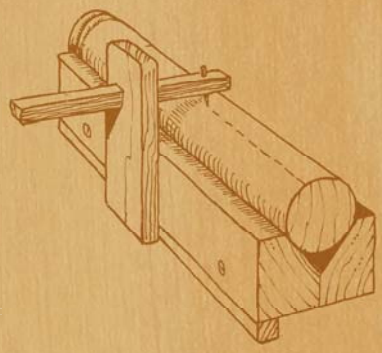
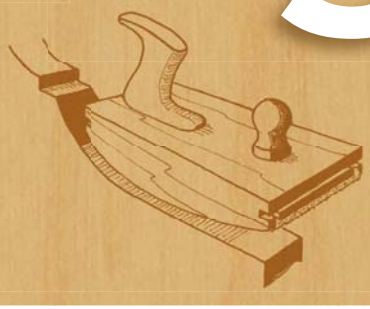
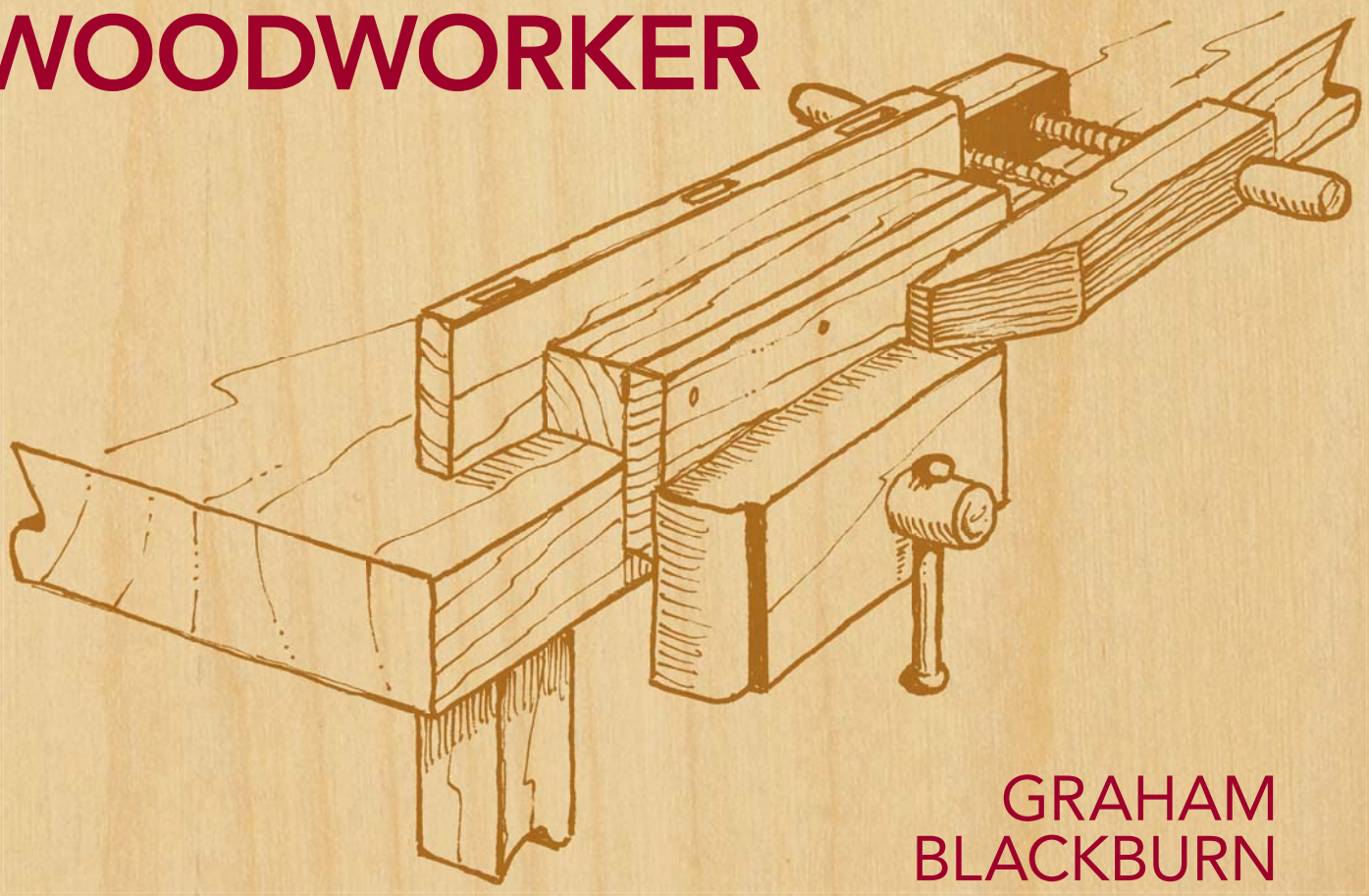
POPULAR WOODWORKING

Jigs & Fixtures





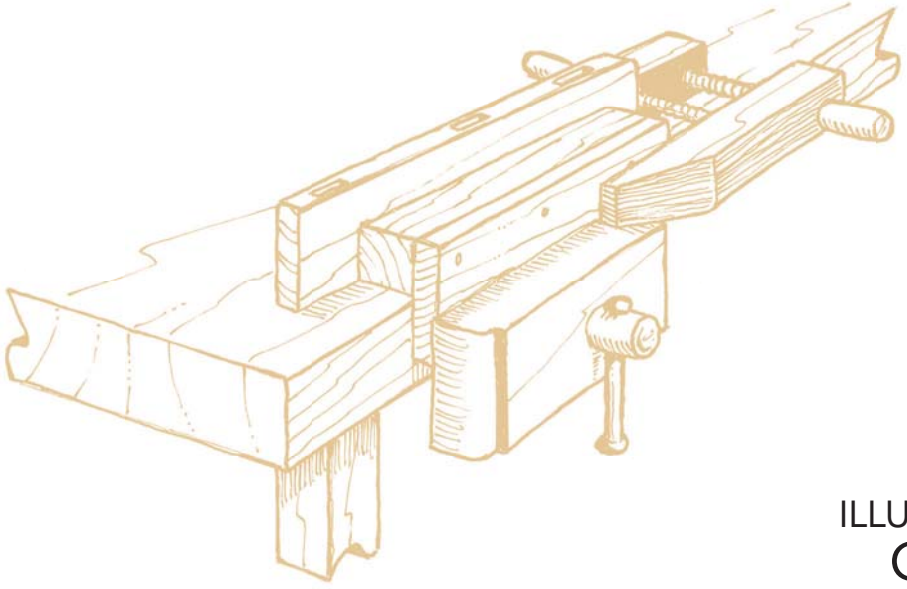
FOR THE HAND TOOL WOODWORKER



GRAHAM BLACKBURN

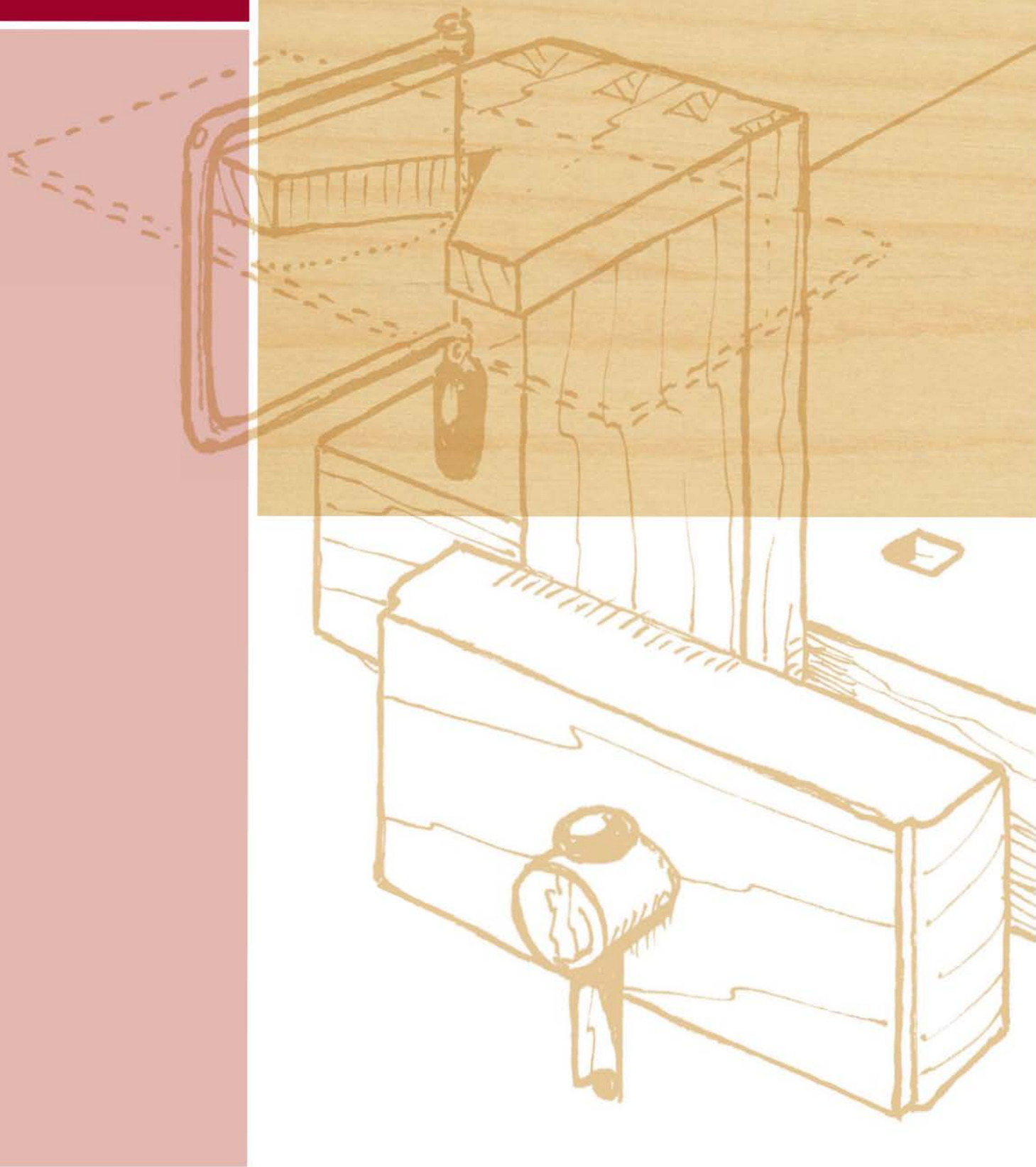
Jigs & Fixtures

FOR THE HAND TOOL WOODWORKER



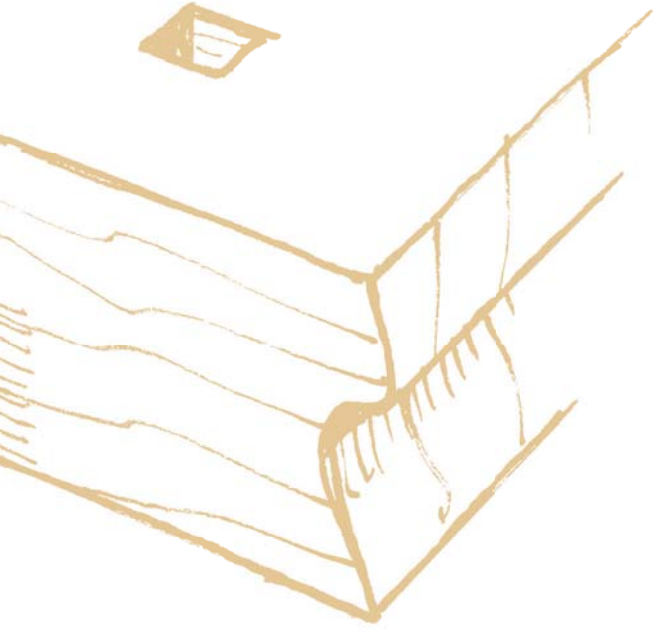
WRITTEN &
ILLUSTRATED BY
GRAHAM
BLACKBURN

POPULAR WOODWORKING BOOKS
CINCINNATI, OHIO
www.popularwoodworking.com



Jigs & Fixtures

FOR THE HAND TOOL WOODWORKER



WRITTEN &
ILLUSTRATED BY
GRAHAM
BLACKBURN

ALSO BY GRAHAM BLACKBURN

NON-FICTION

Illustrated Housebuilding

The Illustrated Encyclopedia of Woodworking

Handtools, Instruments, & Devices

Illustrated Basic Carpentry

The Postage Stamp Gazetteer

Illustrated Furniture Making

Illustrated Interior Carpentry

The Illustrated Encyclopedia of Ships, Boats,

Vessels, & other Water-borne Craft

The Illustrated Dictionary of Nautical Terms

The Parts of a House

An Illustrated Calendar of Home Repair

Quick & Easy Home Repair

Floors, Walls, & Ceilings

Creative Ideas for Household Storage

Year-round House Care

Furniture by Design

Traditional Woodworking Handtools

Traditional Woodworking Techniques

Furniture Design & Construction

FICTION

Icabod

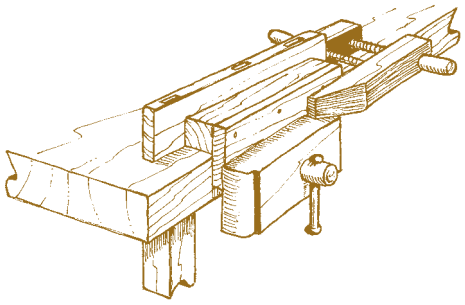
The Party

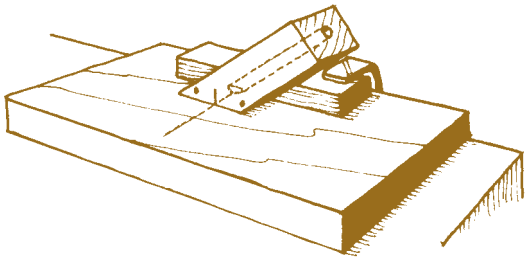
The Stanford Solution

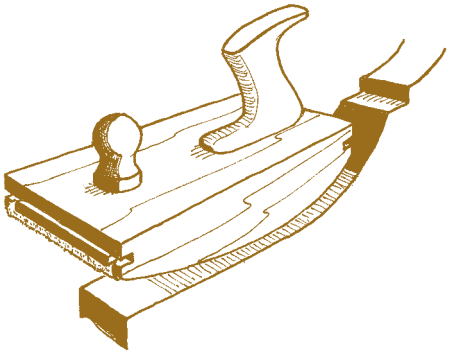
For Love or Money?

