

This hybrid design holds work any which way you want to.

BY ROBERT W. LANG

Good design is little more than selective thievery. This workbench is a good example of that. A combination of features from several historic forms, ranging from the Roubo to the Workmate, becomes a new form, suited to being the center of a modern woodworking shop.

I've never seen a workbench that I was entirely happy with. I have love/hate relationships with many common features. I like tool trays, but hate the way shavings and other detritus collects in them. I want to be able to clamp work quickly, but speed means nothing if the clamping isn't solid

and secure. Good design is also the art of compromise, finding the happy medium between extremes.

This bench began with the idea of building a reproduction of an English Nicholson bench. The Nicholson was popular in Colonial America, and variations of it appeared in woodworking books until the 1920s. The dominant feature on the Nicholson is a wide front apron, which allows work to be secured to the front of the bench as well as to the top.

The drawback to the extended apron is that it limits the ability to clamp down to the



Old ideas, new combination. Elements of several historic benches are combined in an easy to assemble, solid work-holding fixture.

21st-Century

top of the bench from the edge. I narrowed and lowered the apron so I could clamp work to the bench in two directions. I was also intrigued by the knock-down joinery on some of the historic Nicholson benches. While I don't plan on moving my bench very often, I decided to make it in manageable chunks, to ease the process of making it and assembling it.

The design is based on function in the completed bench, and also on the process of making, moving and maintaining it. The tools I used to make it are basic home-shop equipment—a 10" hybrid table saw, a 6"-inch

jointer and a 12" "lunchbox" planer. And I didn't need a bench to build my bench. I made the top first, then placed that on a pair of horses.

Getting it Straight, One Part at a Time

The best reason for assembling the top of the bench first is that when it is complete, it can be put to work to fabricate and assemble all the other parts. It's almost as good as having a place to sit down when you're halfway through building a chair.

I began with rough 8/4 ash lumber, and

picked through my stock for the straightest pieces to use for the top. After running one edge over the jointer, I ripped each piece to a rough width of 3 3/4". Then I dressed one face of each piece flat on the jointer. When I had 14 pieces ready, I moved to the planer.

I wanted the stock to be at least 1 7/8" thick, but stopped milling when I had two clean faces. Each half of the top consists of six pieces glued face to face, and leaving the parts as thick as possible allowed me to maximize the width. If the stock had ended up thinner than planned, I would have added a seventh piece. The goal was



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Workbench

to have the halves of the top finish at least 11½" wide, but less than 12".

The length of the bench was also a variable. I wanted a minimum length of 84", but I was able to get clean lengths of 90" from the 8'-long rough material. After all the parts were milled, I let them sit over a weekend to be sure the wood wasn't going to move or warp.

I began laminating the top boards in pairs glued face to face. To keep them flat, I clamped them together on the strongest, straightest surface available: an I-beam made of ¾"-thick plywood. I let each pair sit in the clamps for at least four hours, and let them all sit for 24 hours to allow the glue to dry.

Back to Milling, then Serious Gluing

I ran the edges of each glued pair over the jointer to get a straight, square edge on each lamination. I then ran the boards on edge through the planer. Once again, I stopped when I had two clean surfaces rather than taking the boards to a specific thickness.

The cleaned-up pairs were slightly over my planned 3" thickness, but I would still need to remove some material after gluing up each top

section. How much to remove would depend on how well these pieces went together.

I set two long boards between my horses, and placed square boards across them, about a foot apart. This gave me a nice level surface

to work on, and provided the ability to reach around, over or under the tops as I was setting the clamps. A test-stacking of three pairs of boards gave me the confidence to glue each half-top section in one go.



Spread with speed. A disposable paint roller applies an even coat of yellow glue quickly. Apply the glue to one side of the lamination only. Doing both sides wastes time and glue.



Sum of its parts. The flatness of the finished benchtop depends on the quality of its component parts. Milling the pieces as true as possible and gluing them together on a flat surface is crucial.



Practice makes perfect. Taking time to set up a level and accessible surface for gluing, and making a dry run, makes the final glue-up stress-free and yields good results.



