From the editors of

Canadian Woodworking & Home Improvement

# PRACTICAL SHOP PROJECTS

# editor's letter

rbrown@canadianwoodworking.com

## Great Projects, Great Shops

We all love our shops. We love them even more when they're safe, efficient and well organized. This booklet will share some of the best shop projects we've included in our pages over the past 10 years and will help you create a functional shop that's a joy to spend time in.

From workbenches to tool storage, machinery to dealing with works-in-progress, there's a great project in here to improve your shop. Tried-and-true workshop fixtures go a long way to producing better furniture and woodwork, so think of improving your workshop as an investment in all your future projects.

And if you like these articles, visit our back catalogue of shop projects to further enhance and perfect your woodworking space. We have a collection of several hundred project articles online and I'm sure there's going to be an article covering something you've always dreamed of making but didn't know how to go about designing. Our articles have detailed step-by-step instructions, clear progress pictures, exploded 3D drawings and complete material lists to help you work through each project with ease and accuracy.

We'll also run projects like these in many future issues of Canadian Woodworking & Home Improvement, so check us out on the newsstand or take out a subscription. Trust me when I say you really don't want to miss out on any of these great shop projects!

Rob Brown
Editor, *Canadian Woodworking & Home Improvement*

Canadian Woodworking & Home Improvement

# Storage Projects



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# Build a Knock-Down Finishing Rack

This simple rack is easy to make, and provides a lot of storage for panels while they're being finished. It can also be adjustable to hold many more panels.

BY ROB BROWN

Space is always at a premium in my workshop, especially when applying a finish to something large like a wall unit, kitchen cabinets or another oversized project with many doors and panels. It's fairly easy to make a big rack to hold work to be finished, but I wanted to have something that could be dismantled and stored easily the other 99% of the time, so this was my solution.

This rack isn't meant to hold a massive amount of weight, but it works great with small- to medium-sized panels, even when fully loaded. It's more for small shop usage rather than larger industrial applications.

**Quick, Square Assembly** – With a square panel clamped to a worksurface, Brown was able to use it to keep the rungs perpendicular to the uprights. He also aligned the pencil marks on the uprights with the corner to speed assembly.

## Design

When stored, my rack is broken down into two halves and a small panel that will hold the two halves together. It's so light I can screw the parts face-to-face and then screw everything to my ceiling, where it's completely out of my way.

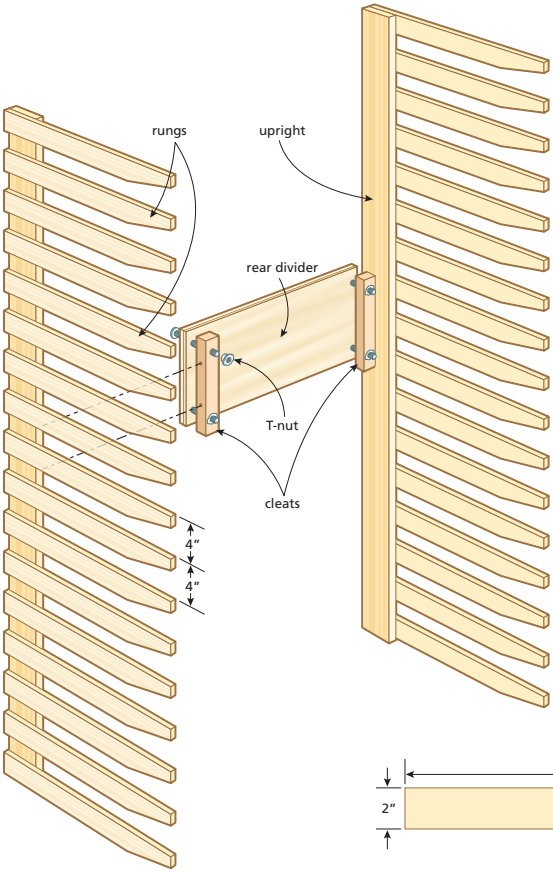
The rack I made has 17 levels. If you want to make a larger rack, just use longer uprights and more rungs. When assembled the rack sits on the floor, against my workbench, and is clamped in place. You could temporarily fix yours to another shop fixture, or even screw it to a wall. The underside of my lowest rung is flush with the bottom end of the uprights. This helps when I'm setting the rack up, but the lowest rungs aren't strong enough to support the entire rack during use.

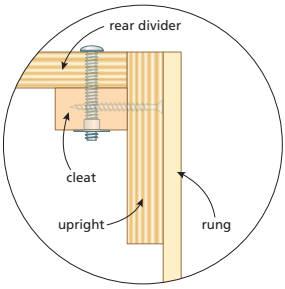
I used even rung spacing, keeping 2" between each rung, but you can either increase this spacing entirely if you often use thicker workpieces, or keep some rungs spaced 2" apart, and others spaced farther apart. After using this rack a few times, I found the 2" spacing to be a workable minimum and would probably use the same spacing again. Increasing the spacing to 2-1/2" or even 3" may be a bit better for you, though that means the rack will hold fewer workpieces.

**Clamp Them Tight** – Once they're brad nailed in place, adding clamps to each joint ensures a strong rack.

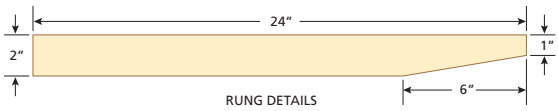
## Construction

The uprights need to be quite strong to support the weight of all the panels it will hold, but the rungs only need to be strong enough to hold one panel. I used 3/4" plywood for the uprights, and 3/8" plywood




REAR DIVIDER ASSEMBLY DETAILS
TOP VIEW




RUNG DETAILS

for the rungs, but you can increase the thickness of both the parts if you'll be finishing heavier panels. Just keep in mind, thicker parts mean a heavier rack to handle and store.

Break out the uprights and rungs to their final width and length. Use a ruler to draw a 6"-long angled line on the front, underside of each rung, then trim the waste with a band saw. This leaves the front of each rung 1" wide. This notch makes it easier to insert a finished panel into the rack during use. Heavily ease all edges of the uprights and rungs.

Starting from the top of the uprights, mark a series of lines 4" apart. These lines will locate the upper edge of each rung during assembly. Ensure both uprights match each other.

I used a 16" × 16" assembly panel to assist with keeping the rungs perpendicular to the uprights during assembly. It was clamped to a worksurface with enough room so the 4"-wide upright and a 2"-wide rung could be supported by the worksurface. With the square panel clamped in place, I applied some glue to the end 4" of the lowest rung, positioned it flush with the

## Materials List

| Part | Qty | T | W | L | Material |
|---|---|---|---|---|---|
| Uprights | 2 | 3/4 | 4 | 68 | Plywood |
| Rungs | 34 | 3/8 | 2 | 24 | Plywood |
| Rear Divider | 1 | 3/4 | 10 | 16 | Plywood |
| Cleats | 2 | 7/8 | 1-1/2 | 10 | Maple |

## Hardware List

| Name | Qty | Size | Details | Supplier |
|---|---|---|---|---|
| T-Nuts | 4 | 1/4-20 | | Misc |
| Large-Head Bolts | 4 | 1/4-20 × 2" | | Misc |

bottom end of the upright, pressed both the upright and the rung against the assembly panel and brad nailed the rung in place. Moving fairly quickly, I was able to pin the entire 17 rungs to the first upright well before the glue dried. I then added a clamp to each joint and let the first half dry.

### Mirrored assemblies

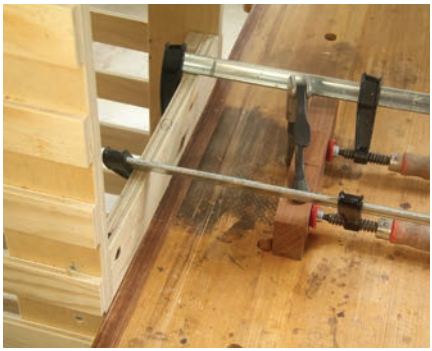
The second half was done the same way, except for one important difference; because the rungs needed to be on the outside of each upright, I repositioned the square assembly panel so I could assemble it to be the mirror opposite of the first assembly. The two solid wood cleats would eventually be glued and screwed to the inside faces of each of the uprights, and having rungs on the inside surface of the uprights would interfere with this.

### Cleats

Machine the cleats and rear divider to final size. Bore a couple of countersunk screw clearance holes in the 7/8"-wide edge of the cleats. With one of the rung assemblies lain flat on a worksurface, and with its rung-side down, mark a line the thickness

**Cleat Location** – Using the rear divider as a spacer, Brown marks the location of the cleats on the uprights. Once the uprights were temporarily screwed in place, he drilled a clearance hole through both parts so he could use the T-nuts and large-head bolts.

**Knock-Down Hardware** – Once T-nuts are installed in the cleats, the cleats can be glued and screwed to the uprights for good. Using T-nuts and bolts make for quick setups.



**Set It Up** – Brown choose to secure his rack to his workbench for use, but there are many other ways to accomplish this. Select the best method for your space.

**Keep It Simple** – When set up, the rack provides lots of room for small- to medium-sized panels, and should provide solid support for many years.

of the rear divider (3/4" in my case) away from the back edge of the upright. The distance of this line from the bottom of the upright depends on how high you want the rear divider to finish. I wanted the top of the rear divider to finish just above my workbench working height, but you might have different needs.

Align the backs of the cleats with the pencil lines, and temporarily screw them into the inside face of the uprights. Align the rear divider with the cleats, and drill 5/16" holes through both the rear divider and the cleat. Remove the cleat, hammer the T-nut into the hole on the front face of the cleat, then glue and screw the cleat to the upright for good. Adding a few more screws through the upright into the cleat was added insurance that the cleat would be strong enough to hold the rack side assemblies together during use.

If you really wanted a bomb-proof finishing rack, you could add a second rear divider, along with two more mating cleats. If you go this route I would suggest positioning one rear divider so it is fairly close to the top of the rack, and the second one so it is near the midpoint. The rack could be fastened to a stud or large, stationary fixture while in use.

## Using the rack

With the rear divider installed so it holds the side assemblies together, it's time to fix a clamping block to my bench so I can clamp the rack in place. I use my hold-down clamp through a bench dog hole and a bench dog in another hole to secure a piece of scrap wood to my bench, but there are many different approaches to doing this. A few clamps between the scrap of wood and the rear divider keep the entire rack in place nicely. There are likely dozens of other quick and easy ways to secure a rack for use, like screwing it to something solid or using oversized French cleats to hang it on a wall. Use your imagination to figure out what works best for you.

This rack has helped me out many times. I don't often have the need for finishing multiple medium-sized parts, but when I do this rack is a serious time saver, and helps me create a quality finish in a small shop.

ROB BROWN
rbrown@
canadianwoodworking.com

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# Pint-Sized WORKBENCH

Build this super-sturdy, efficient workbench for your small shop and you'll never regret it. It's big on functionality, but small on space.

Photos by Carl Duguay Illustration by Len Churchill

BY CARL DUGUAY

Early last year, I downsized to a small shop that is less than half the size of my former shop. In order to accommodate a basic set of machinery, and to have sufficient space for bench work, assembly, and storage, I opted to replace my full-size work bench with a much smaller version, and integrate my hand tool storage into the bottom of the bench.

I designed the bench so that it could be built over a two-and-a-half-day weekend, and set a budget of $300 for materials and hardware. This excluded the purchase of plywood for the bottom cabinet, as I had ample cut-offs on hand. Rather than traditional square dogs, I chose to incorporate 3/4" round dog-holes. They are much quicker to install and would enable me to use the wide range of Veritas workbench accessories. To speed up the build, I chose to make as much of the bench with 2"

## Janka Hardness

Janka hardness is a general measure of how effective a particular wood is at withstanding surface denting. The number is derived by measuring the amount of pounds-force (lbf) that it takes to drive a .444" steel ball into the wood's surface to half the ball's diameter. White ash is a very strong wood (1,320 pounds of force on the Janka hardness scale) and is one of the more shock resistant woods, making it perfect for workbenches. For contrast, Hard Maple rates at 1,450 lbf, Douglas Fir is 660 lbf, and Red Oak is 1,290 lbf.

rough (1-3/4" dressed) stock as possible, and to use dowel and bolt joinery rather than dovetails or mortise and tenon.

Once ash is acclimatized, I find that there is very little latent shrinkage. Anyone who has used ash will know that it's a pleasure to mill and work with hand tools. Best of all, though, it's probably the least expensive domestic hardwood. On the West Coast 8/4 ash is priced at $4.50 a board foot.

It's best to purchase all your hardware before you build the bench. I chose a front and tail vise from Lee Valley, as I've used both before, and they're easy to install. You'll also need a 3/4" Forstner bit to drill the dog holes. To avoid chipping the edges of the dog holes when inserting or extracting the dogs, it's worth chamfering the holes. I use a Lee Valley 82° countersink (#44J21.01). By the way, most screws have an 82° head angle, so this countersink is also ideal for ensuring your screws seat perfectly.

This bench called for 40 bf of lumber, excluding the base cabinet. Once in the shop, I milled the lumber slightly oversized, and let it rest for the better part of two weeks before milling the stock to finished dimensions. Keeping all main parts the same thickness (1-3/4") proved to be a real time-saver.

