

Workbenches

Design, Construction & Use



by Christopher Schwarz



Christopher Schwarz is the editor of *Popular Woodworking* and *Woodworking Magazine* and is a long-time amateur furniture-maker and hand-tool enthusiast.

He began working with wood at 8 when his family members built their first home on their farm outside Hackett, Ark., using hand tools because there was no electricity. After studying journalism at Northwestern University and The Ohio State University, Chris became a newspaper reporter but studied furniture-making at night at the University of Kentucky and joined the staff of *Popular Woodworking* in 1996.

In addition to his duties at *Popular Woodworking*, Chris writes about hand tools for *The Fine Tool Journal* and has four DVDs on traditional hand tool use produced and sold by Lie-Nielsen Toolworks. He teaches handwork at the Marc Adams School of Woodworking and Kelly Mehler's School of Woodworking.

He lives in Fort Mitchell, Ky., with his wife, Lucy; two daughters, Maddy and Katy; and at least three cats. This is his first book.

Acknowledgments

I began writing this book as a manual for my students after explaining for the 100th time why their workbenches weren't working. It was written on the couch at night with the kids by my side, on weekends and in hotels from California to Germany.

Lucky for me, lots of people around me gave their time, effort and goodwill in generous measures. At the top of the list is my wife and daughters: Lucy, Maddy and Katy. They tolerated me being chained to my laptop without a single complaint.

John Hoffman, a fellow woodworker in arms, read every word of this book in both its rough and polished form, helped me shape the narrative and listened to untold hours of me droning on about workbench obscura. Also without complaint.

Louis Bois, a professional draughtsman and amateur woodworker, made all of the construction drawings in this book and also edited every chapter for style and substance.

Gary Roberts, who runs the excellent Toolemera Press web site (toolemera.com) provided many of the old photos and engravings from his personal collection. His web site is an excellent resource for anyone investigating the written record of early woodworking.

Other illustrations, photos and research materials came from a fair number of readers and woodworking friends, including: Michael Gladwin, Stephen Fee and Wiktor Kuc of the internet magazine OldToolsShop.com.

After the book was written and (basically) designed, Linda Watts, my art director at *Popular Woodworking*, spent a few days cleaning up behind me. And Megan Fitzpatrick, the managing editor for the magazine, spent several of her lunch hours copy editing my book and rooting out numerous typographical errors.

And finally, I'd like to thank one person who probably doesn't know this is coming. David Raeside, one of my most enthusiastic students, suggested one day during a class on handwork that I should write a book. While I'd been asked several times by publishers to write books on a topic of their choosing (and then declined their offers) it was his suggestion that set me in motion. Without his casual remark, this book simply would not exist.





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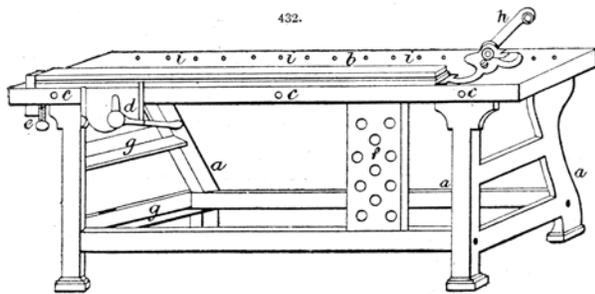
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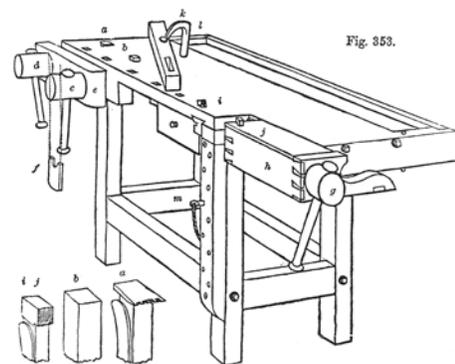
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"Portable cabinet bench" from "Spons' Mechanics' Own Book."



Cabinetmaker's bench from the book "Holtzapffel's Construction, Action and Application of Cutting Tools."



