



18th and 19th century English joiner's tool kit from The Wealden Museum, West Sussex

PHOTOGRAPHS BY MICHAEL T COLLINS

BEGINNERS' GUIDE:

Using hand tools and traditional methods to make a draw-bored mortise and tenon joint

Michael T Collins looks at how a selection of basic hand tools can be used to make a variety of traditional joints

We have one drawer in our kitchen that contains our shared tools – the tools we reach for when something needs doing and I don't want to trek to the workshop to get my tools. It's a set of tools that has taken years to refine, based totally on our needs. You could call them 'necessary tools'. English joiners through the years have used a small selection of tools and were able to produce a wide variety of beautiful furniture.

When starting out acquiring tools, it's easy to be confused with the plethora available, some so specialised that you may only use them once or twice. It's important to not fall for the more is better philosophy – if I have this tool or that tool, then I'd be a better craftsman.



Michael T Collins

Michael has been working with wood off and on for 40 years. Having run out of projects in the UK, he moved to a small village in the heart of the Finger Lakes in Upstate New York with his family in 1996. Over the years, he has made bespoke furniture, including clocks, inlay work, Adams fireplaces, book cases, reproduction furniture, woodcarvings, restorations, bowls, tables and some major construction projects. As a mathematician by training, he is constantly looking to solve puzzles and woodworking for him is a continual process of solving puzzles – or maybe that's just the way he works...

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THE TRADITIONAL JOINER'S TOOL KIT

When starting out in hand tool joinery, you do not need to go out and buy all the tools you are ever likely to use in your woodworking career – you only need a subset of the traditional joiner's tool kit.

The saying 'you get what you pay for' is so true when purchasing woodworking tools. Unless you have a lot of money to fork out, reasonably priced, good quality tools are hard to come by and forget chain DIY stores for quality hand tools. Very few of my hand tools were purchased new and, for the most part, were obtained by scouring flea markets, car boot sales and online auctions. These offer the best hope of finding good quality, older tools at reasonable prices.

I received my first tool kit when I was about seven-years-old, a wooden box

filled with every tool that someone else assumed an aspiring joiner needed. A key tool missing was a mentor. At that young age, it was my father and I learned mostly by observation. After that it was my secondary school woodworking teacher, who instilled in me a passion for working with wood and the respect and care of tools and I have been making sawdust and wood chips ever since. As I tell woodworkers starting out: "The only difference between where you are and where I am is time and equipment ruined."

So what's in the tool kit?

- Dovetail and tenon saw
- Jack and block plane
- Chisels: 10mm mortise chisel and a 20mm bevel edge
- Brace and 6, 10 and 20mm twist bits

Basic joiner's tools



- Mortise gauge
- Marking knife
- Try Square or combination square
- Wooden 150mm mallet with flat head
- Bradawl
- Homemade bench hook

LET'S MAKE A JOINT

When woodworking, there's a natural progression at play, but only if derived from an understanding based on personal experience. If you have a plane and develop a connection between eye, brain, muscle, hand, tool and wood, you will gain an understanding of how the tool responds in the hand and also its limits. The more you use the tool, the sooner you will know when it's time to acquire the next tool to accomplish a given task.

By this experiential process, your knowledge and skills will develop and your tool kit will need to grow along with your experience.

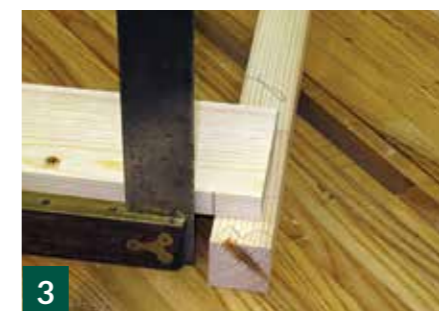
Now that we have our tools assembled, let's look at producing one of the fundamental joints that has been used for thousands of years: the draw-bored mortise and tenon. This classic joint can be found everywhere, in chair, table and door construction.

1 After planing your leg stock to size, mark the face side and face edge with cabinetmaker's marks and gang the parts together. Lay out the mortise location using the width of the rail, a try square and pencil.

2 It's a good idea to leave extra wood 'horns' at the end of the legs; this prevents blowout when chopping the mortise. Set the legs aside for now.

