Starting Out

Build and fit a basic drawer

by Roger Holmes

I have always been fond of cabinets filled with row upon row of little drawers, each cleanly dovetailed and snugly fitted in its opening. Drawers seem full of promise and mystery. When they're closed, that is; an open drawer usually reveals much more junk than treasure. But there is pleasure in sliding open a well-made and well-fitted drawer, even if it's filled with shoelaces and paper clips.

Making drawers can be fun, too, if you don't let your ambition outstrip your ability. I'll never forget the sight of my first attempt, a little drawer barely three inches deep, buried beneath a network of pipe clamps attached in a vain attempt to pull its ill-fitting dovetails tight and its corners square. The drawer joinery shown here is more modest, but perfectly adequate. Using it will allow you to get the hang of making a drawer square and fitting it to a cabinet before you stir dovetails into the mix. And if you need lots of drawers, these are quick to make. Drawers are also well suited for mass production—if you're making more than one, do the same operation on all the pieces at the same time.

The fit of a drawer in a cabinet can be as important as the construction of the drawer itself. I always make the carcase first and then the drawers to fit it. The ideal is a snug fit, with drawer sides and carcase sides sliding against each other like the walls of a piston and its cylinder (well, as much like a piston and cylinder as your patience and the material allow). But the drawer will work even if it is looser, so fitting a drawer really well is a challenge more than a necessity—a distinction worth remembering after you've fiddled around for an unsuccessful hour trying to do it. I use the method described below when I'm trying for that ideal fit; for a less refined and much quicker method, see the box on p. 62.

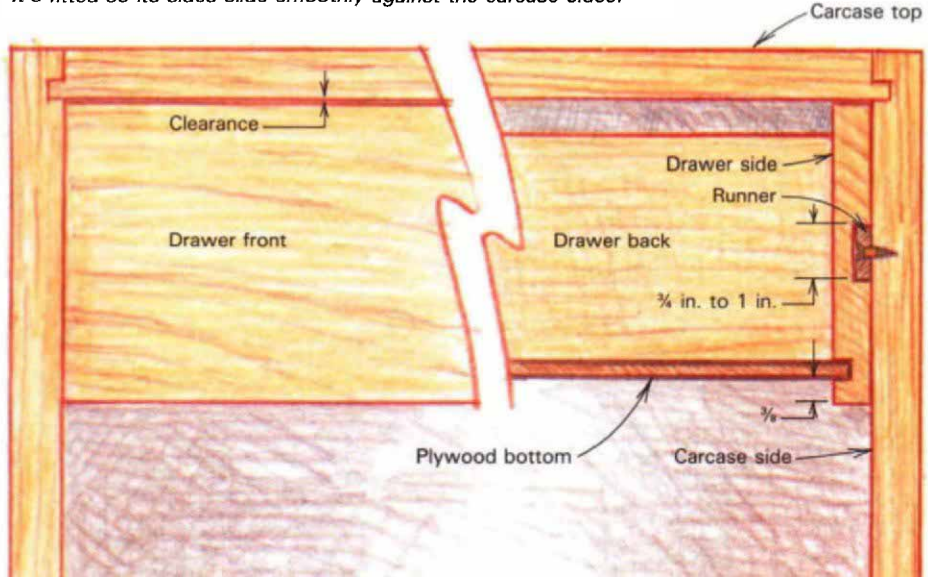
The drawer joinery—locking tongue-and-groove at the front corners, dadoes for the back and sides—is a variation on the carcase joinery described in the last "Starting Out" article *(FWW #50,* pp. 54-59). I've hung the drawer on runners housed in its sides, which is less traditional than resting the drawer on a frame (a rail under the drawer front, runners under the sides). Frames can stiffen a carcase, and I use at least one or two in tall stacks of wide drawers. Side-hanging the drawers saves time (no frames to make) as well as the space taken up by the frames, which can be as much as 3 in. on a four-drawer cabinet. The method below, however, can be used to fit either type of drawer.