### Begin at the top

I began by orienting the boards for the top so the grain ran in the same direction, and then marking out the location for the dog holes. While I chose to drill the holes 6" apart, you can vary the distance.

My goal when gluing the top was to align the boards so that I wouldn't be faced with a lot of extra work hand-planing or power sanding the surfaces after glue-up, particularly as it couldn't be run through my planer. Edge dowelling the boards together resulted in a smoothly aligned top that required minimal hand-plane work. I used the DowelMax, though you could also use a biscuit joiner or the Festool Domino. I also used cauls to sandwich the boards together, which further helps to keep them flush, particularly at the ends.

The board at the front of the bench top, in which you'll drill a row of dog holes, should be milled the same width as the block of wood you'll use for the wagon vise jaw, which in my case was 3" wide. The jaw width isn't crucial, but it has to be wide enough that you can bolt the end guide onto the jaw. You'll also want to trim the end of this board flush before gluing up the top. Once the glue dried, I trimmed the top to length.

### Assemble the base

The front legs are assembled from two pieces of 1-3/4" stock, aligned with dowels. I made the back legs narrower, but if you like the look of beefy legs all around, double them up the same as the front legs (Note: If you do, add an additional 4 bf of 8/4 ash to your lumber order).

I chose to use 3/8" dowels to join the top and bottom braces and rails to the legs, using four 3" long dowels per joint. Of course, if you're concerned about the strength of dowels, you could use floating tenons or mortise and tenon joinery. I've used dowel joinery quite a bit, and have never had any joint failure.

Once the base was glued together, I drilled 5/8" holes in the top side braces, through which I would later bolt the base to the bench top. To prevent the end grain on the bottom of the legs from splitting if

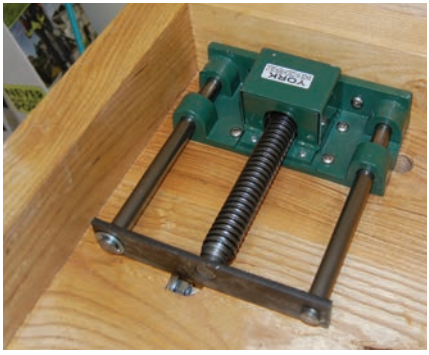
**Wagon Vise** – Duguay routed a 1/4" wide groove in the back of the front rail and installed a 1/2" wide runner to fix one half of the movable portion of the wagon jaw. One the other side, he machined a wider runner and fixed it, and the spacer it's attached to, to the underside of the top. Both of the runners ensure the jaw moves parallel with the upper surface of the top.

the bench is ever manhandled across the shop floor, I glued 3/4" feet to the legs. While a finish isn't absolutely necessary, I happened to have some polyurethane on hand, so I applied a few coats.

## Finish the top

With the top laid upside down on the base, I measured out the location of the bolt holes for attaching the aprons, then drilled 1" holes about 1-1/4" deep that the nut and washer could fit into. You'll also need to chop a flat on one side of the hole to accommodate the nut and washer.

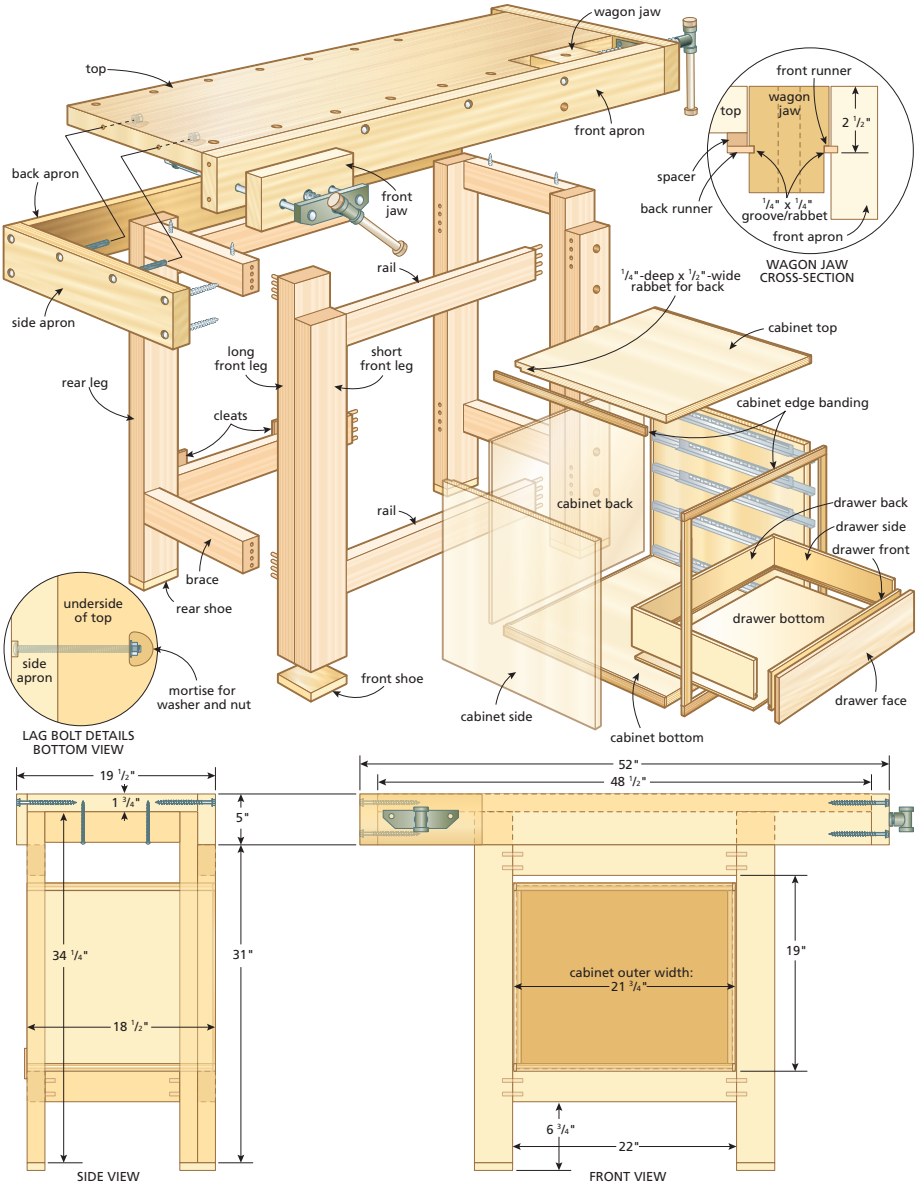
Then locate and drill the holes in the front rail for mounting the front vise.



**Front Vise** – With the top, aprons and rails in place, Duguay positions the front vise and drills the necessary holes before screwing it in place.

There is also a 1/4" by 9" slot you'll need to rout into the front rail to accommodate a 1/4" by 1/2" runner for the wagon vise jaw. There is a similar runner on the opposite side of the jaw, which is screwed to

**Surface Clamp** – Dog holes in the front of the leg allow a surface clamp to be used so that large panels can be fixed in place.



## Materials List

| Part | Qty | T | W | L | Material |
|---|---|---|---|---|---|
| Top | 1 | 1-3/4 | 16-3/4 | 48-1/2 | Ash |
| Side Aprons | 2 | 1-3/4 | 5 | 19-1/2 | Ash |
| Rear Apron | 1 | 1 | 5 | 48-1/2 | Ash |
| Front Apron | 1 | 1-3/4 | 5 | 48 -1/2 | Ash |
| Front Legs | 2 | 1-3/4 | 3-3/4 | 31 | Ash |
| Front Leg Add-Ons | 2 | 1-3/4 | 3-3/4 | 34-1/4 | Ash |
| Rear Legs | 2 | 1-3/4 | 3-3/4 | 34-1/4 | Ash |
| Side Braces | 4 | 1-3/4 | 3 | 11-1/2 | Ash |
| Rails | 4 | 1 | 3 | 20-1/2 | Ash |
| Front Jaw | 1 | 1-3/4 | 5-1/2 | 12 | Ash |
| Wagon Jaw | 1 | 3 | 4 | 3 | Ash |
| Front Shoes | 2 | 3/4 | 3-1/2 | 3-3/4 | Ash |
| Rear Shoes | 2 | 3/4 | 1-3/4 | 3-3/4 | Ash |
| Runner (Apron) | 1 | 1/4 | 1/2 | 10 | Ash |
| Runner (Rear) | 1 | 1/4 | 1 | 10 | Ash |
| Spacer | 1 | As Req'd | | | Ash |
| Cabinet Top / Bottom | 2 | 3/4 | 20-1/4 | 18-1/2 | Plywood |
| Cabinet Sides | 2 | 3/4 | 17 | 18-1/2 | Plywood |
| Cabinet Back | 1 | 1/4 | 18 | 19-3/4 | Plywood |
| Cleats | 2 | 1/4 | 1-1/2 | 3 | Ash |

## Hardware List

| Name | Qty | Size | Details | Supplier |
|---|---|---|---|---|
| Front Vise | 1 | | 70G08.01 | Lee Valley |
| Tail Vise | 1 | | 70G01.52 | Lee Valley |
| Bench Pups | 2 | | 05G04.04 | Lee Valley |
| Bench Pup Muzzles | 2 | | 05G04.06 | Lee Valley |
| Veritas Surface Clamp | 1 | | 05G19.01 | Lee Valley |
| 16" Drawer Slides | 5 | | | Misc |
| 3/8"x 6" Lag Screws / Washers | 7 | | | Misc |
| 3/8" x 4" Lag Screws / Washers | 4 | | | Misc |
| 1/2" x 6" Lag Bolts / Washers | 6 | | | Misc |
| 1/2" x 4" Lag Bolts / Washers | 4 | | | Misc |
| 3/8" Dowels | As Req'd | | | Misc |

**Simple Box** – To keep tools nearby, Duguay built a simple box, outfitted it with drawers, and secured it under the workbench top.

the underside of the bench top. Attach this second runner now, but only glue it in place after the top is mounted to the base. You'll also need to insert a spacer to correctly position the runner in the groove on the wagon vise jaw.

Finally, determine the location of the hole in the right side apron for the wagon vise screw. Drill the hole, and then chop a mortise for the collar on the inside of the apron.

At this point, I turn the bench top right side up, and dry clamp the front and rear rails and aprons in place. I also check to ensure that the vises mount properly. Best to check that everything goes where it should, and make any necessary corrections before you glue things in place. Once you're satisfied with the fit, glue and screw the back and front rails in place, and then screw and bolt – but don't glue – the aprons in place.

**Lots of Storage** – The tool cabinet keeps tools at arm's reach. Ensure the handles on the drawers don't protrude past the face of the top, or they will interfere with larger panels that are clamped to the face of the bench.

## Install the vises

To make it easier to install the vises, I flipped the workbench on its back. There may be some tendency over time for some slight top to bottom racking when the front jaw is tightened. To account for this, you can plane a 2° bevel on the inside of the front jaw or glue on a leather face, which will compress somewhat to accommodate any racking. I chose to bevel the jaw.

I glued up two pieces of scrap ash to make the wagon vise jaw, creating a pocket into which the end guide is bolted to the jaw. Drop the jaw into the opening from above the bench; one side of the jaw will land on the runner you glued into the inside of the front rail. Then, from underneath the bench top, attach the second runner and spacer to support the other side of the wagon vise jaw. Screwing the end guide into the vise jaw is a bit awkward – a ratcheting screwdriver helps.

**Tool Tote** – A simple tool tote attached to the back of the top with screws keeps the work surface as free as possible from tools.

To ensure the top of the front jaw and wagon vise jaw are level with the top of the workbench, install them so that the jaws are about 1/16" above the bench top, and then hand-plane them flush.

I drilled dog holes into the right front leg to accommodate a Veritas Surface Clamp. This makes it easy to clamp wide boards and panels vertically against the workbench.

## Build the cabinet

I used whatever leftover plywood I had on hand to make the bottom cabinet, trimming the edges with ash. As the top and bottom aren't visible, I simply screwed them together. The cabinet rests on the lower rails, and a couple of screws through the bottom of the cabinet into the lower rails keep it from shifting. I sized the drawers to accommodate what I wanted to store, and installed them on fully extending side mount sliders. The cabinet is set back 1/2" and the drawer handles are recessed somewhat to keep them flush with the front of the bench.

## Final thoughts

While I thought I might miss a large work surface, this was not the case. I can easily clamp 30" wide panels on the bench top and can hold 60" boards in the front vise, supported by a surface clamp inserted in the front leg.

The bench has held up beautifully over the past year. There hasn't been any noticeable movement in the top, probably because there is very little temperature and humidity fluctuation in my shop, and the dowel joints are as tight as the day they were made. I don't know what the bench weighs, but it's heavy enough that, even with aggressive planing, it remains rock steady.

I recently added a tool tote to the back of the bench: a simple plywood box that provides a catch-all for hand tools and bits of wood that would otherwise clutter up the small work surface on the bench. It hangs off of two screws and can be easily removed.

If you've recently built a workbench for a small shop, I'd love to hear what you did. You can email me directly or share your comments on the digital version of the article on our website.

