Nothing beats the silky whisper of a wooden drawer moving in and out of a wooden case. It’s a sensation unlike any other, with wood riding against wood in a smooth, fluid movement. When constructed correctly, the drawer slows on a cushion of air as it’s pushed home. When you open it, the vacuum sucks all other drawers inward. Building and fitting a fine drawer like this is a hallmark of craftsmanship, and provides a lifetime of pleasurable use.

In this article I’ll describe how to fit inset drawers, where the entire drawer—including its front—is enclosed by the cabinet. Dovetails are the perfect joint for top-notch drawer construction, with half-blinds at the front and through dovetails at the rear. In the examples shown here, the drawer front is integral, having been joined directly to the sides. However, you can use the same techniques for a drawer box whose overlay front is attached after the box has been fitted to the case.

I use a three-pronged approach—first fitting the individual drawer parts to the case opening, then assembling the drawer sides for a bottomless fitting, and finally adding the drawer bottom for a final fit. In truth, the work doesn’t require an extravagant amount of skill, mostly just a healthy dose of patience. All the same, it’s a great way to fine-tune your hand-tool skills.
Choose your wood wisely

Whenever possible, make your drawer fronts, sides, and backs from top-quality, mild-grained stock that planes easily and cleanly. You want wood that remains seasonably stable—especially for the sides—so use riftsawn or quartersawn stock if it’s available. (See Figure 1 detail.)

Quartersawn maple, cherry, mahogany, oak, sycamore, and ash are all good choices.

I let the wood for the front determine my choice for the sides so I can create contrast and highlight the joinery. Dark-colored fronts get light sides, and vice versa. For example, a cherry or walnut front looks great with maple, sycamore, or ash sides. Cherry or mahogany sides would complement a light-colored front such as ash.

While it’s preferable to use quartered or riftsawn wood for the drawer bottom, it’s fine to use regular plainsawn stock since the drawer box itself keeps the bottom flat. Alternatively, you can use plywood, in which case wood movement is not an issue. Whatever material you choose, I suggest avoiding ¼"-thick bottoms, which look and sound cheap and tinny. Instead, make standard-size drawer bottoms ½" to ¾" thick for sturdiness that speaks of fine craftsmanship.
Well fitted drawers start with a well made case. It’s vital that your drawer openings are consistent in size from front to back and top to bottom, so be sure to check the openings when you assemble the cabinet. Smooth the insides of the case where the drawers make contact, such as the sides and web frames, sanding through 220 grit and then wiping or brushing on a thin sealer coat of 2-lb.-cut shellac. Polish these surfaces with paste wax, and buff them using a soft cloth and plenty of elbow grease.

When my design permits, I do two things. First, I mill my face rails about $\frac{1}{64}$" thinner than the web frames and attach the rails so they’re flush with the bottom edges of the frames, as shown in Figure 1. This way, the drawer rides $\frac{1}{64}$" above the rail, preventing gouges from the drawer front during travel. My second trick is to leave the cabinet back unattached during the drawer fitting process, which allows better visibility and access to the parts.

Once the case is built, mill all the drawer parts to final thickness, but leave them about $\frac{1}{8}$" oversized in length and width for now.

Organizing and marking the parts for their final orientation during assembly can make a world of difference when fitting the completed drawers later. For example, arranging the sides for clean planing from front to back reduces the possibility of blowing out the grain on the ends of the drawer front when planing the sides of the assembled drawer. To determine the best orientation, start by hand-planing both faces of each side to determine the best planing direction, and mark the “starting” end on each face. Next, orient and mark the sides so that the cleanest, easiest-to-plane face will be on the outside of the drawer, with the starting end at the front. If one edge of a drawer side is trickier to plane, orient it toward the bottom because the top edge is the one that’s worked during the fitting process.

Crosscut the sides to length, and then plane the bottom edges on a shooting board to make them straight and square (Photo A). Next, rip the opposite edge of each side to make the piece about $\frac{1}{16}$" wider than its opening. Then plane each of these upper edges bit by bit until each side just slides into its opening without...
Before cutting any joints, hand-plane and/or sand the inside surfaces of the front, sides and back, finishing up with 220 grit.

Drawer joinery is a topic for another day, but suffice it to say that a drawer worth fitting this well deserves dovetails. When cutting dovetails for the drawer joinery, mark and cut them so the tails stand a hair proud of the pins. That way, during the fitting stage you can remove material from the sides without touching the back or front.

Once you’ve cut the joints, mask them off with painter’s tape, and apply two thin coats of 2-lb.-cut shellac on the inside surfaces, sanding the first coat with 320-grit sandpaper. After the second coat is dry, smooth and polish it with a vigorous rubbing with paste wax and a cloth.

Coating only one face invites cupping. To keep parts flat, assemble the drawer as soon as possible after finishing.
Assemble the drawer box

Glue up the drawer and check for square by comparing diagonal measurements before the glue sets (Photo D). If necessary, tap the appropriate corner to bring the drawer into square. Thanks to your careful marking and laying out, the tails should stand proud of the pins by \( \frac{1}{64} \) or so (inset).

After spreading glue, I tap the joints home with a small dead-blow mallet, using a block of wood to protect the sides. Well-fitted dovetail joints shouldn’t need clamps to assemble. Friction alone does the work. That said, I always keep clamps on hand in case I need more persuasion.

Figure 3: Pinch Rod

A pinch rod for comparing diagonals is made from two pointed sticks, a mortised hardwood block, and a thumbscrew for locking the sticks.