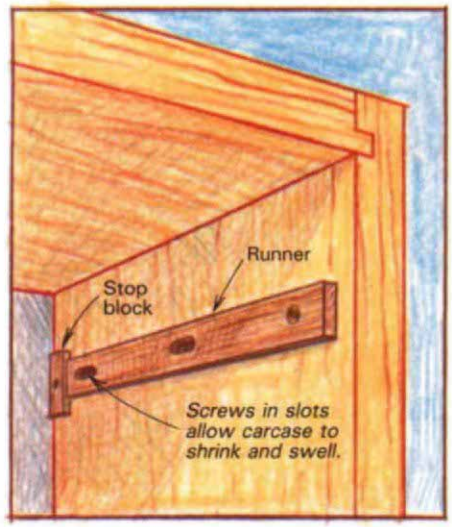
I made the drawers of pine, but it's not the best-wearing wood for drawer sides—a hard wood would be better. Boards with growth rings more or less parallel to the edges when viewed on the end grain (called quartersawn or riftsawn) are least likely to cup and shrink, and are worth culling out of your lumber pile for use as drawer sides.

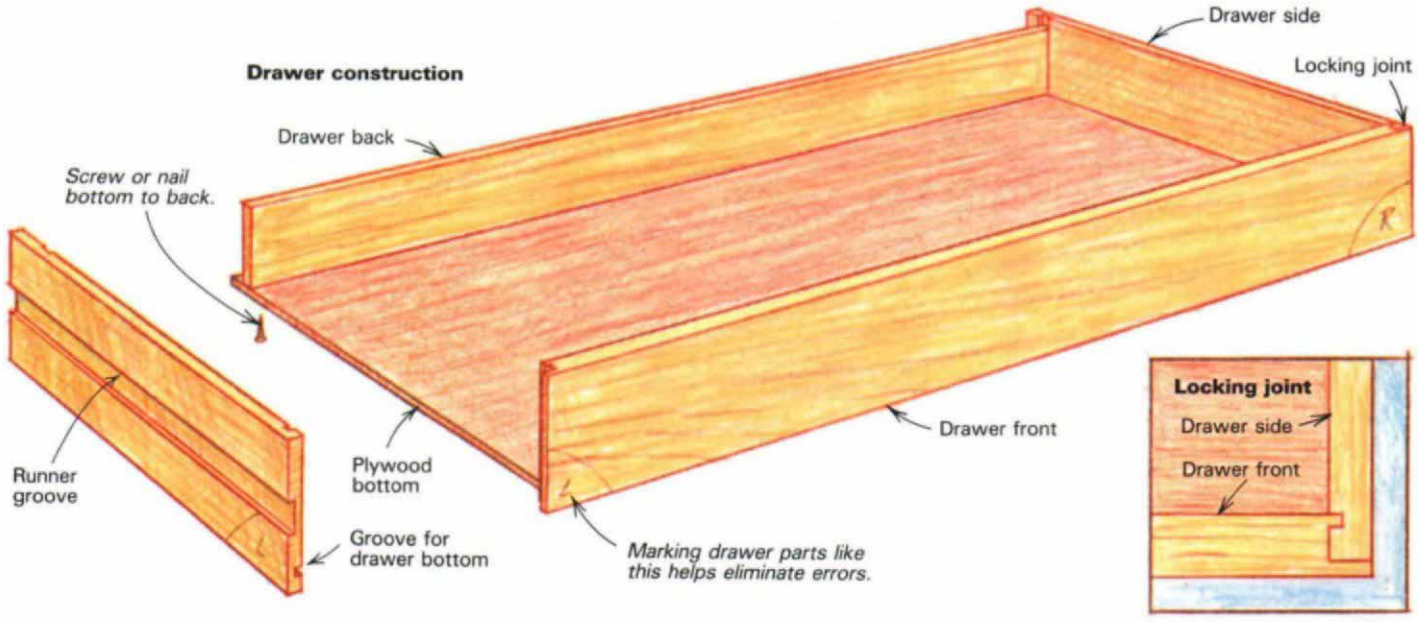
Accurate stock preparation is the key to successful drawermaking. If the parts aren't square, the drawer won't be either. Cut all the fronts, backs and sides roughly to size: front and back about 1/32 in. longer than the distance between the carcase sides; drawer sides about 1 in. less than the width of the carcase sides. I make the fronts 3/4 in. thick; the backs and sides

A side-hung drawer

This drawer is easy to make and hang in a new or existing carcase. It's fitted so its sides slide smoothly against the carcase sides.







about ½ in. thick. Take care when flattening the pieces—twisted parts make twisted drawers. The back is dadoed to the sides, so match its thickness to a standard plow-plane blade or router bit.

