

A Riff on the Faceted Glass Door

Improv with
some classic
Krenovian
techniques

**BY DAVID
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During my second year as a student in James Krenov's Fine Woodworking class, in 1984, my siblings asked me to create a gift for our parents' anniversary. Lacking time and confidence, I drew inspiration from Krenov's V-door display cabinet, featured in his book *The Impractical Cabinetmaker* (Van Nostrand Reinhold Co. 1979, Linden Publishing, 1999). That cabinet had a single door, but I saw that Krenov had adapted the method to double-doored cabinets. The formal bay-windowed appearance of a two-doored cabinet appealed to me, and I wondered if I could express the same feeling with a single door. My door owes its existence to the techniques Jim developed.

With a complex door like this one, I think it's easiest to make the door first and build the cabinet to match. Here I'll explain how to build the door. For a look at the cabinet construction, see my article "The Dowel Joint," in *FWW* #287.

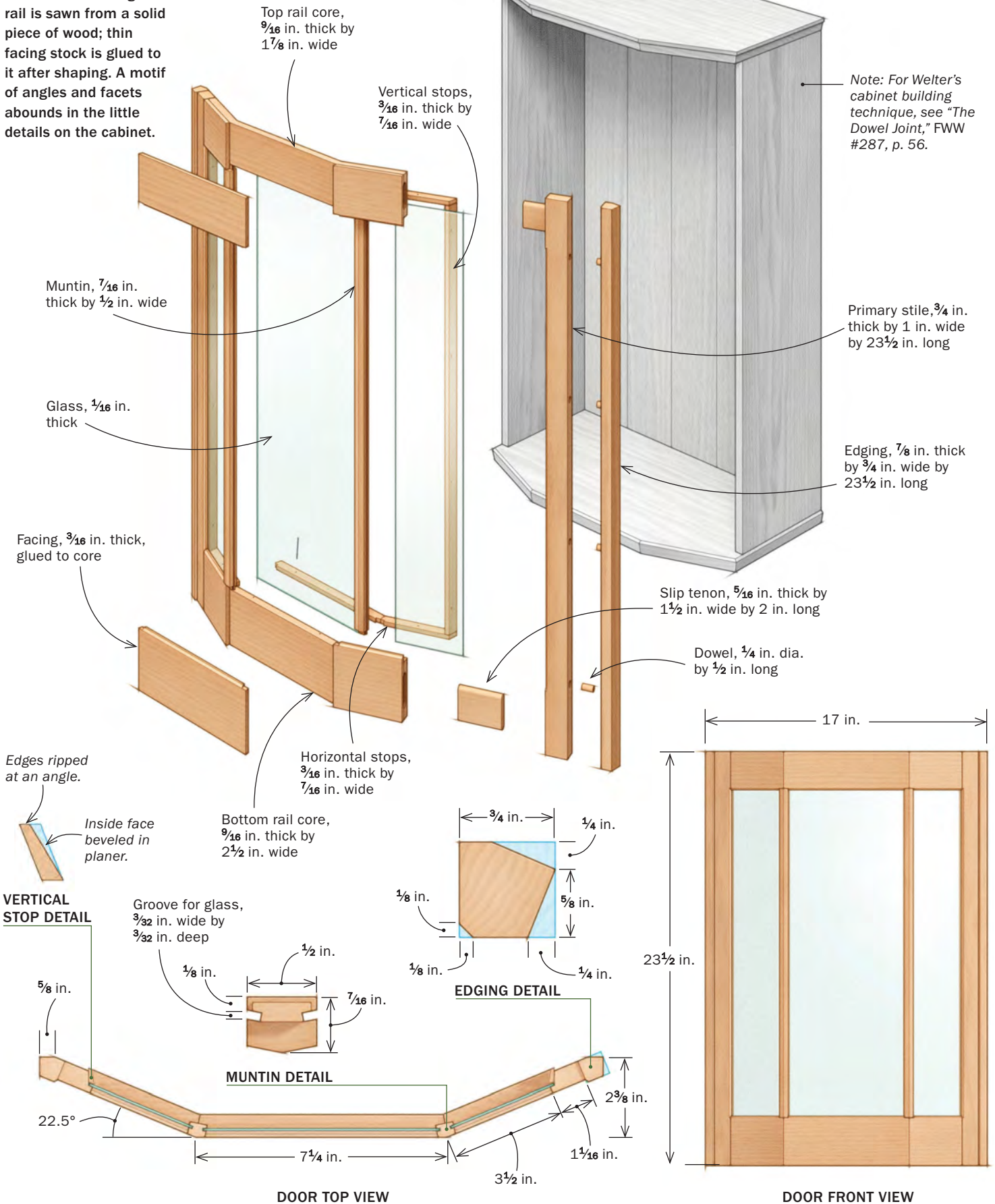
The rail core

Each of the door's angled rails is sawn from a single thick piece of solid wood. This avoids the short, weak tenons that would



FACETED DOOR

The core of the angled rail is sawn from a solid piece of wood; thin facing stock is glued to it after shaping. A motif of angles and facets abounds in the little details on the cabinet.



The core of the matter

The rails are made up of a solid-wood core with thin shopsawn facing. This clever workaround eliminates the need for short, weak tenons joining separate angled pieces.

Outside face

first. Lay out the double-V shape on the top edge of the rail blank, then carefully bandsaw the two angles off the outside face.



Mirror the outside face. Use a combination square registering off the outside face of the rail to lay out the inside face.

result if the rail were made by joining three pieces end to end. However, unless you use quartersawn stock, the grain pattern revealed by the angled sawing isn't pleasing. Jim's solution was to laminate facings (thin stock) onto a solid core.

Begin with shaping the front of the double-V core stock. Lay out and bandsaw away the waste on both rails. Clamp the two pieces side by side and plane the bandsawn surfaces.

Using a marking gauge or combination square, lay out lines parallel to the front surfaces, then cut to the lines on

the bandsaw to remove the interior waste.

Start the cleanup of the interior of the rails by running a rabbet plane crossgrain at the inside corners. Broaden the initial cleanup by cross-planing with a block plane. Finish the interior by planing toward the cross-planed surfaces. Use a hand scraper and sandpaper to refine the inside corners.

Facing out

