

Building a Short Roubo Workbench

Nathan Zeldes April 16, 2024



The finished bench (and the folding one it was built to replace)

Contents

Decision and preparation	2
Lumber selection.....	3
Laminating the top slabs.....	4
Making the legs	6
Assembling the base.....	9
Installing and finishing the top.....	11
Building the leg vise.....	14
Installing the planing stop.....	17
Drilling dog and holdfast holes	19
Building the shelf.....	20
Creating the gap stop	21
Finishing.....	23
And it's done!.....	24
Some concluding remarks.....	25
Appendix 1: Design drawings.....	27
Appendix 2: Cut list	29

This project was motivated by two opposing sentiments. First there was the excitement of tackling a major DIY project beyond my prior experience. And then there was apprehension – this was to be my first large project with real wood (which, unlike the plywood I’ve worked with before, is a natural material with a mind of its own). It required skills I’ve never acquired. What if I ruined it all by producing crooked parts, skewed joints and misaligned glue-ups?

This apprehension guided my execution of the project. First, I made some validation tests: I got a bunch of two-by-fours and glued up a small slab, then built two short legs to practice the joinery. I was happy to discover that I could



Some test pieces

make it work. Then I made sure to practice every step on test pieces, until I was confident enough to touch the real thing. All this paid well.

Lumber selection

I knew I had to find a lumber merchant who would agree to plane wood to my specification. Natural wood reacts to changes in ambient humidity, and can warp after it’s been sawn. The accepted wisdom is to let it sit in a corner until it stabilizes, and then run it through a jointer and a planer. Not having these expensive power tools, and not feeling up to hand-planing dozens of planks for a perfect fit, I had to rely on the merchant to sell me planed planks.

The only lumber merchant in town that was willing to do that had European beech that he promised me was well-dried; so that’s what I bought. The guy did give me nicely planed planks – and two of those destined for the top were already warped two days after he’d cut them! Luckily, I’d ordered two extras... and I hurried to laminate the top the very next day.



Beech aplenty as delivered

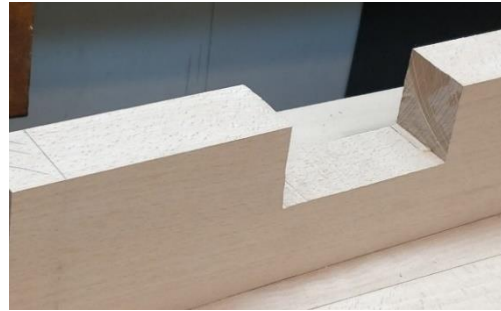
Lessons and caveats

Yes, beech is harder and more difficult to plane than the pine I was thinking of using, but I found that if you sharpen your planes and chisels diligently it is quite workable. Before embarking on such a build, make sure you possess the means and skills involved in sharpening and honing your blades; you will need them!

Laminating the top slabs

So, without delay I invited my brother to help, and we laminated the two slabs. This stage can definitely benefit from an extra pair of hands.

Before gluing I cut the mortises that would accept the leg tenons on the underside of the slabs. Because those tenons are (by design) the width of a single top plank, I cut the mortises into the bottom of the two planks that would accept the legs, which guaranteed a perfect fit later on.



A mortise for a leg tenon in a slab plank

My earlier tests showed me that wet glue is a lubricant, and the planks can “swim” on it once the clamps push on them. I decided to leave nothing to chance, and created a big jig to constrain the planks to stay in line. This was a thick plywood plate that I fixed to the Workmate. I put on it two pairs of cauls and an end stop to keep the planks aligned. To prevent the wood sticking to them, the cauls were coated with packing tape. We glued each half-top from six planks using Titebond Extend glue, which has a longer set time.



The lamination jig with its cauls and end stop



A benchtop slab being glued in the jig

The results were quite gratifying, with the planks aligned to within a millimeter.



The two glued slabs, bottom side up. The “spare mortise” is where a defect in the wood was cut out; it will later be plugged with a matching piece of wood

Lessons and caveats

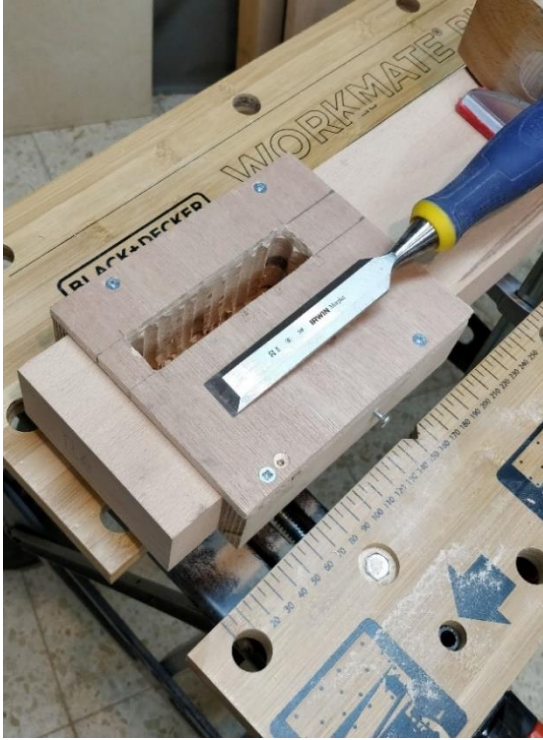
I found that you can put a slightly bowed plank between two straight ones and when glued under clamps it will end up straight.