Mark the good faces, then plane and mark the good edges on all the boards, checking them with a straightedge. I put the good edges on the bottom of the drawer. (A simple way to keep the pieces straight is shown above.) The ends of the pieces *must* be square to the good edges. If they're not, the drawer will certainly be twisted, and probably not be square. I usually do this planing freehand, holding the piece end-up in the vise and checking squareness with a try square or a framing square.

A shooting board, shown in the drawing at right, is a good jig for doing the same thing, particularly if you're making lots of drawers. There's not much to a shooting board, but it must be made accurately; obviously the stop must be dead square to the guiding edge, and the sole of your plane perpendicular to the plane's sides. Use whatever plane is most comfortable for you. I use my jointer plane because of its weight and long bearing surface. (No, you won't plane the guiding edge as well as the workpiece.) Fool around squaring up scrapwood until you get the hang of the shooting board.

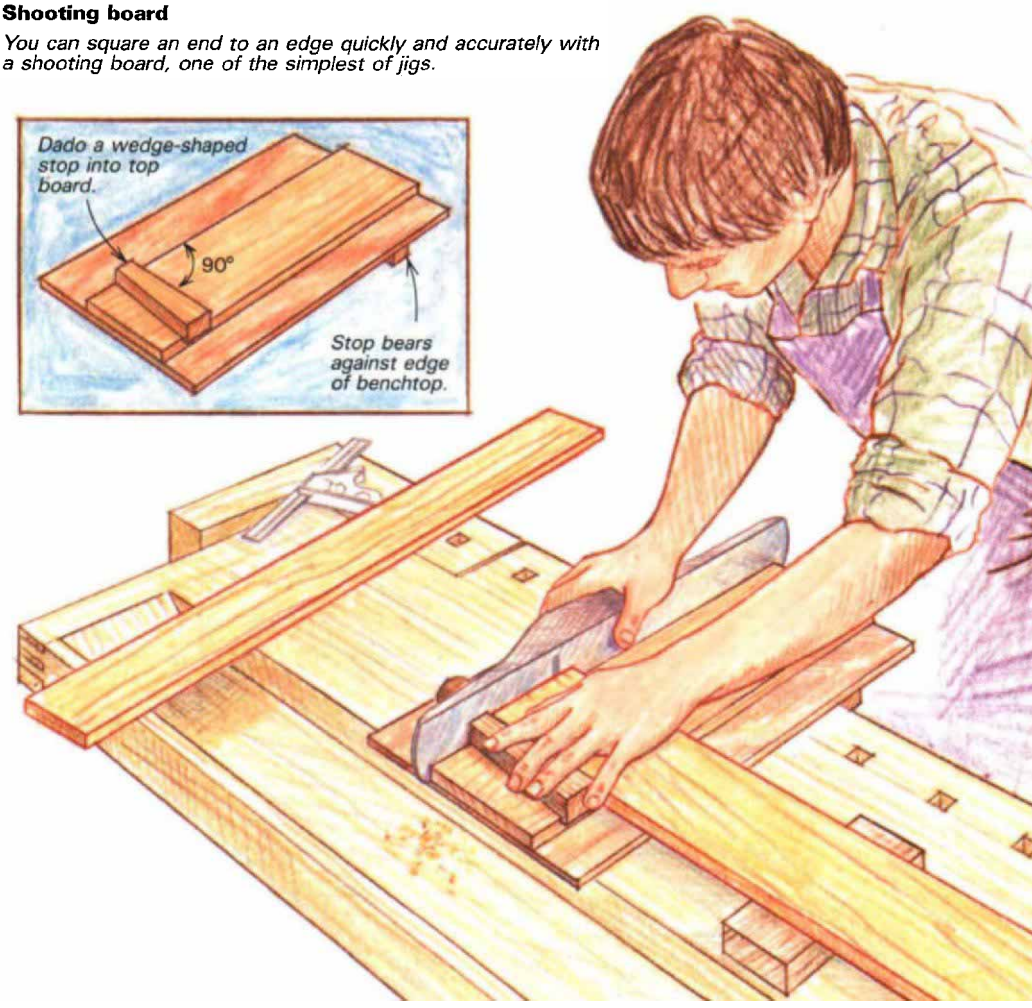
Square the ends of the drawer front first, planing enough off so that the front will just about, but not quite, fit between the carcase sides. Only the front end of each drawer side need be square for this construction; if you're corner-jointing the back to the sides as well, square up both ends. Unless you're sure of the dado depths now, plane the back to exact length after you dado the sides.

