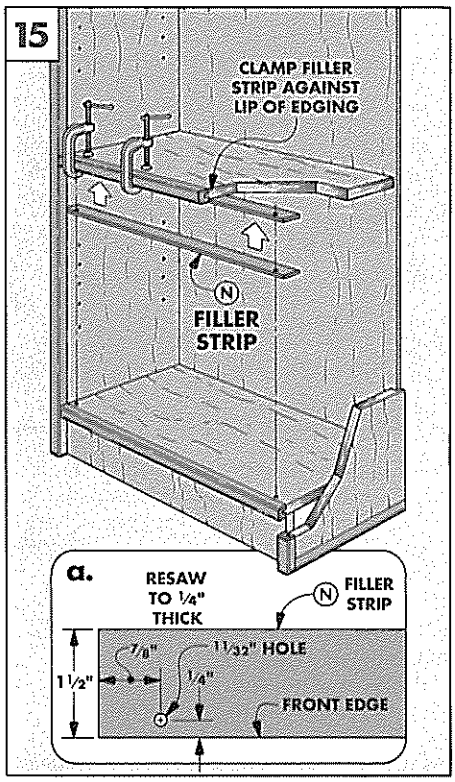
PULLS. Before mounting the doors, I cut recesses for the pulls and mounted them. (See Shop Notes on page 12).

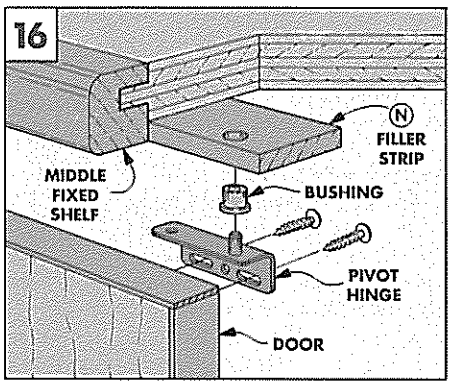
HINGES. The doors are mounted between the two lower shelves with pivot hinges. The holes for these hinges are already drilled in the bottom shelf.

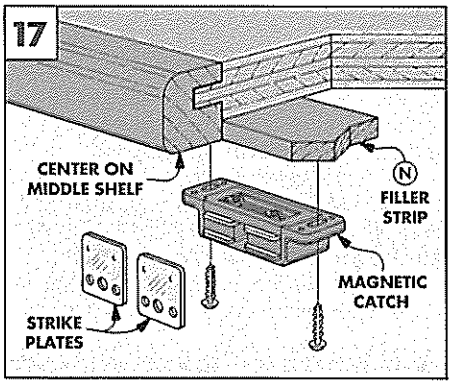
As for the top holes, you need to add a **filler strip (N)** behind the lip of the edging strip on the middle shelf, see Fig. 16. Cut this strip to fit, then drill the holes in the same position as on the bottom shelf, see Fig. 15a.

Then mount the hinges and screw them to the backs of the doors, see Fig. 16. I also mounted a double magnetic door catch underneath the middle fixed shelf, see Fig. 17.





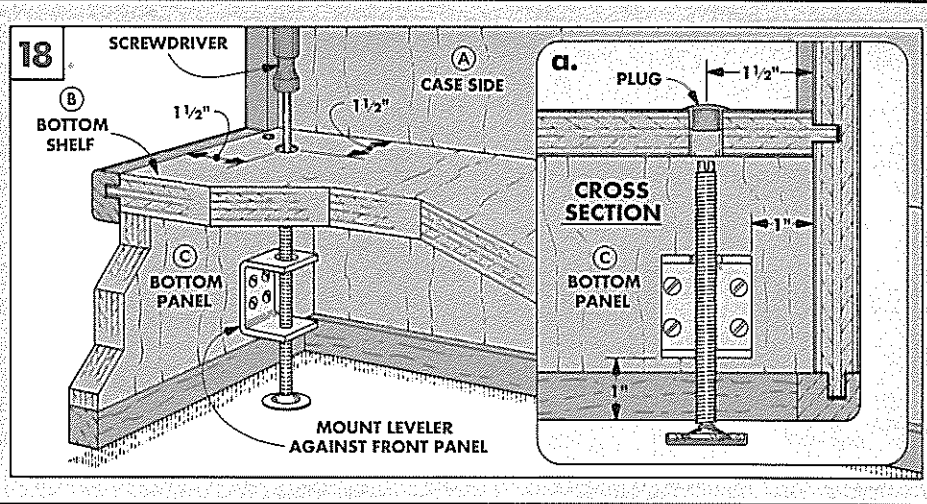




LEVELERS

Although this Wall Unit may be perfectly square and level, the floor it rests on may not be—especially if the unit is on carpeting and against a wall. There's usually a tack strip under the carpet near the wall. This can tilt the top of the Wall Unit out from the wall.

To level it, I added two adjustable levelers behind the bottom panel, see Fig. 18. The trick to adjusting each leveler is to drill a hole through the bottom shelf for access to the screw in the leveler. Locate this hole so it aligns with the top of the screw. Then mount the leveler bracket to the bottom panel, and level the Wall Unit. Cover the accesss hole with the plug that comes with the leveler.



Cutting Plywood

When you build a project with plywood, the first challenge is to lay out all the pieces so they fit on a 4x8 sheet (or on partial sheets) with a minimum of waste. The second challenge is cutting those pieces out of the sheet — with clean, straight edges.

ROUGH CUTS

The initial step in cutting out the pieces is to cut them to rough size. I usually cut them about ¼" to ½" larger than needed. This allows enough extra so you can make a second pass on each edge to get a good clean cut.

To illustrate some of the problems involved, we've made up a cutting diagram that presents a number of typical cuts.

The first step on this particular cutting diagram is to cut off the right end of the sheet, separating off parts G and H. This is also the first problem area.

WIDE CUTS. It's often the case that you have to cut a piece off the end of a much larger sheet. In most cases, if you have some help, you can make this type of cut on a table saw. But in this case the pieces are 26" wide — too wide for the rip fence settings on most table saws (which is usually limited to 24"). So, what do you do?

There are several ways to go about it. I usually make a rough cut with a portable circular saw or a sabre saw to get the pieces down to a manageable size.

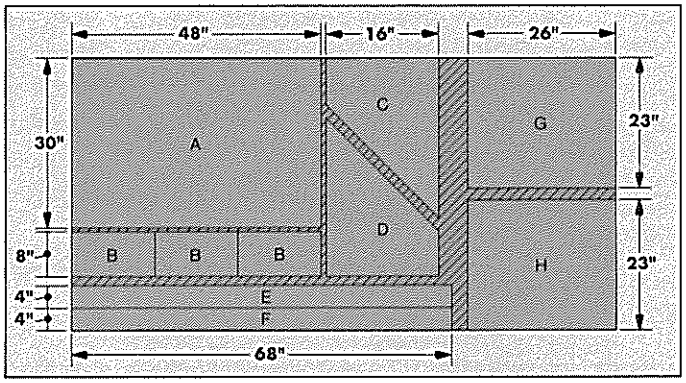
FENCE. In order to make this type of cut on a large sheet of plywood, I clamp a straight-edge fence to the plywood to guide the circular saw or sabre saw. The fence I use automatically aligns the blade of my circular saw right on the cut line.

To make the fence, rip a piece of ¾" plywood about 4" wide, and glue the plywood on top of a piece of ¼" Masonite, see Fig. 1. Then run the circular saw against the plywood fence to trim off the right edge of the Masonite. This gets the right edge perfectly in line with the path of the blade.

When the fence is clamped to the plywood, you're ensuring a *straight* cut, but you also have to make sure it's perpendicular (at a right angle) to the top and bottom edges of the sheet. If not, you'll run into problems when cutting off adjacent parts later. Clamp the fence to the sheet of plywood, and use a framing square to check it against the top and bottom edges.

SUPPORT. To make the rough cuts, you have to raise the plywood off the floor to provide room for the blade to clear. I place the sheet of plywood on some 2x4's — with at least two boards on both sides of the cut, see Fig. 2. Another nice way to support the plywood is to lay the sheet down on a piece of Styrofoam bead board. (This tip is explained on page 3.)

If you use a circular saw or sabre saw, place the plywood with the good face *down*. Both tools cut on the upstroke, so most of the splintering is on the top side. Table saws cut on the down stroke, so the splintering is on the bottom side.



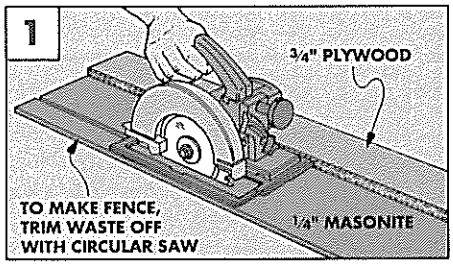
Okay, back to the cutting diagram. Cut off the end section with parts G and H first, cutting at least ¼" wider than the final width (preferably ½" wider).

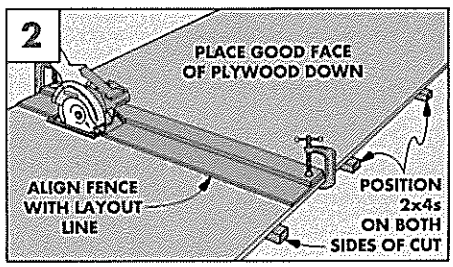
CUTTING PAIRS. On the remaining section, there are three groups of pieces to cut: A,B and C,D and E,F.

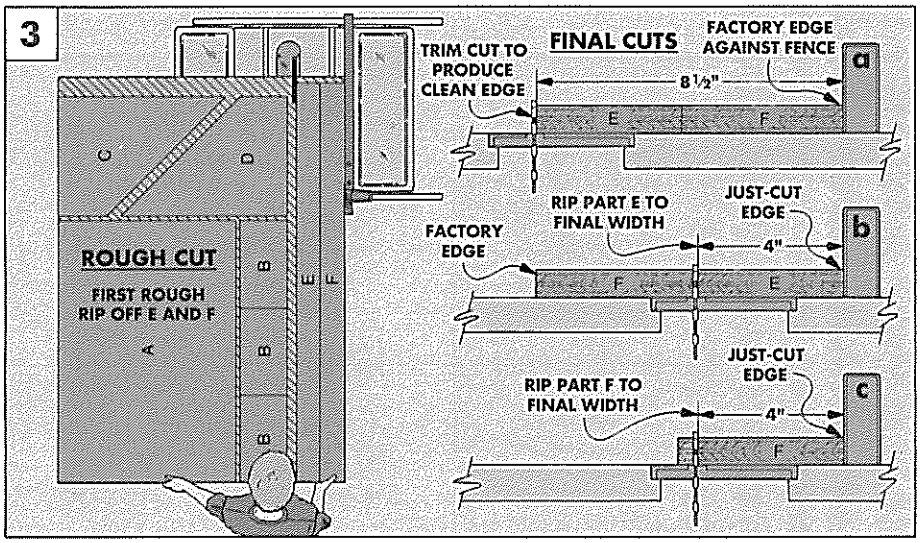
When you're dealing with two pieces like E,F that are the same width, I rip them off on a table saw as a *pair* first, see Fig. 3. Then I final cut them into two separate pieces.

The key here is to make the rough cut wide enough to account for the cuts made *between* the two pieces as well as on the outside edges of both pieces. That is, allow ¼" for the outside cuts, and another ¼" for the cuts between the two pieces.

ROUGH EDGES. Of the remaining section, you could cut off parts C,D the same way as E,F — on a table saw. But the edge that goes against the fence (the edge to the right of







parts C,D) is not a "factory edge" — one of the original edges. It's the rough-cut edge left over from cutting off parts G,H.

As mentioned earlier, when you make a "rough" cut, as when cutting off parts G,H, make sure the fence is perpendicular to the top edge (the factory edge). This just-cut rough edge is the edge that will now be against the fence to cut off parts C,D.

The point here is that "rough" cuts are not supposed to be rough. They are *initial* cuts that get the pieces down to a manageable size. They should be made with care so other cuts that follow won't be messed up.

FINAL CUTS

After rough-cutting the pieces down to a manageable size, you can trim the edges to get them to the final size. This usually calls for a series of cuts, not just one.

For example, parts E and F were cut to rough size as a pair. To cut them to final size, it's relatively easy to rip them apart on the table saw because the pieces are only 4" wide.

However, it requires more than just one cut down the middle of the rough piece. I would actually make three cuts to get these pieces to width.

FIRST PASS. The first pass I would make is to re-cut the rough-cut edge (the one above part E) to clean it up, see Fig. 3a. You should be able to get a good cut here because the factory edge is against the fence. All you need is to make a very slight trim cut to produce a new, cleaner edge.

