

## **MAKING A WORKBENCH -**

### **The basis for the talk to Guild Members at the March meeting in 2009 by Fred Buckley**

I thought it might be useful to share with members of the Guild my experience in making a new workbench in October and November 2008. This new bench is the second I have made, but the first in which I really had both a proper understanding of what I wanted and the skills and equipment (including a bench) to build it.

I made my first bench about ten years ago. It has served me well but I was aware from the beginning that it could be improved both in its design and the standard of making. It has been a project on my “to do” list for quite some time; and when in September 2008 I realised I had to use a gift voucher from Thors Hammer which was nearing its twelve month expiry date, I decided to go ahead and make a new bench.

This paper sets out how I went about it and provides, I hope, some answers to the inevitable questions about materials, design, costs, construction and all the associated issues about the significance of those decisions.



*The completed workbench November 2008 Recycled Australian Hardwoods*

### **Design Factors**

The first question some may ask is that, if I already had a workbench, which served its function, why go to the trouble and expense of making a new one? My answer would be that while my old bench was adequate, it had some shortcomings. It was not sturdy and rocked when planing; the positioning of the vice away from the end made it uncomfortable to use in some situations; the vice was slightly askew; and the front apron limited the clamping options. These added up to a general feeling of dissatisfaction and the realization that I needed something better. Since the workbench is the most significant tool in the workshop it makes sense to design and make one that meets all your expectations.

In the view of Scott Landis a workbench is "...the foundation tool of the woodworking trade upon which all handwork is performed and without which we would have difficulty completing a single project." He adds that "although the bench takes different forms it is perhaps the only tool that is common to every branch of the craft..."<sup>1</sup> Given that it plays a central part in our craft it is inevitable that we spend more time at the workbench and working on it in various ways than we do using any other tool.

The height of the bench is also an important consideration. When making my previous bench I specifically made it at a height at which I felt comfortable. I have made the new bench at exactly the same height (984mm) and have never experienced any discomfort from backache or fatigue despite spending long hours at the bench. Some tasks were awkward and uncomfortable but this arose from the positioning of the vice rather than the height.

It was with these considerations in mind that I decided that a new workbench would be well worth the time and effort, as well as the expense involved, and so my first task was to set about deciding on a design which would overcome the problems of the first bench and provide a more comfortable and enjoyable tool to use.

## **The Design**

There are many different styles of workbench. These range from the simple to the more sophisticated cabinetmaker's benches which accommodate different needs. This can make the decision on the kind of workbench best suited to your particular needs a difficult one. It seems to me that in part the choice is often based on tradition and experience. The fundamental requirement of a benchtop, supported by four legs and a vice and or other attachments for clamping and holding work have, in Western tradition at least, remained unchanged for many hundreds of years.

From the basic design countless variations have been developed to fulfill specialist requirements. So, for example, we have the cabinetmaker's workbench which supports a shoulder vice and end vice, a tool well, and various other holding and clamping devices such as board jacks and bench dogs. Without question these features increase the utility of the bench, and from the cabinetmaker's perspective, represent the ideal solution to the wide ranging requirements of cabinetmaking.

Frank Klausz, who is now living in America but was born and trained as a cabinetmaker in Hungary in the 1950's explains his choice of a traditional cabinetmaker's bench in unequivocal terms. "If you're a cabinetmaker, if you do casegoods, frames, if you plane, saw or sand wood, if you do dovetails... I can't see anything quicker or better."<sup>2</sup>

Having seen video footage of Frank Kluasz cutting dovetails on his cabinetmaker's workbench I toyed with the idea of building my own corner vice as this represents the

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<sup>1</sup> Scott Landis *The Workbench Book – A Craftsman's Guide to Workbenches For Every Type Of Woodworking*, The Taunton Press Inc. 1988, Introduction, p.1.

<sup>2</sup> *ibid.*, p.51

ideal holding device when cutting dovetails. This largely stems from the fact that the corner vice allows for boards to be held directly behind the vice screw, there being no guide rods to interfere with the work.<sup>3</sup> However, in the end I decided against it given the complexity and additional effort involved.