Tenons

3 Mark the tenon depth based on the mortise depth you want – my rule



of thumb is three-quarters the width of the mortise stock, but there are no hard and fast rules.

4 Gang the rails and scribe the shoulder line on the face side, then with the try square, using only face side and edge side to mark a knife line on all faces.

5 Set the mortise gauge using the width of the chisel. I make my tenons half the width of the stock, so 20mm stock will have a 10mm mortise – I find this is a good size for most mortises but I have been known to over-engineer things. ➤





6 Adjust the mortise gauge so that the mortise is in the centre of the rail. Scribe the tenon, using the face side, by dragging the gauge away from you across the wood.

Cutting the tenons

7 Cut a 'V' groove on the waste side and then pare out a notch using a chisel; this will give you a place for the saw to cut and produce a very clean shoulder. Using a bench hook and a tenon saw, saw down to the tenon marks. If your tenon is going to have four shoulders, then repeat on all sides.

8 Place the rail in the vice at 45° and mark a small 'V' notch on the waste sides of the tenon lines. Using a dovetail saw, rip down on the waste side to the ends of the scribe marks you can see. You can only cut what you can see – do not try and cut down to the shoulder in one go. Rotate the wood in the vice and again saw at 45° using the saw kerf as a guide – you will have left a triangle of uncut wood at the bottom of the kerf. Place the wood vertically in the vice and then cut down to the shoulder and the waste should fall away. If need be, you can clean up with a chisel by paring towards the tenon. If you have two intersecting tenons, bevel the ends



and leave a small gap for any seasonal movement in the leg.

Chopping out the mortise

9 From the face side, mark the mortise, using the same mortise gauge setting you use to mark the tenon. If you want a reveal, then simply move the mortise gauge's fence away from the pins by the depth of the reveal. To chop the mortise, place the wood over the leg of your bench so that the forces are concentrated in the chop rather than absorbed by the bench.

10 Chopping a mortise is a simple matter of placing the chisel with the bevel facing the mortise and about 1.5mm from the end; this will protect the wood from being damaged while removing the waste. Now 'walk' the chisel towards the far end of the



mortise with each successive chop and you'll find the chisel will go deeper into the mortise.

11 Continue to within 1.5mm of the end, then about face and repeat the process back to the start, clearing out the chopped wood as you go.

12 You should only remove wood that has been cut – don't try and lever out unchopped wood as you are likely to split the wood and even bend the chisel. Lastly, true up the ends of the mortise by chopping vertically down the end mark. If two mortises are going to intersect, only chop the mortise down to the level of the intersecting mortise. This way, you will have support – in the bottom – when chopping the second mortise. You can draw a line or add a bit of tape on the chisel as a depth gauge.



DRAW-BORING



1 Draw-boring is a technique that has been used for thousands of years. Pegs are driven through the mortise and tenon to secure the joint and there is no need to use glue or cramps when assembling. Some of these joints have lasted many centuries and are as secure now as they were then.

2 Position your holes so that they do not intersect with those securing the other tenon in the leg and not too close to the edges. Bore through the tenon from the side with a 6mm bit – choose a size that's proportional to the joint. Offset the pins if you think the wood is liable to splitting.

3 Hold the joint together firmly and using a bradawl, mark the tenon through the holes.

4 Take the joint apart and offset a point 1.5mm towards the shoulder – in hardwoods you can use 3mm and bore through the tenon.

5 Reassemble the joint, making sure to give each a unique label – remember, these are custom made. Traditionally, a draw-bore pin was used to smooth the path in the holes.

6 Make your pegs by splitting straight-grained dry stock from the same wood or harder than the wood of the joint. If making green wood furniture, the joint will get tighter as the wood



dries. If much harder, the peg will deform the hole and you will be able to fit a square peg into a round hole. Pegs should be tapered to navigate the offset in the hole.

7 Hammer the pegs home using just enough force to seat the peg, but not so much as to split the joint.



Lastly, cut the pegs and plane flush. The finished joint should look something like this

9 In some period pieces of furniture, the pegs were left showing on the exit side of the hole. OK, now I just need to make six more joints and a tabletop! ■