SECOND PASS. After trimming off the rough-cut edge, I make two final cuts to rip the pieces to final width. But instead of making the cut with the factory edge against the fence as on the first pass, I flip the piece around and run the just-cut edge against the fence to cut off piece E first, see Fig. 3b.

FACTORY EDGE. The reason has to do with the factory edge. Although this edge can be trusted to make initial rough cuts, I don't like it as a final edge. It's usually banged up in some way — with splintered and dented edges that ought to be trimmed off.

THIRD PASS. So, cut off piece E using the fresh-cut edge against the rip fence. Then you have to make a third pass to cut part F to final width, see Fig. 3c.

CUT TO LENGTH. Pieces E and F are now cut to final width, but not to final length. The problem here is that they are very long. If you place them against a standard miter gauge to cut off the end to length, the piece may tend to twist (because the far end drags) and you don't get a good cut.

To solve this problem, I add a fence to the miter gauge to support the long piece for most of its length, see Fig. 4.

TRIMMING WITH A ROUTER

There's a different set of problems with cutting apart pairs like G,H, or when dealing with a very large piece like part A.

In both cases you have a factory edge to work off of, but the pieces are more than 24" long — more than can be cut with a standard rip fence on most table saws.

You could use a portable circular saw to make the final trim cut. (Since you're making a fine cut on the edge, use a good plywood blade and take it slow and easy.)

However, if your circular saw produces a rough, splintered edge, or if you use a sabre saw on the rough cut, there's another way to get a good edge. I would trim the edge with a router. And there are two ways to go here — with a straight bit, or a flush trim bit.

STRAIGHT BIT. To trim with a straight bit, I like to use a large straight bit (usually a ¾" bit). Then clamp a straightedge fence to the plywood to guide the router. Adjust the fence so the bit trims about 1/16" to 1/8" off the edge of the plywood, producing a fresh edge.

The fence for this trimming operation can be the same type as used for the circular saw (see Fig. 2), except set up for the router. The one thing you have to watch is that the fence is perpendicular to the edge of the piece so you're not cutting at an angle.

FLUSH TRIM BIT. Another method is to trim the rough edge off with a flush trim bit. This is a very similar technique to using the straight bit, except for the fence.

A flush trim bit has a ball bearing pilot that rides on the bottom of the bit. So, the fence has to be clamped to the bottom side of the plywood while the router rides on the top side, see Fig. 5. Also, the edge of the fence is aligned right where you want the cut line.

CUTTING AT AN ANGLE

If you need to make an angled cut on a large piece, as on parts C and D, there are a couple ways to go.

This type of angle cut is difficult on a table saw. So that limits you to using a circular saw, or a sabre saw — both of which might produce a fairly rough edge that has to be cleaned up in some way.

Another technique is to make the cut with a router. Again, clamp a fence on the plywood at the angle you want. Then use a router with a straight bit to cut through the plywood, see Fig. 6.

When making this cut, I use a ¼" carbide-tipped bit. Also, this cut should be made in two or three passes to reduce the strain on the router.

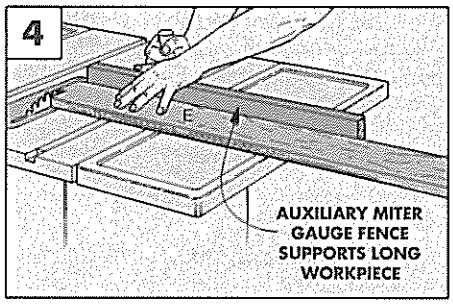
LONG PIECES

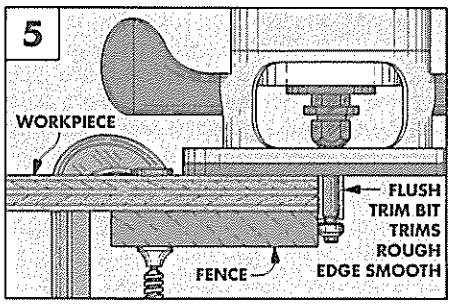
There's one other technique I use, particularly when I'm making a cross-cut on a long piece, such as is needed to separate the three parts B. To make this type of cut, I use a panel-cutting jig. This jig is a poor-man's version of a sliding platform found on some large saws.

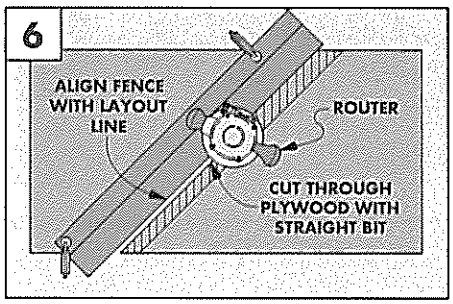
It's basically just a piece of plywood with a runner screwed to the bottom. The runner rides in the miter slot to guide the plywood platform. There's also a fence on the back edge to guide the piece square to the blade, see Fig. 7. (This jig is discussed in detail in *Woodsmith* No. 18.)

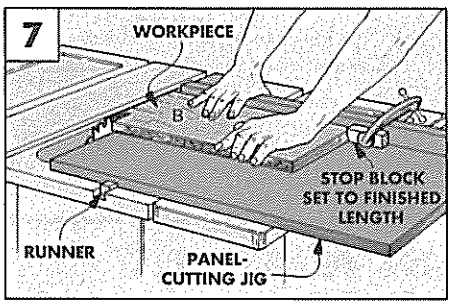
I use it to cut pieces off a long, narrow piece (like parts B). Just lay the long piece on the panel-cutting jig to support it to cut the pieces off to rough length.

To cut them to final length, clamp a stop to the fence on the jig. Place the left end of the rough-cut piece against the stop and trim off the right end. The stop allows you to cut off the other two pieces at exactly the same length, without measuring.









Shop Notes

DRAWER PULLS

■ My first thought about routing recesses for drawer pulls (on the Wall Unit and Desk) was to make a template and use a router and a guide bushing. That's probably the best approach if you're doing a whole kitchen.

Since I only had a few recesses to rout, I did them freehand. The pulls have a 3/32"-wide lip around the outside — that's enough room to allow some minor variations.

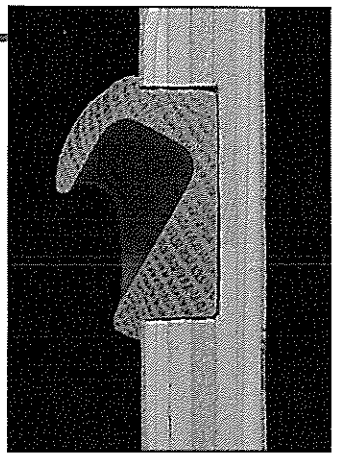
LAYOUT. I began by locating the position of the recesses on the workpiece. (The measurements are on the plan drawings.) Use a square to draw layout lines forming a rectangle, see Fig. 3.

Now, set a drawer pull inside the layout lines as a template to draw the round ends, see Fig. 1.

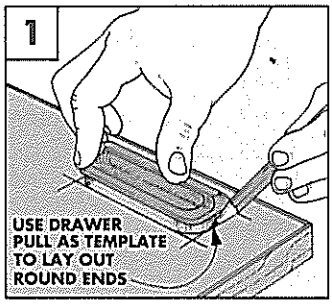
FREEHAND OUT WASTE. To rout out most of the recess, mount a 1/4" straight bit and set it to depth to align with the *deepest* part of the pull, see Fig. 2. (Note: On the pulls I used, the back is sanded at an angle. So the distance from the lip to the back of the pull is inconsistent.) The recess has to be routed deep enough or the lip won't seat tight against the front of the the door or drawer front. (With a small router, make two cuts, increasing the depth between cuts.)

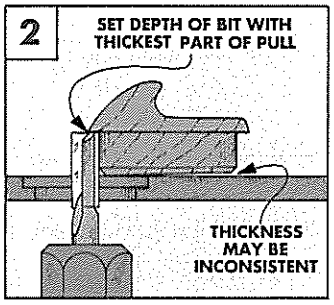
Now, turn on the router and plunge the bit into the center of the layout lines. Slowly clean out waste moving in a clockwise direction from the center to the layout lines, see Fig. 3. Stop about 1/16" from the lines.

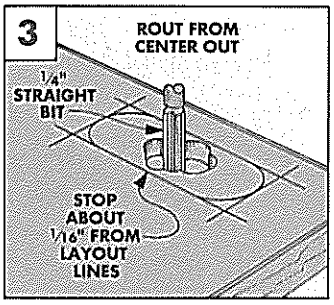
CHISEL TO LINE. After most of the waste is cleared out with a router, switch to a chisel to clean out to the layout line, see Fig. 4. The lip is wider on the ends of the pull, so you don't have to chisel out a perfect radius.

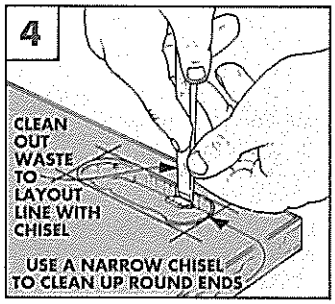


When routing out the recess for a pull, rout deep enough so the lip of the pull seats tight against the drawer or door front.









ROUTER FENCE ALIGNMENT

■ When routing a dado across a wide panel (such as on the Wall Unit), I usually mark the location of the dado first. Then I clamp a straightedge parallel to the layout lines to guide the router.

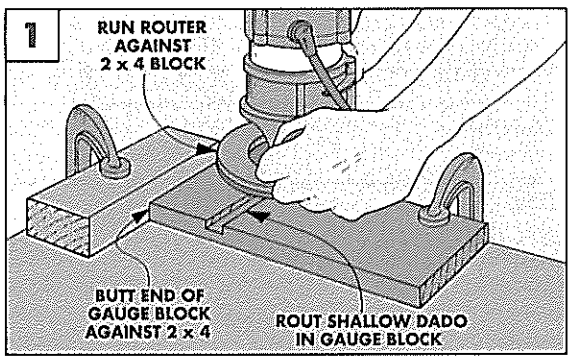
The problem is trying to figure out the *exact* location of the fence. You have to measure the distance from the edge of the router base to the cutting edge of the bit, then transfer this measurement to the workpiece. Somewhere in this process, there's likely to be some errors.

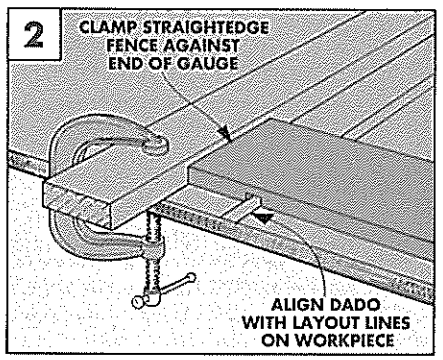
GAUGE. To be a little more accurate, I made a simple dado alignment gauge. It's just a piece of scrap with a dado cut across it that you can use to align the straightedge fence parallel to your layout lines, see Fig. 2.

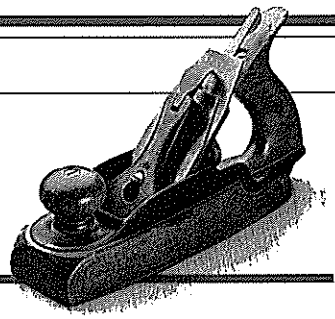
To make the gauge, clamp a piece of scrap down to the bench and clamp a higher fence at one end, see Fig. 1. Now mount the bit in the router and run the router base against the high fence to rout a shallow dado across the piece of scrap.

USING THE GAUGE. To use the gauge, turn it over on the workpiece so the dado aligns with the layout lines. Then butt the straightedge fence against the end of the gauge and clamp the straightedge down, see Fig. 2. Now rout along the edge of the straightedge. The dado should match the layout lines perfectly.

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







DRAWER ALIGNMENT

When mounting the false fronts to the front of the Desk drawers, I used a four-screw technique. The two bottom screws get the false front close to the correct position, while the two top screws fit in oversize shank holes so you can fine tune the final position of the false front.

SHANK HOLES. Begin by locating and drilling four 3/8"-dia. counterbored shank holes in the drawer front. Drill the bottom two holes a little *smaller* than standard shank holes (drill 1/8" for No. 8 screws) so the screw threads will slightly "grab" the wood. Then, drill the top two holes 1/16" *larger* than usual (drill 1/4" for No. 8 screws).