PHOTO COURTESY OF GARY ROBERTS

NICE WORKBENCH (AND HAT): Note how the legs, stretchers and almost certainly the front edge of the benchtop are all in the same plane. This is one of the oft-missed fundamentals of workbench design. I've studied this photo for months. And the only explanation for the pose he is striking is that he is pulling the handplane toward him. My guess is that's because the photographer asked him to.

Chapter One



Introduction: Functional Failures

Every piece of lumber has three kinds of surfaces: edges, faces and ends. A good workbench should be able to hold your lumber so you can easily work on these three kinds of surfaces. Any bench that falls short of this basic requirement will hold you back as your woodworking skills advance.

It took me years to come to this conclusion – years of frustrating fits and starts, observation and – eventually – success. And though this maxim above looks so obvious when written down, it sometimes eludes both the woodworkers who set out to build their own benches and the manufacturers of commercial workbenches.

To understand how I got to this modest epiphany, it's helpful to understand where I began.

It is 1976. I am 8 years old and sport a bowl haircut that hasn't been fashionable since the Reformation. My grandfather has come for a visit to our house in Arkansas, and he's decided we should build a workbench together. I need a place to build my model airplanes that's away from my father's bench, and I am also taking an interest in woodworking, which is an obsession and hobby that runs deeply through both twigs of our family tree.

Grandad buys some white pine 2 x 4s for the legs and some plywood for the top. I can remember building it in our family's suburban garage. He held the nails as I drove them. The completed bench had a portable blue vise that clamped to the benchtop. The jaws were closed by a spindly chrome-plated handle. I clamped everything in that vise, regardless of the workpiece's shape or size. I didn't have bench dogs, a tail vise, a face vise or even a planing stop.

I wish I could tell you I built a Newport kneehole desk at that bench despite the primitive working conditions. But I didn't. I first built a tool tote for my hand tools. And I used my hand tools for that project because my father forbade me from using the table saw or radial arm saw. The tool tote was a sad piece of work. But I kept on

working with those tools and found myself drawn to my workbench after school and on weekends.

I wanted to be an architect, so I pilfered my father's books on house building. At the time he was framing out two houses on our farm in nearby Hackett, Ark. In his library, there were two books I was fond of. I liked one (I can't remember the title) because the house-building process was narrated by a married cartoon couple and in a few frames they were naked. I suspect that hippies were involved in the production of that book.

The other book was Graham Blackburn's "Illustrated Furniture Making." In addition to houses, my father also built some furniture.

But I suspect he had this book because Blackburn showed how to use hand tools, and we had no electricity at the farm as of yet.

I consumed Blackburn's book. I would stare at his drawings for a long time and then try some of the techniques. I remember attempting to raise a door panel with a block plane one day.

But my time at my bench began to decrease as I became interested in girls, guns, cars,

guitars and (in time) college. By the time I left for college my grandparents had bought the house next door and my grandfather had dragged the bench into his garage so he had one.

During the next four years my parents got divorced, my father abandoned his home-building efforts, my grandfather died and the bench was likely sold during a garage sale while I was living in Ft. Lauderdale, Fla., squatting in a guy's garage and writing crime stories for a newspaper.

In on the Ground Floor

Of course, just a few years later marked the moment I was ready to build furniture, but I lacked the tools and a workbench. Again, my grandfather came to the rescue, though he was gone from this world.

"At its most basic we are only discussing a learned skill, but do we not agree that sometimes the most basic skills can create things far beyond our expectations? We are talking about tools and carpentry, about words and style ... but as we move along, you'd do well to remember that we are also talking about magic."

— Stephen King, "On Writing"



IT WAS THE 1970S: Even our garage was fully clad in ugly dark paneling (you should have seen my room). Here is my first workbench and the first project I ever built on it, a tool tote that probably fell apart within a few years – I can't remember its specific fate. Note the nice hammer marks on the bench's legs from my expert pounding.