Power lunch. This bench was designed around available machinery. After cleaning one surface with a handplane, the opposite surface is planed on a portable machine.

It just fits. Trimming the top halves to final length is within the capacity of this 12" sliding compound miter saw.

With nearly every clamp in the shop standing by, I spread yellow glue on one face of two of the parts with a 3"-wide paint roller. With an even coat of glue applied, I turned the parts 90° and starting tightening the clamps, working from the center out to the ends.

Wooden handscrews across the ends of the glue joints prevented the parts from sliding out of place. I removed any glue squeeze-out with a wet rag and a scraper, and let the pieces sit in the clamps overnight.

Because I had carefully milled the parts before gluing, and glued carefully on a flat surface, the tops were in good shape coming out of the clamps. I knocked down the high spots with a handplane to get a flat surface, and ran the assembled tops through the portable thickness planer.

Leaving the top halves less than 12" wide allowed me to use this small machine for surfacing. At some point in the future I may need to resurface the top, and the little planer will always be an option. This strategy also allowed me to cut each top half to length with my sliding compound miter saw.

The Structure Down Below

Joinery on a bench is on a different scale than joinery for furniture. The parts are larger, and the emphasis is more on function and strength than appearance. The legs are two pieces glued face to face, and each pair of legs is connected with an upper and a lower stretcher with mortise-and-tenon joints.

The legs and stretchers are assembled into units, and the two ends are connected



Minimize the layout. After laying out the tenon locations on the stretchers, lines are transferred to mark the matching mortises on the inner parts of the legs.



with rails running the length of the bench. The large scale of the components made it possible to locate joints for the knock-down connections in the outer halves of the legs, and these joints were cut before the legs were laminated together.

In furniture I use through-tenons to show off, but in this bench I used them to make life easier. The mortises are only cut in the inner half of each leg. After laying out the joints, I removed most of the waste at the drill press with a 3/4"-diameter Forstner bit.

Working on my new benchtops placed on horses, I used a chisel to square the mortises to the layout lines. I then cut the tenons to fit the mortises. I cut most of the shoulders by hand, but also cut some on the table saw to compare techniques.



Wasting away. A 3/4" Forstner bit in the drill press is used to remove most of the material from the through-mortises in the inner legs.

Online EXTRAS



Videos, plans and text about building and using the 21st-century bench are available on the *Popular Woodworking* Editor's blog:

popularwoodworking.com/oct08

A full-length video of the construction of this bench is available on DVD for \$19.99. In addition to the video content, the DVD contains additional detail drawings and photos. For more information and to order, visit:

popularwoodworking.com/bench



Chop for an easy fit. A bit of chisel work cleans up the mortises to the layout lines at top and bottom. Widening the sides allows an easier fit and stronger joint with the addition of wedges.

The hand-cut shoulders were a bit neater, and didn't take much longer to make. After cutting the shoulders, I removed the waste around the tenons at the table saw, using the miter gauge to guide the boards across a stack-dado set.

With a shoulder plane and rasp, I fine-tuned the fit of the joints. After tweaking a couple to a perfect fit, I realized I could make the tenons narrow in width, widen the outside of the mortises with a quick chisel cut, then secure the joints from outside with wedges.

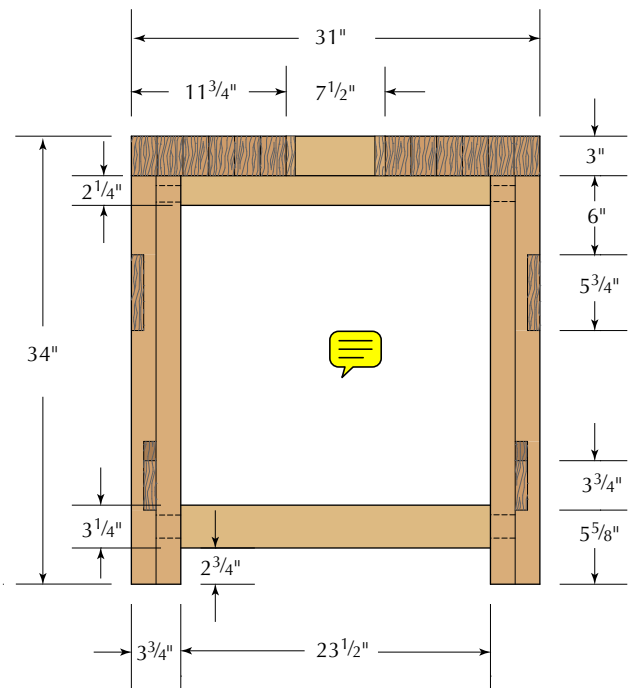
This saved time, and gave stronger joints. With the tenons wedged, they can't pull out of the mortises. After letting the glue dry, I trimmed the wedges with a flush-cutting saw, followed by a block plane.