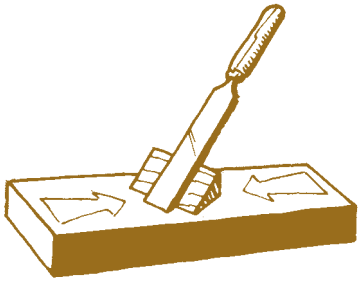
The Castilian Suite

CONTENTS









ACKNOWLEDGEMENTS

It would be impossible to list all those anonymous woodworkers who over the ages have contributed to this particular store of knowledge, but I would in particular like to thank Reginald Smith, my school shop teacher, George Harris, the cabinetmaker to whom I was unofficially apprenticed during my college years, and several colleagues I have had the privilege of working with in America, namely Paul Potash, Paul Schürch, and David Marks, whose contributions have been particularly helpful.

I also owe a debt of gratitude to my editor John Kelsey who has consistently clarified much that I have attempted to explain.

ILLUSTRATIONS

FOREWORD

One of the chief attractions of woodworking as a hobby has always been the satisfaction of producing something ourselves by hand. We are after all by definition tool-using creatures. Today's world, however, has become so complicated that there are fewer and fewer opportunities for indulging this urge. Few people can build their own computer, make a cell phone, or even fix their cars anymore. Woodworking is one of the rare opportunities remaining to us for creative self-expression.

But even woodworking, by taking advantage of modern technology, can become far removed from what it once was. For many people, woodworking now means acquiring expensive power tools and machines such as tablesaws, shapers, jointers, planers, routers, and a host of other items. The expense, increasing technical complications, not to mention the extra space needed — especially with a tablesaw in the middle of the shop — and the potential dangers of equipping a shop this way have turned hobby woodworking into something far removed from the hands-on approach of hammer, chisel, and saw.

Perhaps in response, today there is a renewed interest in more traditional methods. Many woodworkers are once again discovering the pleasure and advantages of using hand tools. These provide not only less expensive, safer, and greener methods of doing things, but also ways of working that can be quicker, better, and more versatile, offering more choices to the hobbyist than a shop full of machinery. Today's marketplace offers an increasing supply of quality hand tools alongside a mountain of secondhand tools. To pick up a plane and immediately produce a shaving is a very different and more personal experience than donning earplugs and safety glasses, turning on dust extractors, clearing the area of onlookers, and starting an expensive stationary machine.

Unfortunately, traditional woodworking is not quite as simple as merely picking up that plane, and your results might not be so immediate. The plane needs to be understood, and you must learn how to tune and sharpen it. This may not be particularly difficult, especially since there are now good books on the subject and an increasing number of opportunities to attend schools and workshops. But beginners often ignore the jigs and fixtures that traditional woodworkers use along with hand tools to improve speed, accuracy, and efficiency. A few of these things survive, and may even have been incorporated into the tool itself — in the form of fences and depth stops, for example. But the vast majority of these aids were user-made as the occasion demanded, and so do not appear in standard tool catalogs. The result is that beginners experience unnecessary frustration with traditional hand-tool woodworking, tempting them to return to power tools. Of course, practice and experience will improve your technique no matter how you work, with or without extra jigs and fixtures, but there is little point in attempting to do something unaided when the assistance of a simple device would go a long way toward achieving perfection.

There is no end to the number of jigs and devices that have been or may be invented to facilitate traditional woodworking. Furthermore, experience with just a few of them will invariably suggest others – workable modifications are limitless. *Jigs and Fixtures for the Hand Tool Woodworker* is my attempt to re-introduce many of these useful items. My selection primarily includes the traditional user-made devices, plus the ones I personally grew up with, together with a few more recent adaptations and even some manufactured items. Most of these user-made jigs are simple to construct and use. Taking some of them into your shop will make all the difference between frustration and success in woodworking.

INTRODUCTION

What is a jig or fixture and what is an actual tool? The lines are often blurred. A tool works directly upon and alters the workpiece — such as a saw, a plane, or a drill. A fixture holds the workpiece and a jig guides the tool, and sometimes these functions are combined in a single device. Though these are the terms in common use, to avoid confusion I prefer to call them all "woodworking aids."

What contemporary woodworkers often take for granted as a manufactured tool often started out as a user-made jig or accessory. Squares, bevels, and gauges all were typically made by the craftsman, not bought in a tool shop or from an online catalog. Indeed, few self-respecting craftsmen would waste money buying such items, for it used to be considered self-evident that a craftsman who could not make a simple trysquare would stand little chance of being able to construct a complicated piece of furniture. Nowadays, however, a trysquare not only is thought of as a tool but also is generally bought rather than made. Even simple items, such as dovetail marking guides, are sometimes sold as tools, and in expensive velvet-lined boxes to boot!

Now of course you should feel free to indulge the desire to treat yourself to a gorgeous item for your hobby, but surely the pleasure and rewards of traditional woodworking derive from doing it yourself rather than relying exclusively on store-bought or premanufactured items. Otherwise we might just as well sit back and let a preprogrammed computer numerical control (CNC) machine produce the ideas that pop into our heads. That's fine when the end product is the sole goal, but if it is the process that provides the pleasure and satisfaction of being a tool-using animal, then the hands-on approach is better. It is to this end that this book will be more than useful, as a means to producing better work as well as making the process more rewarding.

Methods and Materials

How various jigs and fixtures are made is usually self-evident. Since in most cases the underlying principle is most important, feel free to improvise, alter, and adjust these designs to suit your own particular needs and situation. The materials you use also may be varied: hardwood, carefully assembled and polished for posterity, or something simpler picked up from the scrap heap. Materials such as plastic, plywood, or particleboard, although esthetically at odds with tradition, may be perfectly effective for carefully made jigs and fixtures. From a practical point of view accuracy or adjustability are most important, but always remember that hand tool use does not necessarily imply freehand use.

The illustrations show most of the jigs and fixtures realistically and in use, along with a simplified working drawing. The given measurements need not be adhered to slavishly or thought of as absolute; their purpose is merely to make clear the basic structure, to show what will work as a starting point. Many of these jigs and fixtures may be equally efficient if made considerably larger or smaller, depending on the scale of your particular projects.

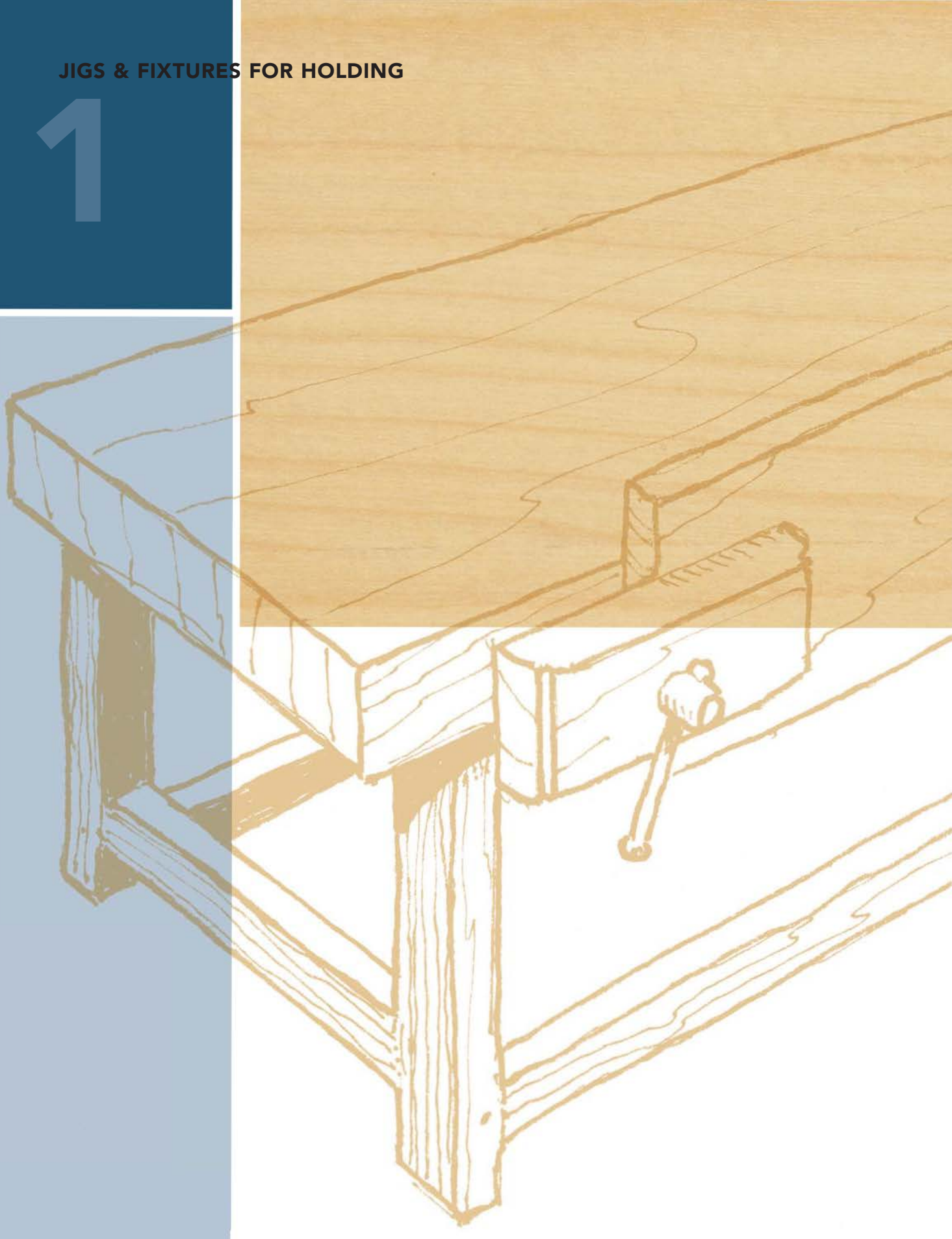
Organization

To make their discovery easier, I've grouped the jigs and fixtures in chapters that follow the standard workflow governing most woodworking projects: holding the work, measuring and marking, sawing, planing, joining, boring, assembly and finishing. Such groupings are not necessarily definitive, since any particular jig might be equally useful under another heading. For this reason I've also included a complete alphabetical index with cross-references.

One last note on terminology: there is very little consistency in the naming of woodworking items and terms, with preferences changing from one side of the Atlantic to the other as well as from one generation to the next. I've therefore listed the items included in this book by their common contemporary American names, with alternative terms from other eras and places in parentheses.

1

JIGS & FIXTURES FOR HOLDING



The bench is the woodworker's most important aid.

CHAPTER 1

JIGS & FIXTURES FOR HOLDING

Very little hand woodworking is done literally by hand alone. You might be able to hold a piece of wood in one hand and carve it with a knife held in the other hand, but beyond this you'll require something more. For this reason the workbench is for the traditional woodworker the most important item in the workshop because it supports and holds the work. You would need some kind of work surface even in a shop that depended solely on power tools and machines, if only for assembly. But the moment you involve hand tools, a bench becomes essential. I consider my cabinetmaker's workbench my single most important tool, in fact it is probably more true to call it my most important woodworking aid.

Its history may be traced back to low Roman benches, used primarily for supporting wood for sawing. Today's benches have many more uses, including as a work surface for planing, cutting joints, assembling, gluing, finishing and numerous other operations during the course of any project. There is also a wide variety of styles available, including the so-called Scandinavian, German, British and European benches, as well as benches designed for specific kinds of woodworking, such as cabinetmaking, joinery or carving. It is unfortunate that although making your own bench could be a fine place to start when setting up a shop, you might not actually know what works best for you until after you have made (or bought) your first bench. Nevertheless, whatever kind of bench you end up with, there are a number of shop-made items that will improve its efficiency. These are chiefly items to improve the holding ability of this most fundamental tool.

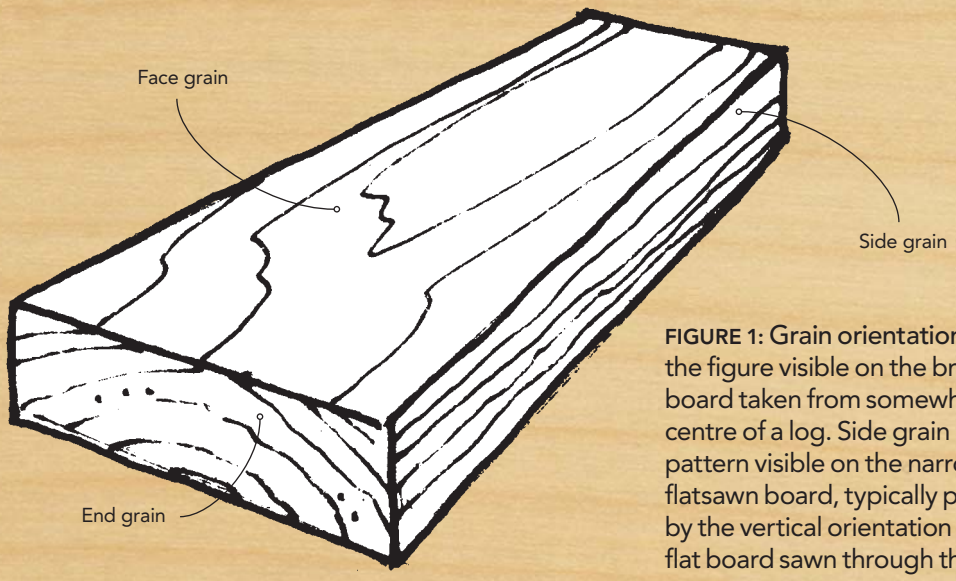


FIGURE 1: Grain orientation –Face grain refers to the figure visible on the broad side of a flatsawn board taken from somewhere other than the centre of a log. Side grain refers to the figure pattern visible on the narrow edge of that flatsawn board, typically parallel lines formed by the vertical orientation of the growth rings. A flat board sawn through the center of the log is quartersawn.