The joints of the facings are butted miters. Find the miter angle by setting a bevel gauge to a line that connects the core's exterior and interior ver-



Inside faces are next. Welter first makes incremental freehand cuts to create some blade clearance where the angled section meets the center section of the rail (far left), and then he rips the inside faces parallel to the outside faces by riding the stock against the fence. The more slowly you feed, the smoother the resulting surface.

Show your facings

The three thin pieces of facing for each rail ideally come from a continuous length of stock. The facings are wider than the core, and Krenov would say that the extra width gives you a glass rabbet for free, no milling necessary.



Cutting the miters. Welter rests the edging stock on a wedge at the table saw to cut the miters. To find the correct angle for the wedge, Welter draws a line between the vertices on the front and back of the core stock and sets a bevel gauge to that angle.



Working between angles. After cutting the first mating miters (left), clamp the end facing in place, butt the center piece up to it, and mark the second miter on the center piece. Cut conservatively even if that means you have to make a few trips to the table saw to line up the cut exactly to the angle on the core. You should now have a precisely cut center piece, and two overlength end pieces.



Glue the center piece first. Before applying glue to the center section of the core, clamp the two end pieces in place, and dry-fit the center piece. When the fit is right, glue and clamp the center piece in place. Once dry, glue and clamp the side pieces in place.

tices. Cut the facings to that angle on a table saw. Refine one miter on the center facing with a plane and shooting board.

Clamp one of the end facings to the core, aligning the facing's mitered end with a vertex of the core. To determine the exact length of the center facing, butt its cleaned miter to the clamped end piece. Mark the other end of the center facing from the core's second vertex. Cut and shoot that miter.

Put the center facing in place and push the second end facing up to it. There should be no gap between the inside of

the facing pieces and the outside of the core.

Clamp the center facing and the second end facing in place. Pinched between the two end facings, the center now has nowhere to go when being glued. Unclamp the center facing and spread glue on it, taking care to avoid the miters; then clamp.

When the glue cures, turn to the end facings. Shoot the miter of each facing again, shimming as necessary to match the mating miter of the center facing. Once you have satisfactory joints, you're ready to glue up the side facings. To see a



The final length. When the glue is dry, trim the rails to length on the table saw.