Tenons, plan B. The tenons can also be cut on the table saw, but the machine must be adjusted several times to hit the layout lines precisely.



Shoulders by hand. I think it's faster to cut the shoulders by hand and avoid exacting setups on a machine. It's just a matter of cutting to the lines.



PROFILE

Great Big Dovetails

It's easy to think of dovetails as decorative joints, but there are many practical reasons for using this joint to hold the ends of the bench together. Most of the stress on a bench in use is end to end, and the wedged shape of the rail-to-leg joints can't be pulled apart. In fact, if you push the base of this bench from the end, the joints tighten rather than loosen.

The dovetails also serve to positively locate and align the parts during final assembly. As the joints come together, they fit where they fit; it isn't possible to put them together in the wrong place.

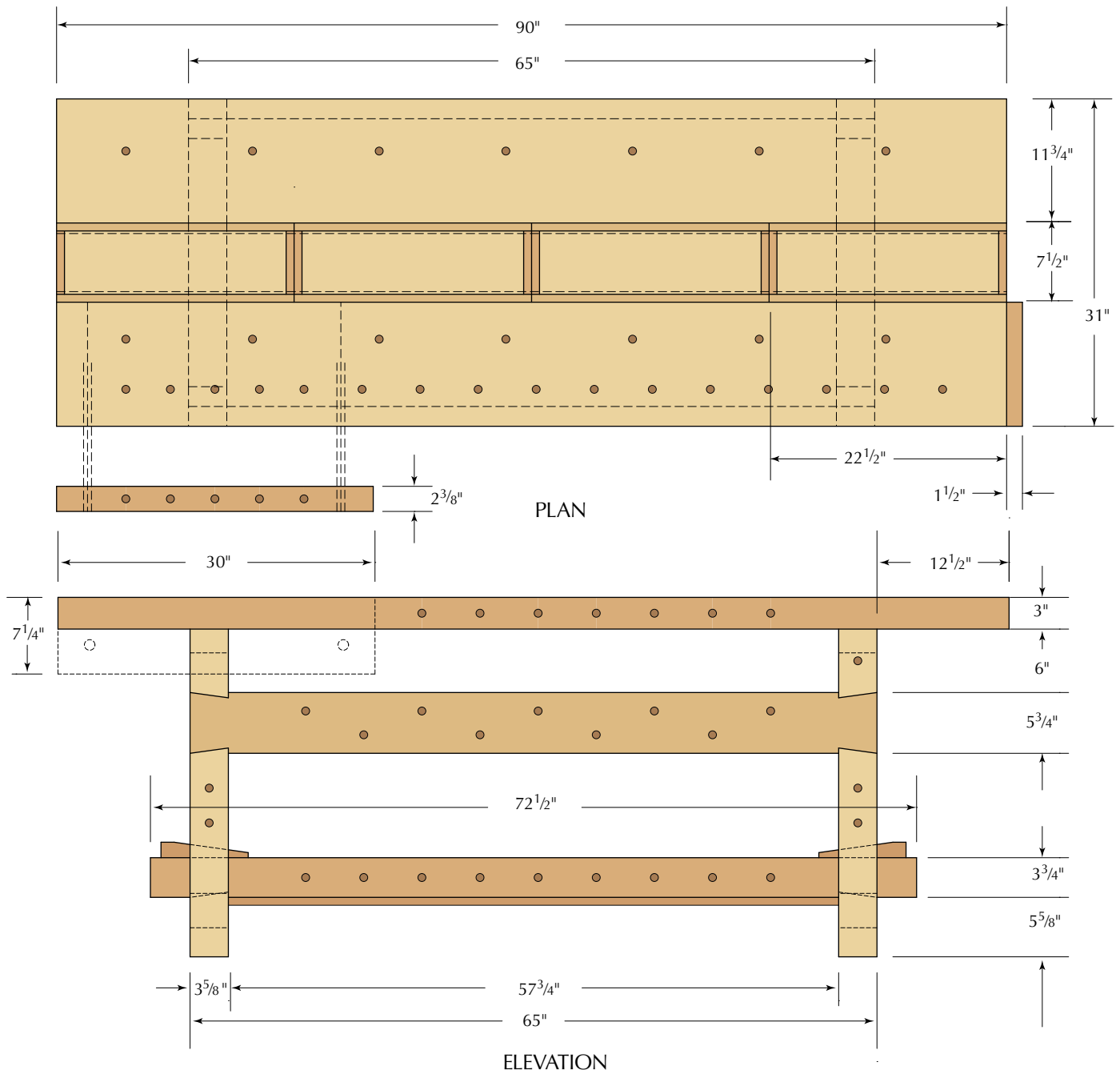
Both upper and lower dovetail joints are half-lapped with the outer portion of the leg. The lower joint is on the inside of the leg and is a half dovetail; the other half of the joint is a removable wedge. The upper joint is on the outside of the leg and secured by a lag bolt.