Making the legs

The legs are each laminated from two parts, one longer than the other to provide a tenon that will go into the benchtop. Each part has mortises where the stretchers connect. Fortunately I could make those before gluing, so I had access to each mortise from two sides.

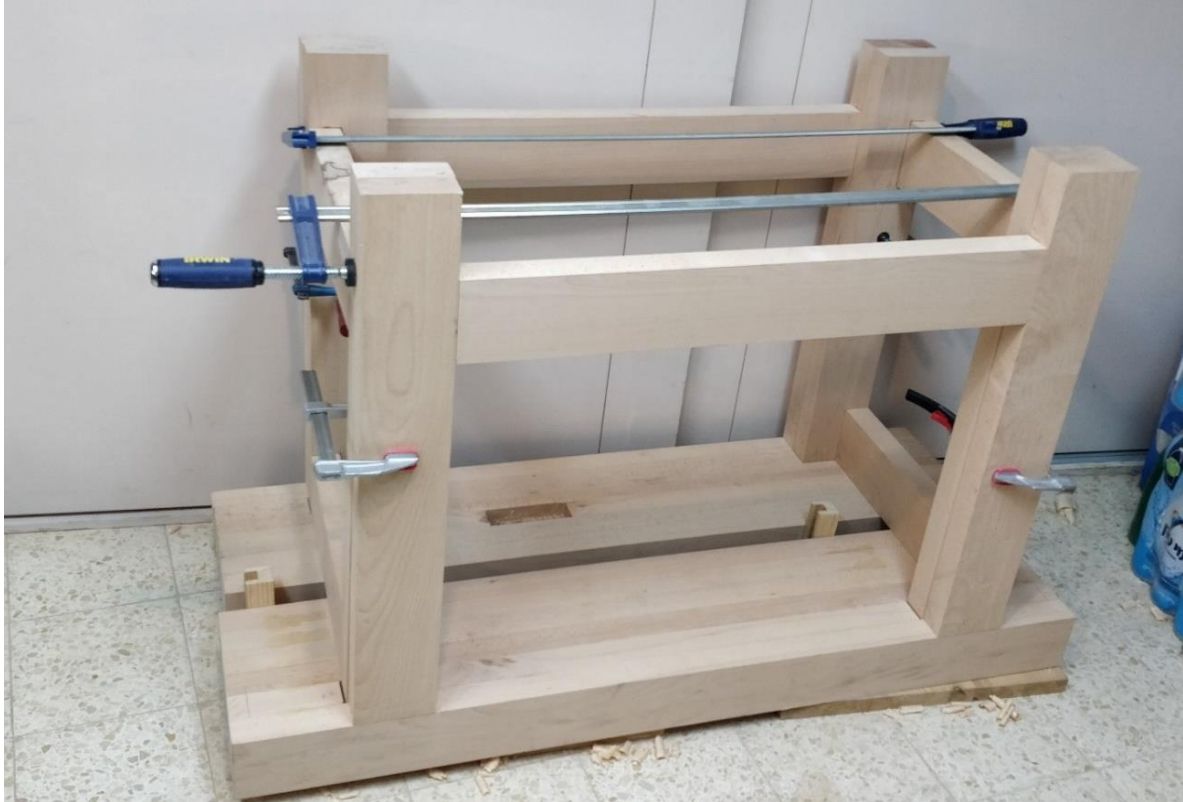
To make the mortises I used a Forstner drill bit to remove most of the material, then a chisel to straighten the remaining wiggly edges. The photos show work on the two types of mortises – wide ones for the long stretchers, and deep ones for the short stretchers.





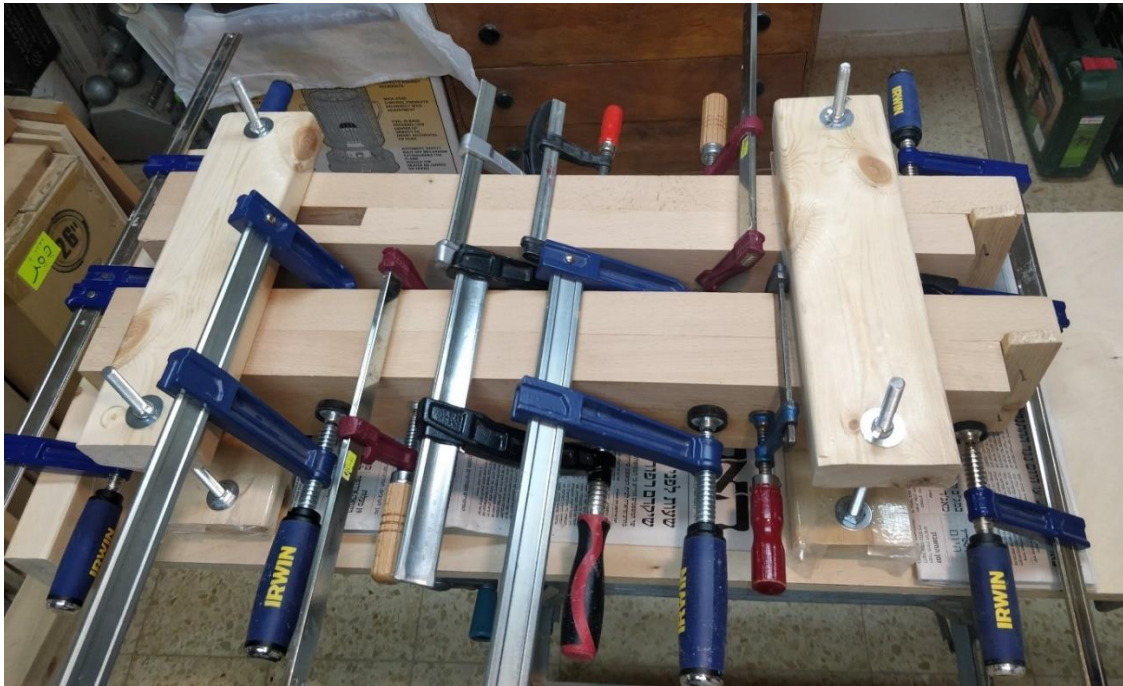
Mortises, mortises, and more mortises!