CARL DUGUAY
cduguay@
canadianwoodworking.com

Carl has been involved in home renovation, cabinetry, and furniture making for over three decades. He's often at the computer, working as web editor for CW&HI, but can sometimes be found in his matchbox-size shop.

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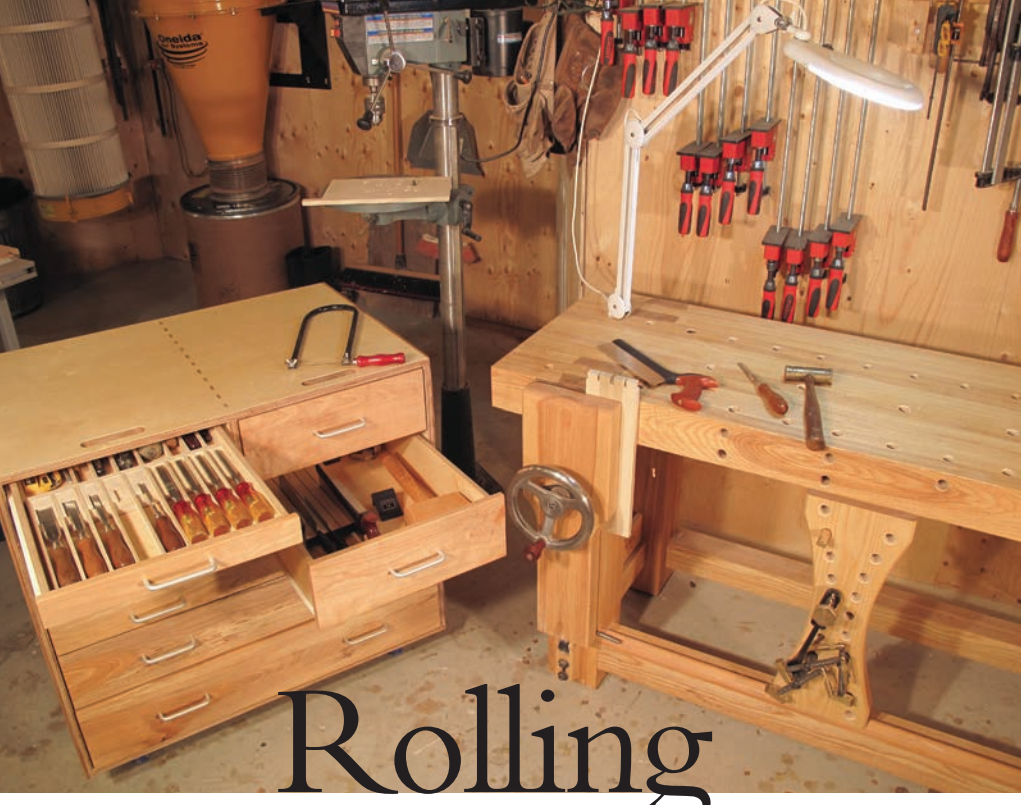


# Rolling Shop Storage

These rolling storage cabinets will help out in more ways than you can imagine around the shop. You won't know what you did without them.

BY HANS BRAUL

As hobbyists, most of us do woodworking for the satisfaction it gives us. For some, it's the finished product, whatever path you took to get there. For others, like me, it's the process. There is nothing more satisfying than seeing an idea taking shape through the use of finely tuned tools and ever-improving skills. It gives me a sense of satisfaction and accomplishment. But if there is one thing that dulls that sense, it is the chaos that comes from a congested mess with too many tools with no home. Dropped chisels, scratched pieces that were ready for finish, tools that simply

Photos by Hans Braul Illustration by Len Churchill

**Solid Worktop** – Torsion box construction yields a rigid work surface. Braul supported it with two plywood gables and a divider, and used L-brackets to secure the vertical panels to the ground.

**Add Case Joinery** – After cutting the case parts to size, Braul used his router table to machine rabbets for joinery. A table saw could also have been used.

disappear until the project is finished. Add to that the frustration of trying to maintain a clean shop when every corner is jammed with homeless tools. Some people thrive in such a space (think Einstein). Those of you need read no further. For the rest of us, our enjoyment depends in large measure on organization, especially when our space is limited.

For me, the solution was to replace a roughly built set of open shelves made of construction lumber with a utility bench and a set of rolling cabinets that could accommodate all the hand-held tools that I use on any regular basis.

## Start with some planning

The first step was to lay out all the tools that needed a proper home, and measure each one. Then I thought about exactly how and when I would be using these tools.

Which tools were the most frequently used? Which tools would likely be added to my collection in the foreseeable future? I took a hard look at low-quality tools that had somehow found their way into my collection (gifts, inheritance, poor choices from another time, etc). Some had never been used and some had been replaced

**Additional Strength** – Domino tenons were added into the case corner joints to add additional strength (left). Once the glue was dry, the tenons were cut flush with the outer surface and sanded smooth (right).

## Materials List

| Part | Ltr | Qty | T | W | L | Material |
|---|---|---|---|---|---|---|
| Torsion Box top/bottom | A | 2 | 1/2 | 24 | 72 | Baltic Birch |
| Torsion box long edges | B | 2 | 1/2 | 1-1/2 | 72 | Baltic Birch |
| Torsion box short edges | C | 2 | 1/2 | 1-1/2 | ~23 | Baltic Birch |
| Torsion box internal grid long | D | 3 | 1/2 | 1-1/2 | ~71 | Baltic Birch |
| Torsion box internal grid short | E | 8 | 1/2 | 1-1/2 | ~23 | Baltic Birch |
| Bench supports | F | 3 | 3/4 | 24 | 33-1/2 | Baltic Birch |
| Cabinet sides | G | 4 | 3/4 | 23 | 29-1/4 | Baltic Birch |
| Cabinet tops/bottoms | H | 4 | 3/4 | 23 | 33-5/8 | Baltic Birch |
| Horizontal divider | I | 1 | 3/4 | 23 | 32-7/8 | Baltic Birch |
| Vertical divider | J | 1 | 3/4 | 23 | 11-3/4 | Baltic Birch |
| Cabinet backs | K | 2 | 1/2 | 28 1/2 | 33-5/8 | Baltic Birch |
| Drawer Box Material | L | - | 1/2 | As Necessary | | Baltic Birch |
| Drawer Bottom Material | M | - | 1/4 | As Necessary | | Baltic Birch |
| Drawer False Front Material | N | - | 5/8 | As Necessary | | Solid Cherry |

## Hardware List

| Name | Qty | Size | Details | Supplier |
|---|---|---|---|---|
| Aluminum Wire Pull | 21 | 4 | Item 01W7604 | Lee Valley |
| Swivel Caster w/Brake | 8 | 3 x 4 | Item 00K2131 | Lee Valley |
| Standard Blum Slides, pr. | 10 | 22 | Item 02K6255 | Lee Valley |
| 100 lb Slides (Full Extension), pr. 4 | 20 | | Item 02K3022 | Lee Valley |
| T-nuts | 8 | 5/16 | | Misc |
| Bolts | 8 | 1 x 5/16 | | Misc |
| Washers | 8 | 5/16 | | Misc |

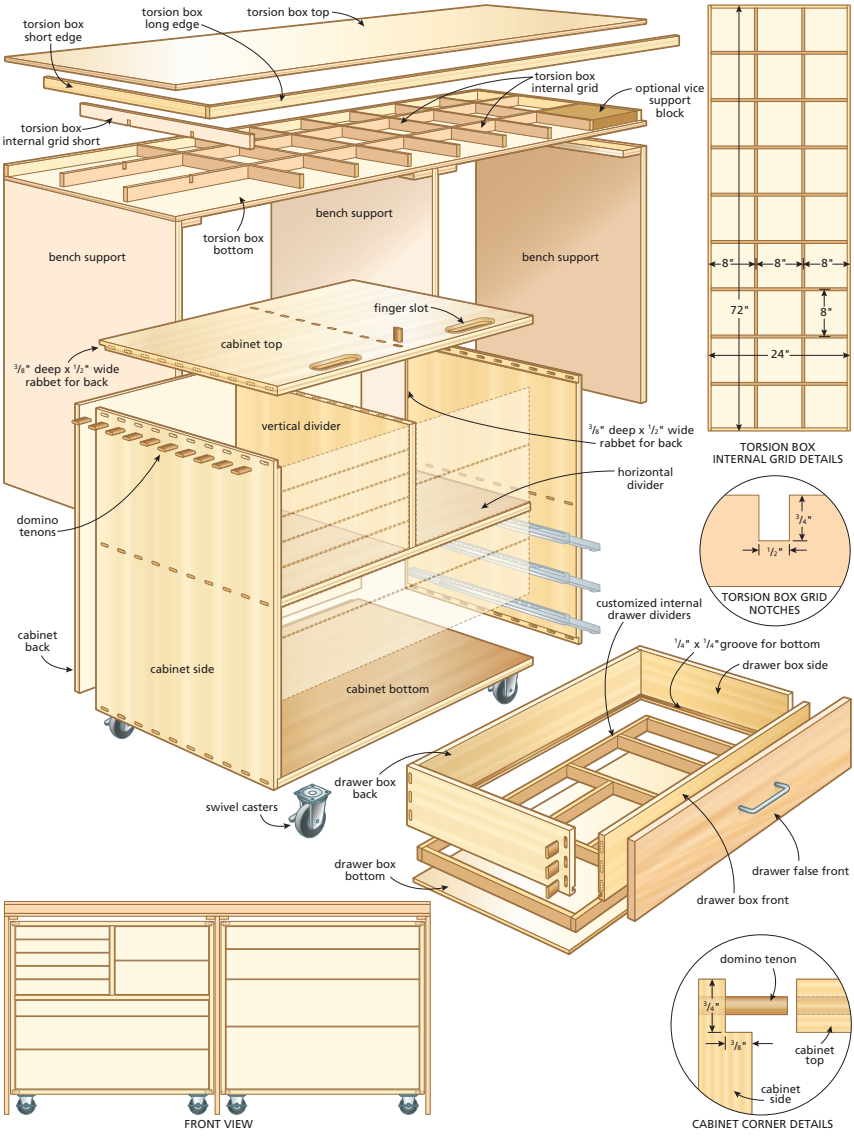
with better versions. I decided that any tool that had not been used in the last five years or so did not deserve a home. These went to the "Kijiji pile".

Once I had decided on which tools were to be stored and in which configuration, I used Sketchup to design the drawer configuration.

It was important to provide just enough room for each tool, with minimal wasted space. By carefully arranging the available space, I was amazed that I could easily accommodate my entire collection, with space available for future acquisitions.

### The bench

The workbench top was constructed as a torsion box, from 1/2" Baltic birch. The internal grid was an 8" square pattern. The vise was mounted to the top



**Dominos Everywhere** – In addition to adding strength to the rolling cases, Braul added them to the drawer joints.

by through bolts that engaged T-nuts, set in a reinforcing block internal to the box. The bench was set on a set of three 3/4" BB dividers that were secured to the floor and back wall using L-brackets. The dividers were spaced to allow about 1/2" clearance on the sides and 1" clearance on the tops of the cabinets.

## Simple and strong cabinets

The construction of the cabinets was pretty straightforward. The cases were of 3/4" Baltic birch, with dado joints on the corners, cut with a router, then glued and reinforced with through Dominos.

One of the cases included dividers to allow for two sets of narrower drawers. I chose not to dado the dividers to the case sides and top, reasoning that the through Dominos, together with 1/2" back panels, would provide more than adequate strength and rigidity. I cut the backs to size and glued and pinned them into the rabbets in the back of the case. I mounted heavy-duty 3" locking casters on the bottom of each case using 5/16" through bolts and T-nuts.

The top of each cabinet includes finger-slots to allow the cabinet to be maneuvered in and out of their home under the bench. These were cut using a spade bit and jig-saw, and finished using a 1/8" round-over bit in a router.

**Work Upwards** – Once the cases, drawer boxes, and false fronts were complete, Braul worked from the bottom, upwards, clamping, and screwing on the false fronts. He used 1/8" spacers below each false front to maintain a gap on the front below.

**At Arm's Reach** – Not only does Braul know exactly where his tools are, but he can roll them to where he's working, saving time and energy.

## Drawers

The drawer sides were made from 1/2" Baltic birch plywood, with 1/4" BB ply bottoms, rabbeted into the sides and glued. I debated whether this would provide sufficient strength, but it is clear that even for my heaviest tools, these drawers provide adequate strength. For the drawer glides, I chose to use standard Blum glides for the lighter items, and heavy-duty full extension roller glides for the drawers that would hold heavier power tools. This choice was simply a matter of cost. The drawers' corners were constructed by gluing and pin-nailing the boxes together, then adding through Dominos.

It was important to ensure the boxes were square and correctly dimensioned, since the drawer guides allowed only 1/32" tolerance.

I happened to have some thin spalted cherry that had been sitting in my stash for many years. Because it was less than 3/4" thick in the rough state, I had never found a project where it could be used

# Dealing with Drawers

For the drawers for my tool collection, I used a variety of options. For some drawers – mainly the smaller ones – I made a simple grid of ¼" BB ply held together with pin nails and secured to the drawer sides using double-sided tape. This gave me lots of flexibility down the road, when my tool collection morphed, and I needed to make adjustments. I was also sure to create specific homes for sharp tools that could be easily damaged. I didn't want them moving around at all.