After cutting the shoulders by hand, I removed the waste with the stack dado on the table saw, and used a roller stand to support the long workpieces. The angled cuts were made with a jigsaw.

I smoothed out the waste left by the dado cutters with a chisel, shoulder plane and rasp, then marked the locations of the sockets on



Together forever. After assembling the leg and stretcher joints, wedges are glued and driven in the joint from the outside to lock it permanently.



the outer legs directly from the tails. I cut the angled ends of the sockets with a backsaw, and removed most of the waste in between at the table saw.

The remaining waste was removed with a chisel, followed by a shoulder plane. Then I used a plane maker's float to achieve a flat bottom on these joints. The upper joints need to be equal in thickness so that the outer surfaces of the legs and rails will be flush when the bench is assembled.

Down at the lower rail, the tail needs to

be thinner than the socket so that the end of the rail can easily pass through the socket in the leg. The socket also needs to be wide enough to allow the square end of the rail to enter the narrow portion of the joint, then drop down into place.

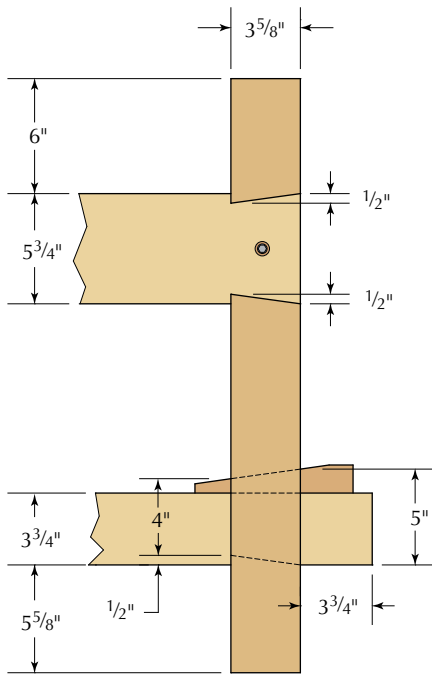
This requires some fussing, but because the outer half of the leg is loose at this point, it's easy to see what is going on while adjusting the joint. After fitting the lower portion of the tail, I cut and fit the removable wedges.

With the joinery complete, I spread glue

on the inside surface, and glued the outer legs to the previously assembled inner legs and stretchers, taking care to keep the parts aligned. After letting the glue dry overnight, I was anxious to see the completed bench.

Screws, Wedges and the Hole Story

I set the completed end units on the floor, and inserted the two lower rails into one end, knocked in the wedges then slid the rails into the other end. The upper rails were knocked into place, and after marking the centers of the



LEG DETAIL



Halfway gone. The dovetails on the ends of the horizontal rails are half-lapped. I removed most of the material with a stack dado set on the table saw. An adjustable roller stand supports the other end of the long parts.