I then clamped the base together, tested for squareness, and fixed any deviations in the fit (I'd chiseled some mortises a tad too wide) by gluing thin shims to the tenons where required.



Dry-fit test... everything looking good!

Next I glued up the legs, using the top lamination jig (after moving its cauls closer together).



Two legs being glued up in the jig

I added a chamfer around the bottom of each leg, to prevent wood tear out when dragging the finished bench around.

Next came drilling the holes in the legs – for holdfasts, for the vise screw and for the chop stabilizer rod.



Chamfering the bottom of a leg



Drilling the hole for the vise screw

Lessons and caveats

I wanted to use Forstner bits here, but they are too short. After some experimentation I found that the humble spade bits are quite up to the job, as long as you clamp a sacrificial piece of wood to the exit side to prevent breakout.

Assembling the base

Before assembly I had to make the holes in the upper stretchers that would take the lag bolts that go into the top slabs. These had to be elongated, to allow the bolts to move when the top expands and contracts with the seasons. I used the calculator at <https://bit.ly/wood-move> to compute the range of this movement, added a bit for good measure, and made the holes 10 mm wide by 18 mm long.



Elongated holes in an upper stretcher

Lessons and caveats

Common wisdom holds that air moisture peaks in summer, but in truth this varies by location. Fortunately, I thought to consult the meteorological service web site and found that in my area it peaks in winter. Knowing this fact guided my calculations.

With all legs and stretchers ready, it was time to glue up the base. I did another dry test of the entire base, fitting it upside down into the big mortises in the two slabs that were lying on the floor. I then glued up the two end sections, each consisting of two legs and two short stretchers.



Dry testing the base end sections



Gluing up an end section of the base

When the end sections were ready, I invited my brother over and we glued the long stretchers between them. Again, I used the mortises in the overturned top slab to ensure the right fit at the bottom, and added two diagonal clamps to get a perfect rectangle at the top.



Gluing the long stretchers to complete the base



The finished base

At this time I drilled the pilot holes for the lag bolts in the underside of the slabs. Everything was ready for adding the benchtop to the base!

Lessons and caveats

Experience from the dry fitting showed that pulling the entire glued-up base off the mortises at once would be very difficult – the leg tenons fit tightly, so that pushing them in with the base under wet glue was easier than the converse after everything had set. I solved the problem by placing in the mortises inserts of equal height that effectively made them shallower, while still providing the right spacing for the tenons.

Installing and finishing the top

Now I faced another scary part, that of flattening the top with hand tools. I know, you can do it with a router, but although I have one, I hate its noisy, boisterous demeanor; I wanted to do this with hand planes – a Jack plane and a wooden Jointer that I'd bought for this purpose.

I decided to practice first on the bottom of the slabs. I hauled them individually onto the short stretchers of the base and took on them with those planes; to my enormous relief this worked very well – the uneven, glue-smearred slabs became clean and smooth. It helped that I'd laminated the slabs in that caul jig – I had no twist and only minor deviations to correct.

With the bottoms done it was possible, at last, to assemble the top on the base! One tenon fit only with force (which could hamper future disassembly), so I filed it a bit. With that done I had my first real look at my creation, albeit without the work-holding elements. It looked really nice – there was no doubt that this endeavor was going to work out fine after all!



It's a bench!

Next came the lag bolts, which secure the top to the stretchers (the leg tenons are not glued into the top, to allow for future disassembly). With all the holes ready, this was a quick job.



The lag bolts, ready to go in



Lag bolts in place

So now it was time to actually flatten the top. I used two short spirit levels to serve as winding sticks and a long one for a ruler, and characterized the top carefully for high and low spots.