My grandmother called me one day and asked if I wanted Grandad's tools and workbench, which were still in the shop he kept in Connecticut. I rented a U-Haul and drove the contents of the shop to the house my wife and I had just moved into in Lexington, Ky.

I took classes in woodworking at the University of Kentucky. I started building furniture on our back porch. And I got a job as managing editor at *Popular Woodworking* magazine.

My fellow editors there were former tradesmen, and they had built workbenches for the magazine's shop that were suited to a commercial power-tool shop. Each bench consisted of a large base cabinet with doors that was topped with a thick walnut veneered slab. In a former life, the benchtops had been the doors in our building's cafeteria. All the benches had a quick-release metal vise, placed either on the front or the end of the benchtop. There were no dog holes or planing stops. Functionally, the benches were like my childhood bench.

I didn't have a bench at work at first, so I would work on one of the benches that wasn't being used. On my lunch hour, I would cut dovetails by hand to remember what I'd been taught at the University of Kentucky and stay in practice, and then I came to a rude conclusion: These modern workbenches stink for handwork. They are like trying to cut dovetails at your kitchen table. You can't saw on them. You can't plane on them. But you can sand stuff on them. You can clamp stuff to them for routing. And you can pile parts on them for later assembly on an assembly bench.

My grandfather's bench at home was a bit better. It had a face vise and dog holes, but it wasn't ideal for handwork. And there was other hope. One of the other editors, Jim Stuard, had trained under a German cabinetmaker and had used a European bench and a bench built for patternmaking. One year he built a nice bench that blended those two traditional designs. And whenever I got the chance to work on Jim's bench, I would. It was my first taste of a good bench.

Meanwhile, I was granted some space in the shop against the wall and was bequeathed a section of the walnut slab doors to construct a make-do bench. It was a door slab screwed to sawhorses with a couple vises and a dog hole or two. It was an improvement now that I didn't have to ask permission to work on a bench, but I was still miserable and soon asked to build my own bench from scratch.



HOLDS TOOLS BETTER THAN IT HOLDS WORK: I see a lot of workbenches in professional cabinetshops that look like these benches in our shop. They store a lot of tools below and are useful for piling stuff on. But if you ever want to plane or saw anything, you have to start improvising.

But then I had to design my bench, and I was bewildered. I knew more about what I disliked about workbenches than I knew about what I wanted. So I retreated into books, both old and new. I designed the best bench I could at the time and used it for many years. I built four variations on it while touring around at woodworking shows. I built a smaller version designed to be tucked next to a table saw.

They were all decent benches, but each revealed occasional limitations. I suspected there was a better design out there. I considered copying a form from one of the recent books on workbenches, such as a Frank Klausz bench, a Shaker Bench or an Ian Kirby bench. But each was missing some function that I thought was critical.

So one night at a bar I started making lists. I first made long lists of all the functions I needed to perform to build furniture and cabinets. Then I made long lists of all the features and devices on a workbench that could be used to tackle these essential functions.

For example, one common function is to plane the face of a board that is less than 6" wide and 48" long. You can do this by working

10 Rules for Building Workbenches

RULE NO. 1: Always overbuild your workbench. There is a saying in boatbuilding: If it looks fair, it is fair. For workbenches, here's my maxim: If it looks stout, then make it doubly so. Everything about a workbench takes punishment that is akin to a kitchen chair in a house of 8-year-old boys.

RULE NO. 2: Always overbuild your workbench. Use the best joinery that you can. These are times to whip out the through-tenon, the dovetail, whatever you've got.

RULE NO. 3: You must remain married as you overbuild your workbench. Every project is a strain on everyday life. And when I build a workbench, I feel soreness in my joints and sorry for my family. If something isn't right on a project, I'll tear it out and start again. A bench has to be perfect – like a highboy, but in a different way.

RULE NO. 4: After you sketch out your workbench design but before you cut the wood, do yourself a favor. Compare your design with other historical designs of benches. If your bench appears to be a new design or looks unlike anything built before, chances are your design is flawed. I hate to be the one to stomp on innovation, but we're not talking about the latest fashions from Milan. We're talking about a table designed to grip bits of wood.