Real-time layout. After making the male part of the joint, the socket is laid out directly from the finished part. Simply lay the rail in position, line up the top and knife in the angled line.



Fit the joint, then the wedge. After fitting the dovetail for the lower rail, a matching wedge is cut and fit. Thanks to working on only half the leg, this process is entirely visible.



A little skinny. The end of the rail will need to easily pass through the assembled leg. The square is set to half the thickness, and the space below the blade tells the story.



Careful now. The legs are permanently assembled by gluing. Judicious placement of glue to keep it out of the joint, and a clamp across the bottom to keep the parts from sliding, make the process painless.

tails, I made a $\frac{3}{4}$ "-diameter counterbore deep enough to leave the head of a lag screw about $\frac{1}{8}$ " below the surface. Then I drilled a pilot hole and drove in a $\frac{1}{4}$ " x 2" lag screw.

I set the tops in place on the assembled base, with the edges even with the outside of the legs and a consistent distance in between.

I drilled $\frac{3}{8}$ "-diameter through holes in the upper stretchers, and $\frac{1}{4}$ "-diameter pilot holes in the bottom surface of the tops. Four $\frac{5}{16}$ " x $3\frac{1}{2}$ " lag screws secure each top section to the base. After admiring the assembly for a while, I laid the bench on its side, and flushed the joints to each other.

The front of the bench is really a working work-holding surface, so I took care to level all the parts to be in the same plane. While I was at it, I used my block plane to bring the ends of the tails even with the edges of the legs.

Setting the bench back on its feet, I laid out the locations of the vises, as well as the $\frac{3}{4}$ "-diameter holes in the top, front rails and front legs. A Veritas twin-screw vise straddles the left-front leg, and a small quick-release vise is in the tail-vise position. I routed out

a recess in the end of the benchtop for the tail vise, and glued two 2"-thick x $4\frac{1}{4}$ "-wide blocks to the bottom to hold the screws for the larger, twin-screw vise.

There is a line of holes in the top, centered on the dog location in the end vise. I drew a line the length of the bench at this distance, then marked a hole to just miss each side of the right hand leg. I set a pair of dividers at this distance and stepped off the center-to-center marks for this line of holes.

I carried these marks down to the front rails using a framing square. The holes in the lower rail are centered vertically, and the ones in the upper rail alternate high and low, $1\frac{3}{4}$ " in from the edges. The holes in the rails don't need to line up with the holes in the top, but it seemed a reasonable spacing. It was easier to transfer the existing layout than to think about a new one. The holes in the front will be used with a surface clamp, or a simple dog to support work from below.

On the inside edge of the top, I marked out locations for holdfast holes on 12" centers, 3" in from the back edge on the front half. On the back half is another row of holdfast holes,



A short side trip. After assembling the rails and top halves, the bench is turned on its side to level the front surfaces.

also on 12" centers. I wanted these roughly in the middle of the top, but didn't want to drill into the glue line, so I centered them in the middle of the board beyond the center of the rear top.

There are five holes in the front jaw of the vise, lining up with the holes in the top, roughly in the center and near each end of the jaw. Each of the front legs also has holes, two in the left, equally spaced between the upper and lower rails. The holes in the right leg match, with an additional hole in the space between the upper rail and the benchtop.

Because the parts of the bench are relatively manageable components, I took the bench apart and drilled all of the holes at the drill press using a $\frac{3}{4}$ "-diameter brad point bit at a low speed, about 500 rpm. I used my roller stand to support the long parts that hung off the drill press table.

Where Will the Hamsters Sleep?

Between the two lower rails is a shelf that is supported by 2"-wide cleats nailed to the bottom of the rails. The shelf boards are random widths of $\frac{1}{4}$ " material, with opposing rabbets on the long edges. The boards at each end have a rabbet on only one edge, and butt against the inside edge of the lower stretchers.