Measuring the lay of the land

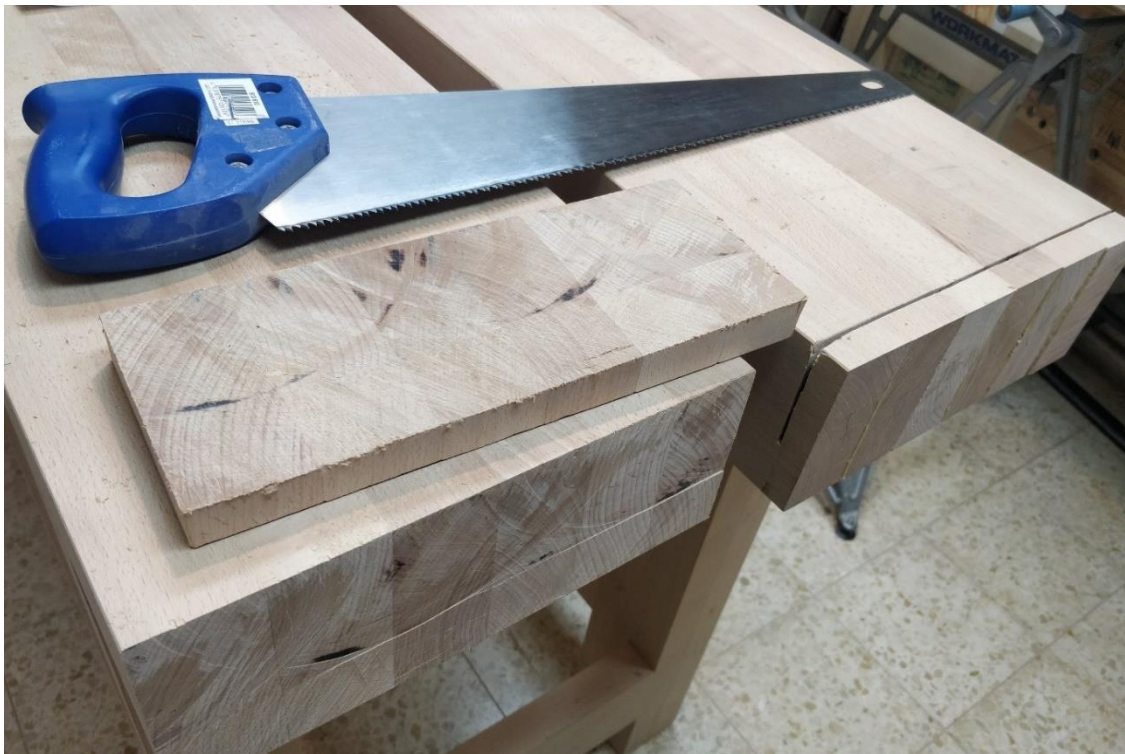
I took on the high spots and then on the entire surface with my No. 5 Jack plane, working diagonally to the length of the bench one way and then back at 90 degrees to the first pass. I then used the jointer plane along the grain. Overall, this went fast and without problems.

Lessons and caveats

I found that well-honed plane irons make a real difference. I sharpen mine on a 1,000 grit diamond plate followed by a 10,000 grit water stone and finally a leather strop.

The outcome was a top that was flat all over but had rough spots where some grain had torn out. I decided to fix the tearout with a smoothing plane, but the result was uneven: most of the surface became super smooth, but the tearout patches remained rough. I could've continued to remove layers but suspected that I'd only make things worse. Instead, I took to heart Christopher Schwarz's insight in "The anarchist's workbench": "I don't try to get the benchtop to a level of flatness that rivals a granite plate in a machinist's toolroom. I aim for a benchtop that won't distort my work". In fact Schwarz recommends against a smooth benchtop, which would make the work pieces slide around. Since the part-smooth, part-rough top looked patchy, I sanded it with medium sandpaper to a uniform state that turned out quite pleasing to the eye and to the touch.

Next came dressing the uneven ends of the top. I marked them all around and cut from above as deep as I could with my circular saw. I then completed the cut with a handsaw.



One cut done, one to go

Unfortunately, the circular saw cut came out slightly skewed vertically. Now I had to straighten the sawn ends by planing end grain. I was surprised to find that the best tool for this was the No. 4 smoothing plane; perhaps it felt it owed me after the top flattening episode. It was arduous work, but it went well. Chamfering the ends all around and clamping a backer board to the bottom helped prevent spelching.



End planing setup – note the backer board below



The finished slab ends

Building the leg vise

The leg vise, an elegant work holding device, came next. First I made a wedge (a right triangle 40 cm long and 7.5 cm wide) to serve as the parallel spacer on the floor. I used the wedge to

mark the diagonal rabbet on the bottom of the plank that was to become the vise chop; I used hand saws to cut this rabbet at the bottom, and the bevel at the top of the chop.



Cutting the rabbet for the spacer wedge



Shaping the bevel at the top of the chop

I debated whether to narrow the bottom of the chop, a common practice, but decided the rectangular form looks more consistent with the straight, simple lines of the rest of the bench (and noted that André Jacob Roubo, bless him, used the rectangular form on his vises as well).

Next came the business of the giant screw. I marked and drilled the hole in the chop, and fixed the screw bushing to the chop and the giant nut to the back of the bench leg. Now I could test the mechanism, and found that it could definitely clamp with a mighty force.



Assembling the screw...



...and the nut

However, there was enough play in the nut to allow the heavy chop to sag down and pull the screw off the horizontal. I solved this with a trick from Jay Bates: I placed a spacer between the back of the screw and the underside of the benchtop. This caused the screw to groan loudly when it moved, but applying some furniture finishing wax reduced the friction and calmed it down.



Spacer to keep the screw horizontal



*Right: Vise chop stabilizing solutions –
Spacer above screw, dowel through leg,
and wedge on the floor*

I also needed a solution to stop the chop from swinging right and left around the screw; I did this by attaching a long dowel to the back of the chop and passing it through a hole in the leg. Between this dowel, the screw spacer, and the wedge, I achieved the stability that would be provided by a criss-cross – at a tiny fraction of the price.