His view on the most suitable bench does, however, illustrate how strong a role tradition plays in our choices. My decision to retain my original Record No53 vice, which I have used for some ten years and which is similar to the bench vises I used at school in the early sixties, is perhaps also at least partly informed by a different but no less familiar tradition.



*Frank Klausz at his cabinetmaker's work bench, corner vice bottom right.*

For the same reason I was also reluctant to equip the new bench with bench dog holes for using clamping dogs and holdalls. Justin McCarthy, who solved his benchmaking problems by purchasing a Sjobergs bench, has amply demonstrated the practicality and ease of using these holding devices. While I toyed with the idea, I could not bring myself to drill the holes in the bench top. This was probably due in part to tradition and to aesthetics. I have been accustomed to working on a flat work bench top without holes. That is the way I like it, and so I will continue to use other strategies for clamping and holding work to the benchtop.

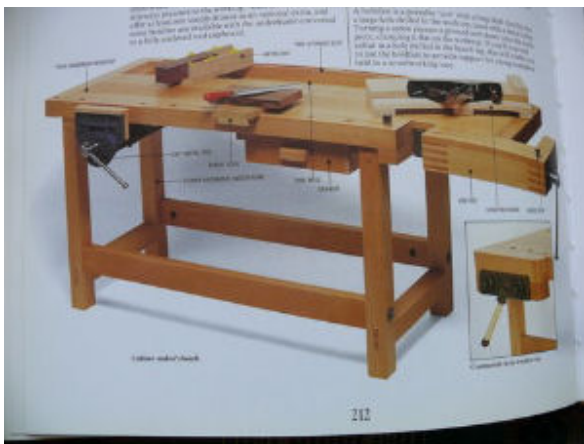


*A couple of views of Justin McCarthy's workbench. Solid (indestructible probably) and eminently practical. Note the bench dogs, holdall and the ample storage space.*

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<sup>3</sup> The Guild Library has a copy of Klausz's video on making drawers in which he can be seen cutting dovetails at his bench in his New Jersey workshop.

In America workbench design took a slightly different path with the development of the Shaker workbenches. These appear to have their roots in the European tradition and retain many of the same features as the cabinetmaker's work bench. The use of bench dogs and holdalls continues as does the use of tail vices and end vices but distinct differences have emerged in the appearance of things such as sliding board jacks and built in storage space. The provision of storage space made redundant the need for a tool well on the bench top thus allowing more working space. These I think are a possible reflection of the Shaker tradition of simplicity and practicality in design, for which they are rightly famed. The provision of storage space appeals to me as it would to most who, like me, have limited space available in a workshop that also serves as a garage. To this end I plan to add drawers underneath the bench at a later date.



*An example of a Cabinetmaker's Workbench. Note the corner vice, bench dogs and tool well.*

## Space

I want to say something also about space; first in relation to the room available and second in relation to surroundings or the environment.

First, one of the considerations I took into account in making a new bench was to make it narrower. This was necessary to accommodate the need to find room for a newer and slightly longer motor vehicle that shares my workshop space, particularly in the winter months. I also wanted a narrower bench to make it easier to reach across to get hold of tools stored on the other side of the bench. Accordingly, in the interests of necessity and comfort I have reduced the width from over 900mm to 764mm and have found this to be much more convenient and practical, not to mention somewhat cheaper to make.

Second, in an article for the Australian Wood Review Magazine in March 2008, Robert Howard wrote about the "art of nesting". This was essentially a piece about the importance of creating the ideal woodworking space. The article is, like many of Howard's, full of interesting insights into what makes us woodworkers tick. He spoke about organising our own space in a way which would motivate us to spend time in our workshops. He wrote "...woodworkers the world over are fascinated by other people's workshops. If we can, we love to visit them. Or we love looking at photos of them. We

love the smell of them and we love nosing about in them checking out the tools, machines, gadgets and jigs.”<sup>4</sup> What he was talking about was creating an ideal working space, which, however large or small, is your space and which allows you to do your woodwork in a space you “own”. Part of that ownership involves feelings and it is important within your space to feel good. Having a well made, practical bench, which is the central part of any workshop and at which you can work in comfort and enjoy the experience, is part of creating a workspace in which you can feel good and in which you are more likely to produce good work. This is another reason why I believed the time and cost involved in making a new bench was worthwhile.