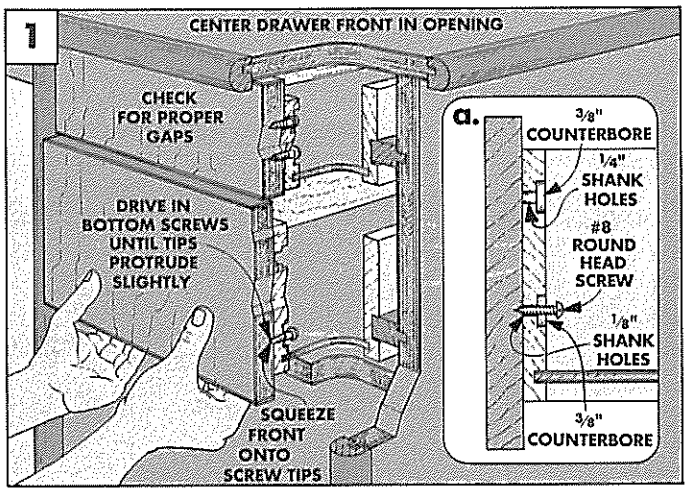
After the holes are drilled, insert roundhead screws into the bottom two holes so the points just stick out from the front of the drawer, see Fig. 1. Then, slide the drawer into the desk.

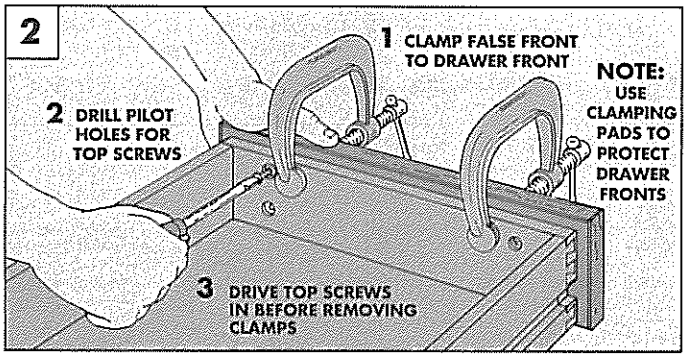
ALIGNING THE FRONT. Next, hold the false front in position on the front of the drawer so it's square and there are uniform gaps on all sides. Once the false front is in position, reach under the drawer and squeeze the false front and the drawer together, see Fig. 1. The screw points temporarily hold the false front in position. (On the middle Desk drawer you will have to pull the drawer out slightly so your fingers will clear the divider.)

SCREW ON FRONT. Now, carefully pull the drawer out of the case and clamp the false front to the drawer, see Fig. 2. Note: To protect the false front, use pads under the clamps. When the clamps are tight, remove the bottom screws. Then drill pilot holes for the two top screws and drive two roundhead screws into place in the holes.

After the top screws are in place, remove the clamps and push the drawer back into the opening. If the front is out of position, pull out the drawer and gently tap the false front with a mallet until it's in position. (The top oversize holes allow some minor adjustments to be made.)

Once the front is square and the gaps even, drill the pilot holes for the bottom screws and drive them in.





THIN EDGING STRIPS

To cover the edges of the plywood doors on the Wall Unit and the plywood false drawer fronts on the Desk, I glued on thin edging strips. The only problem is how to set up the table saw to cut a *series* of 1/16"-thick strips.

If you set up to cut the strips *between* the fence and the blade on the table saw, the thin pieces can easily get caught and kick back. Instead, the best method is to cut the strips off the *waste* side of the stock.

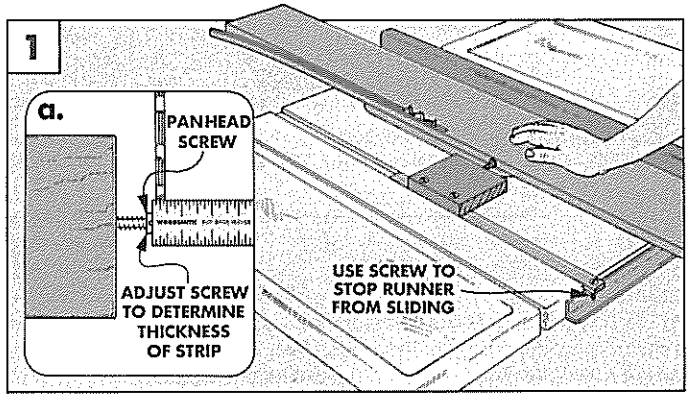
But this can also present problems. How do you move the fence the exact same distance each time to cut multiple strips to a *uniform thickness*?

STOP. The solution is to use a simple stop. The stop is just a block mounted to a runner that's in the miter gauge slot, see Fig. 1. And, on the edge of the stop there's a panhead screw for "fine tuning" the width of cut.

USING THE STOP. To use the stop, move it alongside the blade and adjust the screw until the distance between the blade and the screw head equals the thickness of the edging strip.

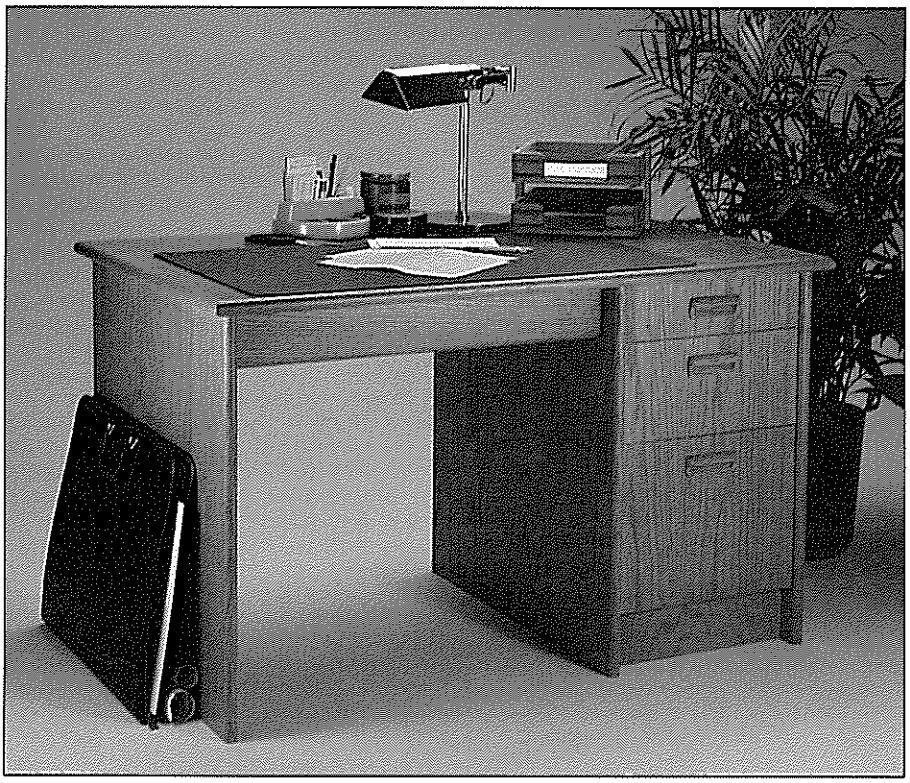
When it's set, pull the stop about 3" in front of the blade, and screw a flathead screw into the end of the runner to keep the stop from moving forward again.

Now, slide the workpiece against the screw head. And then slide the rip fence against the workpiece. After locking down the fence, cut off a strip. To cut strips exactly the same width, slide the workpiece and fence against the screw head again and reset the fence.



Study Desk

Whether you build this desk for a home office or a kid's room, it's designed for efficient use of space. The top is extra deep for more usable surface area, and the bottom drawer is specifically sized to hold file folders.



When I set out to build this desk, the first question I had was: what size should it be? That question, it turned out, had a number of answers.

Starting with the top, there are two "standard" depths: 24" deep and 30" deep. Standard lengths tend to be an even number of feet: 4 feet, 5 feet, etc.

To get the most amount of work surface while taking up the least wall space, I made the desk 30" deep but only 4 feet long. This makes the top seem deep for its length, but it provides a maximum of useful work area.

Next, I had to size the drawers. This depended on two completely different criteria. First, I wanted at least one drawer to hold file folders. So, I sized the bottom drawer to accept a standard office file holder frame.

The other criteria for the size of the drawers has to do with the joinery. Since I wanted to assemble the drawers with router-cut dovetails, I sized them around standard increments for the dovetail template. This got to be sort of a headache, until I decided to use false fronts for the drawers. Then it was easy to size each "real" drawer to fit the dovetail template.

DRAWER SLIDES. Since the bottom drawer is a file drawer and subject to a lot of weight, I mounted it with a set of metal, full extension drawer slides. For the top two drawers, I made wooden runners.

PLYWOOD. This desk is made out of oak plywood, and all of the pieces are sized to lay out on sheets of plywood with a minimum of waste. Because I used plywood, it actually dictated some of the other design features. For example, I added 1"-wide solid-wood edging to the desk top to make it look thicker (which helps get away from that standard ¾" plywood look).

The same was done on the three "legs." Since both sides of the left "leg" are visible, I had to add a piece of ¼" plywood to the ¾" plywood to fill the void behind the edging. However, on the other two legs the 1"-wide edging and the drawer fronts conceal the void.

FINISH. To finish the desk, I started by staining with two coats of Minwax's golden oak. Then, to provide a durable surface, I applied two coats of satin polyurethane. Another option would be to glue plastic laminate to the top and add oak edging around it.

MATERIALS LIST

DESK		
A	Top (1)	¾ ply - 29¼ x 47¼
B	Top Frt. / Bk. Edging (2)	¾ x 1 - 49
C	Top Side Edging (2)	¾ x 1 - 31
D	Drawer Cases (2)	¾ ply - 27¼ x 28¼
E	Case Back (1)	¾ ply - 15½ x 28¼
F	Drawer Dividers (2)	¾ ply - 16¼ x 25⁹⁄₁₆*
G	Drawer Runners (4)	¾ x 1⅜ - 25¼
H	Case Edging (6)	¾ x 1 - 28¼
I	Drawer Slide Spacers (2)	¼ x 1¾ - 25¾
J	Kickboard Spacers (2)	¼ x 1 - 4½
K	Kickboard (1)	¾ ply - 15½ x 4½
L	Aprons (2)	¾ - 4¼ x 28
M	Apron Connectors (2)	¾ - 4¼ x 23½
N	Left Leg (1)	¾ ply - 27¼ x 28¼
O	Left Leg Filler Panel (1)	¼ ply - 26½ x 28¼
DRAWERS		
P	Top Drawer Frt./Back (2)	½ x 3½ - 14
Q	Top Drawer Sides (2)	½ x 3½ - 24
R	Mid. Drawer Frt./Back (2)	½ x 5¼ - 14
S	Mid. Drawer Sides (2)	½ x 5¼ - 24
T	Btm. Drawer Frt./Back (2)	½ x 7 - 14
U	Btm. Drawer Sides (2)	½ x 7 - 24
V	Drawer Bottoms (3)	¼ ply - 13½ x 23⅞
W	Top Drawer Front (1)	¾ ply - 14¾ x 4*
X	Middle Drawer Front (1)	¾ ply - 14¾ x 7*
Y	Btm. Drawer Front (1)	¾ ply - 14¾ x 12*