BENCH AIDS

Bench Stop (Bench Dog)

A bench needs to be a firm and secure workplace. It should be heavy and stout enough to support the work and not budge, rock, or wobble when you are planing or sawing on it. Although most manufactured benches come with some form of vise, you can add many other useful work-holding fixtures. Of these, certainly the simplest and often most used fixture on any bench is a bench stop, or bench dog.

As shown in FIGURE 2B, a bench stop may be nothing more than a dowel or square block let into the surface of the bench at the far (left hand) end of the bench – assuming you are right-handed and generally work from right to left. A friction fit in its hole secures these simple bench stops at whatever height is convenient. Hardwood such as oak is better than softwood because it is stronger. The stop need not be much more than 1" to 1½" square, long enough to go through the top and protrude perhaps a maximum of 2".

A small pin inserted in the face of the stop (as shown in the capped variety in FIGURE 2D) can help keep the workpiece from slipping off the stop.

Construction

ROUND • A length of hardwood dowel is the simplest kind of round bench stop. It's ideal for a bench that doesn't have dog holes, or for any other work surface such as the top of a saw horse or a temporary outfeed table. Commercially available dowel rods rarely are perfectly round; therefore boring a hole the same nominal diameter as the dowel usually guarantees a friction fit as you force the slightly out-of-round dowel into the perfectly round hole. For most purposes ½" diameter rod will be sufficient though larger diameters may be more useful for larger workpieces. The length of the dowel depends on the thickness of the surface into which it is inserted, because it is most convenient to tap the dowel up through the work surface from underneath. Therefore make the stop an inch or two longer than the thickness of the work surface.

SQUARE • A square bench stop is more difficult to make than a round one because its hole must be mortised fairly accurately to match. However, because the stop presents a flat surface to the workpiece, it's often more secure than a round stop. It need not be exactly square; what's important is the flat surface. Use hardwood such as oak rather than softwood such as pine. If the stop and its hole are slightly rectangular rather than perfectly square, orient the surface against which the workpiece bears to be side grain rather than face grain because this is stronger. Drilled round holes may be chopped square with a mortise chisel – of which there are several varieties but all feature square shanks – across the grain.

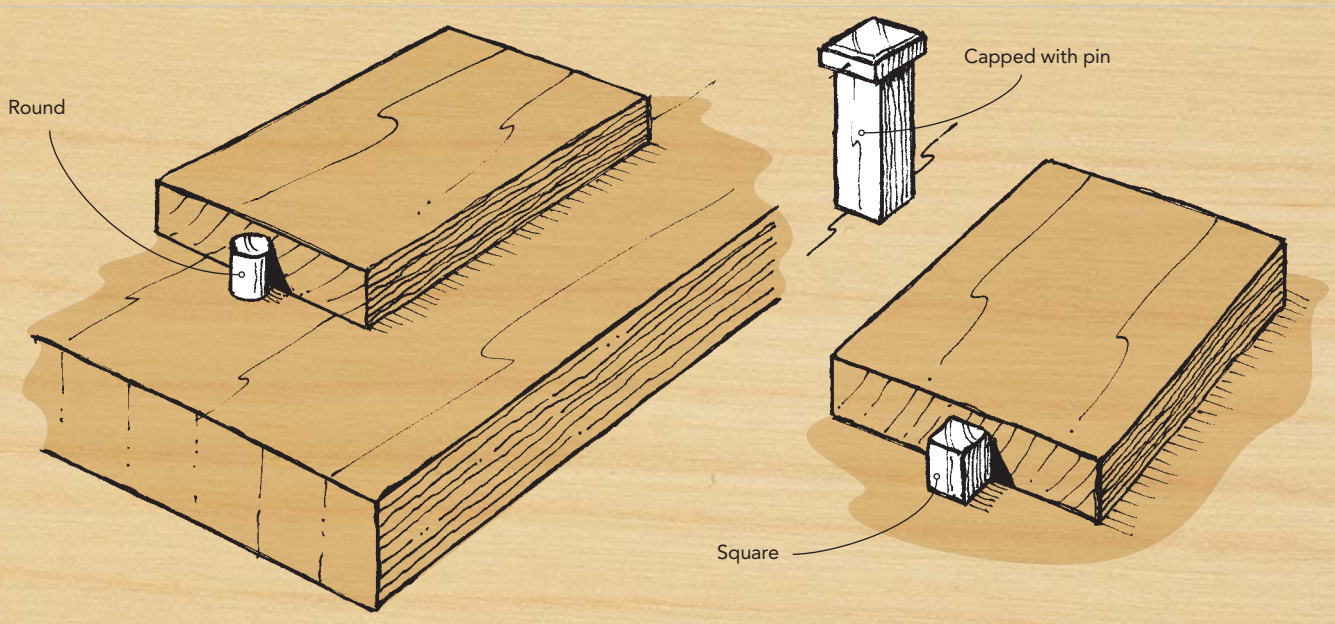


FIGURE 2A: Three kinds of bench stop

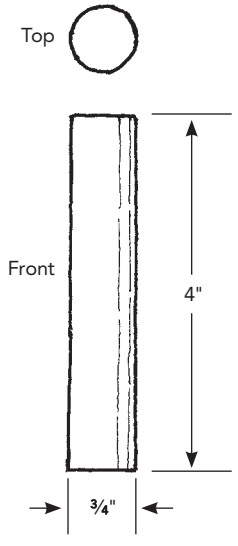


FIGURE 2B: Round

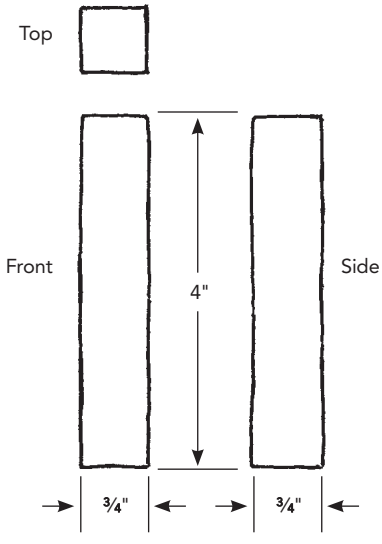


FIGURE 2C: Square

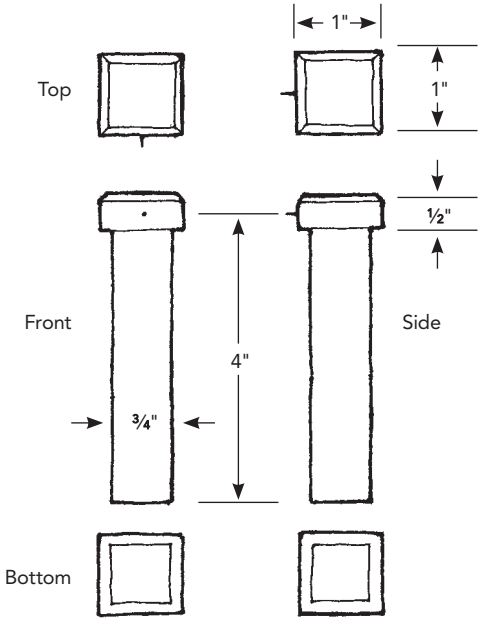


FIGURE 2D: Capped with pin

CAPPED WITH PIN • The three advantages of the capped stop – a flat face against which the work may bear, an added pin to prevent the work from sliding off, and a cap to prevent the stop from disappearing below the surface of the bench – all entail a little more work. My previous remarks concerning size, length, and grain direction apply here equally. How you make the cap is the most important consideration: integral by reducing the shaft of the stop where it passes through the work surface, or added as a separate piece. An integral cap is stronger; an added cap is perhaps quicker provided it's substantial enough and pre-bored to accept the screw that fixes it to the shaft. Only the smallest pin is necessary, but make the stop perfectly square so you can rotate it to avoid the possibility of the pin damaging any finished surface.

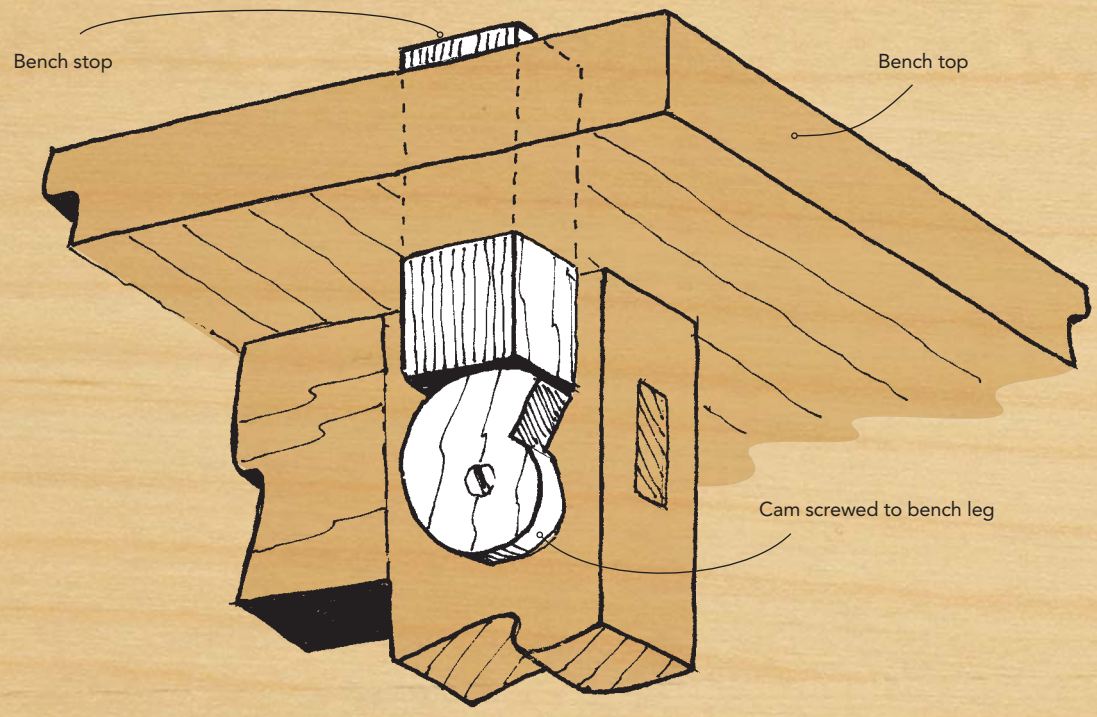
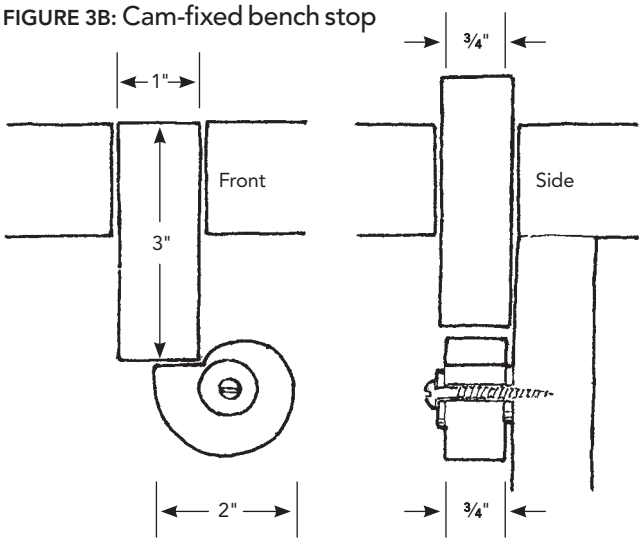


FIGURE 3A: Cam-fixed bench stop

Cam-Fixed Bench Stop

An adjustable bench stop that can be secured at the desired height is slightly more convenient than a friction-fit stop. You lock the height by tightening a cam or screw below the surface of the bench. FIGURE 3A shows the cam variety with the cam rotated to support the stop. When the cam is rotated clockwise the stop sinks down flush with the surface of the bench. The flat step cut in the cam prevents it from falling out completely.

FIGURE 3B: Cam-fixed bench stop



CONSTRUCTION • Note that the cam is a section of a spiral not of a circle. The more exaggerated the spiral the higher the stop will rise as you rotate the cam. An easy way to lay out the cam is to draw two concentric circles, the larger one an inch greater in diameter than the smaller, then freehand a connecting line within the space of one revolution. At the point where this line connects to the outer diameter, cut the perpendicular step back to the inner circle, as shown in FIGURE 3C.

Make sure that the hole for the screw that attaches the cam to the bench substructure is exactly in the center of both layout circles. Locate and attach the cam so that when the stop rests on the step, the top of the stop sits flush with the bench top surface. Although you could use a countersunk woodscrew, a slightly better method is to use a roundhead screw with two washers: one under the head of the screw and the other between the cam and the bench leg. This will prevent the screw from becoming either too loose or too tight as you repeatedly rotate the cam. Tighten the screw so the cam remains at the height you want.