When dealing with many of my large drawers I opted for 1/2" thick Baltic birch plywood. I cut the pieces to size and either glued them in place or, again, used pins and double-sided tape. It all depended on how sure I was that I would have a specific tool around for decades.

For some other drawers, I simply cut strips of wood to size then hot-glued them onto the drawer bottoms to hold the tools in place. I consider these partitions dispensable, since changes will be inevitable as new tools are acquired and/or more optimal arrangements are realized.

**Assembly Tables** – While you're working on future projects, you will find many uses for these rolling cabinets. Using the pair as assembly tables will come in handy from time to time.

effectively. So I decided to take the plunge and give it a place of honour in my shop, in the form of false drawer fronts. The false fronts were mounted to the drawer boxes using self-tapping screws from the inside. The drawer fronts were separated from each other and from the case sides by 1/8". To mount the drawer fronts accurately, I used 1/8" spacers, clamped the false front to the drawer box and worked from the bottom drawer up to fix them all in place.

## A home for each tool

Once the drawers were assembled and installed, the next task was to organize the space so that tools would be held securely. See the sidebar to learn how I did this.

## The Finish

I applied three coats of wipe-on poly to the drawers. For the bench and cabinet boxes, I used four coats of a tough polyurethane floor varnish. I wanted these surfaces to withstand considerable wear, as I could see some tough days ahead for these pieces.

## How are they used?

I have found that this project has transformed my shop in many ways. The biggest improvement is knowing exactly where all my tools are. Also, when I'm doing hand work I can have the tools close at hand, and I can conveniently return each tool to its home between uses. Another benefit is the cabinets can be used as table saw infeed or outfeed tables. A final advantage to having the cabinets around is that they work wonderfully as assembly surfaces.

## Was it worth it?

For me, the answer is a resounding yes, but it comes down to individual comfort level. Some woodworkers have taken their shop furniture and storage to an art form, while others barely give it a thought. I fall somewhere in the middle. This project was a significant investment of my time, and the materials weren't free. But the result is an attractive, organized space that makes me feel at peace when I enter my shop.

HANS BRAUL
hansbraul@icloud.com

For Hans, there are few things more enjoyable in life than getting completely absorbed in a woodworking project – a perfect counterbalance to the sometimes rarified world of nuclear energy consulting.

### Go Online for More

**PAST ARTICLES:** Working With Sheetgoods *(June/July 2013)*, Building Base Cabinets – Part 3 *(Aug/Sept 2003)*

# Saw Blade Holder

This blade holder will not only protect your sharp saw blades, and keep them well within arm's reach, but it also won't interfere with the regular use of your saw.

BY ROB BROWN

My table-saw is essentially right in the center of my shop, far away from those things us woodworkers like to store stuff on: walls. I built this blade holder so all my blades, shims, wrenches, and miscellaneous table-saw items were always nearby. I can rip a full 48" wide on my saw and I didn't want this holder to interfere with that in any way, so I positioned this holder so there was a 4" clearance between my table-saw's surface and the underside of this holder. I have about 10 blades and one dado set, but feel free to customize this holder to suit your storage needs.

## Start at the outside

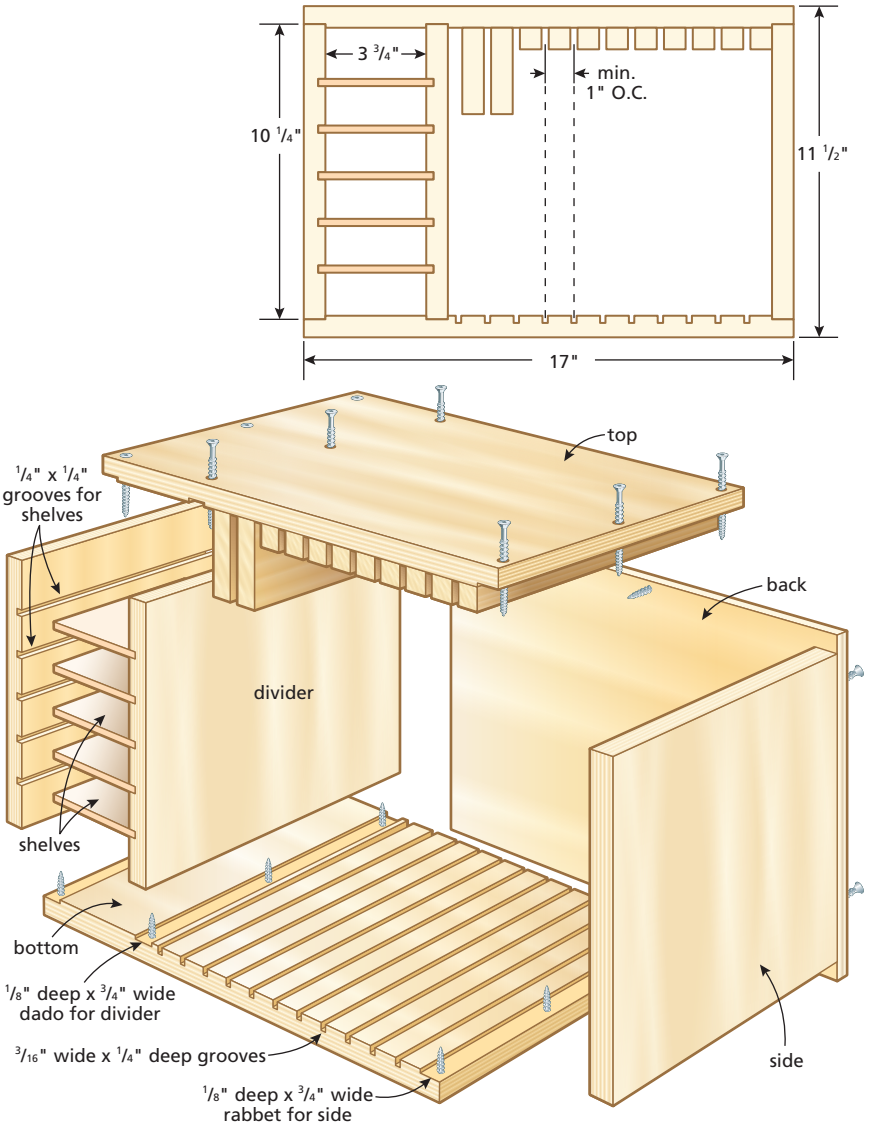
Though I used a mix of particleboard and plywood for my blade holder, I would recommend using plywood. Start by ripping a 96" length of plywood to 11" wide. You can get all but the thin plywood shelves, back, small blade supports, and optional blade stops out of this blank.

Crosscut the top, bottom, sides and divider to length. Though I didn't do this next step, I would recommend running a 1/8" deep rabbet in the top and bottom that would accept the sides, as well as a dado across these two parts to accept the divider. These will assist you during assembly, but don't add much strength to the unit. Once the rabbets and dados are complete, bore a few screw clearance holes through them to make assembly a breeze.

## Work your way inside

Machine narrow grooves across the left side and the divider that will accept the 1/4" plywood shelves. The shelves are about 1-1/2" apart, but as long as mating grooves are equally spaced the exact distance isn't

Photo by Rob Brown Illustration by Len Churchill




crucial. Next, run 1/4" deep dados that will accept the saw blades in the bottom panel. Each dado should be about 3/16" wide so blades can be inserted into the holder easily. Blade dados closer than 1" on center may cause you to cut your fingers each time you reach in for a sharp new blade.

Lay the top over the bottom and mark exactly where the blade dados are located. After machining the small blade supports to size, you can glue them to the underside of the top with these lines in mind, creating gaps where the blades will be located. Be sure to leave 1/4" between each support.

I used two large blade supports to help house the outer blades of my 8" diameter dado set. These large supports were cut to size then glued and screwed in place.

## Materials List

| Part | Qty | T | W | L | Material |
|---|---|---|---|---|---|
| Top / Bottom | 2 | 3/4 | 11 | 17 | Plywood |
| Sides | 2 | 3/4 | 11 | 10-1/4 | Plywood |
| Divider | 1 | 3/4 | 11 | 10-1/4 | Plywood |
| Shelves | 5 | 1/4 | 4 | 11 | Plywood |
| Large Blade Supports | 2 | 3/4 | 11 | 3 | Plywood |
| Small Blade Supports | 9 | 3/4 | 3/4 | 11 | Solid / Plywood |
| Back | 1 | 1/2 | 11-3/4 | 17 | Plywood |
| Support Panel | 1 | 3/4 | 11 | 17 | Plywood |
| Optional: Blade Stops | As Req'd | 1/4 | 1/4 | 1 | Solid |

## Assembly

A quick dry fit, then it's time to add the glue to the 3/4" dados and rabbets. Starting with just the three parts that will be attached to the bottom panel, I apply an even coat to the end grain of the plywood, let it dry for a few minutes, then reapply a healthy coating and bring the parts together. A few screws (a pin nailer would also work well) in each joint and it's time to do the same for the joints that mate with the top panel. Clamps and cauls will hold the parts together until the glue is dry. Cut the back to size, then install it with glue and screws. Be sure to clamp the back to the rest of the holder, as you want the joint to be as strong as possible.

Cut enough 1/4" plywood shelves to fit in the grooves. I store my chippers, and a few other smaller items, on these shelves. My shelves are friction fit, so if something happens to get pushed towards the back of the shelf cavity I can slide the shelf out, like a drawer, and access it.

## Mounting the holder

I felt I should beef up the structural integrity of my saws particle core surface in order to make sure it could support the weight of the holder and its contents. This just meant adding some solid under the end of the surface, and ensuring it was strong and stable. I then glued and screwed the support panel to the holder, overlapping them by about 3 1/2". Fixing the holder and support panel to the saw by myself was a bit tricky. I attached two small L-brackets to the front of the support surface, about 3 1/2" up from the support surface's bottom edge. The L-brackets helped position the unit at the right height, so all I had to do was stop it from toppling over as I screwed the holder to my saw's surface.

At this point I added screws, brackets and hooks to the sides and back of the holder in order to store even more stuff I regularly need when using my table-saw – the table-saw is a shop workhorse, after all. Although I've never had blades roll forward, if your holder ends up angled forward slightly you may want to consider adding small blade stops in the blade grooves to stop this from happening.

ROB BROWN
rbrown@
canadianwoodworking.com

### Go Online for More

**PAST ARTICLES:** Dado Storage Box *(Feb/Mar 2003)*, Saw Blade Storage Box *(June/July 2007)*.

# Build a Moxon Vise

BY CARL DUGUAY

I recently moved to a condo that has a small 180 square foot workshop in the basement. While I still have access to a fully equipped woodworking shop, I find it convenient to use the basement shop in the evenings, or when I want to tinker with a new tool. Unfortunately, the shop lacks a proper workbench – instead, it has couple of worktables and a metal vise. Rather than build a new workbench, I decided it would be quicker, easier and less expensive to add a vise to the existing worktable.

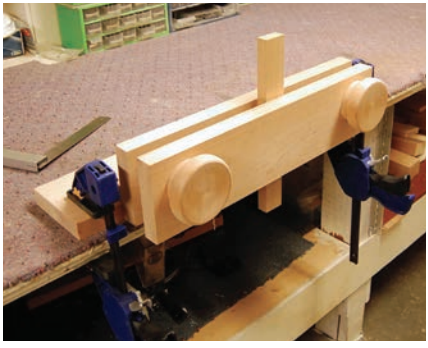
After considering all my options, I decided on a Moxon vise because I could

Photos by Carl Duguay, Illustration by James Provost

**Inset the Nut** – To create a cavity for the nuts in the back of the fixed jaw, draw the outline of the nut and remove the waste with a chisel.

**Hardware Selection** – Basic threaded rod can be bought from most big-box stores, but higher quality threaded rod is available through Lee Valley and your local fastener supplier.

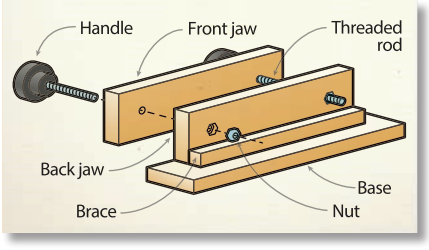
use it in the basement shop or easily transport it to the main shop. Plus, it can be clamped to just about any work surface, which meant I wouldn't have to make any changes to the basement worktables.



**Clamp and Go** – Once the vise is assembled, clamp it to your bench as required and start sawing.

## Three Options

There are a number of options when it comes to making a Moxon. You can make every part of the vise by hand, including the handles, threaded rods and nuts. This requires that you have a threading and




## Materials List

| Part | Qty | T | W | L |
|---|---|---|---|---|
| Fixed and sliding jaws | 2 | 1-1/2 | 5-5/8 | 21 |
| Base | 1 | 1-1/2 | 6 | 27 |
| Brace | 1 | 1-3/8 | 1-3/8 | 21 |
| Handles | 2 | | 2 x 4 blocks | |
| 3/4" x 12" threaded rod and two nuts | | | | |

3/4" Forstner bit

# Even Pressure Top-to-Bottom

A Moxon vise does not do well clamping material that does not extend below the midpoint of the vise screws. To address this problem, I made two slitted pieces of wood. I used pan-head screws to hold them to the underside of my workbench top. The screws should not be so tight as to prevent the supports from sliding easily.