*Measurement Without ⅛" Edging Strip

SUPPLIES

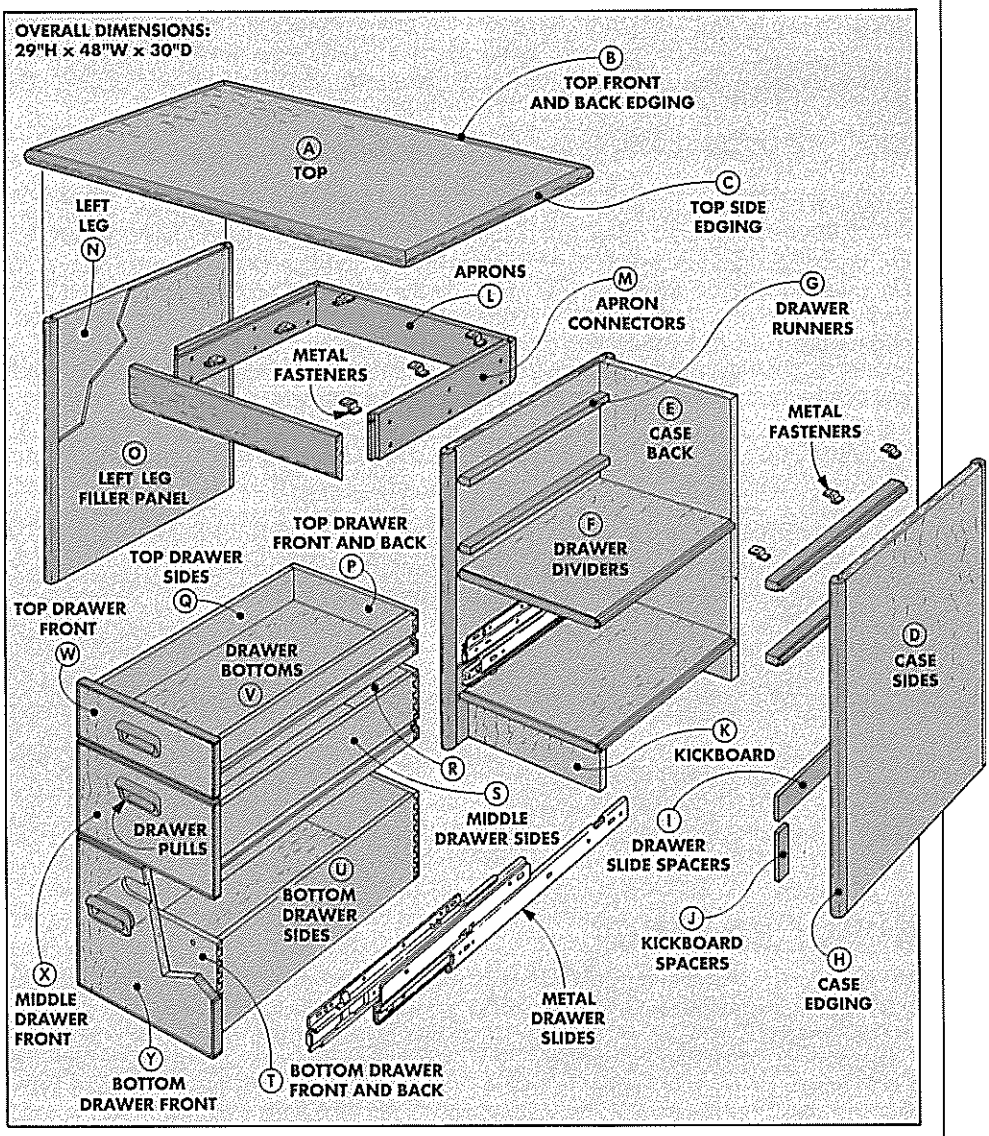
LUMBER

- 1½ Sheets ¾" oak plywood
- ½ Sheet ¼" oak plywood
- 10 Board ft. ¾"-thick solid oak
- 10 Board ft. ½"-thick poplar (drawers)

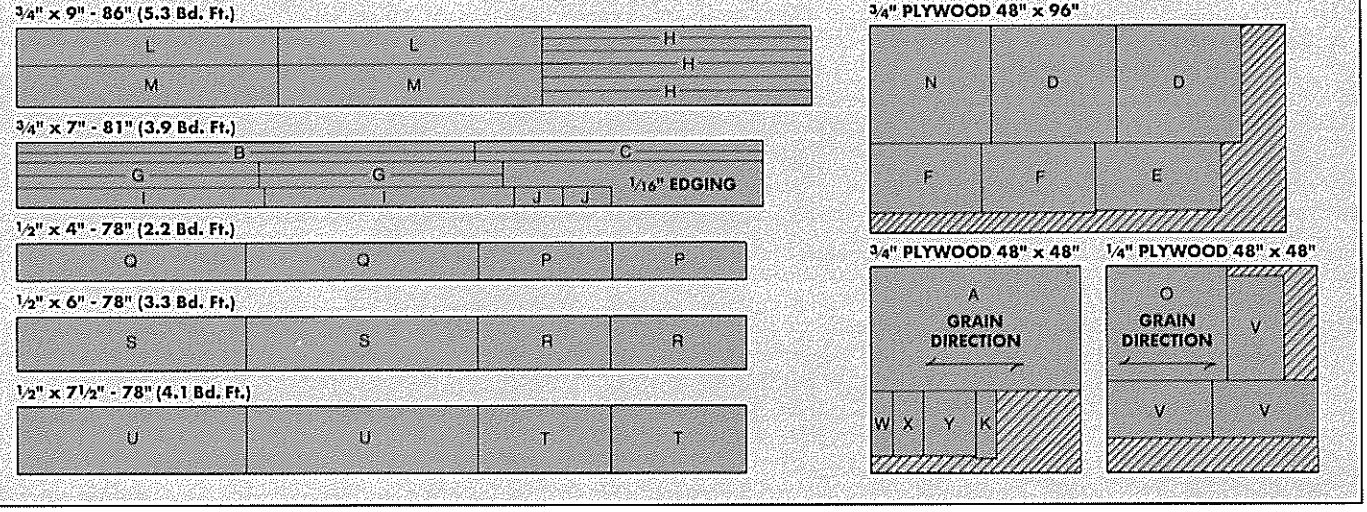
HARDWARE AND FINISH

- Hardware: see project kit, page 24
- Stain: Minwax golden oak
- Varnish: Satin polyurethane

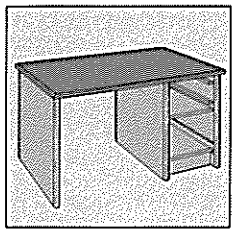
EXPLODED VIEW



CUTTING DIAGRAM



TOP



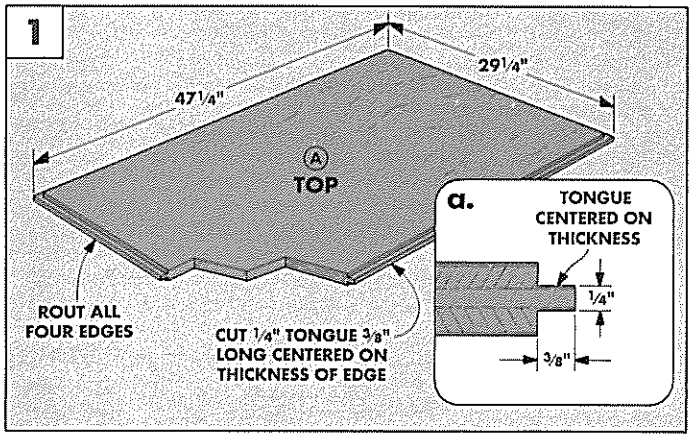
I began work on the desk by making the **top (A)** from a piece of ¾" plywood. Start by cutting a panel 29¼" wide by 47¼" long, see Fig. 1.

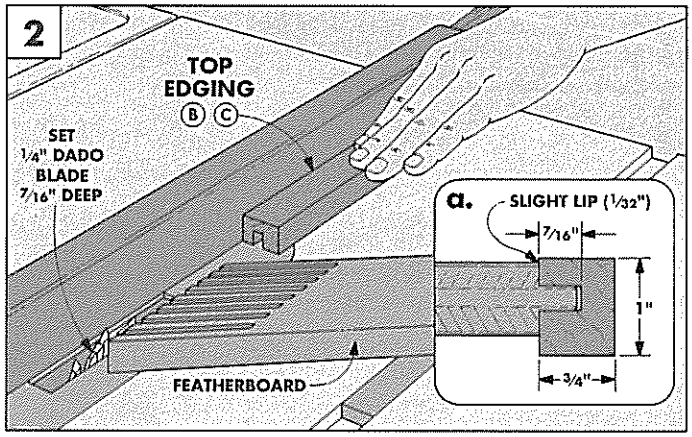
TONGUES. After the plywood is cut to size, you can cut tongues centered on all four edges for the edging strips. To make the tongues, I used a straight bit with an edge guide on the router to cut uniform rabbets on both faces of the plywood. Sneak up on the final depth of cut until the thickness of the tongue matches the width of a ¼" "test groove" that you've cut in a piece of scrap. (For more information on edging plywood, see page 20.)

Procedural Note: Once the router is set to the correct depth to cut the tongues on the top, I didn't want to stop. I kept on going and cut the other five pieces that have tongues to size: the **drawer case sides (D)** and the **drawer dividers (F)** (see page 17), as well as the **left leg (N)** (see page 18). Then I cut the tongues on these pieces before proceeding any farther.

EDGING. After cutting all the tongues, I cut the **edging strips (B,C)** for the top from ¾" stock to a uniform width of 1". Then cut two front and back edging strips (B) and the two side strips (C) to rough length (2" longer than needed).

Next, cut a groove on all four edging strips to fit the tongues on the plywood. I cut the groove with a dado blade on the table saw, and used a featherboard to hold the strip against the fence, see Fig. 2. This groove is cut ¼" wide to fit the tongue, but 1/16" deeper than the length of the tongue to allow a glue relief. Also, the groove is positioned so the edging sticks just a hair (1/32") above the face of the plywood when it's glued in place, see Fig. 2a. (This lip is trimmed flush later.)





APPLY EDGING

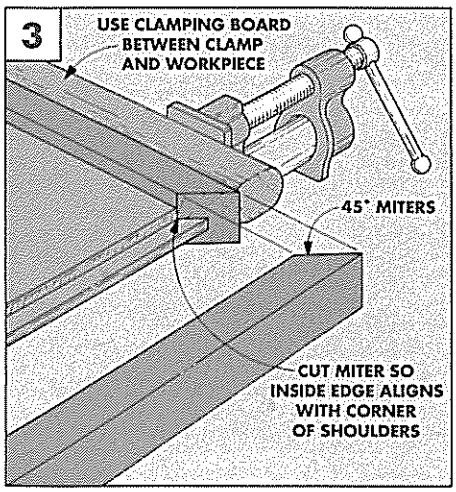
After cutting the grooves, the next step is to miter the **edging strips (B,C)** to length to fit around the **top (A)**.

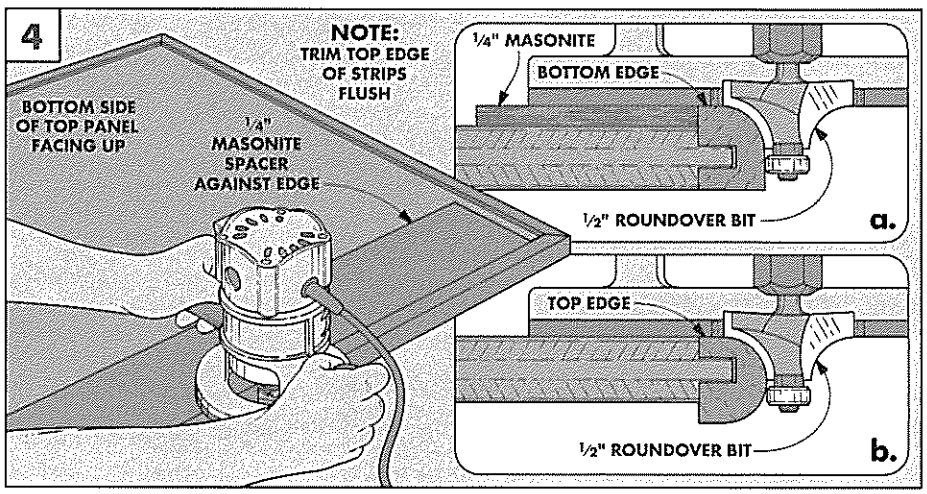
MITER TO LENGTH. The procedure I used was to miter one piece of edging to length, and then glue it in place before measuring and cutting the adjacent side (and on around the top). Begin by mitering the edging strips 1" longer than each side of the top panel. Now, sneak up on the final length until the short points of the miters align with the shoulders of the tongues, see Fig. 3.

GLUE ON STRIPS. After a strip is cut to length, glue it to the tongue on the edge of the plywood. I used a clamping board (with rounded edges) against the edging to help apply uniform pressure, see Fig. 3. To protect the tongue on the opposite side from getting damaged by the clamps, I also cut some scrap blocks with ¼" grooves in them.

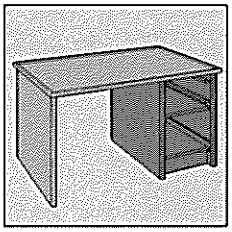
When all four strips are glued in place, the top edge of the strips should be slightly higher than the face of the plywood. To trim it flush, I used a flush trim jig, see page 22.

ROUND OVER EDGES. To complete the top, I rounded over the top and bottom edges with a ½" round-over bit, see Fig. 4. To keep the router from tipping while routing the bottom edge, I placed a piece of ¼" Masonite near the lip of the edging, see Fig. 4a.





DRAWER CASE



After the top is done, I built the case that holds the drawers. To make this case, start by cutting two **case sides (D)** and a **case back (E)** to finished size, see Fig. 5.

Next, cut two **drawer dividers (F)** to width so they're ¾" wider than the back (E). (This allows for the ⅜"-long tongues to fit into the case sides.) Then cut the dividers to rough length to equal the width of the sides. Before routing the tongues on these dividers, add a 1/16"-thick edging strip to the front edge of each divider.

MAKE TONGUES. The next step is to cut tongues on the front and back edges of the case sides (D) and the sides of the dividers (F). (The tongue on the *back* of the dividers is cut later.) Use the same procedure as on the top to rout the tongues, see Fig. 5.