I plan to glue, with contact cement, a layer of Benchcrafted Crubber (a grippy composite of cork and rubber) to the inside face of the vise chop. Haven't gotten around to it yet, though, and it may be overkill anyhow.

I added a temporary tommy bar and could now use the vise to work on the next steps.



The bench after vise installation

Installing the planing stop

The planing stop is a toothy metal plate (made by Benchcrafted) fixed to a wooden carrier that needs to travel up and down when whacked with a mallet, but stay put otherwise. This meant cutting a big through mortise in the benchtop that would give a precisely tight fit to the carrier. I made the mortise by drilling out its central parts, then inching ever closer to the required size with a chisel; when I was really close I was worried of overshooting the mark (although, frankly, it would be easy to shim the fit back if necessary), so I built me a sort of feeler gauge to identify exactly where things stand at each point and depth. This was a rectangle sawn off the bottom of the carrier itself and fitted with a handle.

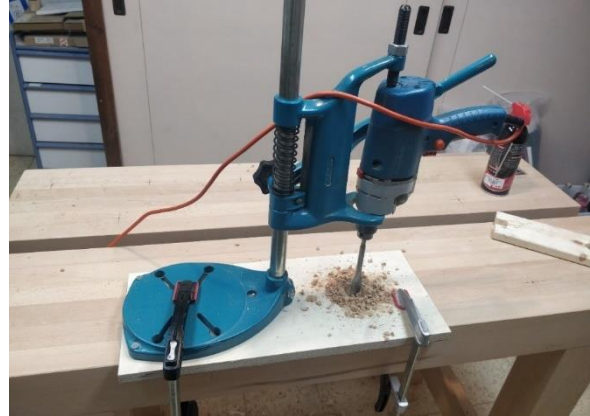
I also made a precision sanding stick, so I could sand just the locations in the mortise sides that needed tweaking. The following photos show some of the steps and the final result.



Drilling dog and holdfast holes

I chose to go with 19 mm round dog holes, and laid out a row of these near the front edge of the bench to receive regular dogs, the Veritas Wonder Dog that will fill the role of a wagon vise, and if necessary holdfasts as well. Additional holdfast holes went in two rows further in.

I debated what drill bit to use. Forstner bits cut super clean, but mine were too short. After some testing I found that a spade bit works fine if you stop drilling once its tip comes out the other side and finish drilling from below. I used 19 mm spade bits in my good old B&D drill press attachment; I screwed the press to a plywood baseplate that allowed it to drill without tipping over. The holes came out crisp and straight; I sanded a small round-over to their lips to make them more resistant to breakout.



Lessons and caveats

In hindsight, the holes are best drilled after the Tung oil is applied. See details in page 24.

There is much debate out there about how thick a benchtop can be before the holdfasts start slipping. Mine is 10 cm (4 inch) thick and the holdfasts grab just fine.

Now the bench was functionally complete, ready to hold workpieces with vise, dogs, holdfasts and planing stop. And it looked pretty cool!



The bench with all work-holding parts finished

Building the shelf

I made the shelf from pine planks fitted together with a tongue and groove joint. I found at the local lumberyard planks with the tongue and groove already cut in, so all I had to do was cut them to size. I made the ledgers that carry the planks from pine 2x4s ripped in two, and screwed them to the inside of the stretchers. I did not screw in the shelf planks, who seemed happy to stay in place under their own weight. This would also make them free to slide under wood movement – I left them a total of 9 mm wiggle room.



Shelf components in preparation



The finished shelf

Creating the gap stop

My original plan was to build the gap stop/tool holder as a sandwich of three beech layers. This failed rather disgracefully (don't ask...) so I went with plan B – planed a solid pine 2x4 to the right dimensions and added the slots for the tools with Forstner bit and chisel. I made sure to leave some 4 mm in the gap for future wood movement in the top slabs and in the gap stop itself (I was building this part in the dry season).

The gap stop has two positions, flush with the benchtop and raised 13 mm to allow use as a transverse planing stop. The 2x4 wasn't wide enough, so I added the small blocks below it that would prop it up over the top stretchers when you moved it along its length.



Cutting the slots in the gap stop



The finished gap stop, ready to go in its place



Gap stop, lower position



Gap stop, higher position

Lessons and caveats

Many benches show a series of identical wide slots in the gap stop. In reality, some chisels are too top-heavy and can flip over when inserted in a wide slot; hence the four narrower slots I put in alongside the two wide ones.

Finishing

I decided to finish the bench in natural Tung oil, which is famous for its durability and beauty. I applied three layers of the Real Milk Paint Company's "Half and Half" (50% Tung oil, 50% citrus solvent – my workshop smelled of oranges for weeks!). I gave the vise chop and gap stop a darker shade, by adding pigment powder to the oil used in their first layer.

This was my first use of Tung oil (or any drying oil), and I found it very pleasing to work with. It is easy to apply (I just brushed in on), and far less messy than paints and varnishes. The wood absorbs the oil thirstily, so you have to keep adding and mopping it judiciously for half an hour – a more personal interaction than just slapping on paint. Of course, Tung's slow absorption and even slower curing means you need a great deal of time during the application, between layers, and after the last layer; but I was not in a hurry.

The outcome turned out to justify the effort. For all its good mechanical properties beech is rather boring to look at, and the Tung oil brought out the grain pattern and gave it a warm honey color.