Next groove the inside faces of the sides and front for the drawer bottom (it passes under the back). You can plow the grooves with a plow plane, rout them, or cut them on the tablesaw with a dado head. They shouldn't be deeper than half the thickness of the pieces. I locate them ⅝ in. above the bottom edges, which leaves enough wood for strength without stealing too much depth from the drawer. Remember to run the bottom, good edge against the fence of whatever tool you use for grooving.

The locking joints at the front corners are a little more complicated than those for the carcase. (If you used the simple car-

Shooting board

You can square an end to an edge quickly and accurately with a shooting board, one of the simplest of jigs.



case joint shown on p. 58 for the drawers, either the end grain of the sides would show, or the tongue would have to be on the sides, running in the direction of most stress—the front would easily pull away from the sides.) This joint is fairly easy to cut on the tablesaw or with a plow plane, but I think it's too much trouble to rout. Regardless of how you cut the joint, do it accurately, because its strength depends on a close mating of the parts.

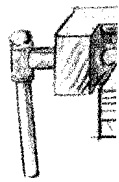
The drawings at right show proportions and the sequence of cuts on the tablesaw. I use a single blade that cuts a kerf about 5/32 in. wide, which is sufficient width for the groove. Make the groove depth (cut 1) about one-third the thickness of the side. Make cut 2 using the same fence setting as for cut 1 to ensure that the end of the drawer side will fit tight against the drawer-front rabbet. Cut the front and several pieces of scrap the same thickness as the front, then use the scrap to reset the fence for cut 3 to make a snug-fitting tongue. I make the final cut just shy of the groove bottom, so the tongue won't bottom out and hold the joint apart.

Though this is essentially a machine joint, it can be cut by hand with a plow plane as shown. I use a ¼-in. cutter to groove the side (B) and a 5/16-in. cutter for the end of the front (A). Plow the groove in the side first, setting the fence using the wider cutter as a gauge. Plug the drawer-bottom groove with a tight-fitting scrap to prevent breaking it out, and remember to chisel ramps at the ends of the cuts to prevent tearout. To make the tongue, set the plow-plane fence using the groove cutter as a gauge. Plowing in end grain, at least in soft woods, isn't much more difficult than plowing with the grain, but practice on some scrap first.

Dado the sides for the drawer back with tablesaw and dado head, router, or plow plane. I place the dado about ½ in. to 1 in. from the end of the side, so there's plenty of wood on both sides of the dado for strength. One-third the thickness of the side is sufficient depth.

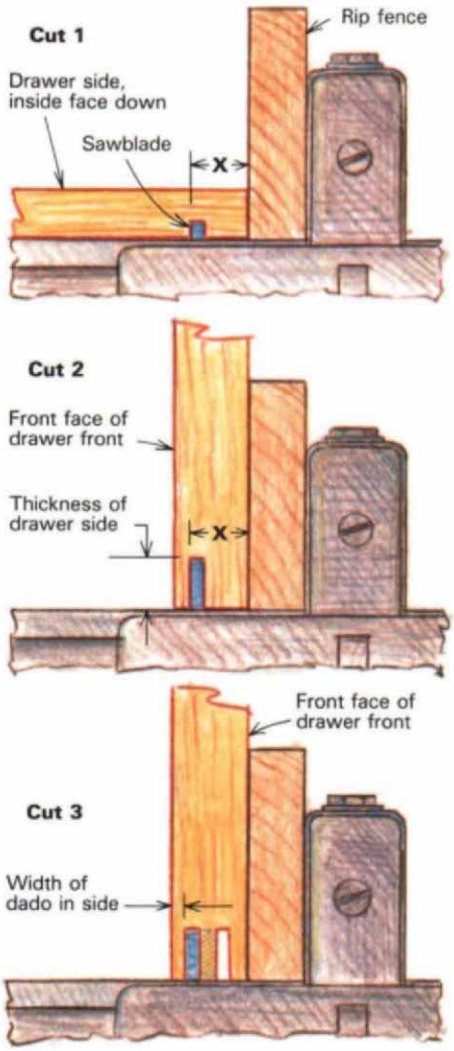
Next groove the outside faces of the drawer sides for the runners. The width of the runners isn't critical; I find that ¾-in. to 1-in, wide runners are easier to work with than narrower runners, and probably stiffer. I make the runner grooves 3/16 in. to ¼ in. deep, and plow them from end to end—the drawer front will cover the groove at the front end. For drawers up to 6 in. deep, center the grooves; for deeper drawers, locate them nearer the top edge.