RULE NO. 5: Your bench design cannot be too heavy or too long. But its top can easily be too wide or too tall.

RULE NO. 6: All benches should be able to grip the wood so you can easily work on the faces, the ends and the edges. Submit your bench to what I call the Kitchen Door Test. Imagine a typical kitchen door that is $\frac{3}{4}$ " thick, 15" wide and 23" long. How would you affix that door flat on your bench to level its joints and then sand (or plane) it flat? How would you clamp the door so you could work on the ends to trim the top rail and tops of the stiles so the door will fit its opening? And how will you secure that door on edge so you can rout its hinge gains and plane off the saw blade marks without the door flopping around? Does your bench pass this test? OK, now ask the same questions with a door that is $\frac{3}{4}$ " x 15" x 38".

RULE NO. 7: Showcase benches made from exotic materials with a fancy finish are nice. No argument there. But focus on the functions before you work on the flash. I'd rather have a construction-lumber bench that followed these rules than a beautiful European beech Ulmia bench that skipped even one of these basic concepts.

RULE NO. 8: When finishing a workbench, less is more. A shiny film finish lets your work scoot over the bench. And a film finish will crack when struck by a hammer or dead-blow mallet. Choose a finish that is easy to apply, offers some protection from stains and doesn't build up a thick film. I like an oil/varnish blend (sold as Danish Oil) or straight boiled linseed oil.

RULE NO. 9: Avoid bolting your bench to the floor or the wall. You should be able to move your bench, but not too easily. Some operations require you to pull your bench away from the wall. However, a bench on a mobile base can be a problem. If the bench rests on the casters (even if the casters lock) it will move too easily.

RULE NO. 10: Your bench is a three-dimensional clamping surface. Anything that interferes with clamping work to your benchtop (aprons, a drawer bank, doors, supports etc.) will frustrate you in short order.

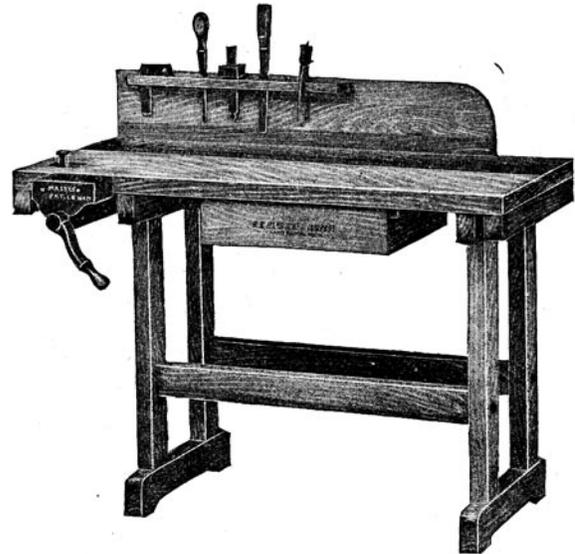
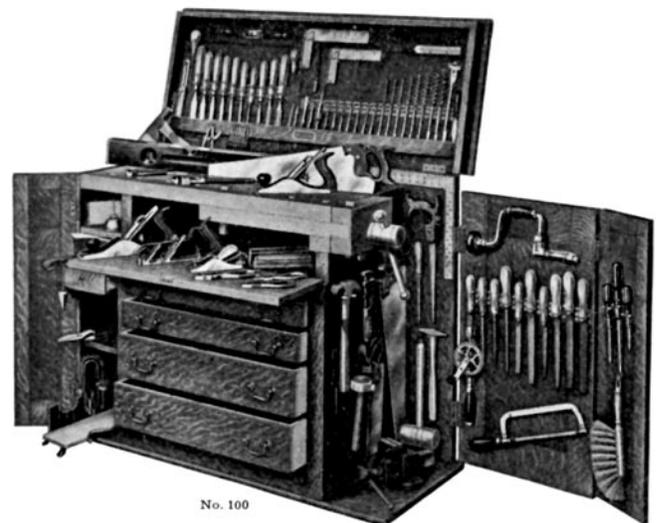


Fig. 2940

STILL SPINDLY: Modern manufacturers don't have the market cornered on workbenches that are small and puny. Check out this vintage example from a William P. Walters tool catalog. This bench would frustrate anyone who wanted to make anything other than small boxes.