Ready to apply the last oil layer

Lessons and caveats

I didn't want the oil to go into the holdfast holes, which rely on friction to do their job. Before applying oil I plugged the holes with wine bottle corks. A little oil did seep through, but at any rate the holdfasts ended up working just fine after each layer. I also made sure not to put oil on the back of the vise chop where I may glue the crubber lining – oil may mess with the glue.

And then, after the 30 day curing period, all the holdfast holes refused to grip! The weather had changed from winter to spring a few days earlier, and some oil that hadn't yet cured due to the cold temperature had now expanded and seeped out into the holes. Fortunately, once out in the open it finished curing, and over the next two weeks the holes returned to their normal grip one by one. The lesson: **drill the holes after applying the oil finish**, not before!

Safety warning: hang out used oil-soaked rags in a cool place to dry fully before throwing them out. Oily rags can spontaneously combust if left unventilated.

And it's done!

Once the oil had fully polymerized (30 days after the last layer) I finally had my workbench ready for my next woodworking projects!

Here it is:





Some concluding remarks

Here are some general observations, from this newbie bench builder to anyone out there thinking to embark on a similar project:

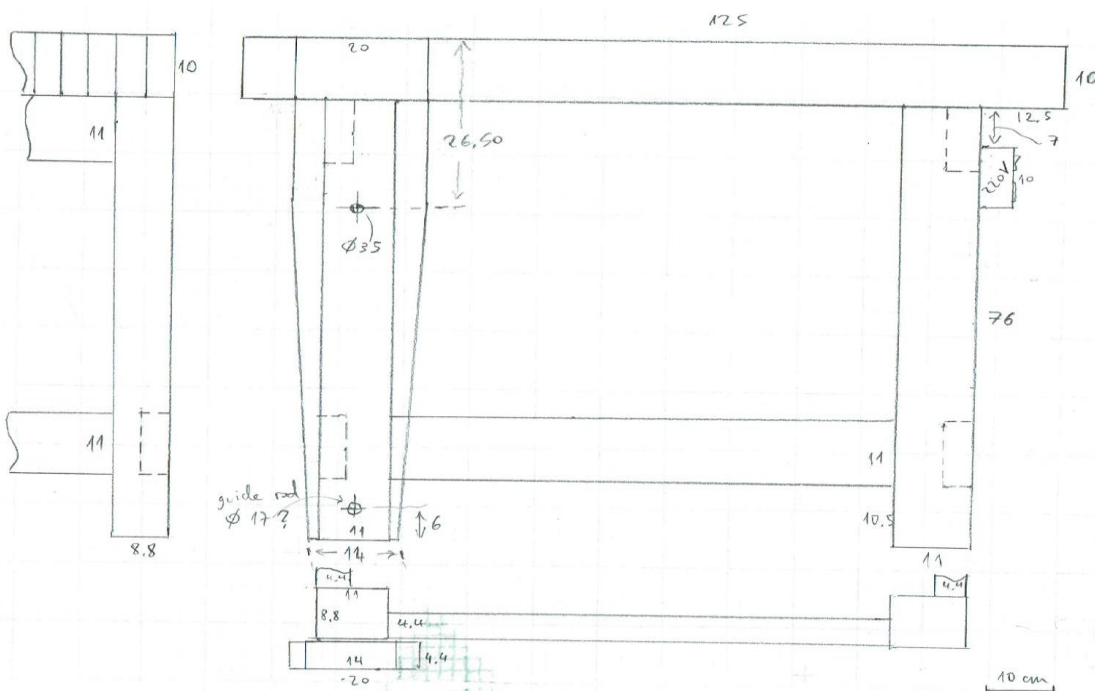
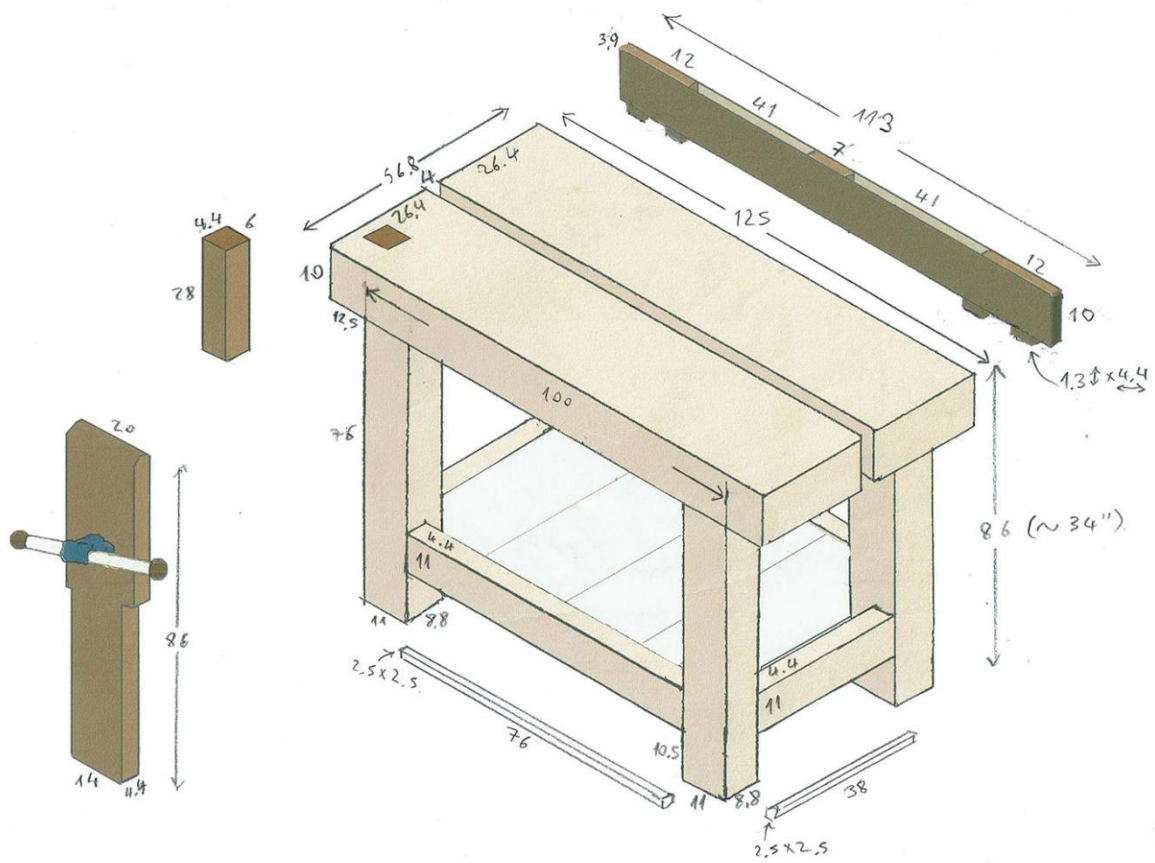
- **First things first:** wood is harder than flesh, and your tools are designed to slice it. Safety is critical, and I don't just mean with electric saws. When I started this project I had no grasp of how sharp well-honed hand tools really are. You don't need to hammer a chisel into your hand to get cut (and yeah, never put a hand in front of a working blade!) – it's enough to carelessly wave your hand near a chisel lying on a bench. Make sure to work slowly and deliberately, use all indicated safety gear, never drop tools or pieces of wood... Stay safe!