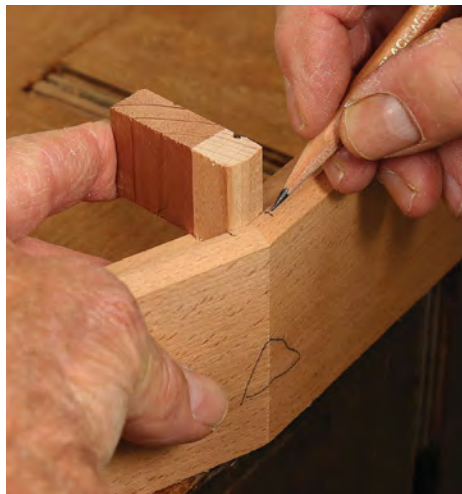
Odds and ends on the rails

Before you move on from the rails, you'll need to address the rail-to-stile joinery, bevel the front of the rail, and cut the muntin joinery.



Floating tenons. Welter cuts the mortises for the floating tenons on the rails and stiles using his horizontal boring machine. Alternatively, you could use a Festool Domino or dowels.

Muntins hold the glass. The muntins, which rest on the rabbet, are let into a socket cut into the facing. The socket is slightly narrower than the muntin and is the depth of the bevel on the rail. Mark the socket placement using a scrap of muntin stock (right). Cut the sides of the socket with a hand saw (far right), and then cut the rest with a chisel (below).



A beveled detail. The bevel that runs around the inside perimeter of the frame is an aesthetic detail, not a structural one, and gets cut with a spokeshave and plane before the frame is glued together.



Krenovian technique for gluing and clamping these joints super tight, go to FineWoodworking.com/306.

Stiles

Each stile is composed of two pieces. A thick piece of edging glued to the primary stile's outside edge stands proud toward the front and gives a pleasing definition to the door while hinting at the cabinet behind.

Rip a piece of edging stock from each of the stiles while they are still full thickness,

and set the edgings aside where they won't be mistaken for scrap. Re-dimension the primary stile to match the thickness of the finished rails.

Frame joint

Because of the shape of the rails, cutting a shouldered tenon would be difficult to manage on a machine, so the frame will be joined with floating tenons. I use a horizontal boring machine with an end mill bit to make custom-size mortises. A Domino machine or dowels could be used instead.

Angled rabbets let you install the glass

Rabbet and bevel the stiles

With the frame joinery cut, consider the stile rabbet that will receive the glass. It needs an angled cheek due to the way the glass is installed. The middle pane, fitted between the two muntins, will be placed first. Then come the outside panes: As one edge is fitted into the muntin groove, the pane is pivoted and the other edge swings into the rabbet in the stile. The rabbet must be angled to permit this action.

The stile rabbet is stopped, and its ends should coincide with the depth of the rabbets in the rails. I start by cutting an ordinary stopped rabbet. Then, to cut the angled cheek, I run the workpiece on an angled shim fastened to a shaper or router table. I make a succession of light cuts, moving the fence to broaden the rabbet. The bit leaves material to be removed after glue-up. Use a spokeshave and plane to create the bevel on the rabbet lip.