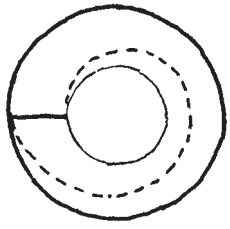


FIGURE 3C: Cam detail

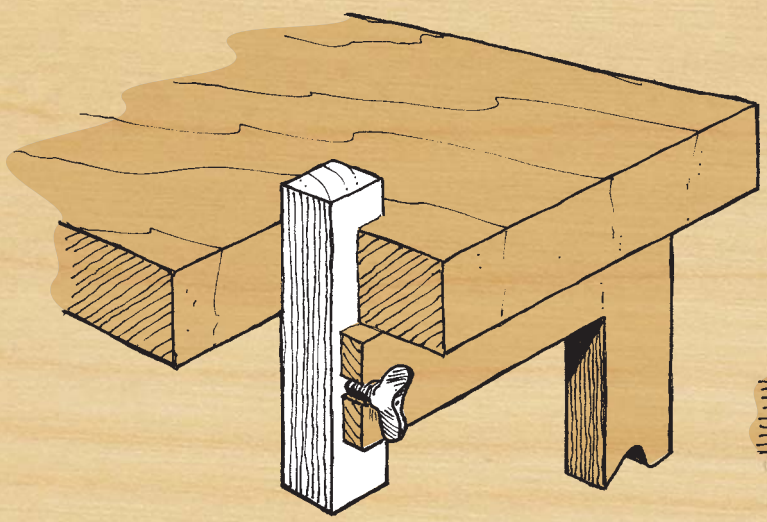


FIGURE 4A: Screw-fixed bench stop

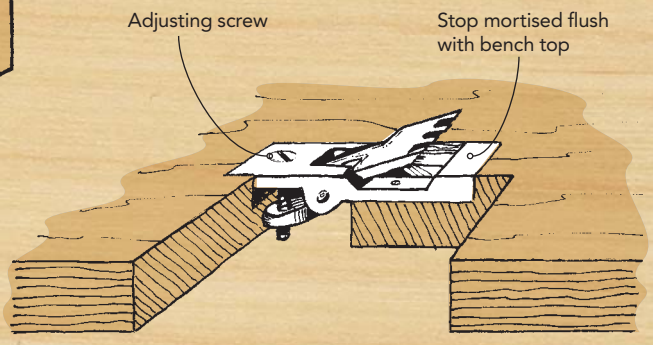


FIGURE 5: Manufactured metal bench stop

Screw-Fixed Bench Stop

Another arrangement is a screw you can tighten against the stop through an adjacent part of the bench substructure, such as a leg or section of skirting. If there isn't a suitable bench part in the right place, you can always attach a separate piece of wood under the top.

CONSTRUCTION • The screw is actually a bolt with a wingnut head that works within a tapped hole. The size designated ¼ x 20 is most useful: the ¼ refers the largest diameter of the bolt in inches, the 20 refers to the pitch of the thread, or how many threads per inch. Buy a bolt that is somewhat longer than the thickness of the wood through which it is to be inserted, and bore its hole 1/64" smaller if in close-grained hardwood such as boxwood or 1/32" smaller if in a coarse-grained hardwood like oak or a softer species such as pine. The first time you twist the bolt into this hole the threads will cut their way into the wood. If the screw is too sticky to turn with ease, wax it.

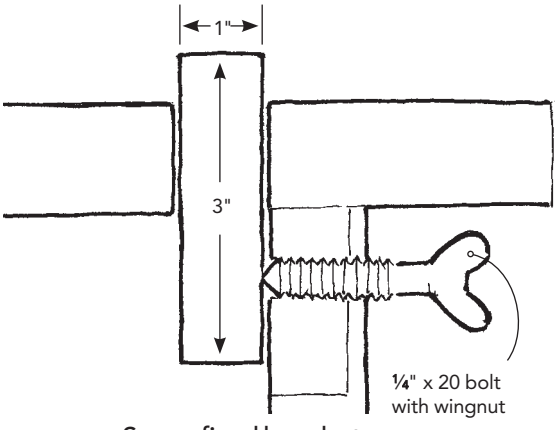


FIGURE 4B: Screw-fixed bench stop

Manufactured Metal Bench Stop

Manufactured metal bench stops controlled either by a spring or a height-adjusting screw have been available for a long time. These are usually designed to be mortised flush into the bench top wherever convenient. The better ones are made of soft metal designed to minimize damage to any cutting edges that may hit them. To protect a finished surface or edge, it's advisable to insert a spacing block between the workpiece and any kind of metal stop.

CONSTRUCTION • The important detail is where to place the stop. On store-bought benches, a manufactured stop usually sits close to the front edge of the bench near the left-hand end. This assumes you are right-handed; left-handers who work in the opposite direction will want to mortise the stop into the right-hand end.

Mortising the bench top will be easier and perhaps more accurate if you lay out with a knife or sharp mortise gauge rather than with a pencil, and then apply the principle of coordination. This means, use similarly sized tools for all the operations in a sequence. Here the principle of coordination means drilling out the waste with the bit closest in size to the metal insert as well as to the width of the mortise chisel you'll use to square up the hole. To avoid splitting the wood, use the mortise chisel across the grain rather than parallel to it. Clean up the sides of the mortise with paring chisels or bench chisels.

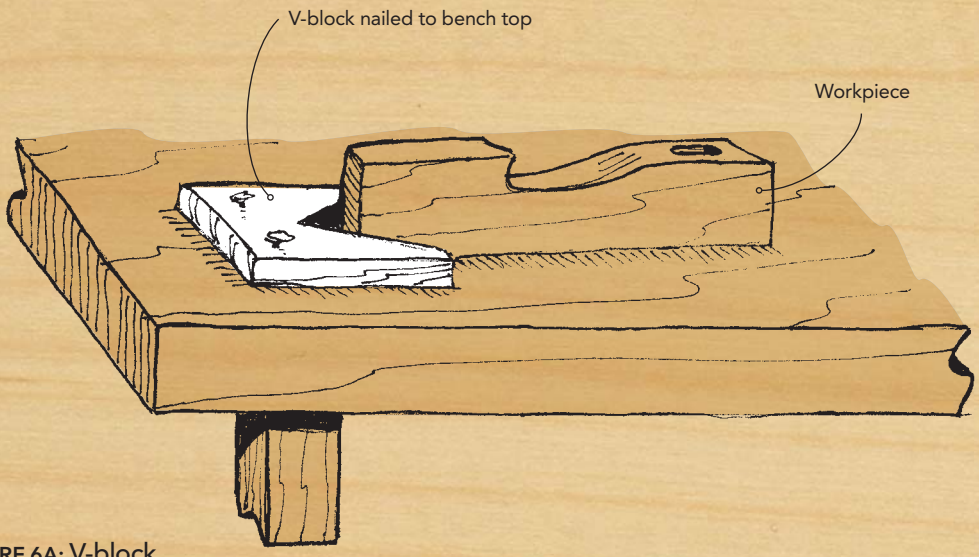


FIGURE 6A: V-block

V-Block (V-Board, Bench Clamp, Top Clamp)

The advantage of a bench stop is that it can be pushed down level with the top of the bench when not needed, leaving a continuously flat work surface with no obstruction. On the other hand, it is not always as secure for stopping or holding the workpiece as a V-block (**FIGURE 6A**).

V-blocks, of whatever size and whether positioned longitudinally or laterally, usually are glued, nailed, or screwed to the surface of the bench. They're semi-permanent, and consequently they are inevitably in the way. If you object to nailing or screwing anything to the work surface, make long V-blocks that can be clamped to the end of the bench top. And if they are large enough, you can mount them on dowels that fit into existing dog holes in the bench surface. (See also Chapter 4: Wedged V-Block.)

Although hide glue is a relative rarity today – except perhaps for traditional veneer artists and restorers – using it to fix temporary blocks to the bench avoids the danger of damaging tools by inadvertently running them into metal fasteners. Furthermore, for those not-completely-traditional woodworkers who enjoy keeping their benchtop as pristine as a piece of finished furniture, it is perhaps easier to remove traces of glue than it is to fill nail orscrew holes.

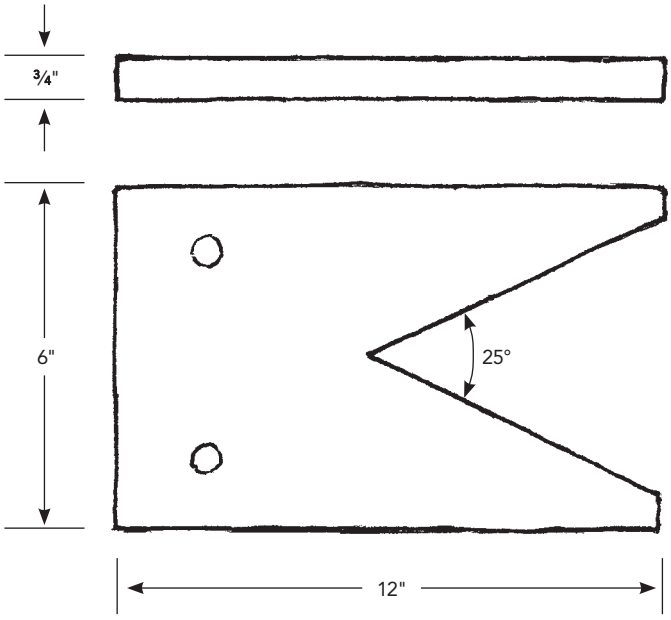


FIGURE 6B: V-block

CONSTRUCTION • Cut a V-block from the end of a length of 1 × 12, which is about ¾" thick. For most work the block need only be about 12" long (**FIGURE 6B**). For securing especially heavy pieces, make it from 5/4 stock. The angle of the V should be no more than 30°. A greater angle will have less holding power and a smaller angle may be liable to split. Plywood has the advantage of being unlikely to split no matter how much pressure you bring to bear on it, but other sheet goods such as medium density fiberboard (MDF) are not as strong.

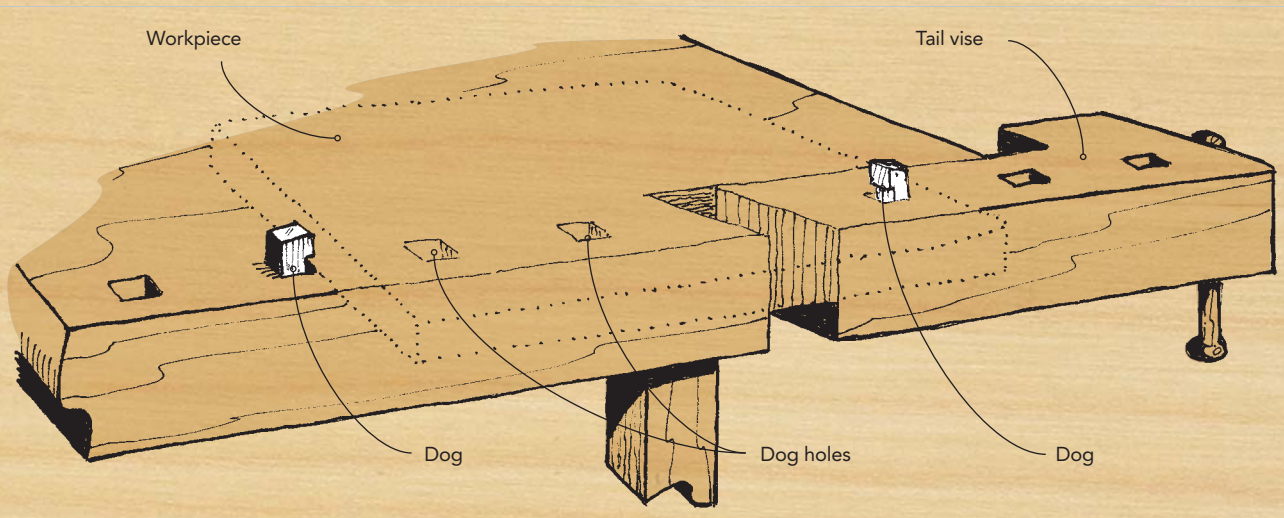


FIGURE 7A: Bench dogs

Bench Dog

The term bench dog commonly refers to a particular kind of bench stop that is located in a regular series of dog holes mortised near the front edge of the top (**FIGURE 7A**).

Like bench stops, bench dogs may be made of wood or metal, they may be round or square, and they may be user-made or manufactured. Large cabinetmaker's benches fitted with tail vises usually are provided with dog holes in the tail vise itself, as well as along the front edge of the bench. That way, a workpiece may be held securely between a dog positioned in one of the front edge mortises and a second dog in the tail vise that has been tightened against it. (A tail vise is a vise fixed to the end of a bench in addition to the one – known as a face vise – fitted at the front.)

Store-bought manufactured dogs are commonly made from metal, as are dogs provided with new benches, but wooden, user-made dogs are better. They're less likely to ding the workpiece, and they're easier on your sharp tools. If the plane runs into the wooden dog its edge won't be damaged, whereas a metal dog, even if made of a soft metal, might inflict serious damage and cause a lengthy resharpening. Furthermore, not all metal dogs are made the same size. They must be large enough to fit in the dog hole with a slight amount of friction (some have springs for this purpose) so that they will stay put, but not so large that adjusting them up or down requires a mallet.

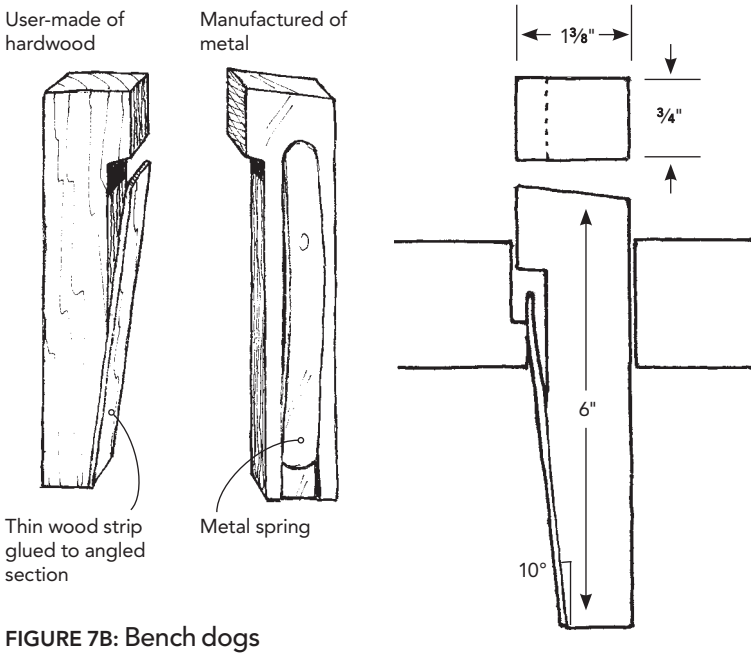


FIGURE 7B: Bench dogs

CONSTRUCTION • Make your own wooden dog from a length of hardwood. Trim it so that its top inch or so fits nicely into any pre-existing stepped dog hole. Cut the lower end of the shank to fit into the dog hole's reduced width at a slight angle, around 10°. Glue a thin (⅛" to ¼") hardwood strip to this angled section, making it long enough to extend just below the head of the dog. The tension of the wooden spring will hold the dog at any required height. Trim the head to lie below the bench surface when the dog is pushed down to rest on the step, as shown in **FIGURE 7B**.