In use, I pull out the supports and place a scrap equal to the thickness of the piece being clamped in the vise. This prevents the jaw from racking when I apply pressure to my workpiece.

*—Chris Wong*

**Install the Sliders** – Wong used pan-head screws to lightly fix the wooden sliders under his bench, centered on his moxon vise. They remain under the bench, out of the way, until needed. (Photos by Chris Wong)

**Needed Support** – When required, Wong pulls the two sliders out and places a piece of scrap wood the same thickness as the workpiece on top of them. The piece of scrap keeps the vise from racking.

tapping kit, and if you do, this is the least expensive option. However, it is also the most time-consuming. Still, anyone with intermediate-level skills should have no problem making all the parts.

A second option is to purchase the Benchcrafted kit from Lee Valley. At $155, this is the sleekest yet most expensive option. All you need to do is supply the lumber. If you like your projects to be as simple and easy as possible, then this is the route to choose.

The third option, which I took, was to purchase the rods and nuts from a local fastener supply outlet and make the handles myself. This turned out to be fairly inexpensive – the hardware cost $18. Whatever option you choose, you'll need to purchase lumber for the vise body. I paid $28 for a 7-foot length of 2x6 Western maple.

Rather than using standard zinc-plated rod, which is available at any Home Hardware store, I used 3/4" Acme threaded rod. Standard rod has V-shaped threads, whereas Acme rod has large square threads that run much smoother. Also, Acme rod has fewer threads per inch, so you can move the rod more quickly.

Most of the designs I looked at called for four nuts – two installed on the back of the fixed jaw, and two mortised into the front of the fixed jaw. I only used two nuts, mortised into the back of the fixed jaw (without glue). So far, it's worked like a charm.

There really aren't any critical measurements for the vise; size it for its intended use. I wanted a vise for dovetail work on stock up to about 12" wide. The dimension I chose provides 15" of space between the bolts. I used 6" rods only because my supplier sells Acme rod by the foot. The result is that I can clamp stock up to 2" thick, though I rarely dovetail stock thicker than 3/4".

## Accuracy Counts

It goes without saying that you should mill your stock as accurately as possible. You want the base and fixed jaw to form a perfect 90° angle. Clamp the two jaws together, ensure that the top edges of the jaws are flush with each other, and drill the rod holes on a drill press – not freehand. Use an exact-sized drill bit – if you use an oversized bit the front jaw will flop around too much.

If you think that you'll be clamping angled stock in the vise, elongate the *sides* of the holes on the sliding jaws slightly – not the top and bottom of the holes. While you can elongate the holes with the drill bit, I found it easier to use a rasp.

I made the sliding jaw about 1/8" wider than the fixed jaw so that it would register up against the worktable. I also extended the base past the jaws by 3" on both sides to facilitate clamping. I like this better than placing clamps on the top of the fixed jaw to secure the vise to the worktable.

I'm no great turner, but I was reasonably pleased with the handles I made. Relieving the back of the handle will help keep your knuckles from hitting against the front jaws. I used Gorilla Glue to adhere the rod to the handles – epoxy would work just as well. Polyurethane glue foams but can be easily scraped off the rod.

All told, this vise took me approximately four hours to build, excluding glue-up. The next time I mix up a batch of shellac, I'll put a few coats on the vise.

I've only been using the vise for a couple of weeks, but I'm very pleased with how it has worked out. The vise is quick and easy to set up and holds stock securely in place. Plus it's a great conversation piece.

## Steps

- Mill the stock to finished dimensions.
- Clamp jaws together; mark out the jaw holes; drill the rod holes.
- Chop out the mortises for the nuts on the back of the fixed jaw. Tip: place a nut on the rod, insert it into each hole, using it as a guide for marking out the shape of the mortise.
- Glue the fixed jaw to the base.
- Glue the brace to the assembled jaw/base.
- Elongate the sides of the holes in the sliding jaw. (optional)
- Glue a cork or leather facing onto the inside face of the sliding jaw. (optional)
- Turn two handles, anywhere from 3" to 4" in diameter.
- Drill 3/4" holes, about 1" deep, in the handles.
- Glue the rods into the handles. Apply a finish then assemble.

CARL DUGUAY
cduguay@
canadianwoodworking.com

When not tinkering in his shop, Carl is usually at the computer, working diligently on the *Canadian Woodworking* web site.

# Build a Hand Tool Cabinet

BY MICHAEL KAMPEN

Those who are new to woodworking may not yet own many hand tools. Often, when woodworkers first set up their shop, and start purchasing the requisite tools, the emphasis tends to be solely on power tools. The perception is that power tools are faster, give better results, and are easier to use.

Those same woodworkers, when they have been at it long enough, come to realize how integral hand tools are for a complete shop. As each woodworker progresses in their craft, they see that there are things that hand tools can do that power tools just can't do. Consider, too, that hand tools offer a more quiet, peaceful way to work with wood, and you begin to understand why most seasoned woodworkers have a variety of hand tools at their disposal.

Whether you are one of those seasoned woodworkers that needs a place for your hand tools, or you are new to woodworking and looking to build up your hand tool collection, this hand tool cabinet is sure to serve your purpose.

## The Design

This cabinet should be hung close to your workbench and is a great way to show off some figured wood and your skill as a craftsman. I made this cabinet of figured cherry with walnut accents. The doors each have one glass panel at the top above a panel veneered with fiddleback makore. The doors are hung using brass offset knife hinges. The five lower drawers are red oak, the faces veneered with bee's wing eucalyptus. If you think this cabinet is too challenging and difficult, you'd only be half right. It is challenging, but it's not difficult. With some simple tricks along the way, any woodworker could build this piece.

I built this cabinet to hold my personal collection of hand tools. Feel free to change the design to suit the tools you have. After all, it will be hanging on the wall of your shop, not mine.

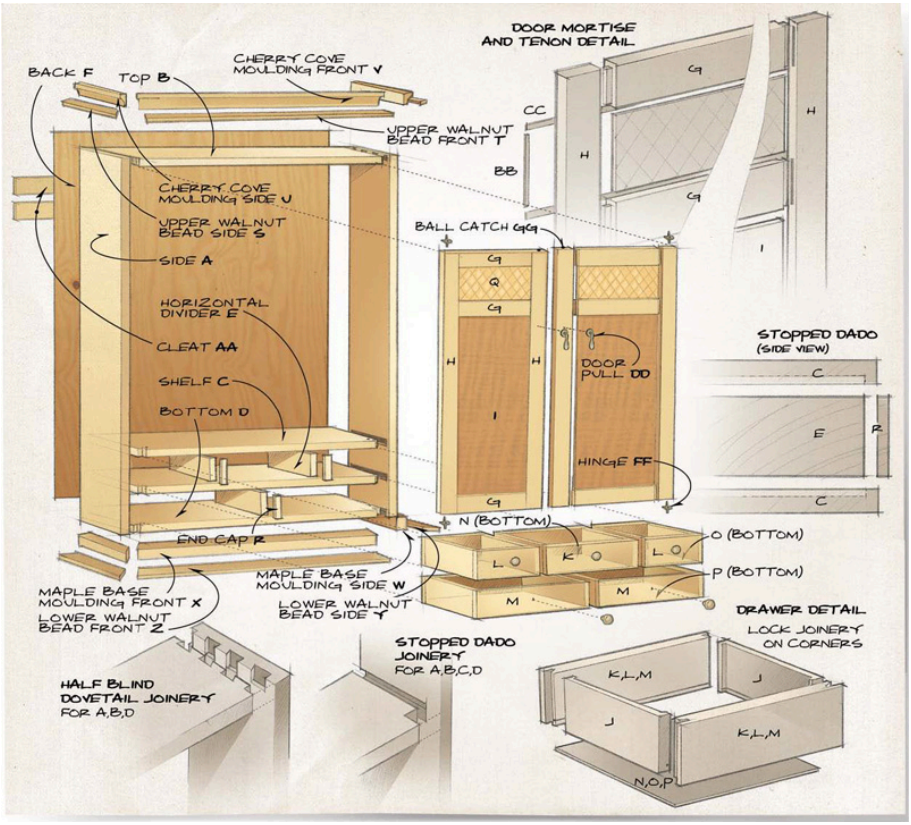
## The Cabinet

The cabinet is made of six glued up cherry panels. If you can find material wide enough and have the tools to work it, they could be made from one solid piece. The most visible parts of the cabinet are the sides (A), so choose your wood carefully and try to hide the glue line. Remember, both sides (A) will be seen from both sides. The next most visible surfaces will be the underside of the top (B) and the upper side of the top shelf (C) so these should also be laid out with an eye to colour and grain matching. All other faces, including the bottom (D) will be hidden so appearance is not an issue. In addition to matching the faces of the panel, the front edges on these parts will also be very prominent. In order to achieve a match with the sides, I had to edge band the front of each of the horizontal members with a 1/4" strip of cherry cut from another board.

Cut the glued up boards for the cabinet to their final dimensions. I used a dovetail jig to cut half blind dovetails to hold the top, bottom and sides together. This makes assembly easier later. In order to do this, the top and bottom had to be 1/8" longer than the shelves. Adjust the length of the top and bottom based on your method. Dowels would work equally well while still providing alignment during assembly.

The two shelves are held in stopped dados. Cut these using a router guided by two fences and an end stop. Use this same method to rout the stopped dados for horizontal dividers (E).

To fit the shelves, cut a 3/8" deep, 3/4" long notch into each leading corner of




each shelf to allow it to slide past the stopped dado and sit flush with the front edge of the sides. Cut the plywood pieces for the three dividers.

Assemble the pieces to be sure everything fits perfectly before proceeding. If everything comes together properly, clamp the pieces together and lay it face down on your workbench. Use a marking gauge to scribe a line 1-1/8" in from the back around the perimeter. Mark this area with chalk so it is readily identifiable as the rabbet for the back after the pieces are taken apart.

Lay out the mortises for the two hinges on the underside of the top, and the top side of the upper shelf. Lay out the mortise precisely using a ruler and a marking gauge, or lay everything out using pieces of wood, a drill bit and a depth gauge.

Install a 3/8" spiral cutter in your router table for a cut equal to the thickness of the hinge leaf.

Set up a fence and use the spacer to set the distance between the cutter and the fence. Keeping the face edge against the fence at all times will ensure the proper

Notes:
All parts are cherry except as noted: (w) walnut; (m) maple
Drawer locations: (TC) Top Center; (TO) Top Outside; (B) Bottom

Milk Paint and Claphams Lavender Beeswax available from:
Homestead House Paint Company, www.homesteadhouse.com

## MATERIALS LIST (All measurements in inches)

| | Part | Qty | T | W | L |
|---|---|---|---|---|---|
| A | Sides | 2 | ¾ | 9 ⅛ | 31 ⅝ |
| B | Top | 1 | ¾ | 9 ⅛ | 23 |
| C | Shelves | 2 | ¾ | 9 ⅛ | 22 ⅞ |
| D | Bottom | 1 | ¾ | 9 ⅛ | 23 |
| E | Horizontal dividers | 3 | ½ | 2 ¾ | 8 |
| F | Back | 1 | ½ | 22 ⅞ | 30 ⅞ |
| G | Rails | 6 | ¾ | 2 | 8 ⁹⁄₁₆ |
| H | Stiles | 4 | ¾ | 2 | 24 ⅛ |
| I | Door panels | 2 | ¼ | 7 ¹³⁄₁₆ | 15 ⅛ |
| J | Drawer sides (TC) | 10 | ⅜ | 2 ¼ | 7 ⅝ |
| K | Drawer front and back (TC) | 2 | ⅜ | 2 ¼ | 8 ⁹⁄₁₆ |
| L | Drawer fronts and backs (TO) | 4 | ⅜ | 2 ¼ | 6 ¼ |
| M | Drawer fronts and backs (B) | 4 | ⅜ | 2 ¼ | 10 ¹³⁄₁₆ |
| N | Drawer bottom (TC) | 1 | ¼ | 8 ⅛ | 7 ⁷⁄₁₆ |
| O | Drawers bottoms (TO) | 2 | ¼ | 15 ¹³⁄₁₆ | 7 ⁷⁄₁₆ |
| P | Drawers bottoms (B) | 2 | ¼ | 10 ⁵⁄₁₆ | 7 ⁷⁄₁₆ |
| Q | Glass panels | 2 | ⅛ | 7 ¹³⁄₁₆ | 4 ⅝ |
| R | End caps | 3 | ¾ | ½ | 2 ¼ |
| S | Upper bead sides (w) | 2 | ¼ | 1 ⅝ | 9 ½ |
| T | Upper bead front (w) | 1 | ¼ | 1 ⅝ | 24 ⅛ |
| U | Cove moulding sides | 2 | ⅞ | 1 ¾ | 9 ⅞ |
| V | Cove moulding front | 1 | ⅞ | 1 ¾ | 25 |
| W | Base moulding sides (m) | 2 | ½ | 1 ⅝ | 9 |
| X | Base moulding front (m) | 1 | ½ | 1 ⅝ | 23 ¼ |
| Y | Lower bead sides (w) | 2 | ¼ | 1 ⅝ | 9 ⅛ |
| Z | Lower bead front (w) | 1 | ¼ | 1 ⅝ | 23 ½ |
| AA | Rear cleat | 1 | ⅝ | 3 ½ | 22 ⅞ |
| BB | Window strips | 4 | ¼ | ⅜ | 3 ⅞ |
| CC | Window strips | 4 | ¼ | ⅜ | 7 ¹³⁄₁₆ |
| DD | Door pulls | 2 | | | |
| EE | Drawer pulls | 5 | | | |
| FF | Hinges | 2 pair | | | |
| GG | Brasso ball catches | 4 | | | |

setback on both the cabinet and door mortises.