The shelf boards and cleats were left as thick as possible, and cleats were also nailed to the underside of each inside edge of the top sections to support the removable tool trays. The trays are open-topped boxes, made from $\frac{3}{4}$ "-thick solid wood. The corners are held together with simple rabbet-in-groove joints. The bottom is rabbeted to fit in a $\frac{1}{4}$ "-wide groove, with the face of the bottom even with the bottom edges of the box sides.

The tool trays can be turned upside down if desired to make the entire bench, or just

portions of it, one wide flat surface. Or they can be removed to allow clamping to the middle of the benchtop. They can also be easily carried to return tools to their homes, or to the trash can to remove the inevitable accumulation of shavings and other trash.

I don't believe that a bench needs a fine finish. After planing all the surfaces, I knocked off the sharp corners of the edges, and applied a coat of Danish oil.

With a few holdfasts and holddowns, along with some F-style clamps, I can hold work securely in almost any position. That's what a good bench is for. It is the tool that makes the work of all the other tools easier and more efficient. **PW**

Robert is senior editor of this magazine and author of several books about furniture of the Arts & Crafts movement. Information on his books is available at his web site: craftsmanplans.com.

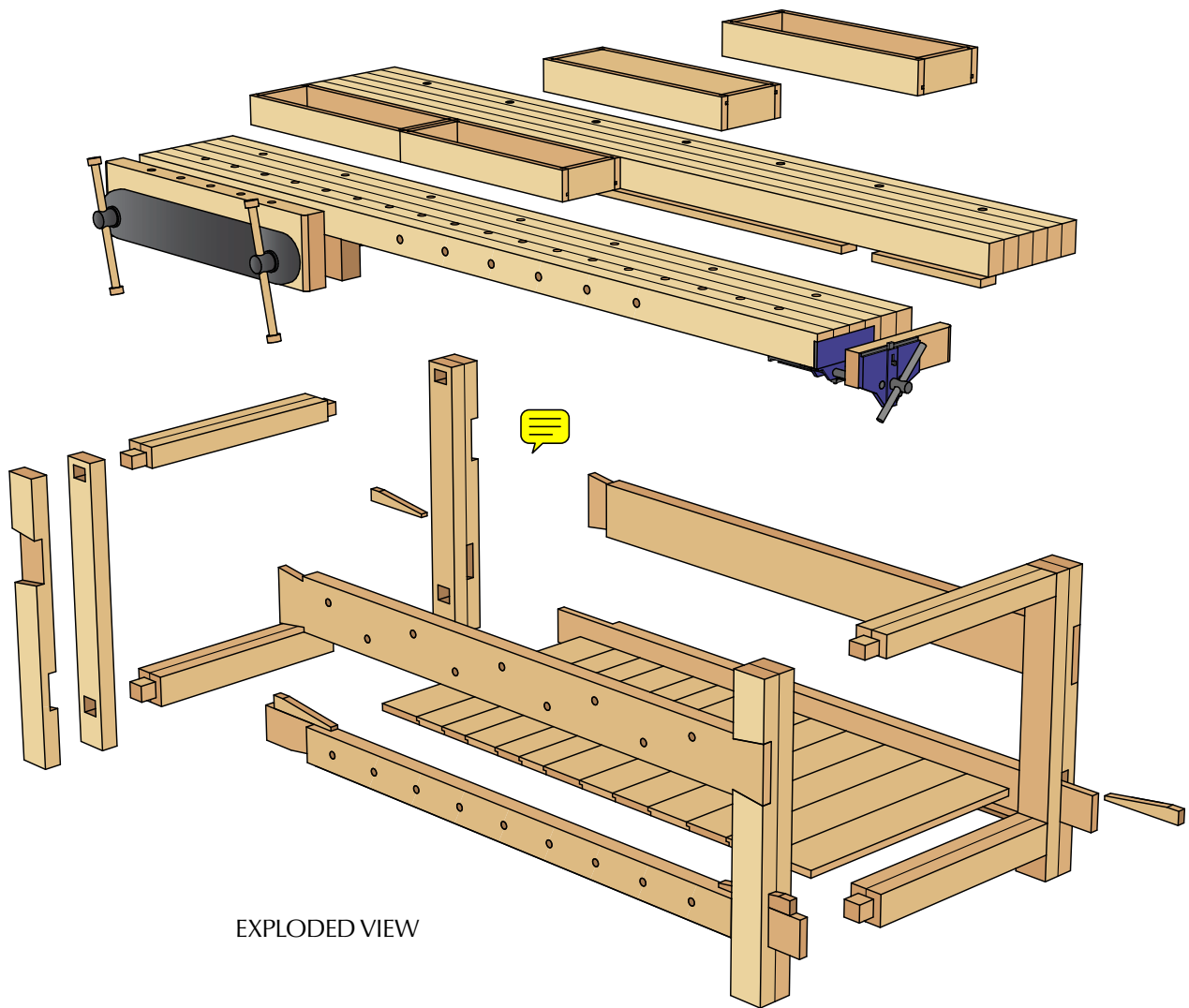


Fine-tuning. The lag bolts that secure the upper rails are counterbored to keep the heads well below the surface. The faces of the rails are made flush to the legs.

Even ends. The ends of the tails are also trimmed flush. The lag bolts that hold the top on are visible behind the block plane.