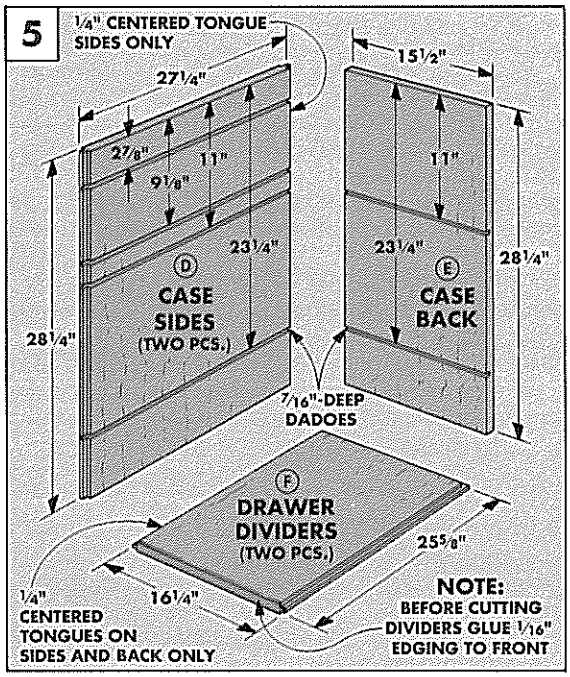
DADOES. The dividers are mounted to the sides by routing dadoes to accept the tongues. These dadoes are positioned 11" and 23¼" from the top edge, see Fig. 5.

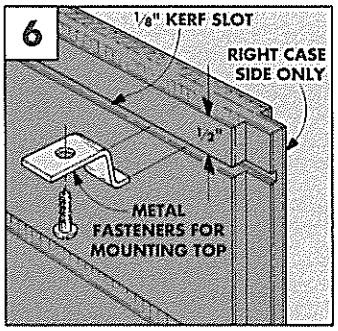
Next, I cut another set of dadoes in the sides for the wooden runners (G) that guide the top two drawers. (The bottom drawer uses metal slides.) Cut these two dadoes across the inside face of the case sides 2⅞" and 9⅛" from the top, see Fig. 5.

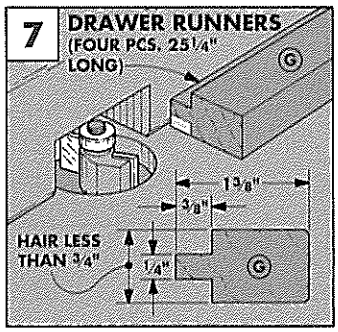
There's one more dado (really, a ⅛"-wide kerf) to cut for the metal top fasteners. It's on the inside of the *right* case side, see Fig. 6.

EDGING. Next, rip 1"-wide **edging strips (H)** for the case sides, see Fig. 8. Then glue the strips to the front and back edges of the case sides (D), and round their edges using the same procedure as on the top (A).

RUNNERS. The top two drawers are supported by four wooden **runners (G)**. These runners are cut 1⅜" wide and just a hair less than ¾" thick (to slide easily in a ¾" groove), see Fig. 7. Rout a tongue on each runner to fit in the dadoes in the case sides.







To determine the length of the runners, first place a scrap of ¾" plywood in front of the back edging strip, see Fig. 8. (This allows for the thickness of the case back.) Then cut the runner to length so the back end butts against the scrap, and the front end is recessed ½" from the front edging strip.

Now you can glue the runners (G) into the top two ¼" dadoes of each case side, leaving room for the case back (E), see Fig. 8.

CUT DIVIDERS TO LENGTH. After the runners are glued in, cut the dividers (F) to final length. Trim off the back end of the dividers so the front end aligns with the front end of the wooden runners (G). Be sure to allow enough length for a ⅜"-long tongue on the back edge. Then rout the tongues on the back edge to fit the dadoes in the case back (E).

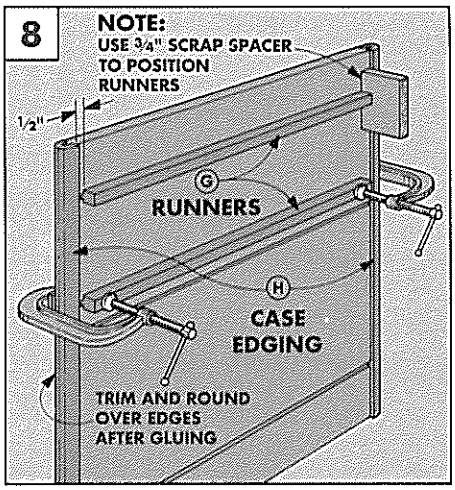
ASSEMBLY. After the dividers are cut, the case can be assembled, see Fig. 9. Begin by placing the case back (E) between the runners and the back edging. (Be sure the side with the ⅛" kerf is on the *right* side.)

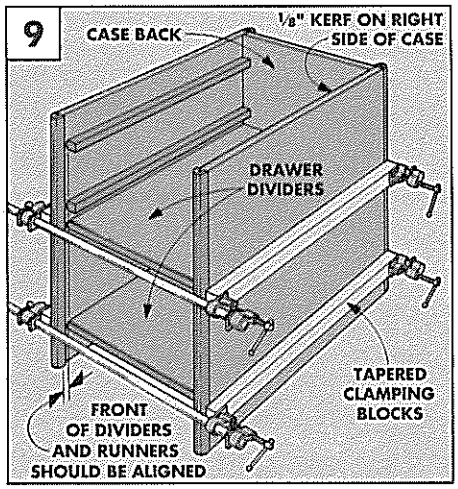
Now apply glue in the bottom two dadoes in each case side and in the case back, and fit the dividers (F) into the dadoes. Make sure the front end of the dividers are aligned with the front end of the wooden runners.

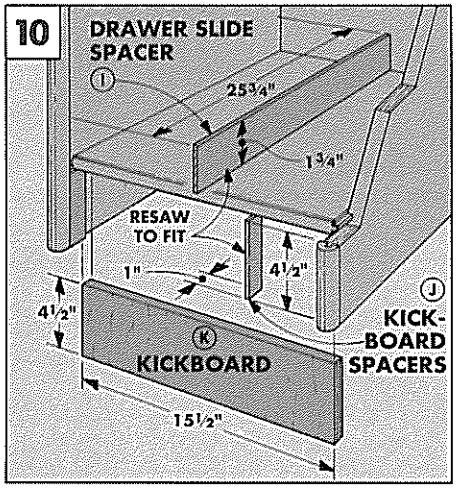
Once everything is in place, clamp the case together. To make sure clamping pressure is applied in the middle of the joint, I used tapered clamping blocks, see page 7.

SPACERS. After the glue was dry, I added spacers to both case sides, see Fig. 10. Two **drawer slide spacers (I)** are added above the bottom divider to mount the metal slide.

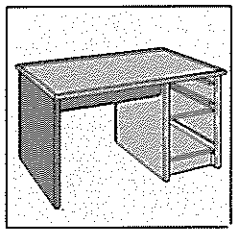
Then, glue two small **kickboard spacers (J)** below the bottom divider to fill in front of the kickboard (K). Finally, cut a **kickboard (K)**, and glue it behind these spacers.







APRON FRAME AND LEG



After the drawer case is built, you can begin work on the left leg and the frame that connects this leg to the case.

CUT PIECES. Begin building the apron frame by cutting two **aprons (L)** and two **apron connectors (M)** to width and length, see Fig. 11.

JOINERY. The frame pieces are joined with dado and rabbet joints, see Detail in Fig. 11. Note that the dado is located so the pieces won't be quite flush on the outside. This is intentional. When you screw the connectors to the legs, the ends of the aprons will be pulled up tight against the legs.

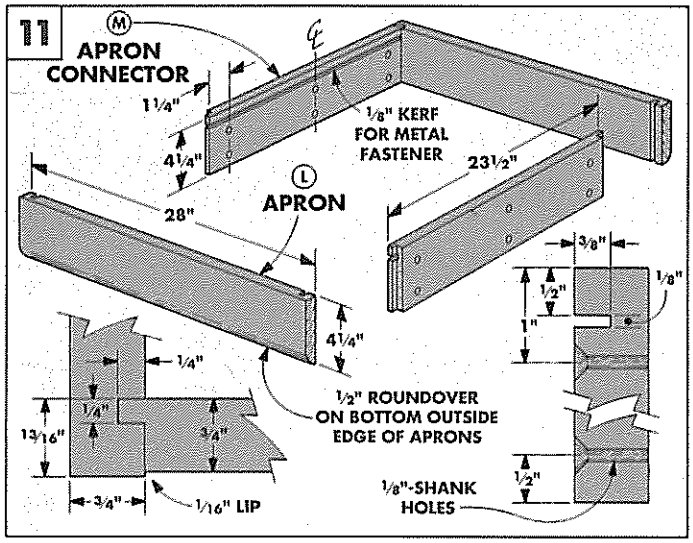
MORE STEPS. There are a few more steps before assembling the frame. First, round over the *bottom* edge of the aprons (L). Then, cut ⅛" kerfs for the metal top fasteners in each connector (M). Also, drill holes in each connector to fasten them to the legs. The frame can now be glued together.

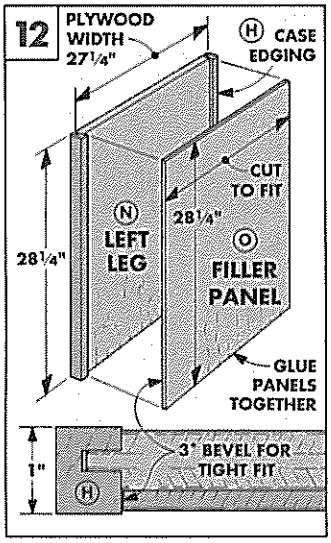
LEFT LEG. The **left leg (N)** is made by laminating ¼" and ¾" plywood panels together. Begin by cutting the leg (N) to the same size as the case sides (D), see Fig. 12. Then make tongues on the edges and add **edging (H)**.

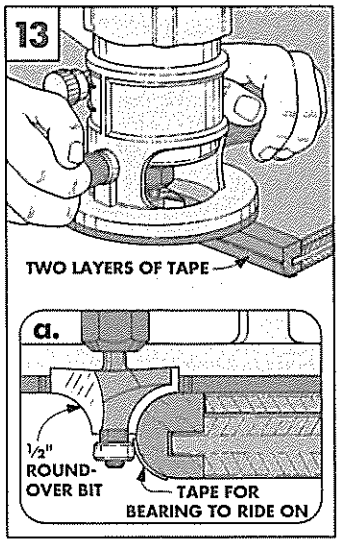
Next, cut a ¼" **filler panel (O)** to fit between the edging on the inside of the leg, see Fig. 12. I slightly beveled (3°) the edges of the panel to get a tight fit. After gluing the panel in place, trim both edges of the edging flush with both plywood faces.

ROUND OVER EDGING. To complete the left leg, round over the edging strips, see Fig. 13. However, there's a little problem when rounding over the second edge.

Since ¼" hardwood plywood is usually less than ¼" thick, the leg and filler panel combined are less than 1" thick. When rounding over the second edge, the bearing on the bit runs below the centerpoint and creates a ridge. To prevent this, I stuck two layers of tape just below the center of the edging for the bearing to ride on, see Fig. 13a.







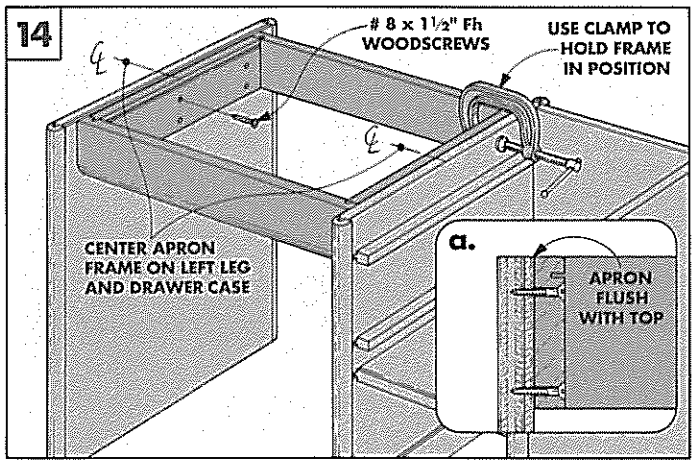
ASSEMBLY

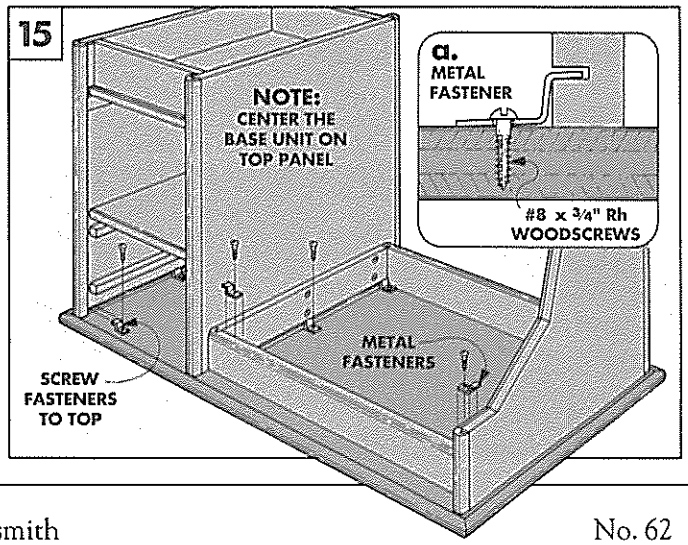
Now that all of the main parts are complete, the desk can be assembled.