Set a stop to limit the length of the mortises and rout all four now; this is the only chance. You will need to move the stop to the other side of the bit to do two of the mortises.

Using the same 3/8" spiral bit in a router table, use a fence and end stops and rout a 1-1/8" inch wide by 3/8" deep stopped rabbet on top bottom and sides to receive the back.

Assemble the cabinet again and fit the two shelves so they are flush at the front. Mark the depth of the rabbet on each shelf and remove the waste with a table saw. With the pieces assembled, measure for the back (F) and cut it to fit snugly in the rabbet.

At this stage, if everything fits, take the pieces apart in preparation for finishing. Because there are many areas of this project that would be difficult, if not impossible, to finish properly later, it is best to do the finishing before various sections are assembled.

Sand the back to 150-grit in preparation for the finish.

Milk paint is an ideal finish for the back; it's a traditional finish that's been made the same way for hundreds of years and imparts a subtle depth and shading that modern paints can't match. It is so easy to use and you get perfect results every time. I used a 'mustard' colour.

Mix the paint powder with water and brush it on. It will dry very quickly, in about 15 minutes. It will need a second coat for even colour coverage and when this is dry, rub it down with 000 steel wool. At this point I like to put on a couple of more quick coats. That seems to help make the colours a little more rich and increases the depth of the finish.

After the final coat of milk paint, use steel wool to burnish the entire surface and then seal it with a coat of Watco Natural.

Sand the six cherry panels through to 220-grit for finishing. Don't sand the upper side of the top, the underside of the bottom and the outsides of the sides. Also, don't sand the front and rear edges. If you like, use a cabinet scraper to remove the traces left behind by the sander. This final step will enhance the depth and clarity of the cherry. Apply a coat of Watco Natural finish to all inside surfaces, being careful not to get any on the areas to receive glue during assembly.

When you've rubbed off and buffed the finish, assemble the clamps you will need to glue up the cabinet. Set the two shelves aside, and apply glue to the ends of the top, bottom and sides. Assemble the cabinet and loosely apply some clamps. Before tightening the clamps, apply glue to the dado and slide the two shelves in. Gradually tighten the clamps; keep an eye on the front edges to be sure they are all flush. Measure the diagonals to be sure everything is square.

## Veneering with the Thin Air Press

Prepare the plywood by sanding it to 150-grit. Fill any imperfections, as they will telegraph through the veneer. Using the Thin Air Press Kit, a product made by the Roarocket Skateboard Company in Toronto, and available through Lee Valley Tools, veneering these panels is a piece of cake. Collect the pieces of the Thin Air Press kit , the plywood and the veneer. When everything is ready, use a roller to spread an even layer of glue on the plywood. The open time of regular wood glue is insufficient; select glue like Titebond III instead. Lay the veneer over the plywood and press it down carefully. It will likely want to curl, so wrap a couple of elastic bands around the panel. Slip the panel inside the breather / netting bag and then place this bag in the vacuum bag. After sealing the bag, use the pump to suck the remaining air out. After the glue has cured, remove the panel from the bag and repeat on the other side.

## The Doors

When selecting stock for the doors bear in mind that using highly figured grain for the rails (G) and stiles (H) could be very distracting.

Mill the material for the doors. Be sure that the pieces are straight and square; there

is no adjustment available with knife hinges.

Lay out the mortises and tenons on the door members and cut them using the tools you have available.

Using a 1/4" bit in a router table, rout the grooves for the lower door panel.

Cut a piece of plywood for panels (I).

This cabinet is finished with an oil to highlight the grain, followed by several coats of beeswax for a warm glow. If the door panel were finished with the rest of the cabinet, it would be impossible to get an even finish in the corners. Prepare the panel with sandpaper and a scraper; finish it with oil and then several coats of beeswax.

Sand the doorframe pieces, being careful not to round any joint areas. Apply a coat of oil to the inside edges of the door panel opening. The solvents in the finish will remove the beeswax if it gets on there during application later. Assemble the door with the panel and check the diagonals for square.

## The Drawers

Cut the drawers sides (J) and the drawer fronts (K,L,M). Ensure that you confirm precise measurements directly off your cabinet. I made the drawers using a small drawer lock bit available through Lee Valley Tools; if you use another method adjust the material sizes accordingly.

Cut the corner joints on the router table.

Use a box-slotting bit in the router table to cut the slot for the bottom.

Cut the drawer bottoms (N,O,P).

Sand and finish the inside faces and the bottom and apply a coat of oil. Assemble the boxes with glue and clamp. Do not over clamp; the sides of the drawer boxes are thin and excessive pressure will bow the sides making them difficult to fit later.

When the glue has set, remove the clamps and sand the outer surfaces. The front of the drawer boxes are veneered with bee's wing eucalyptus. To provide continuous grain across the width of the cabinet try to cut all of the pieces from one strip. Apply glue to the drawer face and place the veneer. Use a piece of melamine as a caul and clamp it to the face of the drawer to sandwich the veneer and apply pressure. Any glue that squeezes through the veneer won't stick to the melamine.

Sand and scrape the drawer fronts and sand the other outside surfaces.

## Laying Out Hinges

The hinge mounts flush with the edge of the door, so the length of the mortise for the cabinet section will have to allow for the gap. The gap at the edge of the door will be the same as the thickness of the washer on the lower hinge member. Coincidentally, this happens to be the same thickness as some textured laminate samples I have that I use as shims for this purpose. Place a shim against the side to represent the width of the gap. Find the largest drill bit that will fit into the hole on the door half of the hinge. Hold the hinge in place pushing it up against the shim and back until the drill bit contacts the edge of the panel. Trace the outline of the hinge. Prepare a spacer the same width as the piece of wood that will be left at the front edge after the hinge mortise is routed. This should be at least 8" long.

## Mortise the Doors

Using the same set up and method used to mortise the shelf components cut the mortises in the doors for the hinges. Remember to use the spacer and keep the face against the fence for the proper setback. Square up the mortise with a sharp chisel.

After routing the hinge mortises, use a bearing guided rabbeting bit in the router table to cut a 3/8" x 3/8" rabbet in the upper opening to receive the glass panel (Q).

## Back of the Cabinet

Mill the end caps for the horizontal dividers (R).

Sand these and apply a finish to the front and sides.

Use a five-minute epoxy to glue these pieces in place on the plywood dividers. Sand the front edges of the cabinet as well as the sides.

Using more of the same shims that were used to set the door gap, trim the doors to fit into the opening. When both doors can

sit in the opening with the shims, (don't forget one in between the doors), remove the doors and drill one clearance hole in each hinge section and use one screw to fasten each hinge section. To hang the door, remove the screw from the upper hinge and place the hinge on the post and slide the door onto the hinge. If everything has gone well, the doors should be perfectly hung. If not, by only using one screw, the other could go into unused wood should you have to make a minor adjustment.

Perform any final fitting necessary on the drawers and finish sanding all of the outside surfaces in preparation for finishing.

## The Final Bits

The base and crown moulding on the cabinet is built up using two different pieces of wood using common bits and milled on a router table. Prepare the stock for the crown moulding (S,T,U,V)) and base moulding (W,X,Y,Z). Use a 1/4" bead bit in the router table to profile the font edge of the walnut trim for both the base and the crown. Use a 3/4" cove bit to mill the top cove pieces in cherry.

Mill the stock for the cleat (AA) at this time. Set the blade on your table saw to 45° and rip the piece in half. One half is mounted to the cabinet, which in turn interlocks with the other half, that is mounted to the wall. Drill counter sunk holes for the screws on the piece that mounts to the cabinet.

Mill a piece of cherry to a thickness of 3/8" for the keepers (BB & CC) that hold the glass in place. Use the table saw to rip strips off this board to accommodate the glass you are using. Drill holes in one inch from each end for the #4 screws that will hold them in. The screws should pass through the piece without catching.

## The Finish

Once the doors and drawers have been fitted remove the hardware and proceed with the final finishing of all the parts. Apply a coat of oil to the cabinet itself. Also, sand and oil the pieces for the moulding. When applying finish to the doors, be careful not to get any on the waxed panels, it will strip the wax. Apply at least two coats, more if required and after wiping off the excess, buff the wood and let the finish cure thoroughly.

To bring out the rich warmth of the cherry and to highlight the colour and figure use a beeswax finish. The only downside is that it takes elbow grease to put on, but it is a finish anyone can master and it is easily repaired in the future. It will take several coats to bring up a nice even sheen but the effort is worth it. Wax the cabinet doors and drawers now as well as the individual trim pieces; doing so now avoids wax build-up in the moulding after it is built. Do not wax the milk painted back. Wax could put a glare on the surface that would be distracting.

When everything has been waxed and buffed, install the back using pan head screws. Drill pilot holes in the cherry or the wood will split.

## Bring It All Together

Installation of the moulding is simple. Cut the beaded walnut section for the crown moulding to length with mitred

corners as needed. Place this on top of the cabinet and fasten it in place with several screws. Drill proper countersunk clearance holes so the screws pass through the walnut and the heads sit below the surface. Cherry is a hard wood and to avoid snapping off any screws or splitting the wood, drill holes for the shaft of the screw. These screws do not need to be super tight; they're only holding the moulding. Cut the cherry cove to size and layer this on top of the walnut bead. Again, drill and countersink the holes and fasten with screws as before. Note the location of the previous screws so you don't accidentally drill into one.

The base moulding is done the same way. Cut the maple sections to size and install them as the others. Follow this with the beaded walnut pieces. When installing the walnut bead, bear in mind that most people will look underneath out of curiosity. For that extra detail and touch of class, use brass screws here. When installing brass screws, follow the same procedure as above, and install steel screws first. When finished, back them out one at a time and replace them with brass screws. Doing this reduces the chance of snapping off the softer brass screws in the hard cherry.

Cut a piece of glass for the door. Textured and coloured glass is readily available at any stained glass shop. Install the glass and use #4 screws to hold the keepers in place.

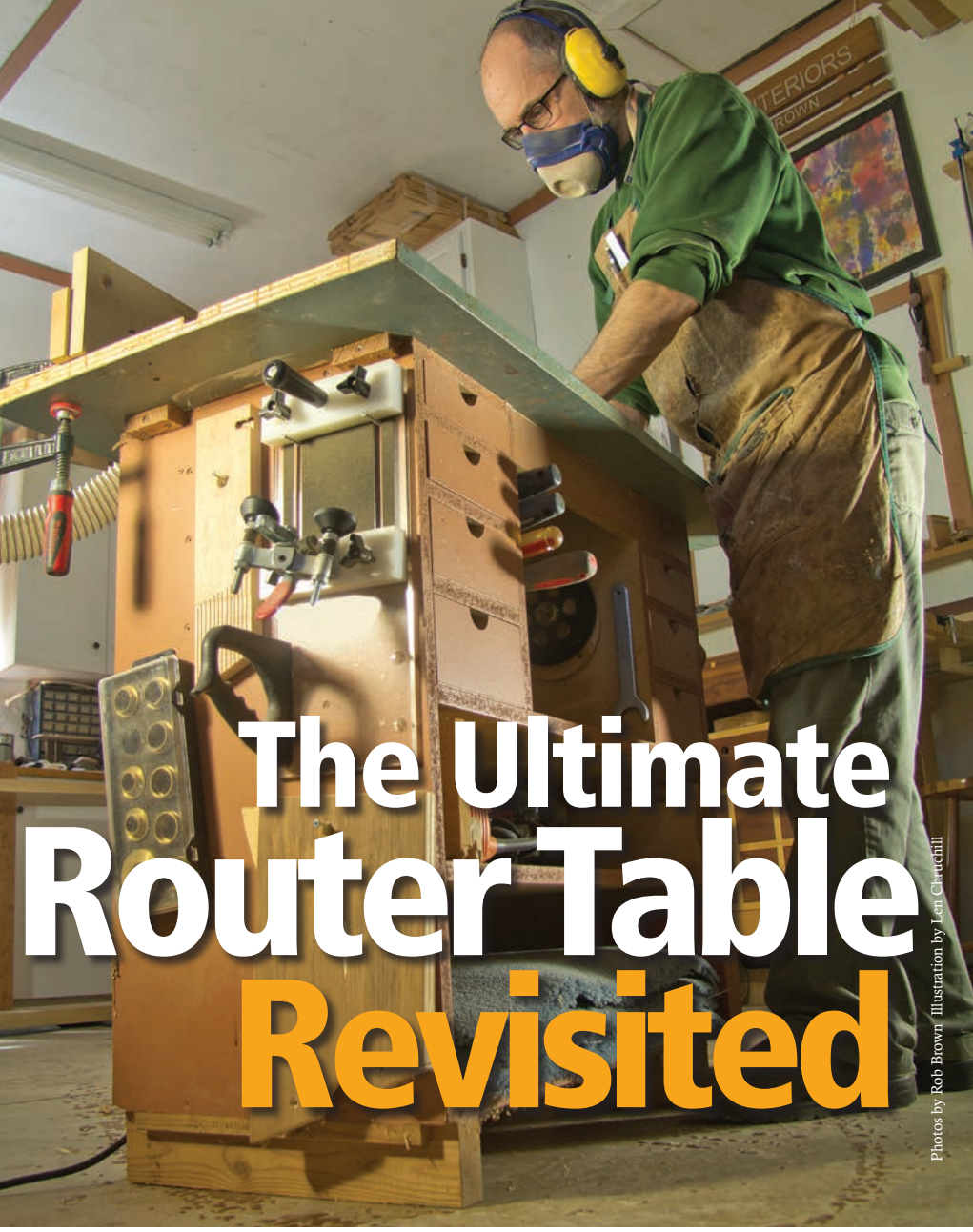
Carefully locate the center of the holes for the ball catches. Use a 1/4" Forstner bit to drill these holes and check the depth often. They must be exact for the catch to project the proper amount. Reference all of your measurements from the front edge of the cabinet. Install the catches in the cabinet. Cut a scrap of wood to set the proper setback for the doors over the catches. Use the ball catch setback to set the marking gauge and then open the doors one at a time, transfer this measurement to the edge of the door using the same front edge of the cabinet as a reference. This ensures proper alignment regardless of door setback and any