### **Positioning the Vise**

Another of the changes I made was the positioning of the vice. I made deliberate decision to position the vice at the left hand end of the top (it having been previously positioned on the inside of the left hand leg about 400 mm in from the end of the bench). The reason for this was that, when paring pieces held in the vice, I had to twist to get my body into the correct position, and over a period of time this proved uncomfortable. The solution was to move it to the end where I can stand directly behind the work without having to twist. The second consideration was that this position also allows for cross cutting pieces without the risk of cutting into the benchtop!

### **The end Result**

I considered each of the above factors in deciding on the design of my work bench. Each was important as was the need to look at the alternatives. In the basic design, however, I must confess that this had been settled some time earlier as a result of my experience and observations of the style of workbenches used at the ANU School of Art Woodwork Shop. The students at the school who are enrolled in the two year Diploma course make a work bench as one of the projects undertaken in their second year. Some time ago I was kindly given a set a plans for one of those workbenches and it is this basic design that I used. I made some minor modifications to the length, height and width, and slightly altered some of the dimensions, but for the most part the bench is very basic and consists of a separate laminated top which sits on an underframe with trestles at each end and two rails with a vice fitted at the left front.

One of the features of the design which appealed to me was the ability to dismantle the bench for ease of transport should the need arise. The top is located by two 30mm diameter dowel pins and can be simply lifted off. The underframe is tenoned into the ends of the trestles. It is not glued together and is held in place by eight 7/8 inch by half inch whitworth bolts, as are the long stretcher rails, all of which have holes drilled in them to accommodate the nuts for the bolts which pass through the trestle ends into the ends of the rails. It is a simple matter, therefore, to dismantle the bench and reassemble it.

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<sup>4</sup> Robert Howard, *The Fine Art of Nesting*, Australian Wood Review No. 58 March 2008, p.84

In the end what I decided on was not that much of a departure from my first bench. It is a simple bench with a standard design compared to some, but the important thing is that, with the minor changes I have incorporated, it meets all my needs as a maker.

### **Materials / Costs**

I had a voucher to the value of \$400 from the Guild from Thors Hammer in Yarralumla and decided that I would make my bench from recycled Australian hardwood timbers. Thors Hammer takes considerable care to ensure that all its timber is thoroughly checked with metal detectors for any nails, screws, metal spikes or other hidden surprises which might make an awful mess of your jointer/ thicknesser. The material was mostly Victorian or Tasmanian ash recovered from old flooring timbers. The total cost for the timber was \$512.

The eight machine bolts for holding the frame in place came in at \$110. Fortunately, I used the existing four bolts for fixing the vice to the bench top and I already had a Record No53 vise from my old bench. If you had to start from scratch and using recycled timber you could build a new bench like mine for just under a \$1000. Some additional cost would be involved if you did not have the facilities for machining your own timber. When everything is taken into account it is clearly less expensive to build your own workbench than to purchase a ready made one.

The cost would be higher if you were to purchase freshly milled timber. If cost is a factor you could consider the use of other timbers besides hardwood, or use a combination of hardwood, softwood and/or man made boards. On the other hand, if cost is not an issue you could consider some of the more exotic Australian or overseas hardwoods. Some years ago I gave some thought to making my first bench in European Beech, one of the traditional timbers for benches in the UK and Europe. The cost was reasonable but common sense eventually prevailed as at that time I realised I did not possess the skills to do the job properly.

There seems to be an expectation that benches will, however, be made from hardwood. In one of my woodworking books there is a statement that "...a good bench will have a hardwood worktop that is at least 50mm thick. Tough short-grain beech is the most common material for worktop construction, although birch, maple and African hardwoods are also used."<sup>5</sup>

### **Machining**

I machined all of the timber for the workbench on my Felder 410 combination machine but I must say that I approached the task with a great deal of trepidation. I have seen freshly milled timber damage cutters as a result of iron embedded in the timber during growth. For this reason I examined each piece carefully before going anywhere near the machine. I wire brushed every piece. Apart from affording the opportunity to closely inspect the timber for hazards like nails and other defects, wire brushing removes all the

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<sup>5</sup> Albert Jackson & David Day *Complete Woodworker's Manual*, Harper Collins, London, 1996.

grit and surface dirt, paint remnants and the like and thus helps to prolong the life of cutter knives.