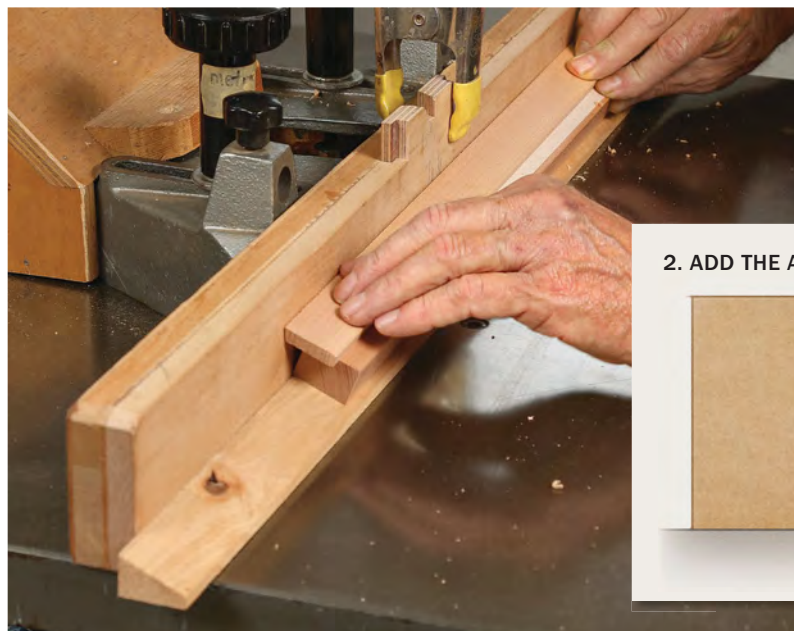
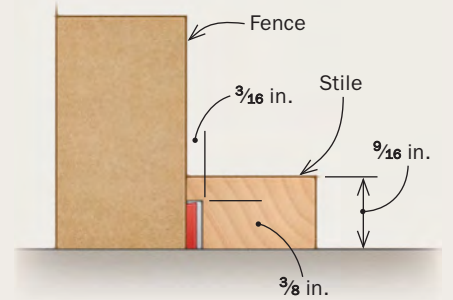
Before gluing the frame together, cut the dowel joints between the thick edging and the primary stiles. The dowels don't need to be long; they



The side panes of glass will be inserted into the groove in the muntin and pivoted into place. To permit this, the stile rabbets for them must be angled.

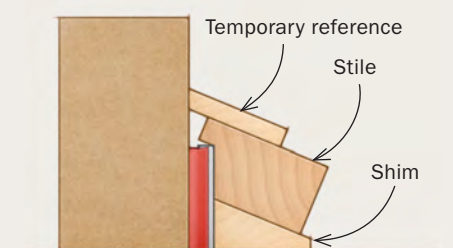
Cut the stile rabbet in two steps. First cut a square rabbet on the stile, stopping the rabbet where the rabbets on the rails will meet the stile. Draw bit reference marks on the fence and end marks on the stile to guide you.

1. CUT THE STOPPED RABBET



Then cut the angle. Use double-sided tape to secure a tapered shim to the router table. Run the stile on the shim to angle the rabbet. Tape a scrap to the stile to control the depth of cut.

2. ADD THE ANGLE



Frame assembly

This glue-up happens in stages. First glue one primary stile to the two rails, then the other primary stile to the other side of the rails, and finally add the edgings to the primary stiles.

Not your square glue-up. The angles of the door present clamping challenges. But a few tricks will make gluing up a breeze. Work on one side at a time. Prop the assembly up on a block so that the short section of the rail is level. Angled clamping blocks provide a purchase point for pressure to be properly applied. Coarse sandpaper glued to the bottom of the clamping blocks helps resist slippage.



are just for alignment. The long-grain-to-long-grain edge joint will provide more than adequate strength.

Assembly time

Glue the floating tenons into the rails as the first step of the frame assembly. When the glue has set, put the primary stiles on dry, checking alignment.

The primary stiles are glued to the rails one at a time with the aid of angled clamping blocks. Then, when the glue dries, glue the thick edging to the primary stiles.

With the door roughly completed, use its dimensions to build the cabinet, making allowance to finish-fit the door.

Muntins

To work safely while making the narrow muntins, glue a backer piece to the inside face of the muntin blank. Muntins ripped from solid stock may warp, wasting effort. Make sure the muntins are straight before gluing them to the backer. You'll rip the backer off later. Mill extra muntins and a setup piece.

Cut the muntins to a length that fits snugly into the frame



Add the doweled edging. With the frame glued up, add the edging to the outside of the primary stile. Use the same clamping blocks as before along with a caul on the inside edge of the stile.



Muntins for form and function

The muntins add to the aesthetics while providing support to the glass.