The boring part. The top halves are heavy, but with the aid of a stand they can be brought to the drill press for boring the dog and holdfast holes.



EXPLODED VIEW

21st-Century Workbench

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
		T	W	L		
□ 12	Top laminates	1 ¹⁵ / ₁₆	3	90	Ash	Mill TAP*, 6 per half
□ 4	Inner legs	1 ¹⁵ / ₁₆	3 ³ / ₄	31	Ash	Mill TAP*, 1 ³ / ₄ " minimum
□ 4	Outer legs	1 ¹⁵ / ₁₆	3 ³ / ₄	31	Ash	Mill TAP*, 1 ³ / ₄ " minimum
□ 4	Upper stretchers	1 ¹⁵ / ₁₆	2 ¹ / ₄	31	Ash	Mill TAP*, 1 ³ / ₄ " minimum
□ 4	Lower stretchers	1 ¹⁵ / ₁₆	3 ¹ / ₄	31	Ash	Mill TAP*, 1 ³ / ₄ " minimum
□ 2	Upper rails	1 ¹⁵ / ₁₆	6	65	Ash	Mill TAP*, 1 ³ / ₄ " minimum
□ 2	Lower rails	1 ¹⁵ / ₁₆	3 ³ / ₄	72 ¹ / ₂	Ash	Mill TAP*, 1 ³ / ₄ " minimum
□ 4	Wedges	7/8	1 ³ / ₈	8 ⁵ / ₈	Ash	Mill TAP*, 1 ³ / ₄ " minimum
□ 4	Cleats	1 ³ / ₁₆	2	90	Ash	Cut to fit between ends
□ 8	Box sides	3/4	3	22 ¹ / ₂	Ash	
□ 8	Box ends	3/4	3	6 ³ / ₄	Ash	
□ 4	Box bottoms	3/4	6 ³ / ₄	20 ¹ / ₂	Ash	
□ 1	Shelf	3/4	22 ³ / ₈	58	Ash	Random width shiplapped boards
□ 1	Face vise blocks	2	4 ¹ / ₄	30	Ash	Total length, trim for each side of leg
□ 1	Face vise chop	2 ¹ / ₄	7 ¹ / ₄	30	Ash	Laminated from 3 pcs.
□ 1	Tail vise chop	1 ¹ / ₂	3	11 ⁵ / ₈	Ash	

*TAP=Thick as possible

Supplies

Lee Valley

800-871-8158 or
leevalley.com

- 1 ■ Veritas twin-screw vise, 24" center #05G12.22, \$225
- 1 ■ quick-release bench vise, 7" #10G04.11, \$99
- 2 ■ Veritas surface clamp #05G19.01, \$67 each
- 2 pr. ■ 4³/₈" bench dogs #05G04.02, \$26.50 pair

Tools For Working Wood

800-426-4613 or
toolsforworkingwood.com

- 2 pr. ■ Gramercy holdfasts #MS-HOLDFAST.XX, \$29.95 pair

Prices correct at time of publication.