variations in thickness that may have occurred during sanding. Transfer this mark around the corner and with the door closed visually mark the distance in from the side of the door to the center of the catch. Drill this with the Forstner bit as well. Glue the catches in place.

Mount the cleat to the rear of the cabinet. To hang the cabinet, mount the other half on the wall using appropriate fasteners for the wall and the load, being sure to go into two studs.

Fitting the interior is largely dependant on your tools and the work you do, so we'll leave that part up to you. If you are just starting out, then be sure to leave enough room for the handtools that you will surely be adding to your shop.

MICHAEL KAMPEN



# The Ultimate Router Table Revisited

Photos by Rob Brown Illustration by Len Churchill

This router table was built 20 years ago and has stood the test of time, although over the years a few minor shortcomings have been realized. Learn how the original was built and how to tweak a new build so it's virtually perfect.

BY ROB BROWN

When I designed it, I wanted to incorporate as much storage into the router table as possible so I added two banks of four drawers, as well as the larger storage underneath the drawers. I have used this router table for the past 20 years and love it. In this article I'm going to detail how you can build the ultimate router table by combining the basic design I started with, but improving on a few essential details.

**Outfeed Support** – When planning the dimensions of his router table Brown aimed for about 1/8" shorter than the height of his table saw out-feed table, so it could be used to support extra-long stock.

I made the height of this table about 1/4" lower than my table saw so I could use it as an outfeed surface. It's worked great for this task, as it's very stable and strong. Unless you have a need for something different I would suggest doing the same.

If you have your mind set on purchasing a router table, in order to get to the fancier builds quicker, check out Carl Duguay's article "Purchasing a Router Table" in this issue.

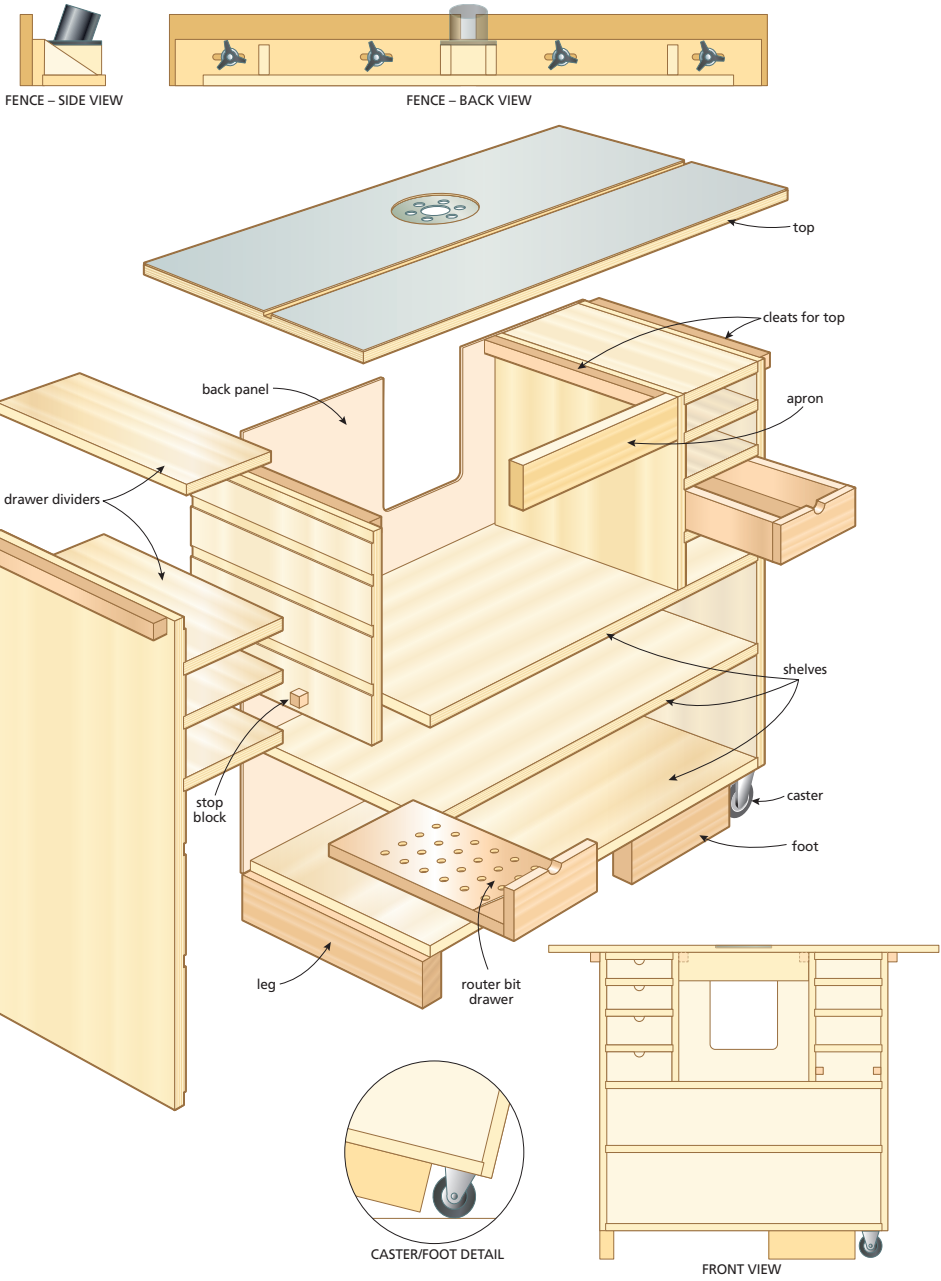
**Keep it Simple** – Though Brown would use dadoes and rabbets to join his next router table, the particle board edges he made the base from were left raw. After about a decade of use he applied a quick coat of paint to much of the outside of the router table to cover up all the marks and smeared glue.

## Materials

I used 3/4" particle board for my router table and I'm glad I did. Particle board is quite heavy, which is good. The last thing you want is a light router table that moves across the floor during use. Plywood might be stronger, but it's also lighter, so use it just for the top surface. Speaking of the top, plastic laminate makes a great surface to protect against wear.

## No need for beauty

Router tables are meant to be efficient, small-shop workhorses, not dining room furniture. I will admit that my router table might not be the best looking piece of shop furniture, but I'm perfectly fine with that. I'd rather spend a little less time and money on this project and have some left over for the next project that will see the inside of my home. If you really want a museum-quality router table you can substitute nicely veneered particle board sheet stock, and use solid wood for the drawer fronts and edging material. I didn't even use solid wood edging on this project, and after 20 years of use I don't regret it one bit.

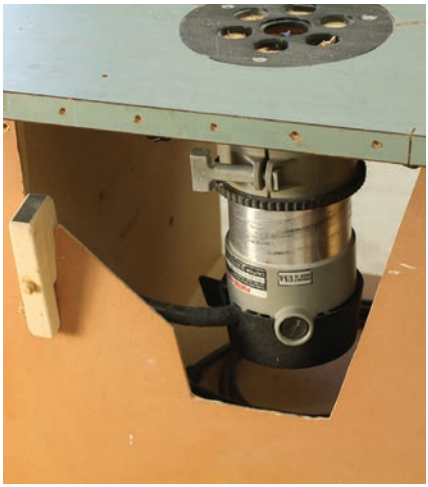


## Materials List

| Part | Qty | T | W | L | Material |
|---|---|---|---|---|---|
| Gables | 2 | 3/4 | 16 | 30 | Particle Core |
| Bottom | 1 | 3/4 | 16 | 29 | Particle Core |
| Shelves | 2 | 3/4 | 16 | 29 | Particle Core |
| Partitions | 2 | 3/4 | 16 | 14-1/8 | Particle Core |
| Drawer Dividers | 8 | 3/4 | 16 | 7-1/4 | Particle Core |
| Lower Drawer Faces | 2 | 3/4 | 3-1/2 | 6-15/16 | Particle Core |
| Lower Drawer Bottoms | 2 | 3/4 | 6-15/16 | 15-3/8 | Particle Core |
| Lower Drawer Brackets | 4 | 3/4 | 2 | 2 | Particle Core |
| Lower Drawer Anti-Tip Cleats | 2 | 3/4 | 3/4 | 2 | Solid Wood |
| Lower/Middle Drawers | 2 | 3/4 | 3 | To Fit | Particle Core |
| Upper/Middle Drawers | 2 | 3/4 | 2-1/2 | To Fit | Particle Core |
| Upper Drawers | 2 | 3/4 | 2 | To Fit | Particle Core |
| Drawer Bottoms | 6 | 1/4 | To | Fit | 1/4" Plywood |
| Apron | 1 | 1 | 3 | To Fit | Solid Wood |
| Back | 1 | 1/4 | 31 | 30 | 1/4" Plywood |
| Side Foot | 1 | 1-1/2 | 3 | 16 | Solid Wood |
| Front/Back Feet | 2 | 1-1/2 | 3 | 6 | Solid Wood |
| Lower Cleats | 2 | 1 | 1 | 15 | Solid Wood |
| Upper Cleats | 4 | 1 | 1 | 15 | Solid Wood |
| Top | 1 | 3/4 | 22 | 42 | Plywood |
| Laminate for Top | 2 | 1/16 | 23 | 43 | Plastic Laminate |
| Solid Wood Edging for Top | 4 | 1/4 | 7/8 | To Fit | Solid Hardwood |
| Fence Base | 1 | 7/8 | 4-1/2 | 42 | Solid Hardwood |
| Fence Split Faces | 2 | 7/8 | 5 | 21 | Solid Hardwood |
| Fence Sub-Face | 1 | 7/8 | 3-1/2 | 42 | Solid Hardwood |
| Fence Brackets | 2 | 7/8 | 3-1/2 | 4 | Solid Hardwood |
| Fence Dust Base | 3 | 7/8 | 1-3/4 | To Fit | Solid Hardwood |

## Hardware List

| Name | Qty | Size | Supplier |
|---|---|---|---|
| Casters | 2 | | Miscellaneous |
| Knobs | 4 | 1/4-20 | Miscellaneous |
| Bolts | 4 | 1/4-20 x 2" | Miscellaneous |
| Washer | 4 | 1/4" | Miscellaneous |



**Easy Access** – So you can get at the router for bit height adjustments, and to remove the router, make a decent-sized cut-out in the back panel.

## Build the base

If you're looking for a router table to work a lot of extra large workpieces I would suggest making the overall depth of the router table's base 20", or possibly 24", though I have never wished I went wider than 16". Stability has never been an issue for me.

Rip the 4x8 sheet into three 16" wide lengths. Cut the gables, bottom, shelves, partitions and drawer dividers to finished length. Set up stops to ensure the gables are the same length, all eight drawer dividers are the same length and the bottom and two shelves are the same length. It's also a good idea to mark all your pieces with name and orientation.

## Rabbets first

The first change I would make to my router table would have been to use rabbets and dadoes to secure all the joints in the base. I used biscuits and strengthened each joint with screws. My base hasn't shown any signs of weakening, but for ease during assembly, as well as increased strength for years to come, don't do what I did.

Set up your dado set to run a rabbet the same width as the particle board is thick. A few test passes and a few shims will have the width dialled in nicely now, so there's no fussing around when it comes time to machine the dadoes. With a sacrificial fence clamped to your rip fence, machine 1/8" deep rabbets in the tops and bottoms of the gables, as well as the tops of the partitions.