TIP WORKING THIN PARTS



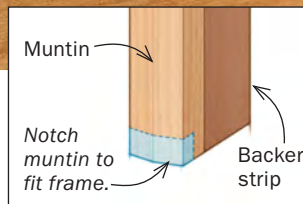
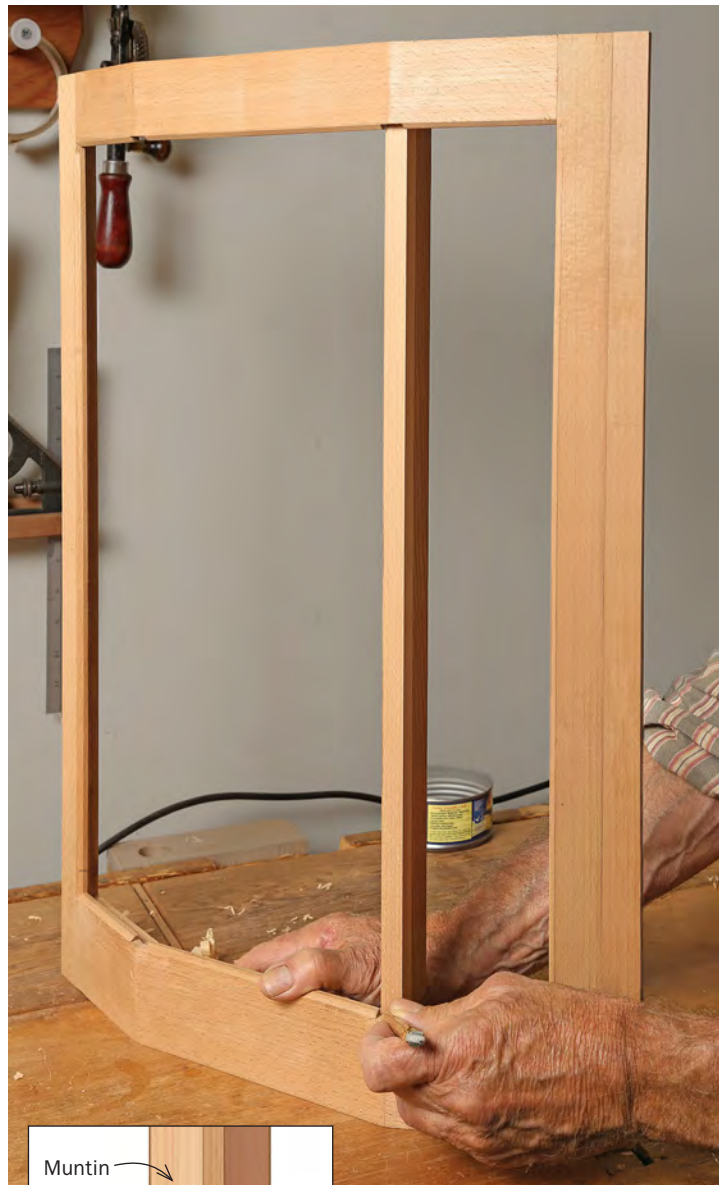
The slenderness of the muntins makes machining and fitting them difficult. You could leave the stock wide in one direction while milling the glass grooves, but in cutting to final dimension, tensions could be released causing warping. Krenov instead milled the muntin stock to a near-finished dimension, glued on a backer piece, and then finished the machining. Afterward, he ripped the backer off the muntin.

rabbets. Notch the ends of the muntin face to fit into the rail socket. Mark the socket's depth on the muntin. Lightly plane the sides of the muntins to fit into the rail socket. On the table saw, cut a notch at the top and bottom of the muntin to the depth that brings the face of the muntin flush to the vertex of the rail.

To shape the faceted front edge of the muntins, make two angled rips at the table saw, staying just shy of the final size

of the facets. The sawn facets should nearly meet in the center of the muntin. Next, with the muntin fitted to the door frame, finish plane the facets flush to the rails.

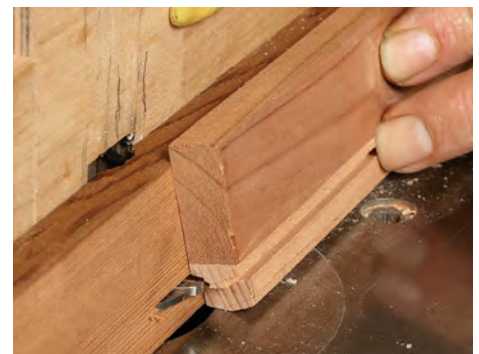
Transfer the location of the rail rabbet to the muntin as a reference for cutting the grooves for the glass. To cut those grooves, use an angled auxiliary fence and a slotting cutter at the router table. Set the cutter height using the rabbet reference on the muntin



Mark directly from the rail. With the muntin sockets already cut in the rails, place the muntins up to the frame and mark for the notches in the muntins.