FRAME TO LEG. Start by laying the left leg down flat and center the apron frame on the leg. Check that the top edges are flush and then screw the pieces together, see Fig. 14a.

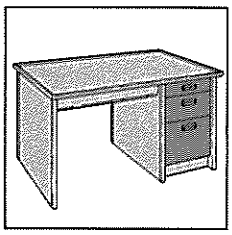
FRAME TO DRAWER CASE. To screw the right side of the frame to the drawer case, stand the pieces up in their finished position, see Fig. 14. Center the apron frame on the drawer case with the top edges flush, and then clamp the parts together to hold them while driving the screws.

ADD TOP. To attach the top, turn it upside down and center the base on it, see Fig. 15. Now, slip three metal table top fasteners into each kerf in the apron frame and right leg of the case, and screw them to the top.





DRAWERS



The drawers are made by using ½" stock for all four sides, and then adding "false" fronts made from ¾" plywood, see Fig. 16.

CUT DRAWERS. Since I wanted to use a router and template to cut dovetail joints to join the four drawer pieces, I sized the height of the drawers to produce an even half pin at the top and bottom of each drawer side. (For more on dovetail joints, see *Woodsmith* No. 58.) This meant the top drawer parts are all 3½" wide, the middle drawer 5¼" wide, and the bottom drawer 7" wide, see Fig. 16.

Next, cut all of the **drawer sides (Q,S,U)** 24" long. Then to determine the length of the **fronts** and **backs (P,R,T)**, measure the distance between the runners and add ½". (This allows for the ¼"-deep grooves that the runners will fit into, see Fig. 17.)

JOINERY. Next, I cut the ½" dovetail joints at each corner. I also cut a groove for a ¼" plywood bottom in each piece (see Fig. 18), and cut the **drawer bottoms (V)** to fit.

Before assembling the drawers, drill four holes in each drawer front to attach the false fronts. (Refer to Shop Notes, page 13.)

RUNNER GROOVE. Before attaching the false fronts, rout a ¾"-wide runner groove on the sides of the top and middle drawers, see Fig. 19.

Now place the top two drawers in the case to check the fit. You may have to slightly plane the runners to get the drawers to slide smoothly. Also mount the bottom file drawer according to the instructions that come with the full-extension metal slide.

FALSE FRONTS. It's best if the false fronts are cut from one piece of plywood so the grain flows from top to bottom, see Fig. 17.

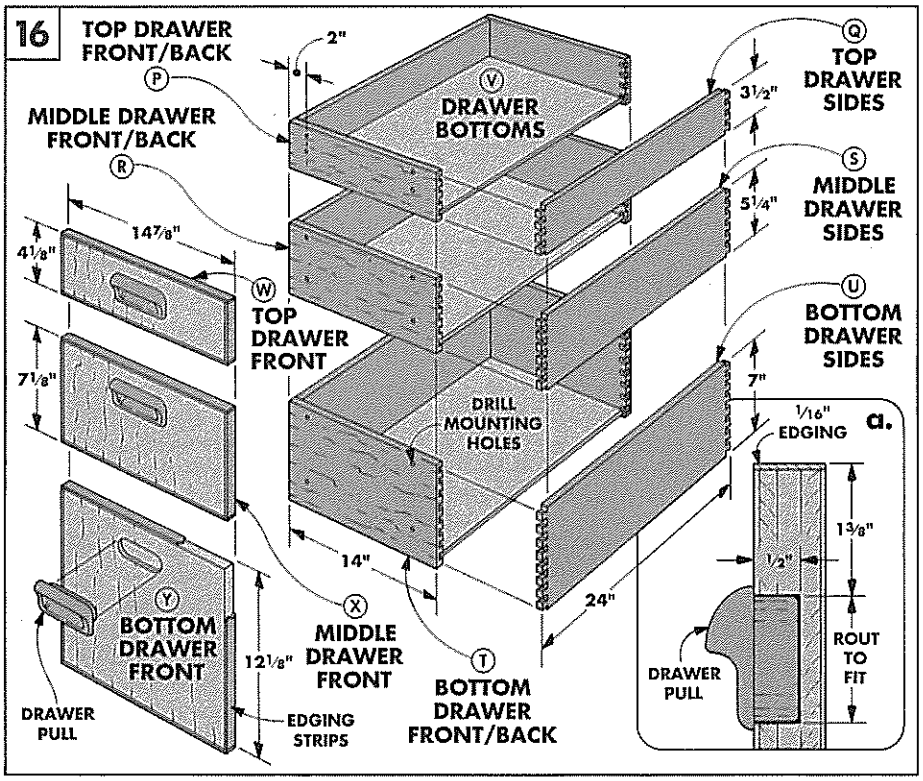
All three fronts are cut to *width* to allow a 1/16" space and a 1/16"-thick edging strip on each side (which means they're ¼" narrower than the drawer opening).

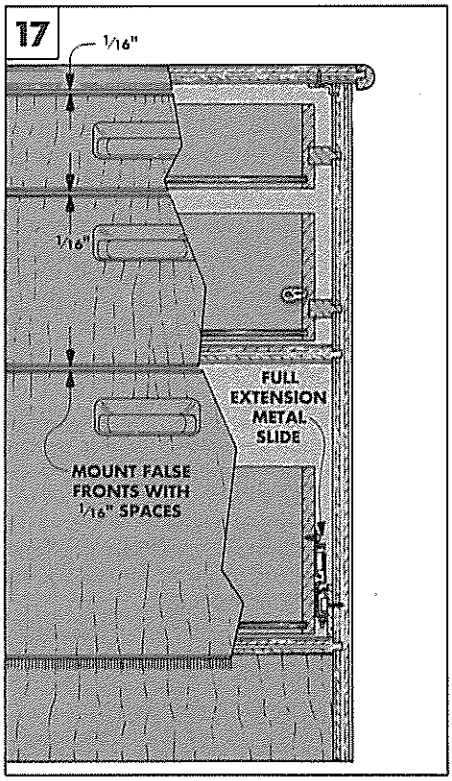
The height of each false front is less critical since they "float" in the vertical space. I cut the **drawer fronts** to heights of 4" **(top, W)**, 7" **(middle, X)**, and 12" **(bottom, Y)**.

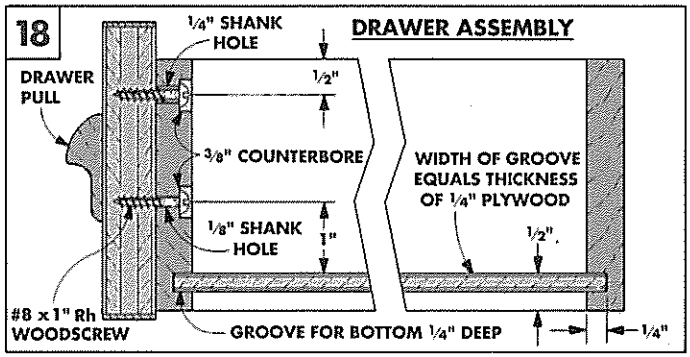
EDGING AND PULLS. Next, all four sides of each false front are edged with 1/16"-thick edging (see page 13). Then I routed recesses and mounted the drawer pulls (see page12).

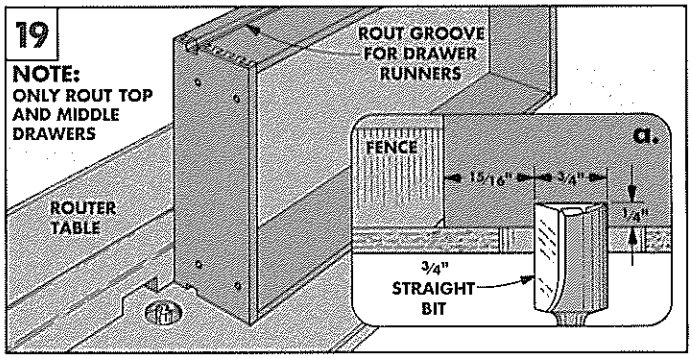
MOUNT FALSE FRONTS. To mount the false fronts, insert the drawers into the case. Then I used the technique described in Shop Notes on page 13 to mount the fronts.

FINISH AND FILE HARDWARE. Once the fronts were mounted, I stained and finished the desk. Finally, I added a metal rack in the bottom drawer for hanging file folders.









Edging Plywood

Unfortunately, the beauty of plywood is only skin deep. It's nice to work with plywood when a project calls for large pieces, but some way you have to cover the edges to hide the plies.

Covering the edges is usually thought of as just a cosmetic coverup. But besides hiding the ply layers, there's another good reason for adding edging to plywood.

APPEARANCE. On the Wall Unit and the Study Desk shown in this issue, all of the main pieces are cut from plywood. This makes construction easier, but it creates a problem from a design standpoint.

The problem is that the main pieces look too thin if edging isn't added. For example, on the Wall Unit the sides are over 6 feet high, yet only ¾" thick — a little out of proportion. On the Study Desk, the top really ought to look a little thicker than ¾".

The solution is to add solid-wood edging strips to the plywood. By adding a 1"-wide strip to the plywood, the piece looks thicker and more in proportion. (It also allows you to round over the edges.)

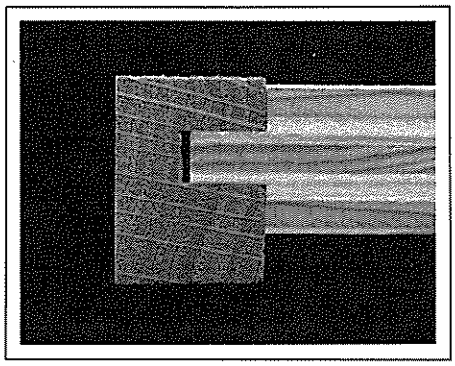
TONGUE AND GROOVE

When I want to apply solid-wood edging strips to plywood, I use a tongue and groove joint. But why not just glue the strips right on the edge?

Granted, you can simply glue on edging strips with just a simple butt joint. But that may not actually be the easiest method. The problem has to do with alignment.

On the Wall Unit for example, I wanted to add 1"-wide edging strips to the plywood sides. I could have just cut the strips and glued them on with a simple butt joint.

ALIGNMENT. It sounds easy, but when you actually start dealing with strips that are over 6 feet long, and try to get the edge of the strip aligned with the face of the plywood, it can lead to headaches. As the clamps are tightened, the edging will tend to slip on the glue. The pressure applied with each clamp



can actually push the edging out of alignment — in different directions.

If the edging slips down below the face of the plywood, you'll see the exposed edge. To prevent this, I try to align the edging just slightly (1/32") *above* the face of the plywood, see photo above.

This little lip ensures the edging strip covers the edge of the plywood completely, even if there are variations in the thickness of the plywood. Also, by creating this lip, you don't have to try to get the edging to fit exactly flush with the face of the plywood. After the edging is glued on, you can come back and trim off the lip so it's perfectly flush.

Trimming off this lip is easier than it sounds. On small pieces, I use a hand plane or scraper to trim off the lip. If I'm working with large pieces (with a lot of edging), I use a router with a flush trim bit. (We're showing a flush trim jig to help with this trimming process on page 22.)

TONGUE OR GROOVE FIRST?

The easiest way to align the edging to get this 1/32" lip is to use a tongue and groove joint. That is, cut a tongue on the edge of the plywood, and cut a groove down the edging strip to fit over the tongue. But which do you cut first, the tongue or the groove?

PROBLEMS. Most of the fitting problems stem from cutting the groove, because you have to be concerned about both the *width* of the groove and the *position* of the groove.

The groove has to be the right *width* to fit the tongue. *And*, it has to be *positioned* on the edging strip so the strip sticks up to form the 1/32" lip above the surface of the plywood.