*One of the machinist's nightmares!*

This caution paid off. I discovered nails, some where the tops had either broken or rusted off. Some appeared only after the first pass over the jointer/thicknesser! It was with some relief that I completed the machining without mishap. There is clearly a risk involved in using recycled timber and, while this time I was fortunate, next time I would think carefully about machining large quantities of recycled timbers. If your nerves are not up to it would be better to pay someone else to do it for you or to avoid recycled timber altogether.

### **Construction**

The design of this workbench is simple and straightforward. The legs have twin tenons which are mortised into the top and bottom rails of the trestle ends while the the sub-frame and the large stretcher rails have double tenons which fit into mortises in the legs and the top of the trestle frame.



*Mortice and Tenon Joints on the frame and legs*

The dimension for the legs are nominally 85 x80mm and this required laminating two pieces together; in fact all the frame members and the top are laminated with the exception of the stretcher rails.

After machining all the components I finished all the surfaces to be joined with a hand plane, taking care to ensure the surfaces remained flat and square to the sides. I glued all the members together using a two part Techniglu epoxy resin. Once the glue had dried I completed the final dimensioning with a hand plane, again ensuring that all the members were square. I then used the table saw to dock each component to the correct length and proceeded to cut all the mortise and tenon joints.



*A view of the clamping for gluing of one of the frame ends. Note the holes for the connecting bolts have been drilled prior to assembly.*



*The mortices in one of the trestle sled feet.*

To cut the mortices I used a 12.5mm right hand down spiral HSS router cutter. This bit is long enough to cut the full depth of the mortices which were set at 60mm. However, the bit protrudes beyond the base plate of the router so some care is needed when starting the cut. This requires the router to be started before the bit is lowered into the work and for the fence to be in position against the edge of the piece to be cut. Once the router has been started it can then be safely lowered into the work. After the first cut is made it is simply a matter of proceeding in small increments to cut the mortise to the full depth.

Cutting the mortises in this way requires extreme caution first, in commencing the cuts and second, in proceeding to make succeeding cuts in small increments. This makes it easier to control the router in the event that the bit catches in the work at the end of the



cut. The spiral bit does lessen the tendency for this to happen but towards the bottom of the mortice, when the bit is inserted to the full depth of the cut, I experienced one or two occasions in which the bit caught with a momentary loss of control. An alternative method, and one with which you may feel more comfortable, is to drill the majority of the waste from the mortice on the drill press and to finish the mortice with a chisel. It's a bit slower but there will not be any heart stopping moments.



*The underframe for the top*

Although I had to cut a total of 36 tenons, for some reason I cut the first with a handsaw! I soon realised that a different method was required and the rest of the tenons were cut on the bandsaw. The bandsaw is an ideal tool for cutting tenons quickly and accurately. I set the joint out so that I needed only to set the fence once for each joint and with the sides spaced evenly, simply turning the piece over to cut the first side of the second tenon and so on. I removed the waste in the centre with two diagonal cuts. I used a handsaw to remove the cheeks about 0.5 to 1mm from the knife line and cleaned up all the shoulders with a chisel.

It is important to ensure all the tenon pieces are accurately dimensioned. They all need to be exactly the same size if you wish to avoid adjusting the bandsaw fence for each piece when cutting the tenons. The care taken in preparation paid off in terms of the time saved and in the accuracy of the finished joints. The extra time spent in paring the waste to the knife line with a chisel also paid off as each of the shoulders was dead square with a clean arrise. The process could be done more quickly on the table saw by cutting on the knife line but this still leaves the central waste to be cleared out with a chisel. The opportunity to practise this seemed too good an opportunity to miss so I opted to use the chisel and do it all by hand.

The glue up of the underframe is straight forward although you need to make sure that you drill the bolt holes and the 30mm diameter recesses for the head of the bolts and the nuts before gluing up the frame. If you leave it until after the glue up you may not be able to use the drill press for this purpose.

