



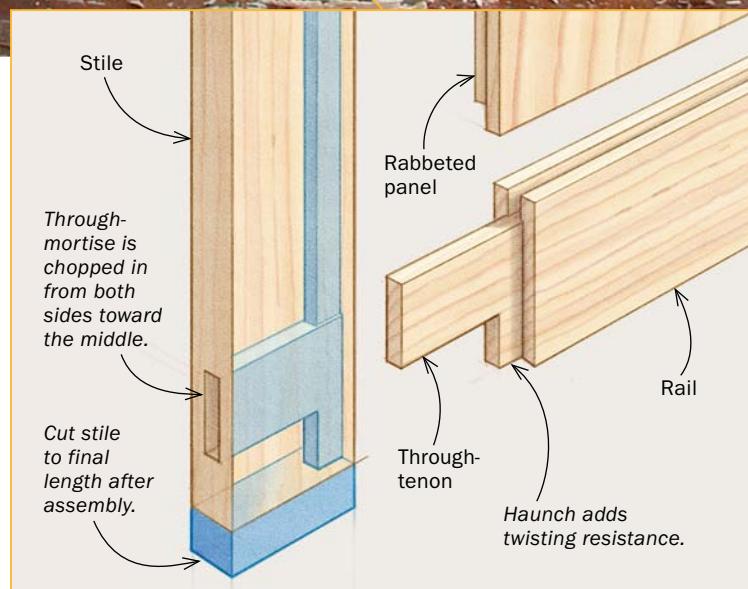
Frame-and-panel doors

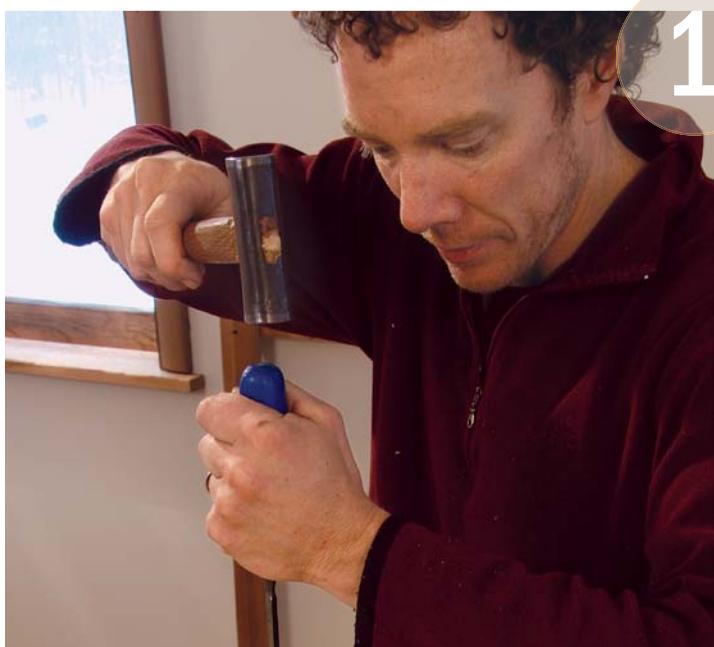
HAUNCHED THROUGH-TENONS MAXIMIZE STRENGTH

BY ANDREW HUNTER

I designed the doors for my hutch (p. 64) to be both rock solid and well suited to hand-tool woodworking. I joined the rails and stiles with haunched through-tenons, which deliver maximum strength and a batch of other benefits.

When working by hand, through-mortises are easier to chop accurately than stopped mortises, because you cut them from both sides of the workpiece toward the middle. They also offer the option of adding wedges to the tenons for even greater holding power. The haunch itself not only adds glue surface and increases resistance to twisting, but it also makes the job of cutting grooves for the panels simpler. With ordinary tenons, you need to stop the panel grooves in the stiles so the empty groove isn't visible at the top and bottom of the door after assembly. But the haunch fills that space, so you can use through-





1 MAKE THE MORTISES



Drill and chop. After drilling out the mortise with a brace and bit—drilling holes from both sides so they meet in the middle—Hunter uses a narrow chisel (far left) to chop the ends of the mortise square and clear much of the waste. Then, with a wide chisel (left), he pares the walls, working in toward the middle from both sides.