So, go ahead and cut the grooves in all the edging strips first, right? Well, you could do that, but once the grooves are cut, you're committed to the *position* of the groove. That is, you won't know if it's in the right position to create that little 1/32" lip until after the tongue is cut.

So, cut the tongues first? Well, if you cut the tongues first, and then cut the grooves later with a dado blade, you have to make sure the tongue fits the exact width of the dado cut — but the groove isn't cut yet, so you can't check it.

It's a problem either way. So what I do is cut both of them first. That is, I cut the actual tongue on the plywood first. *But*, I also set up the dado blade and cut a groove in a test piece to test the fit of the tongue.

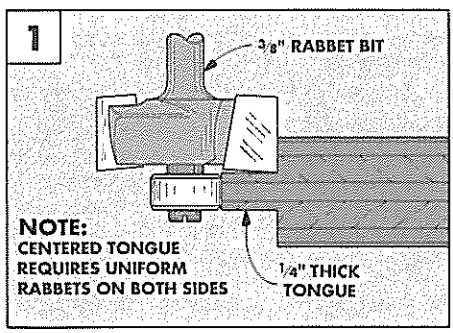
CUTTING THE TONGUE

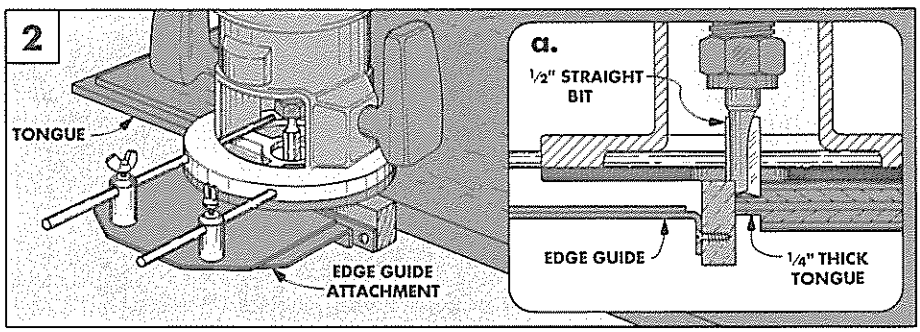
Although the tongue can be cut on a table saw, I think you get the best results with a router. Router bits don't splinter the plywood as saw blades sometimes do.

If I'm working with small pieces, I use a router table, sliding the workpiece against the fence. With large pieces (as on the two projects in this issue), I use a hand-held router. It's a whole lot easier to handle a router on a large piece of plywood rather than having to man-handle the sheet on a router table or on a table saw.

ROUT RABBETS. To make a tongue, just rout a rabbet on each face of the plywood. Since you're working from both faces with an identical setting on the router, the resulting tongue will be perfectly centered on the thickness of the plywood. That's exactly what you want.

ROUTER BIT. Okay, let's back up a minute.





Since you're going to be routing rabbets, there are two ways to go about it: use a rabbet bit with a ball-bearing pilot, or, use a straight bit with an edge guide attachment on the router.

RABBET BIT. The rabbet bit (see Fig. 1) is the quickest to set up, but may not give the best results. Often the pilot hits a little void in the core plies or runs over a little splinter on the edge. If that happens, the shoulder of the rabbet gets a little bump in it.

EDGE GUIDE. Although it takes longer to set up, I like to use an edge guide on the router with a straight bit, see Fig. 2. (For a 3/8"-wide rabbet, I use a 1/2" straight bit so I'm sure to clear away all the waste in one pass.)

The edge guide smoothes over any bumps or dips in the plywood edge and tends to give better results for the shoulder. (Most routers have some sort of edge guide accessory that attaches to the base of the router so you can cut rabbets or make profiles on the edge of a board.)

Also, since standard rabbeting bits only cut 3/8"-wide rabbets, you can use an edge guide if you only want a 1/4"-wide rabbet.

SET UP ROUTER. To make the tongue on the edge of the plywood, set up the edge guide to rout a 3/8"-wide rabbet. Then the depth has to be set. This is when you need the test piece with the groove in it.

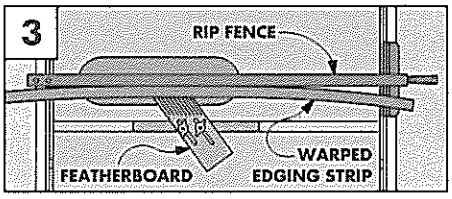
Use a dado blade on the table saw to cut a groove in a piece of scrap. Then set the depth of cut on the router and rout rabbets on both faces of a piece of scrap plywood. (Make sure the scrap is from the same sheet as the "real" pieces.)

Gradually adjust the depth of cut, always making cuts on *both* faces until the resulting tongue fits the groove in the test piece. When the tongue fits the groove, rout rabbets on both faces of all the "real" pieces.

As each tongue is completed, use the test piece to check the fit in the groove. Run the test piece down the length of the tongue to see if there's a tight area. If you hit a thick spot, run the router back over that area, or clean it up with a chisel.

CUTTING THE GROOVE

After the tongue is formed on the edges of the plywood, I cut the edging strips to width and to rough length (about 2" longer than needed). Then I set up the table saw to cut the groove in the edging. There are three things to consider here.



First, the width of the groove must match the thickness of the tongue you've just cut. That's taken care of with the test groove.

Second, the depth of the groove should be a little (1/16") deeper than the length of the tongue. This allows the shoulders of the tongue to "bottom out" against the edging strip before the end of the tongue hits the bottom of the groove.

Finally, the groove has to be located so the face of the edging sticks up about 1/32" above the face of the plywood.

POSITION GROOVE. To get the groove in that position, it's basically a matter of sneaking up on the cut. To get close, measure the size of the shoulder above the tongue. Then set the fence that distance from the blade, plus 1/32".

Now make a test cut, cutting a groove in a piece of scrap first. Then hold the groove on the tongue on the edge of the plywood. You should be able to feel the slight lip on the top edge. Slide it along all the tongues to make sure you feel the lip everywhere. If you don't, move the fence *away* from the blade just a hair more and cut another test groove.

The idea is to feel a lip. (The 1/32" is just an approximate measurement, but it shouldn't be much more than 1/16".) When the groove in the test piece checks out, you can work on the real edging strips.

WARPED PIECES. As you start, look for any warp in the edging strips. It makes things a little more difficult if a strip is warped, but it will still work because the tongue and groove joint will force the strip into position.

If a strip is warped, face the bowed edge toward the rip fence, see Fig. 3. Then use a featherboard to force the strip against the fence as the groove is cut.

TEST FIT. As each groove is cut in each edging strip, test its fit on the plywood edge. If it's too tight, don't change the fence until grooves are cut in all the pieces.

For any strips with grooves that are too tight, move the fence *away* from the blade slightly, and make another pass. This widens the groove, but keeps the same 1/32" lip on the top edge of the strip.

After the grooves are cut, the edging strips can be glued and clamped to the edge of the plywood, see Box below.

HOW TO CLAMP EDGING TO PLYWOOD

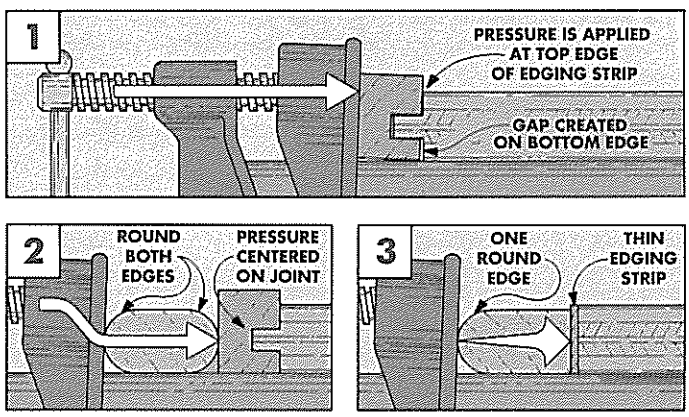
The problem with most pipe clamps (and bar clamps) is that they apply pressure too high up. The pressure is applied in line with the screw on the clamp head, which on most pipe clamps is centered about 5/8" to 3/4" above the surface of the pipe.

This can be a problem when you're gluing 1"-wide edging to 3/4"-thick plywood, or even in the usual practice of edge-gluing 3/4"-thick stock together.

If I'm gluing an edging strip to plywood, I lay the clamps on a flat surface and push the workpieces down against the pipes. However, as the clamps are tightened, the clamping pressure will be applied at the top edge of the edging strip, see Fig. 1. This causes the edging strip to twist so the bottom edge pulls away from the plywood.

ROUND EDGES. One solution is to make a clamping board with *rounded edges*. The round edges redistribute the force of the clamp so it's centered on the thickness of the clamping board, see Fig. 2.

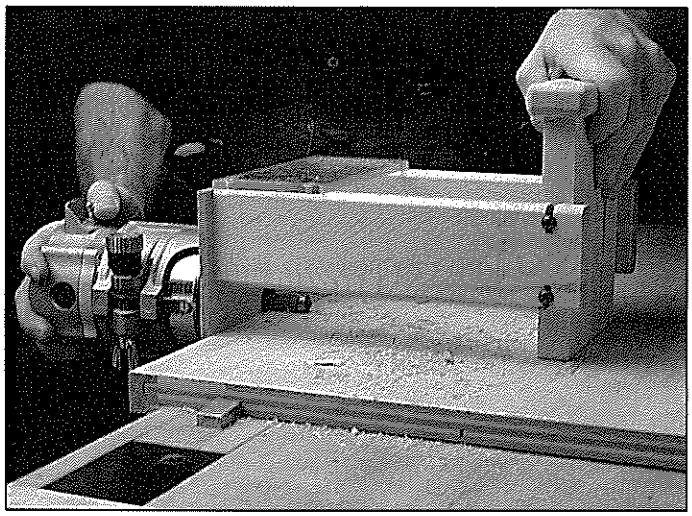
To clamp edging to 3/4" plywood, I rip a clamping board out of 3/4"-thick stock and round over all four edges with a 3/8" roundover bit. The round edge will transfer the pressure to the centerpoint of the radius 3/8" above the pipe — exactly the center of the 3/4" plywood.



THIN STRIPS. When gluing on thin strips (such as the 1/16"-thick strips on the doors of the Wall Unit), I make a slight alteration. These strips are so thin that if all the pressure is at the center, the top and bottom edges may actually curl out and won't get enough pressure.

So, I make the clamping board with only one round edge which is placed against the clamp head. It still distributes the clamping pressure evenly to the other (flat) edge that's against the thin strip.

Flush Trimming



Whenever you use wooden edging strips on plywood (or plastic laminate), you have the problem of how to trim the edging down so it's flush with the surface of the plywood. Using a router with a flush trim bit is probably the easiest method. But, there can be a problem. It's difficult to balance the base of the router on the narrow edging strip without having it tip and creating an angled cut.

To prevent this, we designed a flush trim jig. It's actually an "outrigger" that's attached to the bottom of the router.

NEW BASE. To make the jig, begin by making a **base plate (A)** from ¼" Masonite. First, cut the base plate 7" x 7", see Fig. 1. Then use your router's plastic base plate as a template to lay out the bit hole and the screw holes.

Now drill the holes, counterboring the screw holes to keep the screws below the surface of the plate, see Fig. 2.

SUPPORT RAILS. After making the base plate, I cut two **support rails (B)** to size from ¾" stock, see Fig. 3. Also, there are two ⅛" kerfs ¾" from the end of these rails. These kerfs are used to mount the end support (C) and permit alignment of the bit.

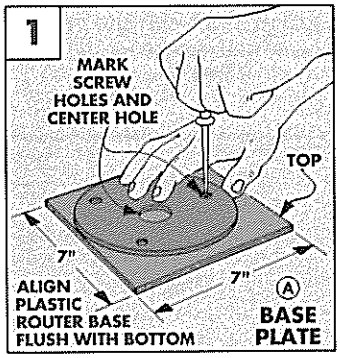
Now, screw the support rails to the base plate, see Fig. 3. Then screw the base plate to the router using the original router screws, see Fig. 4. To keep the chips from flying in my face, I added a plastic chip shield, see Fig. 4.

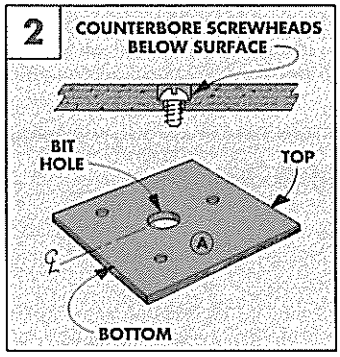
END SUPPORT. The last piece to make is the **end support (C)**. This controls the angle of the bit and acts as a handle. Cut the end support to fit between the support rails, see Fig. 5. Then glue a 1¼"-wide grip on the top edge.