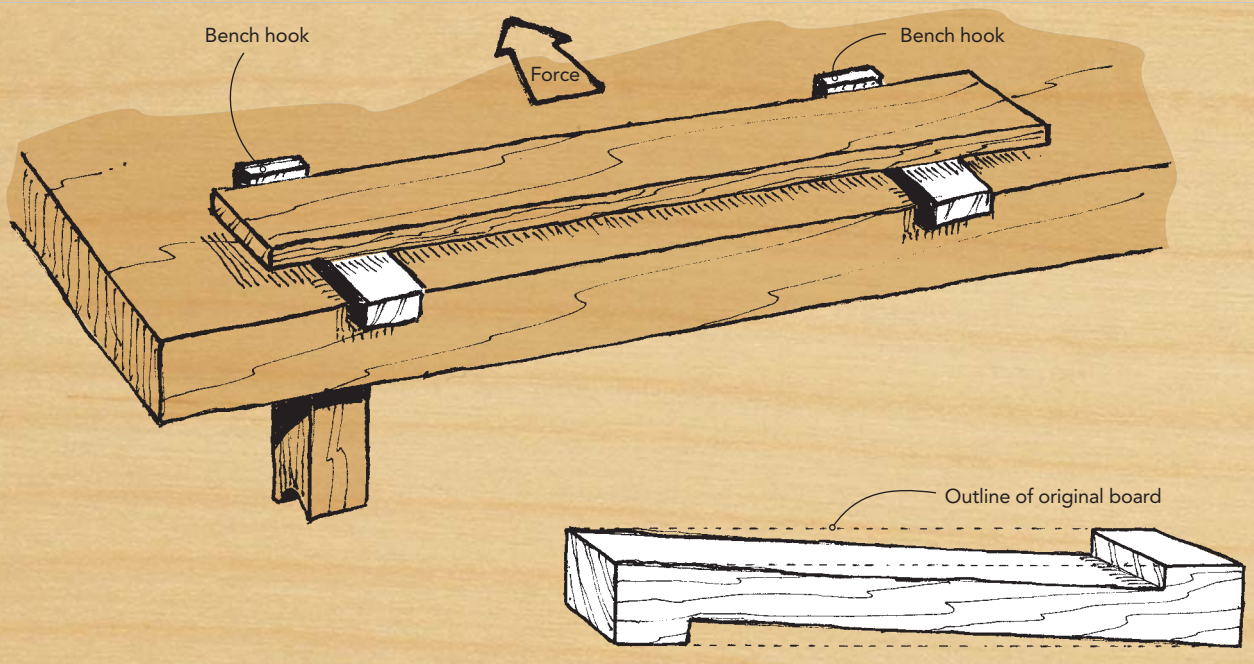


FIGURE 8A: Bench hook

Bench Hook (Side Hook, Side Rest)

Not everything may be conveniently held at the edge of the bench. Bench hooks offer a another choice for sawing and chiseling across the workpiece rather than along it as when planing. The simplest form of bench hook is a narrow piece of wood cut in its thickness so that the bottom hooks against the edge of the workbench and the top provides a stop against which the workpiece may be pushed and securely held (**FIGURE 8A**).

Use two bench hooks for sawing or boring, operations usually undertaken across the workpiece rather than along it. Use a pair of bench hooks of roughly equal size whenever a large or long workpiece needs support.

CONSTRUCTION • Cut a hook or step into a piece of scrap, such as a 12" length of 2 × 4, on both ends but on opposite sides (**FIGURE 8B**). The hook parts need only be half the thickness of the 2 × 4, with the adjoining flats sawn or roughly chiseled in a gentle slope, as shown in Figure 9. Make the vertical cut that defines the hook no less than 2" from the end, or you'll risk knocking it off during some vigorous attack on the workpiece, mortising with mallet and chisel for example. You'll often use bench hooks in pairs, so make two.

Along with one or two narrow bench hooks made from 2 × 4s, you might find a much wider bench hook to be useful. You can make it big enough to support the entire workpiece on its own bed. Even so you'll often need a second bench hook or a scrap of similar thickness to keep the end of a very long workpiece from sagging.

Make the hooked sections of a wide bench hook from separate pieces glued to the base. Glue is better than nails or screws because any metal hardware would risk interference with sawing operations. For more on bench hooks for sawing, see Chapter 3.

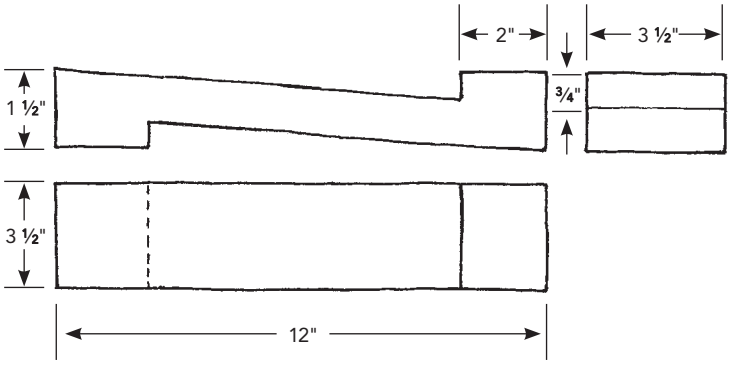


FIGURE 8B: Bench hook

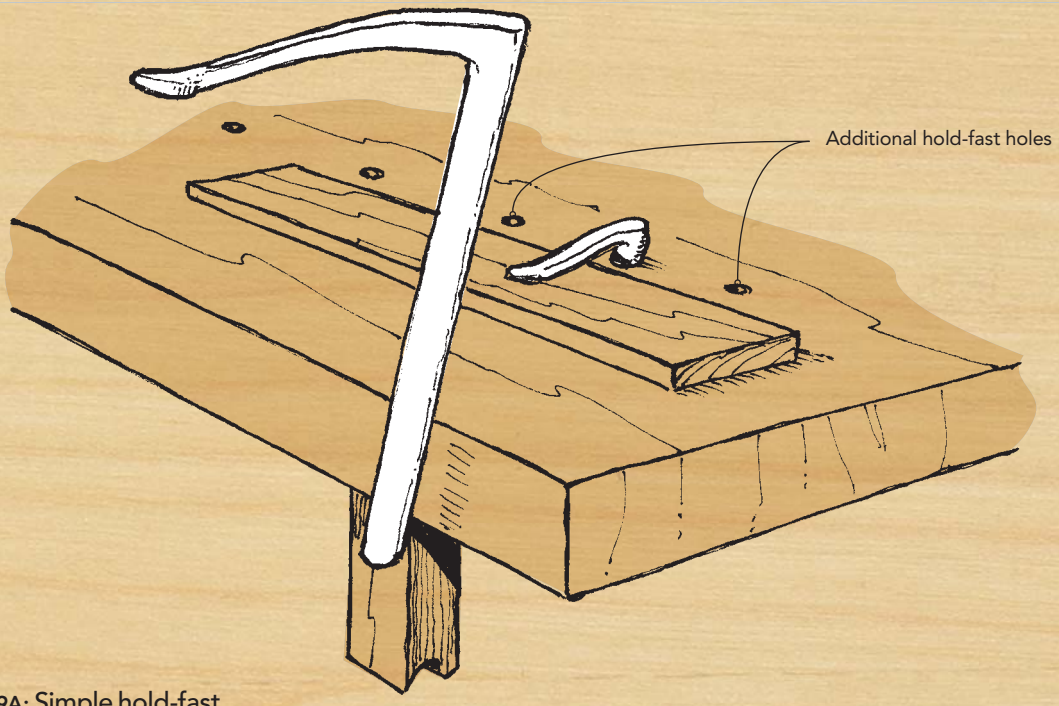


FIGURE 9A: Simple hold-fast

Simple Hold-Fast

While vises – alone, and sometimes in conjunction with bench dogs – are good for securing narrow workpieces, a hold-fast can get a better grip on irregular shapes. The simplest design is no more than an upside-down, L-shaped piece of metal dropped into a hole slightly larger than the diameter of its shank so that the short arm bears on the workpiece, FIGURE 9A. Provided the bench top is thick enough, tapping the shaft into the hole will jam it very securely. A simple tap behind the arm releases the hold-fast.

CONSTRUCTION • The hold-fast, being invariably made out of metal, is now usually a bought item since few woodworkers, even the most traditionally inclined, have access to a small forge.

The hole diameter is critical. If it is too wide or too narrow, the shank won't wedge securely. A good rule of thumb is to bore a hole that's wider than the diameter of the shaft by a little less than a quarter of the shaft's diameter. For example, a ¾"-diameter shaft will wedge securely in a ⅞"-diameter hole.

The depth of the hole is equally important, because if it's too shallow (unlikely in the case of most benches but possible if you're adding a hold-fast to a sawhorse), the wedging will be insecure. The solution is simply to increase the thickness by gluing or screwing another piece of wood to the bottom of the work surface.

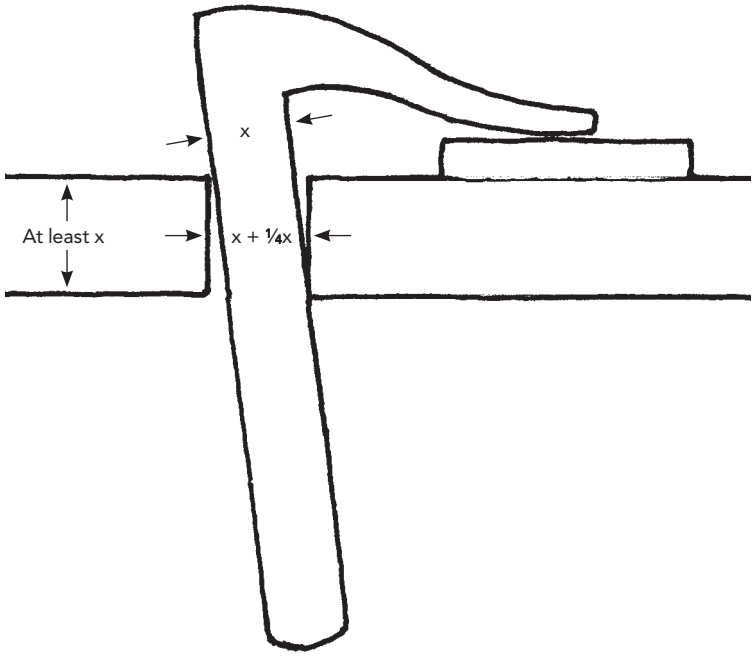


FIGURE 9B: Simple hold-fast

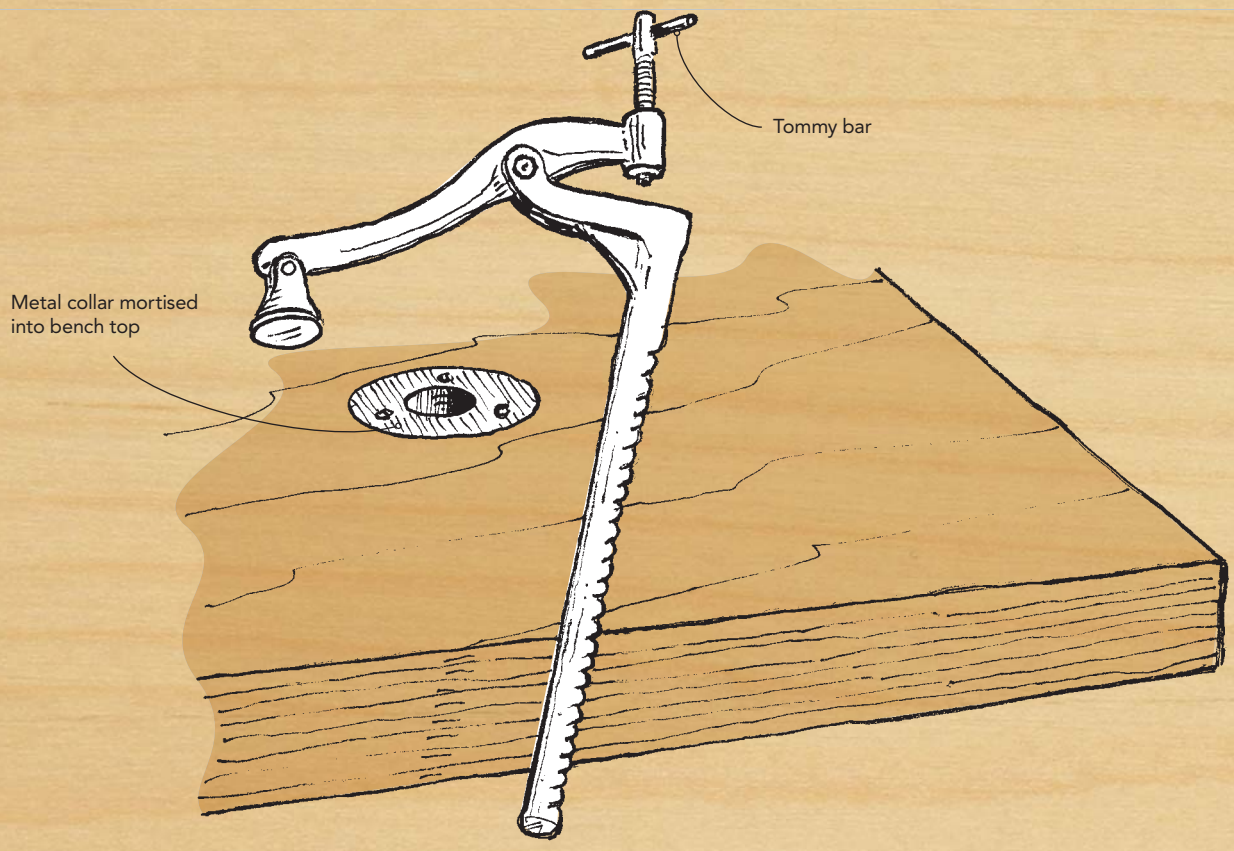


FIGURE 10A: Screw hold-fast

Screw Hold-Fast

The more sophisticated screw hold-fast has a tommy-barred screw that forces the short arm against the workpiece, for a very secure hold. This screw also eliminates the need to hit the back of the hold-fast to release it. Screw hold-fasts may be sold with one or two metal collars of exactly the right size for the shank. These collars are intended to be mortised into the bench, thus preventing a raw hole from enlarging with use.