I think that solid-wood bottoms give a drawer a nice heft, and raise it a notch or two in quality, but they're sure a lot more work than plywood bottoms. When I make solid bottoms, I plane them about 5/16 in. or ⅜ in. thick, then thin them at the edges with a bevel or a rabbet to fit the grooves. Whether the bottom is solid wood or plywood, trim it square and fit it snugly from side to side, and so it runs beneath the drawer back. The grain of a solid-wood bottom should parallel the drawer front so it won't shrink out of the side grooves, or push the sides apart when it expands. Grain direction doesn't matter for plywood bottoms, but I run it parallel to the front anyway.

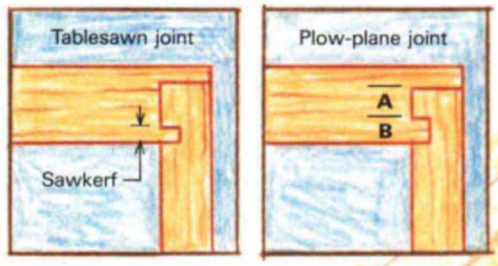


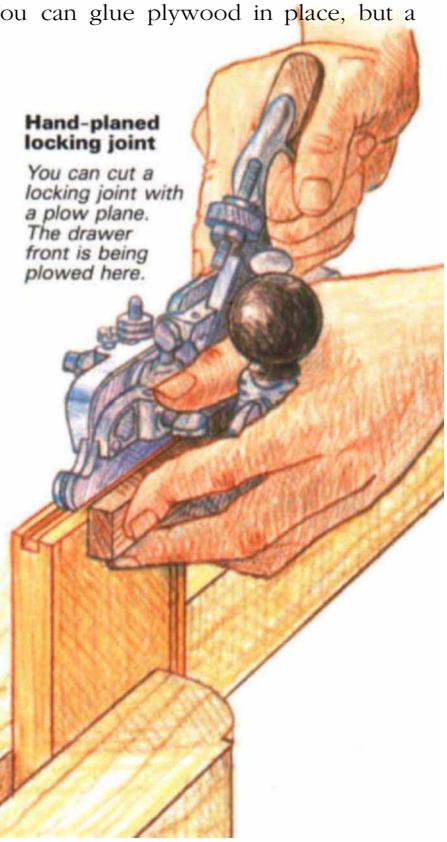
All the parts should be ready for assembly now, but first I clean up the inside faces of everything and wax them, taking care not to get wax on a surface to be glued. It's a lot easier to do this now than later. If you want more protection than wax but not a full-blown finish, brush on a coat of sanding sealer, rub it down with steel wool, then wax it.

Assembly is straightforward, but it's not a bad idea to make a dry run just to see that everything fits, and that you've got all the clamps and paraphernalia you'll need. Then spread glue in the groove and dado of one side, and insert the front and back, aligning the grooves for the bottom. Slide in the bottom and add the second side. (You can glue plywood in place, but a



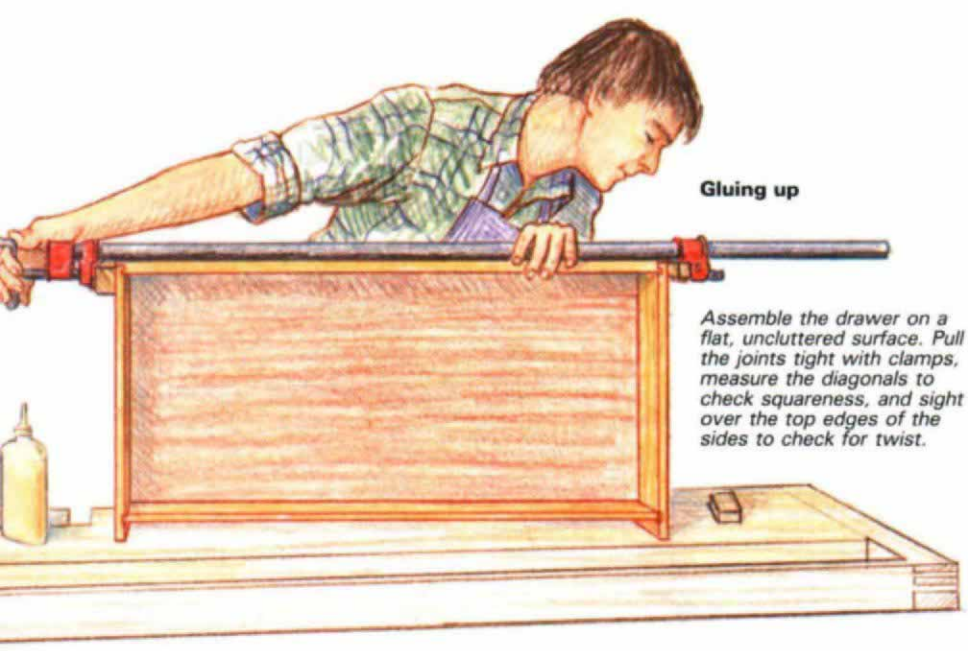
*Lay out a tablesawn joint according to the sawblade thickness, as shown at left below. Lay out a plow-plane joint to match standard cutters (**A** and **B**).*