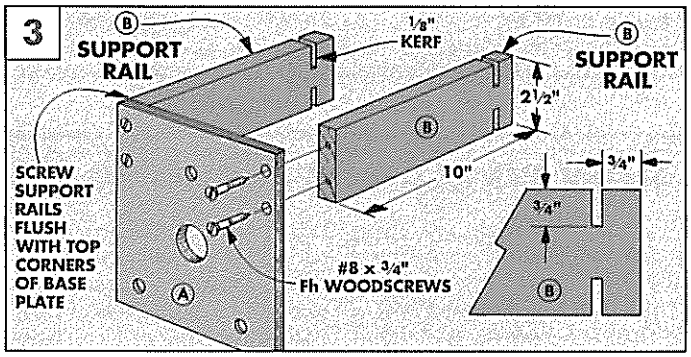
SET UP JIG. To set up the jig for routing, mount a flush trim bit in the router. Then hold a square along the cutting edge of the bit and align the bottom edge of the end support (C), see Fig. 5. When the end support is aligned, tighten panhead screws into the kerfs.

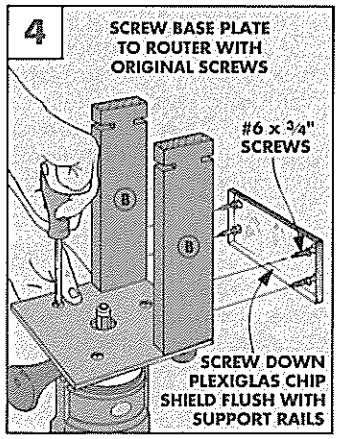
USING THE JIG. To use the jig, adjust the bit depth so the cutting edge is only on the edging. Then place the jig on the workpiece so it rides on the bit's pilot and the end support.

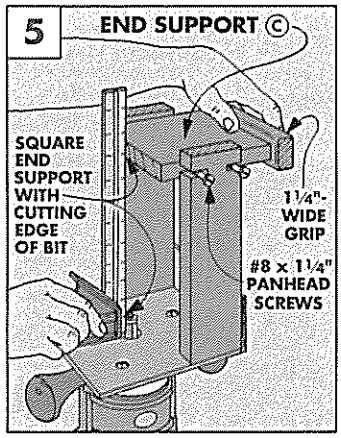
Now turn on the router and pull it toward you, concentrating on keeping pressure down on the *handle*, not on the router. If the bit is cutting at an angle, raise or lower the end support, see Figs. 6a and 6b.

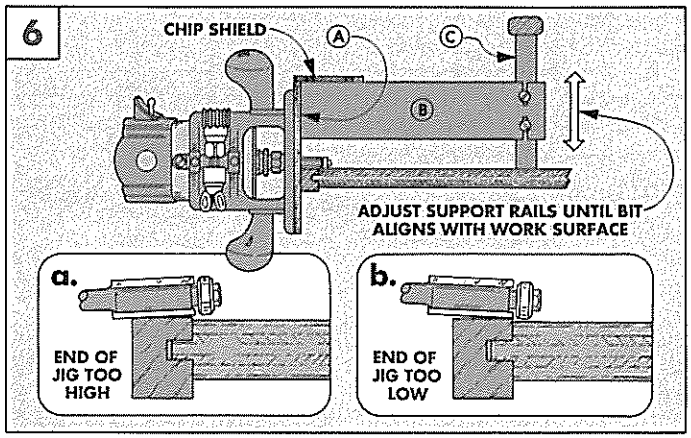




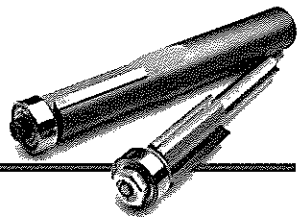








Talking Shop



FLUSH TRIM BITS

■ Flush trim bits are most commonly used to trim plastic laminate or veneer. They can also be used to follow a pattern when you're trying to reproduce an exact duplicate of a shape. And, for the projects in this issue, we used flush trim bits to trim wooden edging strips flush with the face of the plywood.

Flush trim bits have either two or three cutting edges and a ball bearing on the end of the bit that runs against the work surface. Theoretically, if it's a flush trim bit, the cutting edges should align *perfectly* with the ball bearing. But that's not usually true.

We checked with the Amana Tool Company and found out it's a common practice to make the bits so the cutting edge is set back very slightly from the bearing. (Amana sets the cutting edge back .007".) They make it this way so there isn't any way that the cutting edge will strike the surface that the bearing is riding on.

Note: Flush trim bits usually shouldn't be resharpened. Sharpening only increases the set back between the size of the bearing and the cutting edge.

PROBLEMS. For the most part, flush trim bits are easy to use. But there can be a few problems. The first is when you're running the router base along a narrow edge. The bit can tip at an angle to the edge. I solved this with the jig shown on the opposite page.

BALL BEARING CONCERNS. The other problems have to do with the ball bearing and its location. Theoretically, you should be able to set the bearing so it runs right beyond the joint line between the edging and the plywood or laminate. But I usually set the depth of the bit so the bearing is about 1/16" beyond the joint line. Then, if the router base should rock slightly off the surface while routing, I won't miss trimming any areas.

There's another reason for setting the bit beyond the joint line. Sometimes a little glue squeezes out right around the joint line. I don't like to scrape off the glue — it's too easy to lift up wood fibers while scraping. Instead, I let the flush trim bit clean up the glue as it's trimming the wood. Since the bearing has to run on a smooth surface, I set it *beyond* any squeeze-out.

ANOTHER PROBLEM. Why does the area that the bearing has run over have a long scratch line or look burnished? Before you use a flush trim bit, check that there aren't any burrs or dirt on the ball bearing, and that the bearing spins freely. Burrs can leave a scratch in the work.

Also, don't press the bearing hard against the work surface (especially across the grain). This can crush the fibers and burnish the surface — and you may not see the burnished area until after the finish is applied.

DOVETAIL JIG FOLLOW-UP

■ *I made the dovetail jig that was in* Woodsmith *No. 58 and am very pleased with the results. An additional feature that would be worthwhile is a 1/4" template for jewelry boxes and small drawers.*

Doug Breed
Plymouth, Michigan

We've received a number of letters about the dovetail jig that was in No. 58. Many of the readers wanted to know if you can make 1/4" dovetails or through dovetails with this type of jig.

LIMITATIONS. The jig is designed to make half-blind dovetails joints, basically for drawers. It can not make through dovetails. These are usually cut by hand. (However, there are a few router jigs, such as the Leigh jig, or templates, such as the Keller system, that make through dovetails with a router.)

1/4" DOVETAILS. As for smaller half-blind dovetails, I did make a template for routing dovetails with a 1/4" dovetail bit. It works great for small boxes and drawers. To make 1/4" dovetails, you will need a 1/4" dovetail bit and a 5/16" guide bushing, as well as a different template.

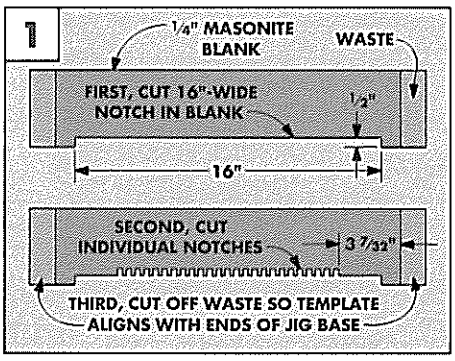
TEMPLATE. You can make the template out of Masonite (as we described for the 1/2" template in *Woodsmith* No. 58) or you can buy a 1/4" plastic template. (See Sources, page 24.)

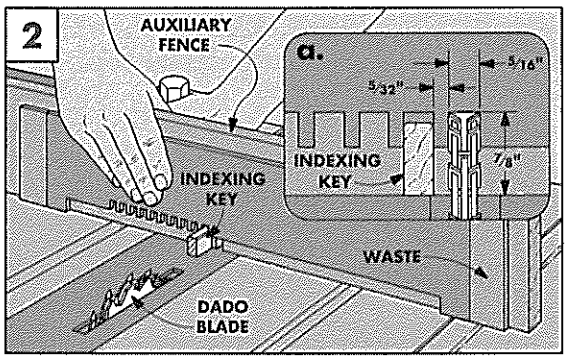
MAKING THE TEMPLATE. To make your own 1/4" template, start with the same Masonite blank as the 1/2" template, but you have to cut different size notches. If you want to use the same stop nut setting on the front of the jig, the notches have to be set back 1/2" from the front edge of the blank. (Setting them back 1/2" gets you close. You may have to shim out slightly with washers to get it exact.) To set the notches back 1/2", cut a wide notch in the front edge of the blank, see Fig. 1.

Then, to cut the individual notches, I used an indexing system on the table saw, see Fig. 2. First, mount a 5/16"-wide dado blade in the saw and raise it 7/8" above the saw table.

Then put a 5/16"-thick indexing key in the auxiliary fence and set the key 5/32" from the blade, see Fig. 2a. (This will cut 5/16" notches with 5/32" pins between the notches.)

The actual procedure for routing 1/4" dovetails is exactly the same as for 1/2" dovetails. Since the individual 1/4" dovetail pins aren't very thick or strong, I've found them best to use only if both pieces to be joined are 1/2" thick or less.





Sources

STUDY DESK

The wooden pulls, the extension drawer slides, the top fasteners, and the file folder package used on the desk are all available from *Woodsmith Project Supplies.*

Similar hardware may also be found from the suppliers listed below.

Desk Hardware

762-100.....$47.95
- (3) Recessed Red Oak Pulls
- (1) Pair Accuride Drawer Slides
- (9) Table Top Fasteners
- (1) File Folder Package (Includes one file frame and 12 hanging files.)

If you wish to order the desk hardware package *without* the file frame and hanging files, use the following order number:

762-200.....$37.95

The Accuride drawer slides can also be purchased separately. These full extension slides are 24" long and load rated to 110 lbs. The quality of these slides is exceptional.

Accuride Drawer Slides

762-120.....$27.95 pr.

DISPLAY WALL UNIT

All of the hardware that we used on the Wall Unit is available from *Woodsmith Project Supplies.* This hardware or similar hardware is also available from the sources listed below.

Wall Unit Hardware

762-300.....$19.95
- (2) Pair of Pivot Hinges
- (1) Double Plate Magnetic Catch
- (2) Adjustable Levelers
- (12) Brass Shelf Supports
- (2) Recessed Red Oak Pulls

ROUTER BITS

We used a number of different router bits while building all of the projects in this issue. All of these bits are now available from *Woodsmith Project Supplies.* These bits are high-quality, carbide-tipped bits, and are available in ½" and ¼" shanks. (We recommend the ½" shank bits, if they will fit your router.)

Router Bits

1514-885 Flush Trim Bit (¼" Shank).....$15.95
1512-887 Flush Trim Bit (½" Shank).....$17.95
1514-625 ¼" Straight Bit (¼" Shank).....$10.95
1512-665 ¼" Straight Bit (½" Shank).....$12.95
1514-643 ½" Straight Bit (¼" Shank).....$13.95
1512-676 ½" Straight Bit (½" Shank).....$14.95
1514-683 ¾" Straight Bit (¼" Shank).....$14.95
1512-685 ¾" Straight Bit (½" Shank).....$16.95
1514-814 ¼" Round-Over Bit (¼" Shank).....$23.95
1512-823 ¼" Round-Over Bit (½" Shank).....$24.95
1514-819 ½" Round-Over Bit (¼" Shank).....$26.95
1512-828 ½" Round-Over Bit (½" Shank).....$28.95
1514-400 ⅜" Rabbet Bit (¼" Shank).....$24.95
1512-400 ⅜" Rabbet Bit (½" Shank).....$26.95

ORDER INFORMATION

BY MAIL

To order by mail, use the form enclosed with a current issue. The order form includes information on handling and shipping charges, and sales tax. Send your mail order to:

Woodsmith Project Supplies
P.O. Box 10350
Des Moines, IA 50306

BY PHONE

For fastest service use our Toll Free order line. Open Monday through Friday, 7:00 AM to 7:00 PM Central Time.

Before calling have your VISA, MasterCard, or Discover Card ready.

1-800-444-7002

Note: Prices subject to change.

MAIL ORDER SOURCES

Similar hardware and supplies may be found in the following catalogs. Please call each company for a catalog or information.

Constantine's
800-223-8087
Study Desk, Wall Unit, Router Bits

Craftsman Wood Service
800-543-9367
Router Bits

Woodcraft
800-225-1153
Router Bits

The Woodworkers' Store
612-428-2199
Study Desk, Wall Unit, Router Bits

Woodworker's Supply
800-645-9292
Study Desk, Wall Unit, Router Bits