The most vexing aspect of this device always is where to bore the hole in the bench top. Wherever you drill it, sooner or later it will be in the wrong place. One useful location is in the center of the bench's width close to the tail vise if one is present, or opposite the face vise. This way, vise and hold-fast can be used together. Ultimately, however, you may need several positions, as shown in **FIGURE 10B**. Hold-fasts like these, with numerous holes, were common in 18th-century French workbenches, which relied almost exclusively on stops and hold-fasts rather than on vises.

CONSTRUCTION • The exact location of hold-fast holes is usually found by trial and error. However, most workers would find it useful to center them in the front-to-back width of the work surface and space them regularly apart at 12" intervals.

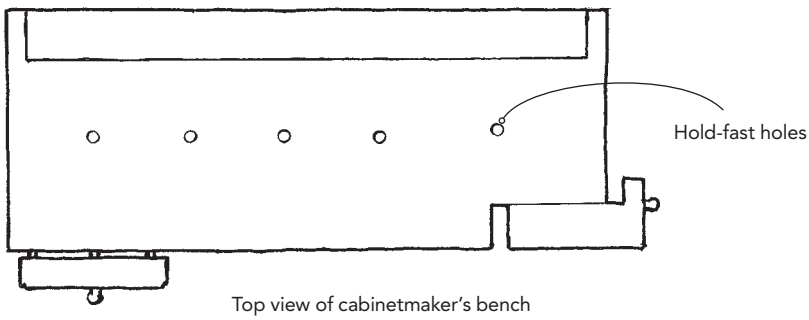


FIGURE 10B: Screw hold-fast

Top view of cabinetmaker's bench

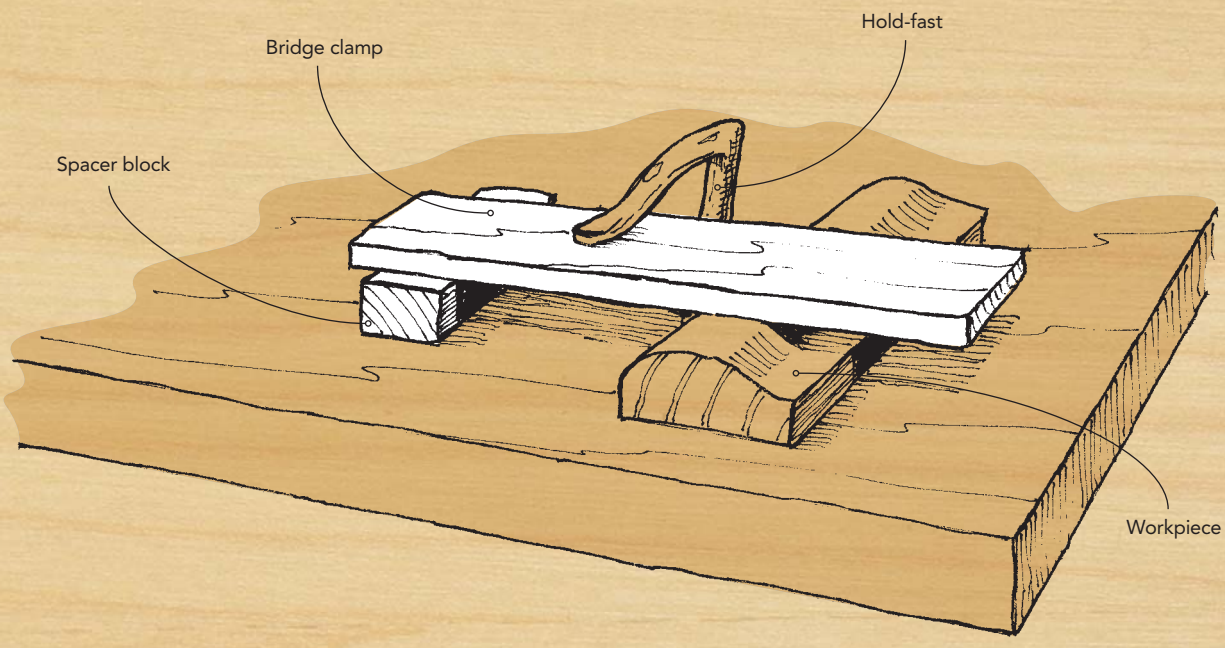


FIGURE 11: Bridge clamp

Bridge Clamp

An irregular workpiece is sometimes best secured by a bridge clamp. It is a separate piece of wood that bears upon both the workpiece and a spacer block of the same thickness and which is itself clamped, either by a hold-fast or by another clamp. If you bandsawed the irregular workpiece, the offcut may provide the ideal matching surface to engage the workpiece securely. It might be long enough to be clamped on its own, but if not you can glue it to the underside of a separate board.

CONSTRUCTION • Both clamp and spacer block can be made from any sufficiently large piece of scrap; softwood such as pine is less likely to damage the workpiece than hardwood. Owing to the irregularity of such a fixture it is seldom useful to keep it, but instead make a new one whenever next the need arises.

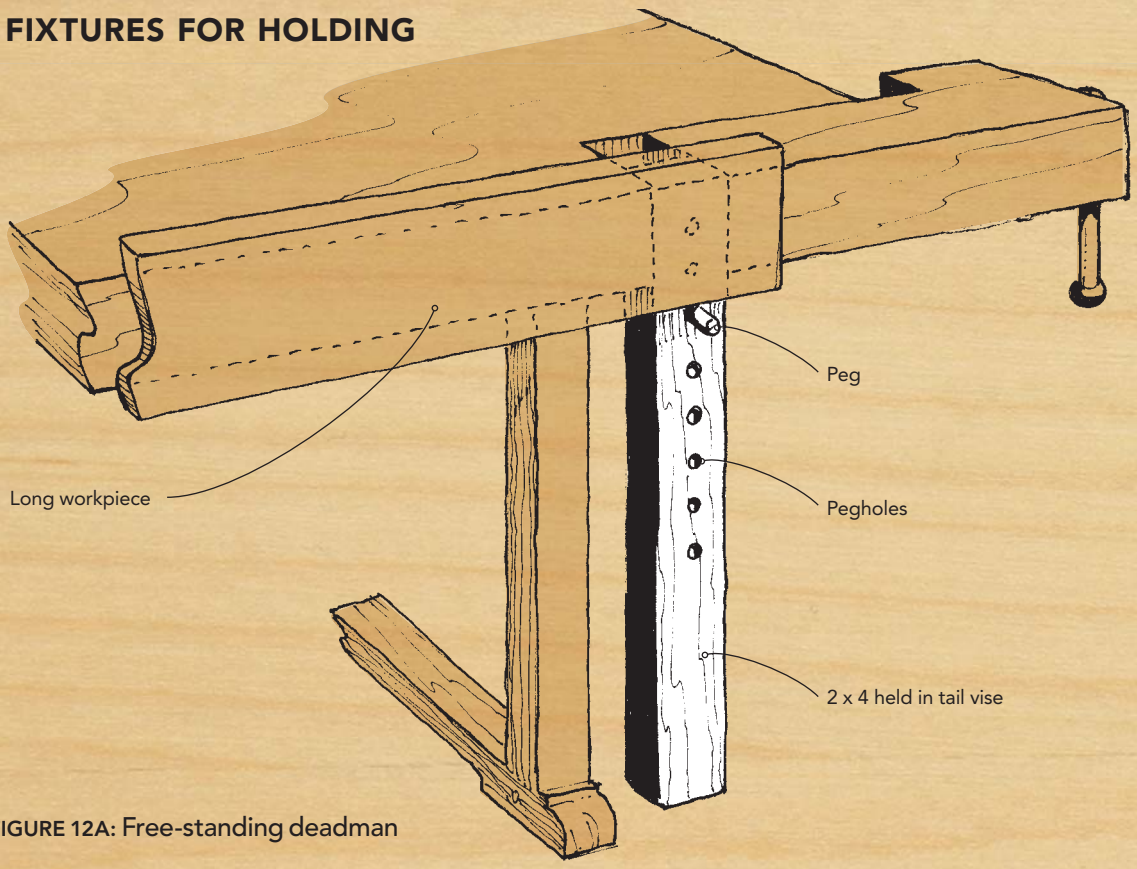


FIGURE 12A: Free-standing deadman

VISE FIXTURES

Since most workbenches are provided with vises, which like benches themselves come in a wide variety, their description is not strictly within the purview of this book. But whatever kind of vise your bench has, there are a number of aids that you can make to increase its utility.

Free-Standing Deadman

A deadman is the somewhat macabre name given to a vertical board or post bored with a number of holes at different heights. A peg or dowel in the appropriate hole will support the end of a long workpiece, with the other end typically being held in the face vise.

The simplest kind of deadman may be nothing more than a length of 2 × 4 long enough to be stood on the floor and held in the jaws of a tail vise, or clamped to the bench understructure.

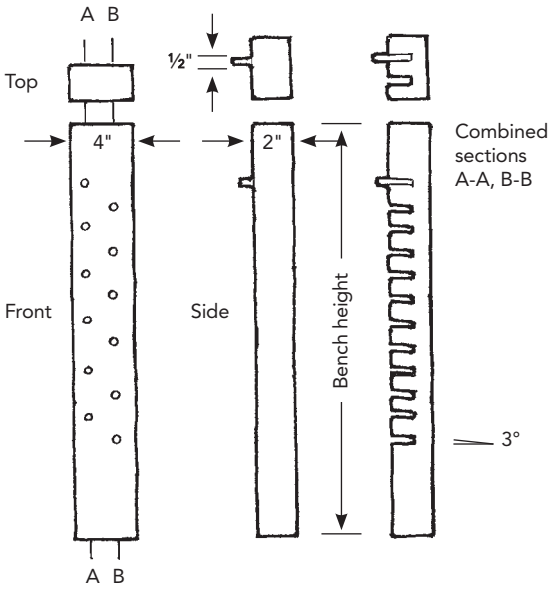


FIGURE 12B: Free-standing deadman

CONSTRUCTION • A 2 × 4, or something of similar size and length, bored on its wide face rather than on its narrow edge, makes a good deadman. The advantage of boring the wide face is that you can stagger the holes to allow a greater choice of height positions for the workpiece. Boring the holes at a very slight angle up from horizontal decreases the likelihood that the workpiece will slip off its peg. Cut regular ½"-diameter hardwood dowels to protrude 2" when installed.

The 2 × 4 is crude and the owner of a fine workbench might make a planed, chamfered and polished deadman as a matching accessory to be proud of.

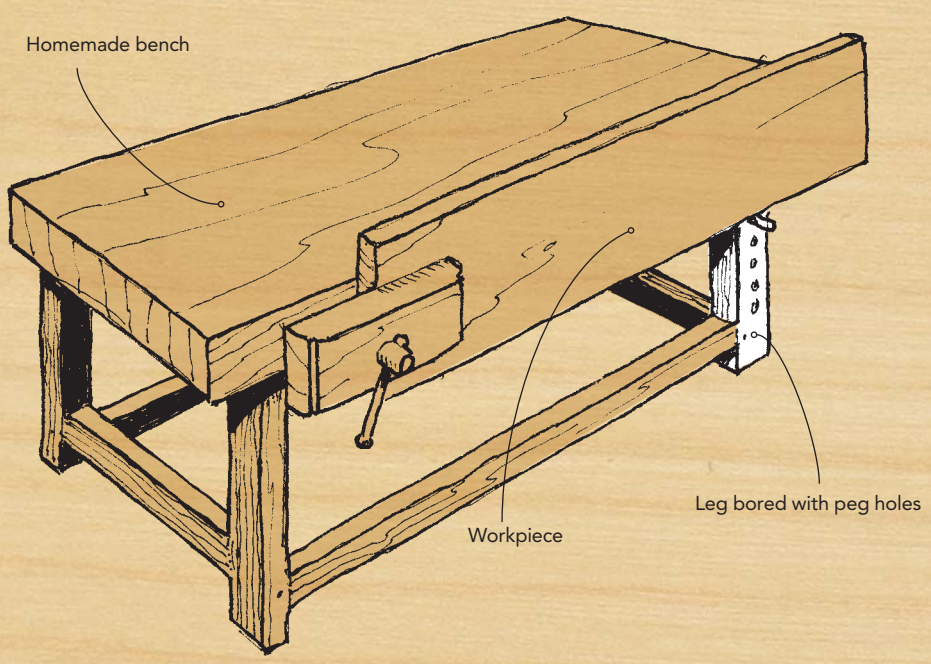


FIGURE 13: Fixed deadman

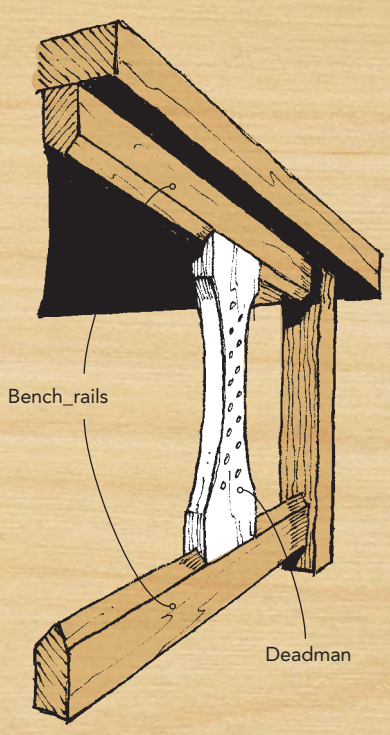


FIGURE 14A: Sliding deadman

Fixed Deadman

Simple home-made benches may have the right-hand leg bored, or a separately made deadman clamped to a part of the bench's substructure.

Sliding Deadman

Sophisticated 19th-century cabinetmaker's benches were often fitted with a sliding deadman, which could be moved to accommodate different lengths of workpiece. These are vertical members with bored peg holes, both ends of which are tongued or V-notched to run on rails shaped to receive them at the front of the bench (FIGURE 14A).

CONSTRUCTION • It is sometimes possible to retrofit a bench with a sliding deadman, provided the apparatus doesn't interfere with any drawers, cupboards or shelving. All that is required are two rails between which the deadman may be slid. One method is to cut a tongue at each end of the deadman and fit these tongues into grooves in the rails. Better (because the groove in the lower rail will become clogged with shavings) is to V-notch the ends of the deadman to slide over a reverse V-shaped profile formed onto the inner edges of the rails. Making the ends of the deadman wider than its center, and keeping the rails waxed, makes this fixture both easy to use and extremely useful. As with the fixed deadman, bore the peg holes in a staggered pattern, at a slight angle up from horizontal.