Hand-planed locking joint

You can cut a locking joint with a plow plane. The drawer front is being plowed here.



Gluing up

Assemble the drawer on a flat, uncluttered surface. Pull the joints tight with clamps, measure the diagonals to check squareness, and sight over the top edges of the sides to check for twist.

solid bottom should just be nailed or screwed to the back.) Assembling with the drawer bottom in place helps keep the drawer square. Pull the joints tight with pipe clamps, placing hardwood blocks between the jaws and the sides to protect the surfaces and distribute the clamping pressure. You can leave the clamps on while the glue sets, or drive a couple of nails in each joint and take them off.

Measure the diagonals to check for squareness. Sight over the edges of the sides or try to rock the drawer on the benchtop to see if it is twisted. If it is, you can weight the high corners; too much counter-twisting can break the joints. If the twist isn't too bad, you can plane it out when fitting the drawer to the carcase. If you find yourself planing off most of the drawer side, make another drawer. Leave the drawer on a flat surface while the glue dries.

The runners for the drawers are best made of a hard wood such as maple, cherry or oak. The easiest way to make them is to thickness a wide board to a sliding fit in the runner grooves and rip the runners off the edge. Plane the edge of the wide board after each cut so each runner will have one smooth face. I make the runners just slightly thinner than the depth of the runner grooves and about ¾ in. shorter than the drawer sides.

The runners are slot-screwed to the carcase sides to allow the sides to shrink and expand with changes in humidity. In better-quality work, the runners are housed in dadoes in the carcase sides, then screwed down. I think three #6 screws are sufficient to fasten a 15-in. runner. The screw near the front end is fixed through a single hole so it won't move in relation to the front edge of the carcase. I make each slot by boring two holes ½ in. apart and chiseling out the waste in between. (Save a little time by boring the holes in the edge of the wide board before ripping off the individual runners.) Countersink the holes and slots so the screwheads will be beneath the runner's surface.

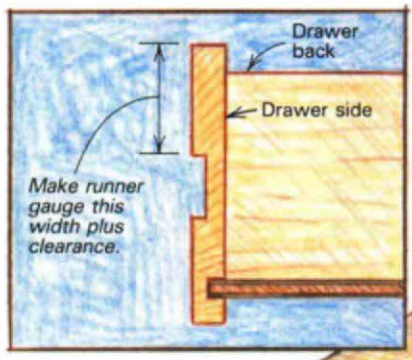
To install the runners, make a gauge block equal in width to the distance from the top of the runner groove to the top edge of the drawer side, as shown in the drawing below. This distance should be the same for each pair of sides on a drawer. The block should be about as long as the carcase is deep. Lay the carcase on its side, butt the gauge into the upper corner, position the runner against the gauge about ½ in. back from the carcase's front edge, and screw the runner in place. (You'll need to bore pilot holes for the screws in hardwood carcase sides.)

The drawer sides and front will expand and contract across their width with changes in humidity. You can allow for this in the gauge, or by adding a spacer between the gauge and the carcase top, or by planing the sides down when fitting. The size of the gap will vary according to the wood used and the conditions where you live. In England, we used to fit drawers in fine work very closely because the humidity was fairly constant year round. On my first job after returning to Nebraska, I fitted the drawers tightly, only to have to plane the height of the sides later to accommodate the extreme variation in humidity from summer to winter—4-in. deep riftsawn oak sides moved more than ⅛ in. across their width. Play it safe on your first drawers.