## Dadoes are next

I find it nice to know when extreme accuracy is required, and when it's not. Some of the dadoes can be located "close enough", while others need to be positioned very accurately. We'll start with the

**Simple and Strong** – Dadoes near the end of the sides accept short tongues in the backs. No need for hand-cut dovetails here.

**Store Your Bits** – The bottom two drawers have no sides or back, and the bottom is 3/4" thick. A series of holes can be drilled in the bottoms to keep often used bits nearby. Notice the 90° angled blocks which help secure the drawer fronts.

**Anti-Tip** – The sides of the upper six drawers keep them from tilting when they're opened. Because the bottom two drawers don't have sides, Brown added a small block just above the drawer bottom so the drawer wouldn't tip when opened.

**A Flat Top** – Notice the angled gap between the drawer bank and the top. Even though the router table's base isn't perfectly square and flat, the top needs to be. The height of the cleats on either side of both drawer banks can be adjusted to secure the top to the base so the top is perfectly flat.

tricky ones first. I would lay out all the dadoes with pencil lines before starting, then double-check every dado is positioned properly, before cutting any joints. Ensure you're taking the 1/8" of material that will fit into the dado into account when laying these joints out. The only joints that need to be located carefully are the "upper-shelf-to-gable" joints (determined by the actual length of the partition) and the "partition-to-upper-shelf" joint (determined by the actual length of the drawer dividers). Set up and run both sets of these dadoes now.

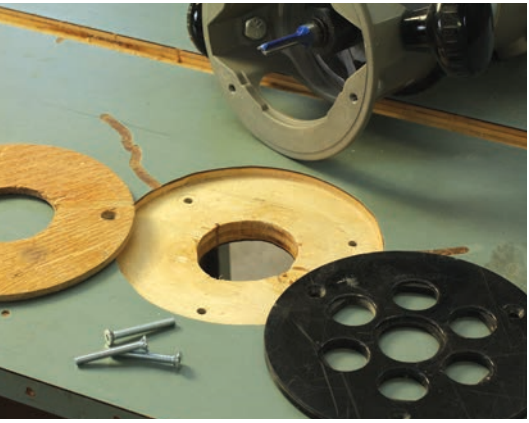
Dadoes that locate the drawer dividers and lower shelf don't need to be positioned overly accurate, since you will rip the drawer parts to whatever width is needed. You can machine the remaining dadoes in the gables now. One dado in each gable will accept the lower shelf, while the other three dadoes in each gable will accept the drawer dividers. While you're machining the dadoes in the gables to accept the drawer dividers, also run the partitions over the blade, as the setup will be the same.

## Dry assembly

The best part about working with non-veneered particle board is you can skip the sanding. These parts are going to go together easily if the ends that are going to fit into a dado are slightly eased, so do that now. A dry assembly is a very good idea, as this isn't a simple assembly. While the base is dry-assembled, drill some countersunk pilot holes so you can drive a few screws during assembly. Screws are going to be more helpful towards the middle of the base, as clamps won't be able to reach in much more than 4" from the front or back edges. If any of the joints are not lining up you can glue 1/8" solid wood into the joint then re-machine the joints in the proper location. These mistakes don't need to be covered up when making shop fixtures, unless your shop's a museum.

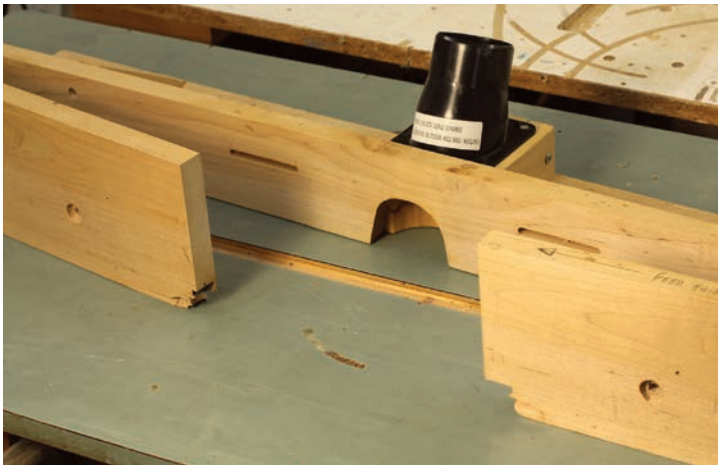
## Final assembly

With enough clamps, lots of glue and your pneumatic nailer by your side, start with one of the "gable-to-upper-shelf" joints. I would strongly suggest assembling the router table base with the back edges of all these parts standing on a flat surface, as if the whole router table had been tipped over on its back. The first few pieces are going to be tricky, but things will get easier as you go. The next step is to add the lower shelf, then the second gable. With some screws in each joint, add a clamp to the face and back of each joint and ensure the assembly is somewhat square. The bottom is added next, followed by a few more clamps to bring the gables together. Moving up top now, glue in the drawer dividers on one side of the base then add that partition. It will likely be easiest to install the uppermost drawer divider after the partition has been



**Moving a Heavy Object** – The foot is about 1/16" taller than the caster, so when the opposite end of the router table is lifted up the caster comes into contact with the ground and the router table can be moved around your shop.

**Base Plate Recess** – Use your base plate to trace the bolt locations, the center clearance hole and the outer perimeter of the plate onto the top. After you have drilled the bolt clearance holes and center hole, use your router and a straight bit to create the recess for the base plate to fit. The router table just gets sandwiched between the router base plate and the router base during operation. The shop-made base plate on the left is used with larger diameter router bits.



**A Strong Fence** – Brown used solid maple to create a strong, adjustable fence. The split face of the fence can be slid open or closed depending on the width of the router bit being used. The fence is shown with the split faces removed for clarity. Notice the circular notch cut into the sub-fence and the base, for chip extraction clearance.

installed. Clamps parallel with the dividers, as well as one pressing the partition into the upper shelf, are needed. Move to the drawer dividers on the other side to finish the assembly.

## Back panel

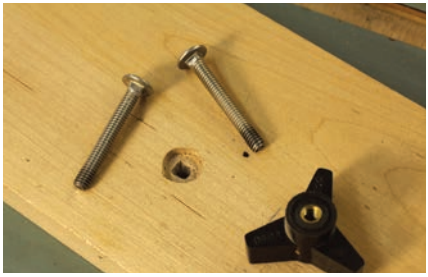
Cut and install a 1/4" plywood back panel. It can sit flush on the backs of all the pieces that make up the base – no rabbet is needed. Make a cut-out in the back so you can easily access the router. There is no need to make this cut-out small, as a bit of extra room will come in handy. Pneumatic nails, screws and glue will keep this router table base square and strong for decades.

## Drawers

I made the drawer sides and backs from plywood, and used particle board for the fronts. There's no problem with doing this, but I have no idea why I did it this way. Possibly because I didn't have enough particle board material left over, as most of the sheet I bought was already used up. Use whatever material you have on hand for the drawers. If money was no object I would go with 1/2" Baltic birch plywood. Some of the 3/4" plywood that will be used for the top will also work fine, as will particle board.

The upper six drawers can be constructed like most drawers. The lack of slides means the drawer should be about 1/16" narrower and shorter than the opening. A groove or rabbet in the inner surface of the drawer will house a bottom. If I was building these drawers again I would opt for a rabbet, as that would give me a little bit more room inside the drawer for storage.

The lower two drawers have no sides or backs and store a healthy selection of router bits. For these drawers I used a 3/4" thick bottom, rabbeted into a front, strengthened with a pair of super simple 90° glue blocks. A series of holes were laid out and drilled on my drill press. It sounds unnecessary, but once the holes were drilled I chucked the twist drill bit in my cordless drill and widened each hole ever so slightly by moving my drill while the bit is in the previously



**A Square Hole** – So the bolt doesn't spin when the tri-winged handles are tightened, Brown cut a square notch in the first 1/4" of the hole and used bolts with square notches under their heads.

drilled hole. This allowed the router bits to be easily removed from the holes whenever needed. An anti-tip block was glued to the inside of each partition, about 13/16" above the upper shelf and 3" from the front edge. This stops the lower drawers from tipping as they are pulled outward.

Simple pulls work fine, though I clamped two finished drawers together, with their upper edges facing towards each other, and drilled 1-1/2" diameter holes with my drill press. Simple and cheap.

## The top

The top needs to be strong and flat. I started with a piece of 3/4" plywood and covered its four edges and two faces with durable plastic laminate. A small step up would be to opt for solid wood edging after both surfaces were covered in laminate.

Run a groove in the top to accept a mitre gauge. The fit must be perfect, so take your time to get this right. Don't go any deeper than is necessary to accept the bottom rail of the mitre gauge, as this will weaken the top. I would have thought a groove in the top would have weakened the top too much, but after a lot of use I don't think it's a problem. If you wanted to be extra safe you could screw a few pieces of solid hardwood to the underside of the top, perpendicular to the mitre gauge groove. I think it works fine without the extra structural additions because the top is fastened to the base with the four 15" long hardwood cleats, which add a lot of strength and rigidity.

Mill the four cleats to fix the top to the base. When in doubt, make these cleats larger. The most important thing to keep in mind at this stage is to secure the top to the base so it is flat. I first used a straightedge to get an idea of how flat and even the top of the base was. Starting at one side of the router table's base I screwed one cleat to the base so the upper surface of that cleat was flush with the uppermost point of the base. Using the straightedge to make sure it was flush with the uppermost point of the base, I added a second cleat to the opposite side of the base. These two cleats should be parallel with each other, and their upper surfaces should be flush with the upper surface of the base. I then fixed the top to the first two cleats and ensured the top was flat. The last two cleats were then positioned against the partitions, and lightly pressed up against the underside of the top and screwed in place. At this point you should remove one of the cleats, add glue to its side and screw it back in place. Repeat this with the other three cleats so they are strong and will stay in place. If, on the off-chance, the top goes out of flat in the future, you can add spacers between the cleats and top.

At this point I cut and installed an apron between the two banks of drawers, directly under the top. A few screws through the partition into the apron, as well as an L-bracket screwed to each end, is enough. The apron helps support the top between the drawer banks while a heavy workpiece is being machined.

Now that the top is fixed in place, it's time to rout the area where the router's base plate will go and drill a few holes. I simply traced the shape of the base plate, and location of the holes, onto the top. First I drilled the bolt clearance holes so bolts could be used to secure my router to the underside of my top. I also cut a 1-1/2" diameter hole in the center of the recess so router bits could protrude up though the top. To remove the waste I used a straight bit in my plunge router to hog out the material to the exact depth of the base plate.

## Feet to stand on

The three wooden feet keep the router table from moving around during use, and are self-levelling, but since this router table is heavy I came up with a simple solution to moving it around my shop. I flipped the router table upside down and attached a caster under two corners at one end of the base. Don't cheap out on casters, as only quality casters are strong enough for this task. I used rotating casters, though fixed casters would also work fine. The feet were to be about 1/16"

taller than the casters. I used 2×4 material for each foot, but any wood will work. I positioned the long foot flush with the outer edge of the base and glued and screwed it in place. Towards the end with the casters I added two more feet: one along the front and back edge of the bottom panel. Both of these feet were placed so the casters would miss them by about 1/2" when the casters rotated. You can also use fixed casters. When turned right side up, the router table would balance nicely on the three feet. When the end opposite the casters was lifted the casters would come into contact with the ground and the router table can be moved around fairly easily.

Because there is a lot of weight being transferred through the lower portion of the gable I glued a cleat to the inner corners of both "gable to bottom" joints.

## The fence

One of the most important aspects of a router table is the fence. It needs to be strong, remain secured in place during use, be high enough for all operations, and have the ability to create a gap near where the spinning bit is located.

Break out the fence parts to final size, but don't split the face into two parts yet. So the split faces can slide left and right, four grooves must be routed into the sub-face – two grooves for each split face. With a plunge router and edge guide cut the 1/4" wide x 2" long grooves with multiple passes. The grooves should be centered on the height of the sub-face. At the center point of the base and sub-face you'll need to create a cut-out so the bit doesn't cut into the base and sub-face and shavings have somewhere to go during use. Run a rabbet in the sub-face and join the base to it. To ensure they're joined at 90°, glue a few wooden brackets in place.

Position the face against the rest of the fence and mark the location of the center of the four grooves on the back of the face. Drill four clearance holes in the face, then remove some material from the front of the face so the bolt will sit completely beneath the outer surface of the face. I used bolts with square necks, so I could create a square notch in the clearance holes in order to keep the bolts from spinning during use. You can now split the face in half and install the two halves on the rest of the fence. The fence gets clamped to the top of the router table during use.

Finally, add a wooden dust collection shroud and plastic attachment to the fence. It works pretty well with the collection hose attached, but I generally only use it for larger runs.

## Bells and whistles

As time went on I added a bunch of screws to the outside of the router table, as well as the partitions, in order to store a wide variety of shop items. I also found myself using four different screwdrivers quite often while working on my router table, so I made a wooden block with four holes in it and screwed it to one of the partitions.

ROB BROWN
rbrown@canadianwoodworking.com

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