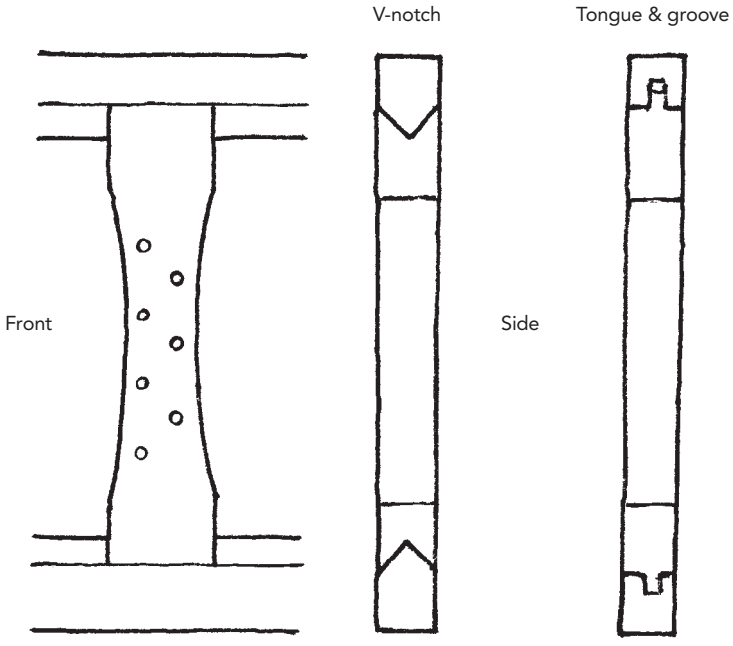


FIGURE 14B: Sliding deadman

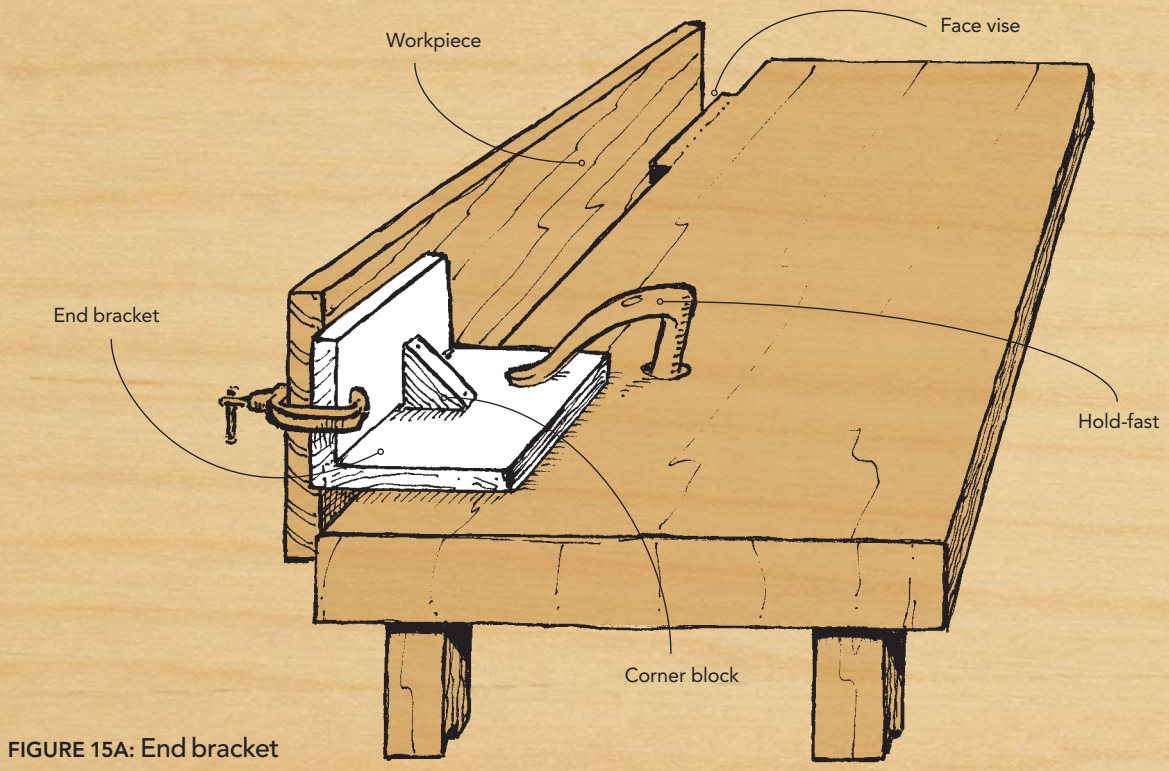


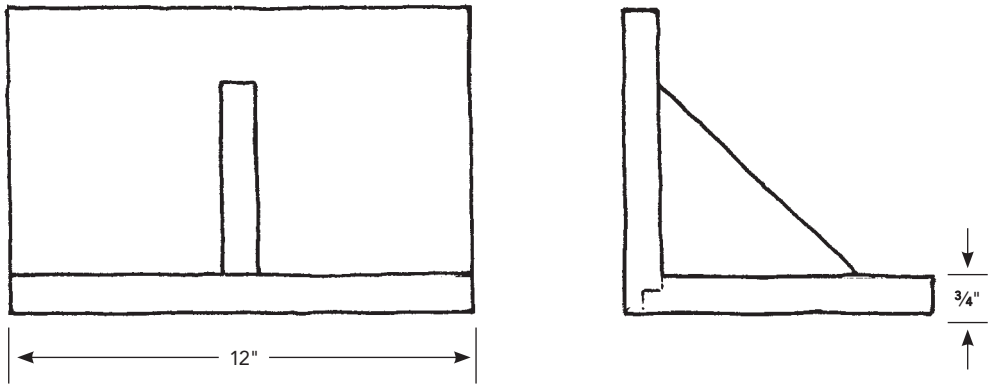
FIGURE 15A: End bracket

End Bracket

A simple right-angled bracket can be clamped to the top of the bench, or held there by a hold-fast, as shown in **FIGURE 15A**. This provides a solid base for clamping the workpiece, taking the place of a deadman for supporting the end of a long workpiece. When clamping a long vertical workpiece, the end bracket may be more convenient than the vise.

CONSTRUCTION • The essence of this fixture is the accurately vertical upright piece to which you clamp the workpiece. If the two pieces are simply rebated together the temptation is to orient the grain horizontally in relation to the bench top, as in **FIGURE 15B**. However, this would leave the upright piece vulnerable to being broken off. It would be stronger to use corner dovetails with the grain of the vertical piece rising from the bench rather than running parallel to it. Plywood, of course, eliminates this concern. In any event it is wise to guarantee both the strength and the squareness of the fixture by including a carefully cut corner block.

FIGURE 15B: End bracket



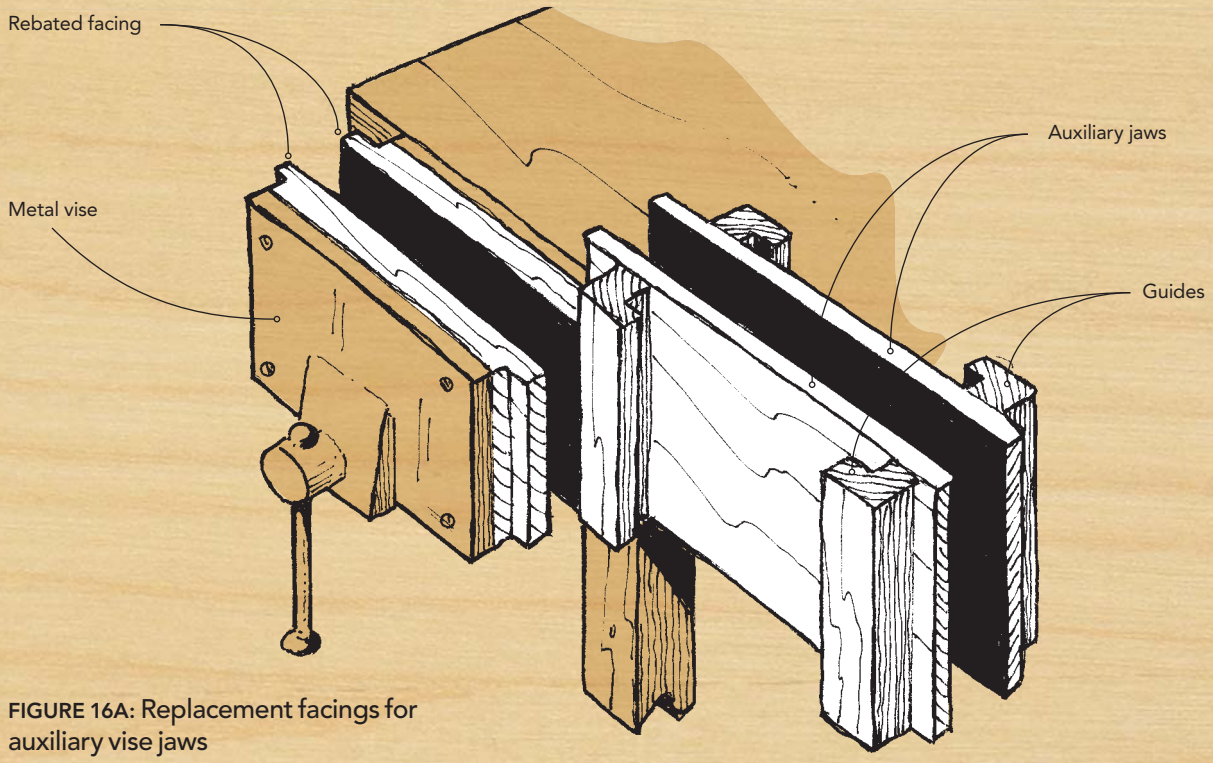


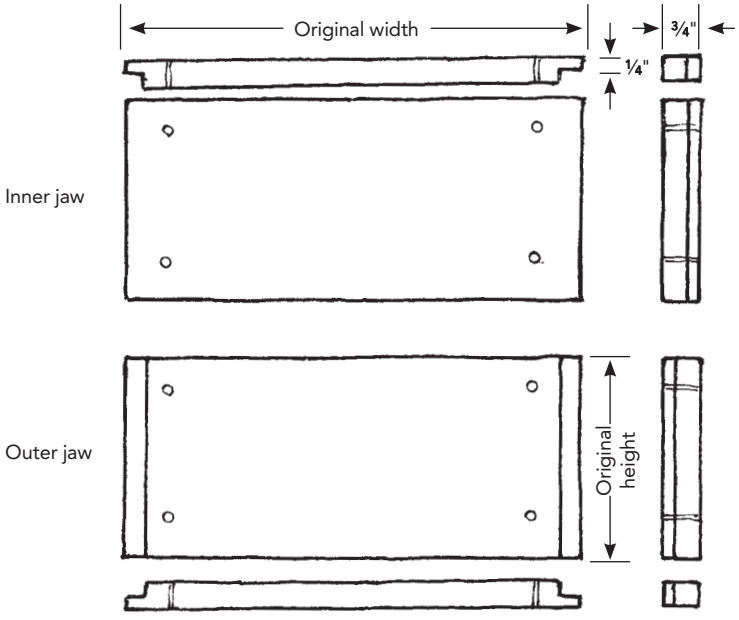
FIGURE 16A: Replacement facings for auxiliary vise jaws

Auxiliary Vise Jaws

A selection of auxiliary jaws also can increase the utility of vises. Many 18th-century British benches had vises whose jaws could be closed parallel or not parallel depending on the shape of the workpiece, as do some modern (and relatively expensive) so-called universal vises. However most contemporary vises, because of the way the guide arms and screws are made, operate on the principle that when properly installed and adjusted the jaws are will remain perfectly parallel. This is fine only if you are trying to hold workpieces that also have parallel faces. For everything else, including very thin items and irregular or round workpieces, you need something else.

Replacement Jaw Facings

Depending on the kind of vise already present on your bench, many auxiliary jaws can be made to simply sit in the vise resting on the guide arms or adjusting screw. If the placement of these vise parts makes this not practical, it may be possible to replace the existing wood facings with slightly larger pieces whose sides are rebated, over which auxiliary jaws can be slipped and held (**FIGURE 16A**). The tongues formed by these rebates, which slide into the slots attached to the auxiliary jaws, should be thick enough merely to fit comfortably into the slots, since no pressure is ever exerted on them.



CONSTRUCTION • Detach – typically by unscrewing – the existing facings, and use them as a template for new facings that are 4" wider. Cut 1" rebates in the ends of these new facings and attach them to the vise, making sure that the rebated ends are clear of the metal jaws. Any auxiliary jaws fitted with guides can be slipped over them, as shown in **FIGURE 16B**. Now the vise can be used as before but with the added ability to accept a wide variety of auxiliary jaws.