Now you're ready to fit the drawer to the carcase. With luck, this will require only a couple of fine shavings off each drawer side and just a touch from a sanding block on the bottom edge of the runners. An assembled drawer is difficult to hold in a vise, so I clamp a piece of ¾-in. plywood to the benchtop to support the drawer for planing. The width of the ply should fit easily inside the drawer, and the

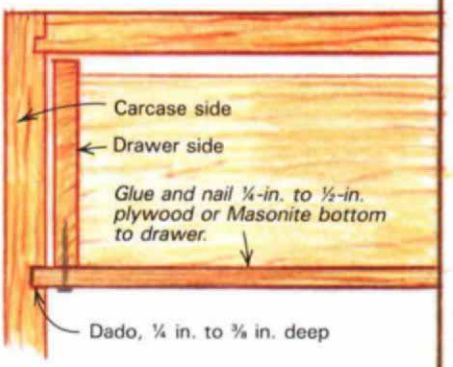
Attaching the runners

Make a runner gauge as shown below, then butt the gauge against the carcase top to position the runner while you screw it in place.



A simple slider

If you're not too bothered by how a drawer looks, or not quite so compulsive about how it fits, try this method. The sides, front and back are joined exactly the same as for the drawer on p. 58, but you don't need to groove for the bottom and the runners. Make the drawer bottom of ¼-in. or ⅜-in. plywood—Baltic birch if you can afford it, or an interior grade that permits few voids if you can't; ¼-in. tempered Masonite will work, too. The width of the drawer isn't terribly important. I leave a ⅛-in. gap between the carcase sides and the drawer sides. (A large gap like this, uniform on both sides, announces itself as deliberate, and shouldn't raise any eyebrows.) I assemble the sides, back and front, then glue and nail the bottom in place after making sure it slides easily in the carcase dadoes.



You can dado the carcase sides to accept the drawer bottom before assembling the carcase or after. If you do it after, dado before attaching the back. Either way, you'll need to fix a fence to the carcase side to guide the router or plow plane. A good trick is to make the top drawer as deep as the distance from the edge of the router base to the bit—just run the base against the carcase top to cut the dadoes. —*R.H.*

Planing the sides

Clamp a piece of plywood to the bench so it overhangs the edge enough to support the drawer for planing. Plane and sand down the sides carefully, from back to front, until the drawer slips easily but snugly into the carcase.

piece should overhang the edge of the bench by about the drawer's depth.

The initial goal when fitting is to get the drawer to slide completely into the carcase, as tight to the sides as possible. Using a sharp plane, first take a thin shaving off the back half of both drawer sides, then try the drawer in the opening. If it fits halfway, plane farther forward until it fits all the way; if it doesn't fit halfway, take more off the back. If the drawer gets hung up, remember to check the runners, too. More than once, I've planed too much off a drawer side before discovering a sticky spot on a runner. You can trim the runners with a sharp, finely set shoulder plane, or with sandpaper wrapped tightly around a square-edged block of hardwood.

When the drawer slides completely into the carcase, work the sides and runners with planes or sandpaper until it slides sweetly. Colored chalk rubbed on the carcase sides will show up high spots on the drawer sides. Finally, paste-wax all the mating surfaces. You should be able to open and shut a well-fitted drawer with only your little finger, and when the drawer is halfway out, there should be very little movement either up and down or side to side.

When the drawer fits, screw stop blocks at the back of the carcase to fix its position when closed. If the drawer front is allowed to strike the end of the runners to stop the drawer, the front will soon be popped off. (The runners are acceptable drawer stops if you stop the runner grooves about 1 in. short of the drawer front.) I like the drawer front to sit about ⅛ in. back from the edge of the carcase. To add another drawer, or a stack of drawers, just repeat the process, gauging from the drawer above to place the runners.

This all sounds like a lot of trouble, you might say, for a simple pine drawer. True, there's no need to fit this drawer with anything like the precision I've described. For that matter, there's no need to fit any drawer like this. I have drawers in my house that you can practically throw into their openings from across the room, and they still do a fine job of corralling my socks and shirts. But if your dream is to someday build one of those exquisite cabinets with lots of piston-fit little drawers, then the more practice you have, even with humble pine drawers, the more likely you are to succeed when it really matters to you. □

Roger Holmes is an associate editor at Fine Woodworking.