Gluing up the top was a little more complicated. I hand planed the edges of each board to get a perfect match for each joint and then proceeded to glue up in sections. I began with two boards and then the next two and then proceed to join those together until I had the two separate halves completed. The final glue up involved bringing the two halves together. Here the challenge was to ensure that the surfaces remained perfectly aligned and flat across the full width. You can do this by alternating the position of the clamps above and below the top in order to apply the pressure more evenly and by proceeding to check progress with a straight edge when tightening the clamps. I achieved this and while the top was in the clamps everything was as it should be.

The first sign of a problem emerged only after I removed the clamps. On checking for flatness across the full width of the top I was dismayed to find that one side dropped away significantly –about two to three millimetres towards the edge. This seemed puzzling giving the care I had taking when gluing up to ensure that the top was flat. On closer inspection I found that one of the boards had developed cracks. I had noticed these after machining but they had been on the underside and did not appear to be serious. However, after gluing, the added weight of the outside boards had caused the cracks to widen and they now extended through the board and for most of its length. The result was that it did not have the structural strength to support the top in its correct place. I had no choice other than to put the whole thing on the table saw and remove the offending board. Thors Hammer replaced it, and after a second glue up I got a top which was close to flat.



*The finished top and other frame members after planing and sanding.*

Inevitably some boards slipped slightly during the glue up so it was necessary to flatten both the top and underside of the bench with a hand plane. For this you need some resolve, plenty of time and energy and a sharp plane. I used both my Stanley No. 6 and 7, planing first diagonally across the top and then along the length. It took three and half hours or more for each side and if you are not fit when you start you probably will be by the time you finish. If you know anybody with a thickness sander wide enough to accommodate your benchtop it could save you a lot of time and effort.

I finished the top by sanding to 240 grit using my random orbital sander.

### **Setting the Record Straight**

One of the final tasks was to fit the vice to the benchtop. I have already spoken about the positioning of the vice and the reasons for this and the actual fitting is relatively straightforward. The biggest challenge is to accurately mark out and drill the bolt holes through the bench top for securing the vice. I managed to use my drill press for this, although it was more a case of taking the press to the top than the top to the press!

There are a number of options available for fixing a Record vice. On my first bench the vice was flush mounted behind a timber apron which served also as the rear vice cheek. To do this I needed to rout a recess in the edge of the bench top behind the apron to accommodate the rear metal jaw. It was only when I removed the vice, the first time I had done so, that I discovered that the recess I had routed all those years ago, was not quite wide enough. This explained why the vice had always (inexplicably) been just a little crooked!

With the new bench it was necessary to mount it flush with the edge of the benchtop. This also required routing a recess to accommodate the rear metal jaw. This time I was determined to get it right. Mounting was completed with the addition of a spacer underneath the bench through which the bolts pass and the addition of front and rear wooden cheeks which I subsequently lined with leather. Very clear instructions on how to fit Stanley vices are set out in the Workbench Book.<sup>6</sup>

*A diagram of the method I used to mount my vise. The only change I made was to use machine bolts which extended through the top of the bench*

To finish I sanded all the components to 240 grit and applied a coat or two of boiled linseed oil over a period of a couple of days to provide some protection.

### **The Proof of the Pudding**

I have now been using this new bench for three to four months. From the outset it was clearly an improvement over my first bench. It does not move about when planing and thus exhibits all the qualities of sturdiness that I had sought. It is comfortable to work at and in particular I can now stand at the end of the bench directly behind pieces mounted in the vice and do whatever it is without having to twist to get into the right position. It may be, as some critics have pointed out, “over engineered”, but in this respect the frame

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<sup>6</sup> Scott Landis op.cit., pp146-7

members seem no more robust than those of its European forebears or of the Shaker benches which were made to last.

Aesthetically I find it pleasing and it represents for me a place in my workshop where I am happy to be. The standard of work is clearly an improvement on that of my first bench and this is something from which I can also feel a sense of satisfaction. So for now I am delighted with the results and the only thing left is for the provision of drawers underneath the benchtop to store tools where they will be close at hand. But that's another story. Should you decide to build your own workbench I hope you get as much enjoyment from it as I did.

Fred Buckley March 2009

*Another view of the workshop with the Bench in use*