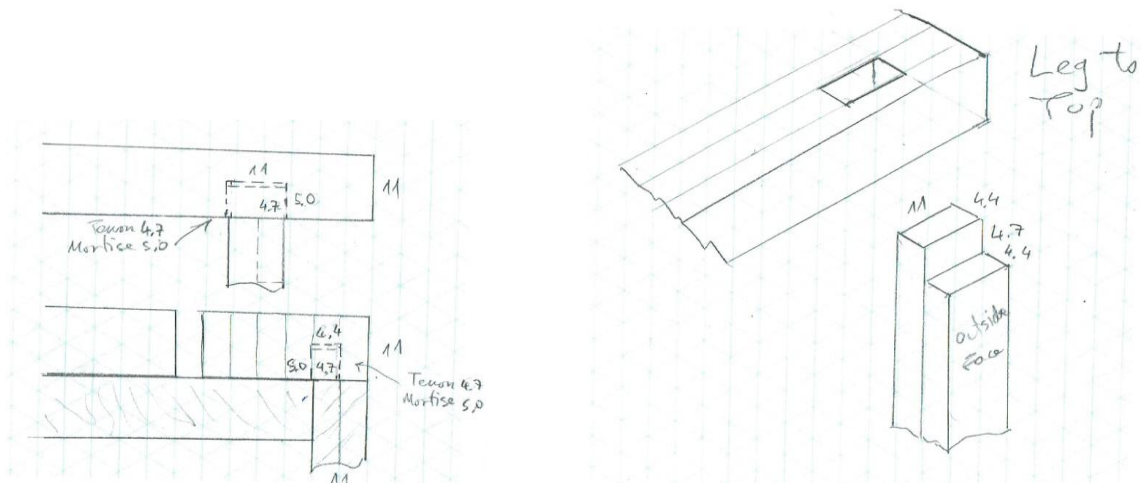
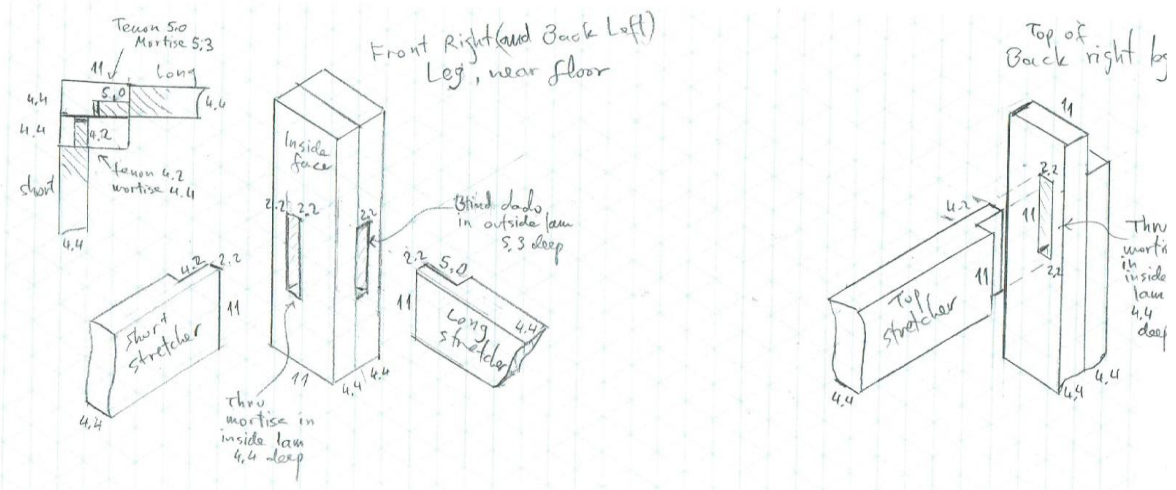
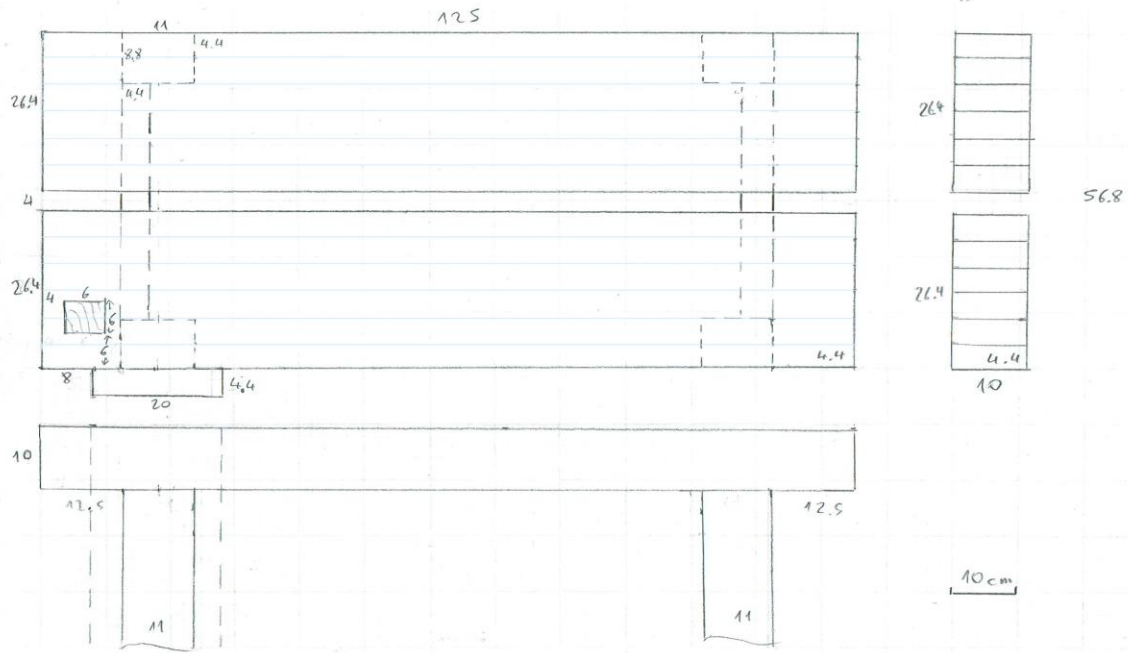
- **You can do this.** Maybe not with one hand tied behind your back like some of those gurus on YouTube probably could, but you can. I'm not the only one to have built a workbench with almost no prior experience. Just be careful, practice on test pieces throughout, and remain in control. I was very pleasantly surprised to find out how overblown my initial fears had been.
- **This is a learning journey.** I started with the idea that I'll build a bench and **then** use it to practice and acquire hand tool skills. **I was wrong.** By the time I was nearing completion of the workbench I realized that I already had a good start into those skills, which I'd acquired during months of working on this challenging project. Sure, I still have a long way to go, but I really landed on my feet running!
- **Learn from the community.** It's incredible how much wisdom is shared, willingly and for free, by both experts and hobbyists on YouTube, Facebook, and the blogosphere.
- **Plane irons and chisels need to be kept sharp.** Really sharp, as in 6,000 grit or higher. Early in this project I've built me a sharpening station and have put it to constant use.