Table-saw tips. With a stop on the crosscut fence, notch the muntin for the sockets. Then rip a slight facet on each side of the muntin (right). The facets will meet in the center of the muntin.



Slots for glass panels. You can use a slotting cutter to mill grooves for the glass. Make an angled auxiliary fence and attach it to the router table fence. The angled fence should place the muntin facets flat on the table.

Stops secure the muntins and glass

Though stops are often mitered, Krenov avoided the technique whenever possible, reasoning that it was too difficult to get a good fit, and even with a good fit, gaps seem to grow. His method is to first place the horizontal stops, flat strips that protrude beyond the thickness of the door. The vertical stops slope toward the inside, giving a sense of openness to the view into the interior.



The middle pane of glass goes into place first. Slide the muntins onto the glass and lay the unit into the door frame, fitting the muntins to their notches. The outside panes slide first into the muntin groove on one side, then pivot into the stile rabbet.



Three horizontal stops per rail. The horizontal stops are installed first; the vertical stops are fitted between them. When fitting the horizontal stops to the muntins, use short strips of thin wood as templates to find the right angles for the ends, then transfer those angles to the stop.



setup stock. After cutting the grooves, saw off the backer.

This is a good time to order the glass for the door. With the muntins in place, find the distance between the rabbets and groove. Commercial glass cutting is not exact, so allow $\frac{1}{16}$ in. of space in each direction.

Door edgings

At last, it's time to return to the stile edgings so carefully set aside early in this process. Put dowel pins in place, then attach the edgings to the stiles without glue. Mark the plane of the stile's face on the protruding part of the edging.

The edging is wider than it needs to be. Some of that width will be lost in trimming the outside edges of the stiles parallel to the cabinet. If you have a table saw that can accommodate the width of your door, that trimming can hap-

pen after gluing. If not, cut the trim angle before gluing the edging to the door.

Cutting the angle on the edge of the door will make the frame appear thicker than its actual dimension. Counteract this by making a flat on the inside edge of the door. I laid the door face up on a flat surface and drew a line parallel to the flat surface on the top and bottom of the door. Saw to an angle matching the drawn line. The result will be a flat about $\frac{1}{2}$ in. wide that matches the carcass face.

Glass stops

Glass stops are the last element to be fabricated. The beveled vertical stops can be created with a simple custom planer sled. Make a carriage by beveling the top face of a long scrap. Tack a fence on the down side of the slope. Place the stop stock against the fence and send it through the planer.

The stops will hold the glass in place but they hold the muntins, too. Because the stop nestles under the shoulders of the muntin tenon, the sides of the notch need not be tight, but the depth of the notch should push the muntin snugly against the rabbet lip.

The horizontal stops are installed first; the vertical stops are fitted between them.

The middle pane of glass goes into place first. The outside panes slide into the muntins on one edge, then drop into the stile rabbet.

With all door parts made, the glass, muntins, and stops may be set aside until the door frame is hung on its cabinet. Make the width of the cabinet about $\frac{1}{8}$ in. smaller than the door. The door can be trimmed to fit the finished cabinet. □

After a 30-year career at The Krenov School, David Welter is enjoying retirement in his home shop.



Glass and stops in place. Use a manual drill to make holes for the pins. Protect the glass with thin cardboard. On the verticals, 6-in. pin spacing should be adequate. The horizontal stops are pressed in place by the vertical stops and muntins, so fewer pins are needed. Clamp the stops against the glass while the holes are drilled. Angle the holes slightly so when placing the pins the stop is tightened against the glass. Krenov used small finish nails, cut to length and recessed into small chamfered countersinks.



Pulling out all the stops. The possibility that glass may someday need to be replaced should be considered. It would be bad enough to have the accident; you don't want to do more damage in removing the stops. The fastening pins can be driven into pre-drilled holes. Size the holes so they will keep the pin in place but require little more than a very light tap or finger pressure to put them in place.