No. 100

THE GNOME BRAND: This "bench" was one of Hammacher Schlemmer & Co.'s "Gnome Brand" benches. Why Gnome Brand? My guess is that the benches were too small for the average-sized woodworker.



THE \$175 WORKBENCH: This bench is an excellent first bench because you can modify the heck out of it without worrying too much about how much the raw materials cost. It's like customizing an old Volkswagen Beetle, I suppose. Chop it. Drop it. Paint flames on it if you like.

against a planing stop or you can pinch the work between dogs using a tail vise, wagon vise, wedges or the Veritas Wonder Dog system. Pick one. They all work.

With these lists complete, I decided to use them as a way to either design a new bench or to find a commercial one that satisfied all of the workholding needs on my list.

I started looking at many of the inexpensive commercial workbenches at woodworking supply stores. I couldn't find a single one that did all the basic tasks for handwork. Plus, they lacked mass and would wobble. So I looked at some of the expensive commercial workbenches. These were better in many cases (especially when it came to mass), but I still couldn't find one that held my work so I could work on edges, faces and ends of boards.

By chance, I stumbled on a drawing of an 18th century French workbench and it was – no lie – like a religious conversion. It looked like nothing I'd ever seen before in stores or in workshops. I built that bench and began working with it. It was everything I'd hoped it would be, and it was simpler to construct than any other bench I'd encountered. Encouraged by my success, I started digging into other old books and found other forgotten forms of benches. I built those (they also were simple to make) and started making furniture on them. After three benches, I had to ask myself: Why are so many modern benches inadequate for basic handwork?



STARTING SPINDLY: When you look at old catalogs of workbenches, they would list a line for pros and a line for "Manual Training." The manual training benches, such as the one above, were almost always lacking. A bench like this isn't a tool for your shop. It's a challenge to overcome.

I don't have a iron-clad answer. But I have clues. My old-style workbenches were the dominant forms in the 18th and 19th centuries, before the Industrial Revolution. Before steam power. Before Manual Training (what we call "shop class") was brought into schools.

These old benches were generally built by the woodworker. Some early books discuss the fact that there were commercial benches available (some with cast iron bases), but the forms offered in the books were for the craftsman to construct.

The Industrial Revolution changed how we made furniture, tools and even an educated citizenry. Furniture, tools and almost everything else became a factory item instead of bespoke. As we moved into the machine age, some thoughtful individuals became worried that people would lose touch with handwork as the nation industrialized, and so the Manual Training movement was born in our schools. This new generation of woodworkers needed workbenches, and factories could make them quickly. As the 19th century closed, workbenches begin to appear in great numbers in tool catalogs, many of them labeled as ideal for Manual Training.

And these Manual Training benches are pretty sorry. Many are spindly and lack key features. But they can be broken down and shipped flat by rail, unlike the traditional old benches, which are unsuited for factory production.

Why didn't the marketplace reject the spindly benches? My guess is that these benches were sold to schools and students who didn't know the difference between a good bench and a bad one. It's a problem still today. (These factory benches are usually called "European Benches," but that is generally an insult to the old form – usually a German form – that they are based on.) Eventually these factory benches became the dominant form and they still are today.

And that's too bad. The older shop-made benches are simpler to make and do all basic woodworking tasks with ease. But they are, for the most part, forgotten relics in dusty books.