Check the assembled box for square by comparing diagonals with a pinch rod. Tails should be slightly proud of the pins.

Plane the faces of the sides

It’s wise to wait a day before planing a drawer, allowing the moisture in the wood to evaporate and the glue to fully cure. Check the corners at the top and bottom to see if they have swollen, and plane them back to flat if necessary. Place the drawer on a dead flat surface to confirm that it sits without rocking. If necessary, plane a bit from opposing high corners to bring all the bottom

Bevel a drawer’s top back corners with a block plane to ease its entry into the case.

Working on a planing board, plane from front to back in consistent, overlapping strokes, stopping when the blade scrapes the end-grain of the pins.
edges into the same plane. While you're at it, plane a small bevel at the top back corner of each side to prevent the drawer from binding when it enters the case (Photo E). In preparation for planing the faces of the sides, make a planing board by ripping a thick, stout board to a width that matches the interior length of your drawers. (Alternatively, double up two pieces of ¾"-thick plywood for the job.) Clamp the board to your bench, slip a bottomless drawer over it, and plane each side in turn, as shown in Photo F. Keep a straightedge on hand to check for flatness along the length and across the width. As you approach the surface of the back pins, plane a small chamfer along the back corner of the side to prevent blowing out the pins.

Fitting for seasonal movement

Next, it’s time to plane the top edges of the sides and front. The trick here is to remove just enough material to allow for future seasonal expansion without removing so much that the drawer rolls during operation. To calculate the expected amount of wood movement, you’ll have to take into account your geographic locale, your chosen wood and its grain orientation, or cut, and the season you’re building in. Let’s use my cherry-and-maple drawers shown here as an example:

For starters, where I live in the southeastern U.S., most domestic plainsawn woods move between ⅛" and ¼" per foot of width from the driest to the wettest times of the year. Quartersawn wood moves roughly half that amount, and riftsawn moves just a bit more than quartersawn. I built these drawers from quartersawn wood during winter when my shop air is at its driest, so I knew that my wood was probably fully contracted. Therefore, I calculated a ¼" gap for the 5"-tall top drawer, a gap of about ⅛" for the 7"-tall center drawer, and a gap of about ⅛" for the 10"-tall bottom drawer. I set to planing the top edge of each drawer in turn, testing and fitting it in its opening, slipping the appropriate number of stacked business cards into the gap at the top of the drawer front as a gauge.

For planing, secure a drawer to the bench between blocks and dogs, and plane an even amount of material from the front and sides, pivoting the plane around the corners. Grip the drawer between blocks and dogs, and plane an even amount of material from the top of the sides and the front (Photo G). As you approach a corner, simply pivot the plane in an arc to maintain a consistent shaving.

Add the bottom and check the fit

Make and temporarily install your drawer bottoms, making sure to orient the grain of a solid wood bottom from side to side so that any movement takes place from front to back. Also, cut a couple screw slots at the rear of a solid wood bottom, as shown in Figure 1. Although I prefer solid wood bottoms for my best work, plywood bottoms are fine. They’re stable, so you don’t have to worry about wood movement, and you can ultimately glue the bottom in place to strengthen the entire drawer.

With its unglued bottom in place, check the fit of each drawer in its opening once again. If it’s too snug, remove a shaving or two, again looking for shiny spots that indicate rubbing. When you’re satisfied with the fit, remove the bottom, sand it through 220 grit, and finish the faces (but not the edges) as you did the insides of the drawer, applying two coats of shellac to both top and bottom surfaces and rubbing them out with wax.

Tip Alert

Plywood drawer bottoms are stable regardless of grain orientation, but it’s visually more pleasing to orient the grain side to side to mimic traditional solid-wood construction.
Add drawer stops

The final step is to add stops so the front of each drawer softly comes to rest precisely where you want it. I typically work with the drawer bottom removed and, when possible, I remove the top of the cabinet for better visibility and access.

Make stops from ⁴⁄₄"-thick hardwood blocks faced with supple leather such as full-grain cowhide. Lightly dampen the rough side of the leather with clean water, lay it moist-side-up on a flat surface, and place the glued edges of the blocks onto it, weighing them down with a hand plane or other heavy item (Photo H). Once the glue has dried, separate the stops and knife the leather flush to their edges.

Because the web frame beneath each drawer sits proud of its face rail, I use a shoulder plane to trim away a section at the center of the front frame member to create a level platform for gluing on the stop.

Position the drawer, without its bottom, into the case. Inset the drawer front the desired distance, and then wedge the drawer in place. Spread glue on the bottom of the stop, and gently push its leather edge against the rear face of the drawer front as you rub the block onto the rail/frame assembly. Wait 15 minutes for the glue to tack, and then lightly clamp the stop to ensure a good bond (Photo I).

Finish the drawers

To finish the drawers, lightly sand the planed surfaces of the drawer box with 220 grit, and apply a single coat of shellac and then wax. Now spot-glue each solid wood bottom into its groove in the drawer front, and screw it to the underside of the drawer back through the slot you cut. This way, expansion happens towards the rear. You can apply a bead of glue completely around the edges of a plywood panel.

Wrap up the job by adding homemade pulls or knobs to your drawer fronts. Then apply your favorite finish to all the exterior surfaces of the case and drawers, and attach the case back. Finally, take a bow as you smoothly slide the drawers home, sweet home.

About Our Author

Andy Rae works wood and writes from Western North Carolina. He’s the author of Building Doors and Drawers (Taunton Press) and the companion videos, Building Drawers and Building Doors (both by Taunton Press).
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