- **Old Roubo knew what he was doing:** this workbench turned out a true delight to use. The ancient workholding methods – the leg vise, the planing stop, the holdfasts – run circles around their modern counterparts. They are powerful, fast, and have that elegance that comes from absolute simplicity.

I so look forward to working wood on this bench!

Appendix 1: Design drawings

Hand-drawn and unpolished, but they've served me well, so here goes. Dimensions are in centimeters.





Appendix 2: Cut list

The following are final dimensions (after planing, before forming tenons and any cutouts).

Dimensions are in centimeters.

Beech

Part	Count	Thickness	Width	Length	Comments
Top planks	12	4.4	10	130	Length trimmed to 125 after top slab lamination
Long leg half	4	4.4	11	80.7	
Short leg half	4	4.4	11	76	
Long stretchers	2	4.4	11	88	
Short stretchers	4	4.4	11	47.6	
Vise chop	1	4.4	20	86	
Planing stop carrier	1	4.4	6	28	
Vise floor wedge	1	4.4	7.5	40	Cut to make a right triangle

Pine

Part	Count	Thickness	Width	Length	Comments
Middle shelf planks	5	3.2	13.3	47.8	Width excluding tongue
End shelf planks	2	3.2	11.9	47.8	Width excluding tongue
Long shelf ledgers	2	2.5	2.5	76	
Short shelf ledgers	2	2.5	2.5	38	
Gap stop	1	3.9	11.3	113	If formed from one piece