This book is an attempt to walk you through the bench-design



DON'T FORGET THE EDGES: Your workbench is a three-dimensional clamping surface, so don't give up the ability to clamp items vertically against your legs, aprons (shown above) or a sliding deadman.

process and help you design a bench that works for you, and that fulfills the minimum USRDA of workholding. I think you'll find that if you follow this advice, you'll build a bench that resembles a classic historical model, even if you are a router and biscuit-joinery woodworker. I came to this same conclusion, and it is a testament to the fact that woodworking processes haven't changed much, just the tools and the technology that produces the tools. The work is the same: We all cut, shape, smooth and assemble wooden parts.

Beware the New – Fight Progress

I hope this book also will prevent you from venturing down unnecessary paths. If you can see in your mind's eye a workbench device that no one has ever invented before and that you think you need, then I caution you. Chances are that someone has come up with a way to do what you want to do, and they used simple technology to do it. Or your particular need is so specialized and narrow that few people would ever need to do that to a piece of wood. So take a moment to look around at what already exists before you build a triple-screw vise with pneumatic suction panels. Or a bench that is attached to a barber's chair (yes, that one exists). Or a bench that is 42" high with vises on all four corners.

Whenever I build a bench, it's inevitable that someone on our magazine's staff will ask me if this is the last bench I'll ever build. They ask if I have found perfection. I don't think there's an answer. Since I started woodworking at age 8, my needs as a woodworker have changed. And they will continue to change.

But the benches I have now – the two benches I show you how to build in this book – fulfill all the basic needs of a furniture maker. I have yet to stumble into any serious limitations of either design. Would I change things if I built them again? Sure. Would that change the way they functioned? No, not really.

So these benches are a good place to begin. And that's what this book is for: To give you a head start in the craft by building a bench that is capable of doing things you might not be ready to do yet. And when you are ready, your bench will be willing and waiting.

The Most Common Workbench Questions (And the Answers)

When woodworkers approach the question of building a bench, they usually have a series of questions that generate quite a bit of debate among veteran craftsmen. Here are some of the most common questions, and the answers (from my experience).

1. SHOULD I BUILD OR BUY MY WORKBENCH? This gets to the heart of many questions in woodworking (buying used tools v. new tools, buying rough lumber v. surfaced stock). Whenever I face a question such as this, I answer: "What do you like to do? Work wood or fix up old tools? Spend a week at the planer or cut joints? Let your answer be your guide." But with workbenches, my semi-Socratic method falls apart. I think you should build your workbench, even if you aren't looking for a career in workbench building. Building a workbench teaches you a lot about woodworking, including: traditional joinery, integrating hardware into a design, balancing form and function and making assemblies that are demonstrably flat and square. And you get to learn all this on a piece of furniture that doesn't have to go in the living room and embarrass you if you stumble.

2. WHAT STYLE OF WORKBENCH SHOULD I USE? Workbench purists will push you toward building a copy of a tested or classic design. I know craftsmen who have built benches that are dopelgangers of benches built in the 19th century. I say that you should use your good judgment instead. While you shouldn't re-invent the wheel when you build a workbench, you shouldn't be afraid to combine elements of different benches, as long as the result meets the minimum requirements for size, mass and workholding. Then I think you'll have a fine workbench. Most workbenches (even the holy relic ones) are hybrid designs with features from other cultures. (The earliest workbench that I know of is an Egyptian rock. That one has mass in spades, but the workholding is lacking.)

3. CAN I MAKE MY BENCH MOBILE OR HEIGHT-ADJUSTABLE? Unless your bench is bolted down, it is already mobile. Every mobile base I've seen for benches has wheels that are too small, a mechanism that is too complex, a design that makes the bench unstable or a price tag that has too many zeros. I move my bench all the time and it weighs 350 pounds. Push. Shove. Done. Height-adjustable benches are for hospitals. If you need to get closer to your work to see details, buy a stool and sit down. Build your bench so it's comfortable for common operations then adjust yourself up or down for the uncommon ones. Few people need a height-adjustable bench unless they also do dentistry or barbering there, too.

4. HOW HIGH SHOULD MY BENCH BE AND WHAT WOOD SHOULD I USE TO MAKE IT? OK, now you're getting ahead of the class. Turn the page and we'll dissect those two questions like frogs in a high-school biology class.