2 CUT THE GROOVES



Make way for the panel. After through-mortising the stiles, Hunter uses a plow plane to cut the panel grooves in the rails (seen here) and the stiles.



Widen the groove. A few strokes of the paring chisel widens the end of the panel groove to accept the tenon's haunch.

grooves—which can be cut with a plow plane, a simple process—rather than stopped ones, which are more difficult to cut.

Mortises and grooves first

For these doors, I cut the stile joinery in three stages: First, I cut the through-mortises; next, I plowed the grooves for the panel (in both rails and stiles); then I cut the haunched section of the mortises. If your mortises are the same width as your panel groove, you can skip this third step—the haunch will fit right into the groove. Because I wanted my mortises wider than the groove, I widened the end of the groove for the haunch. I left the stiles an inch or two long until after assembly, to avoid splitting the wood during joinery and glue-up. I laid out all the joinery in pencil, but I also scribed around the through-mortises with a knife.

To start the through-mortises, cut a series of closely spaced holes with a brace and bit, drilling from both sides toward the middle. For these $\frac{5}{16}$ -in.-wide mortises, I used a $\frac{1}{4}$ -in. auger bit.

With the drilling complete, use a narrow chisel to chop the ends of the mortise and remove the waste between the

3

CUT THE TENONS



Cheeks, then shoulders. After ripping along the narrow cheeks of the haunched tenon, crosscut to release the waste (left). Then rip the wide cheeks (above).



Quick cleanup. A rabbet plane smooths the cheeks as you fit the joint.



Make a tongue. When cutting the cross-grain rabbets, score the panel with a marking gauge (above) to ensure a clean cut. Create the tongue with a rabbet plane (right), working to a depth line by eye. Hunter fits his plane with an L-shaped, shopmade fence to limit the width of cut.

4

RABBET THE PANEL



ASSEMBLE THE DOOR



Put in the panel. Dry-fit the panel (left), making sure it fits snugly at the top and bottom but has room to move across the grain. Then glue up the frame joints (above), using clamp pads to protect the parts.



Trim the tenons. When the glue has cured, saw the protruding tenons flush.



Off with the horns. Overlong stiles prevent splitting during joinery and assembly. Afterward, these horns get sawn off flush.

out the rabbet on the back four edges. With the grain in the panel running vertically, the shoulder of the rabbet should fit tight against the top and bottom of the door frame. This will help keep the door from racking. But leave a gap of $\frac{1}{8}$ in. or so on each side to account for expansion and contraction of the panel across the grain.

I cut the rabbets with a rabbet plane fitted with a shopmade fence. To avoid tearing the wood while cutting the cross-grain rabbets, first score the shoulder with a marking gauge.

Dry-assemble the doors and fine-tune anything that needs it. When it all looks good, finish-plane all the parts. Spread glue in the mortises only, assemble the joints, and put the doors in clamps. You can leave the panel unglued. Wait until the glue has dried a bit to clean up any squeeze-out. Then trim the through-tenons flush, and cut the ends of the stiles flush to the rails.

The doors are laid out for an exact fit to the opening. Once they're assembled, trim them with a handplane to produce a uniform gap all around. Plane the top and bottom from the outside in to avoid blowing out the end grain on the stiles. Then shim the doors in the openings, and mark the location of the hinge mortises already cut in the face frame. Remove the door and mortise it for the hinges, making multiple crosscuts and then paring to the line with a chisel. Before installing the hinges, mount the knobs and glue in stop blocks behind the doors so they will close flush.

Andrew Hunter builds furniture in Accord, N.Y.