FIGURE 16B: Replacement facings for auxiliary vise jaws

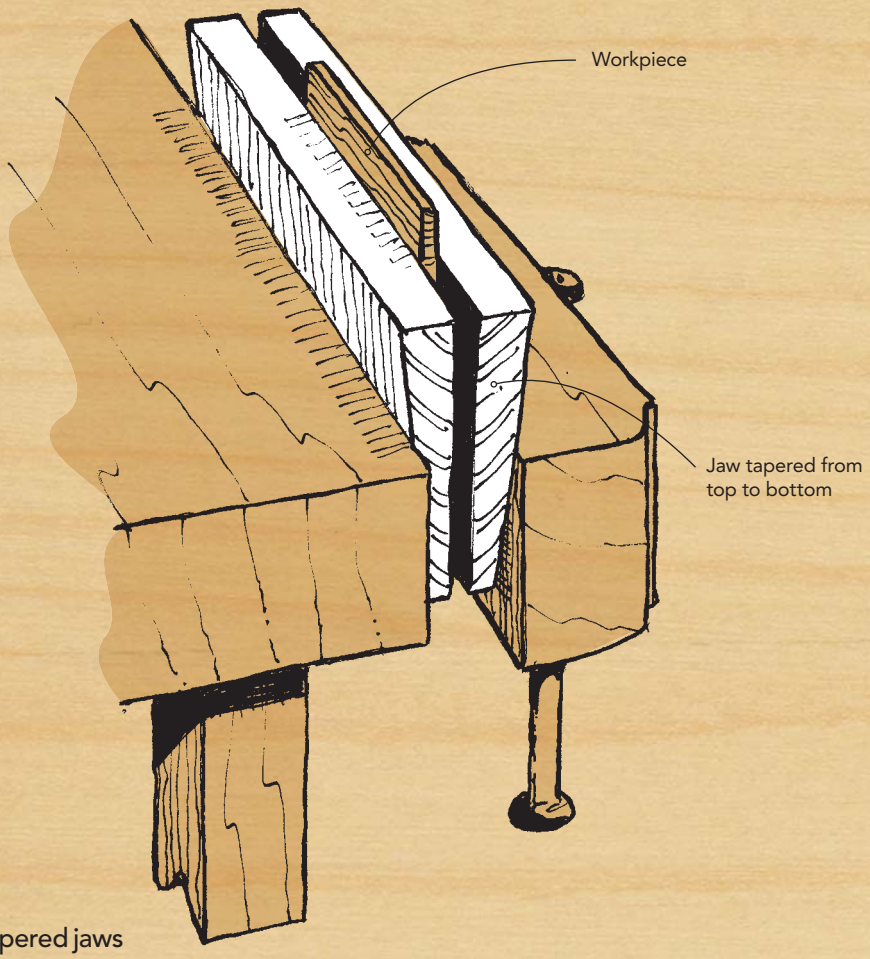


FIGURE 17A: Vertically tapered jaws

Vertically Tapered Jaws

For very thin workpieces a pair of slightly tapered jaws, thinner at the bottom than at the top, will guarantee a secure grip (**FIGURE 17A**). Vertically tapered jaws also can correct vise jaws that no longer close with perfect exactness tight and level with the bench top. In the long run it is best to restore the vise jaws so that they do close properly, but this is not always possible. (See also Chapter 3: Saw Vise, and Chapter 5: Scraper Vise.)

CONSTRUCTION • Make tapered jaws by resawing a thicker board roughly the same width and height as the vise jaws. If the board is about 2" thick, an angled resaw cut should produce two identically tapered jaws. Alternatively, plane a single board to be thinner along one long side than on the other side. Gauge the angle of resawing or the amount of planed taper from the degree to which the closed vise jaws no longer touch at the top.

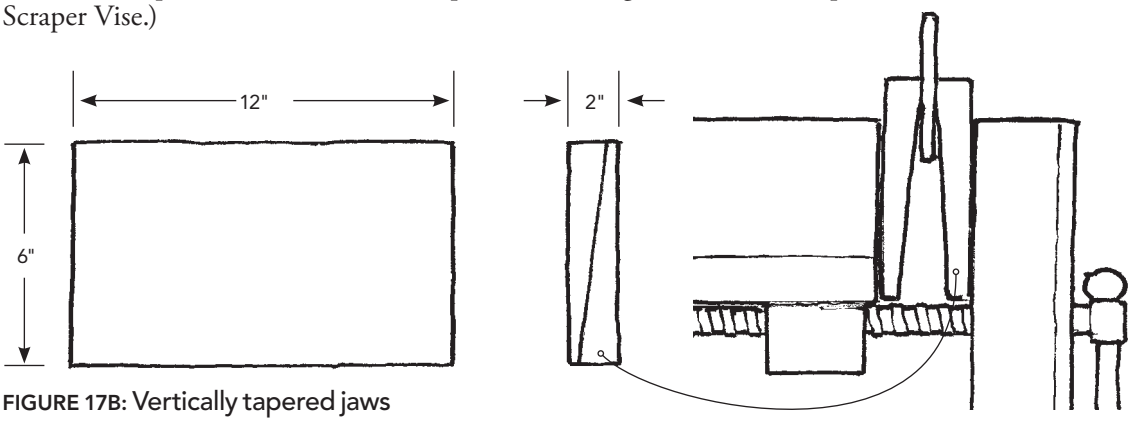


FIGURE 17B: Vertically tapered jaws

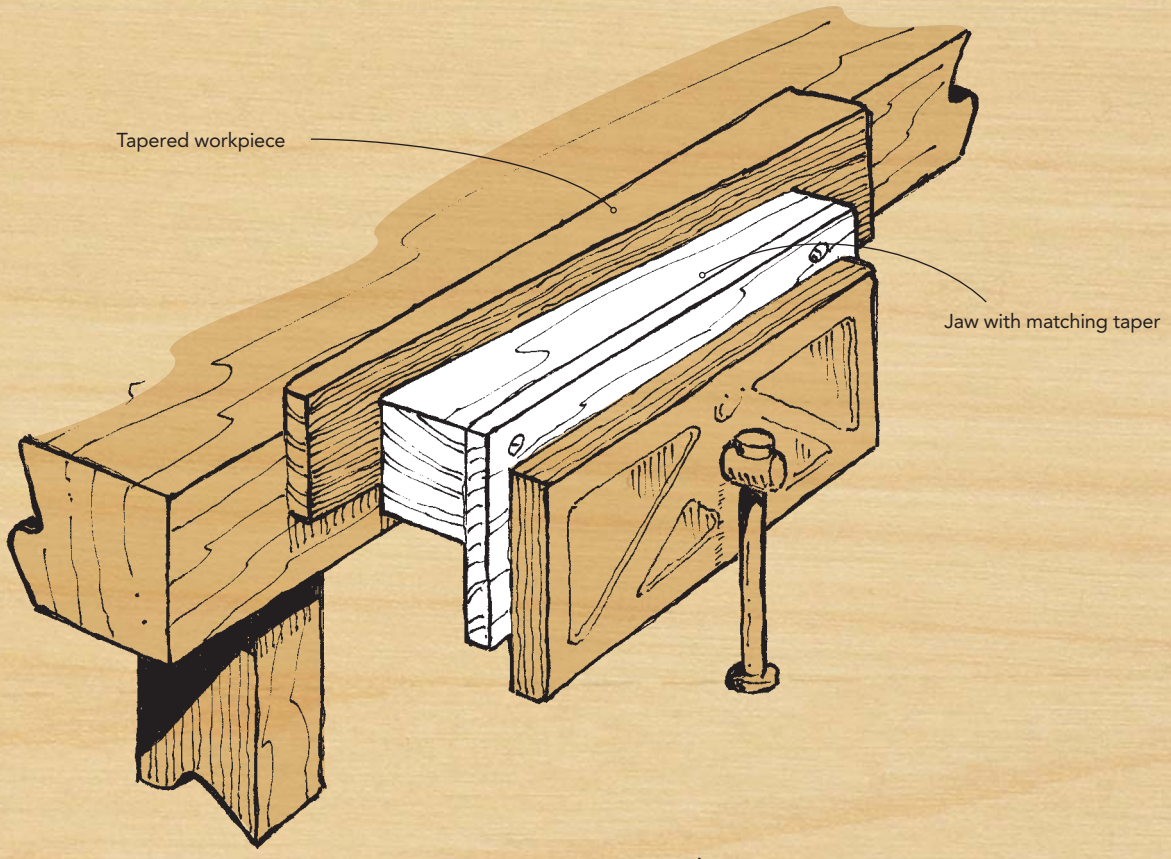


FIGURE 18A: Matching Taper Jaw

Matching Taper Jaw

Sometimes you need to secure a longitudinally tapered workpiece in a vise whose jaws do in fact close perfectly parallel. The solution is to provide an additional jaw facing with the matching taper attached to it. Very often the offcut from the tapered workpiece itself can be used. Use double-sided tape to attach it to an extra inner or outer jaw, or even to the workpiece itself (FIGURE 18A).

CONSTRUCTION • The simplest form of taper jaw consists of a board a little larger than an auxiliary vise jaw with the matching taper attached to it, either permanently in the case of repetitive tapers or temporarily with double-sided tape for different tapers. For operations such as planing, where grain direction is important, reversing the taper jaw will also reverse the grain of the workpiece.

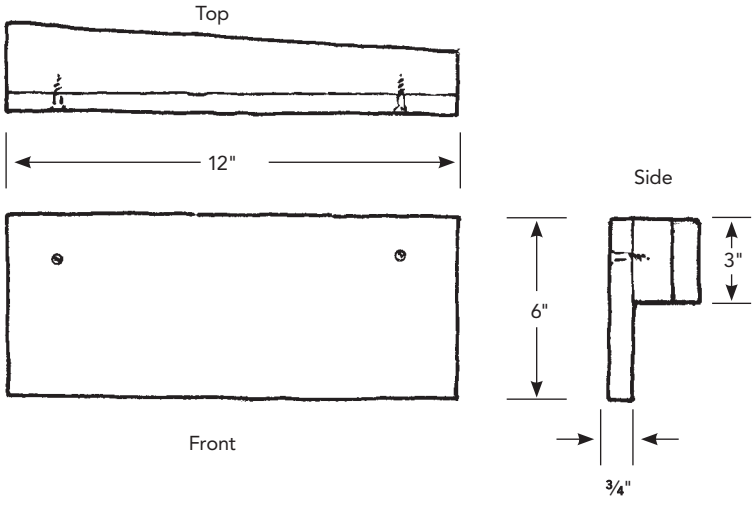


FIGURE 18B: Matching Taper Jaw

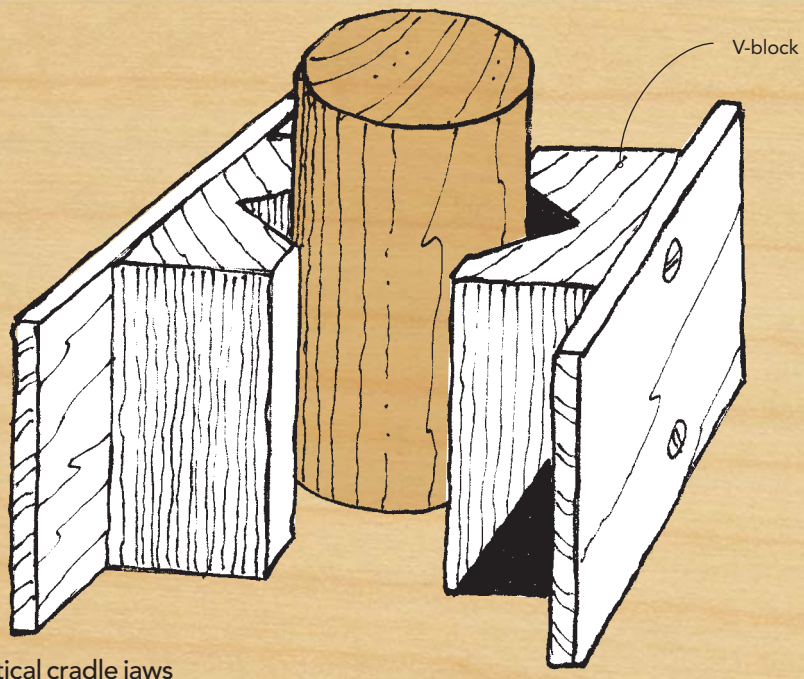


FIGURE 19A: Vertical cradle jaws

Cradle Jaws for Round Stock

Round stock presents a different problem, but a very general solution that will hold a wide variety of shapes is a pair of auxiliary jaws faced with wide V-blocks, sometimes called cradle jaws. The V-blocks may be fixed horizontally or vertically as the occasion demands.

Vertical Cradle Jaws

There is little problem in making a pair of vertical cradle jaws other than ensuring that the V-blocks are not notched too deeply nor with too tight a 'V' (**FIGURE 19B**). Such a notch is typically made with a V-soled rebate plane. Without the traditional tool, you can make it by scoring a line with a cutting gauge or cutting a narrow groove with a plough plane or a fenced hand router. Then enlarge it to the required width – and with appropriately angled sides – with any plane whose iron extends to the edge of its sole, a rebate plane for example. Alternatively, the notch could be ripped on a tablesaw with the blade angled appropriately.

Such V-blocks are a good general solution for holding shaped or irregular stock. For a guaranteed fit when holding perfectly round stock, bore a hole in a solid block to the same diameter as the workpiece and then saw the bored block in half. The kerf will have removed enough wood so that the two halves, when attached to the auxiliary jaw facings, clamp the workpiece with great security (**FIGURE 19C**).

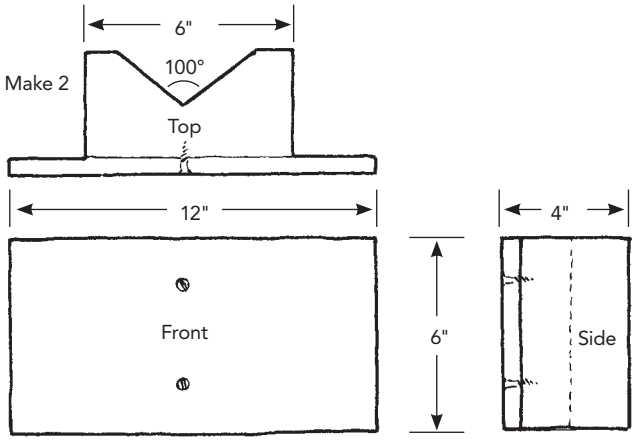


FIGURE 19B: Vertical cradle jaws

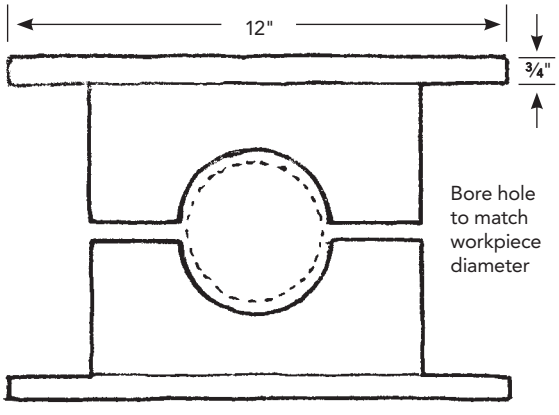


FIGURE 19C: Bored vertical cradle jaws

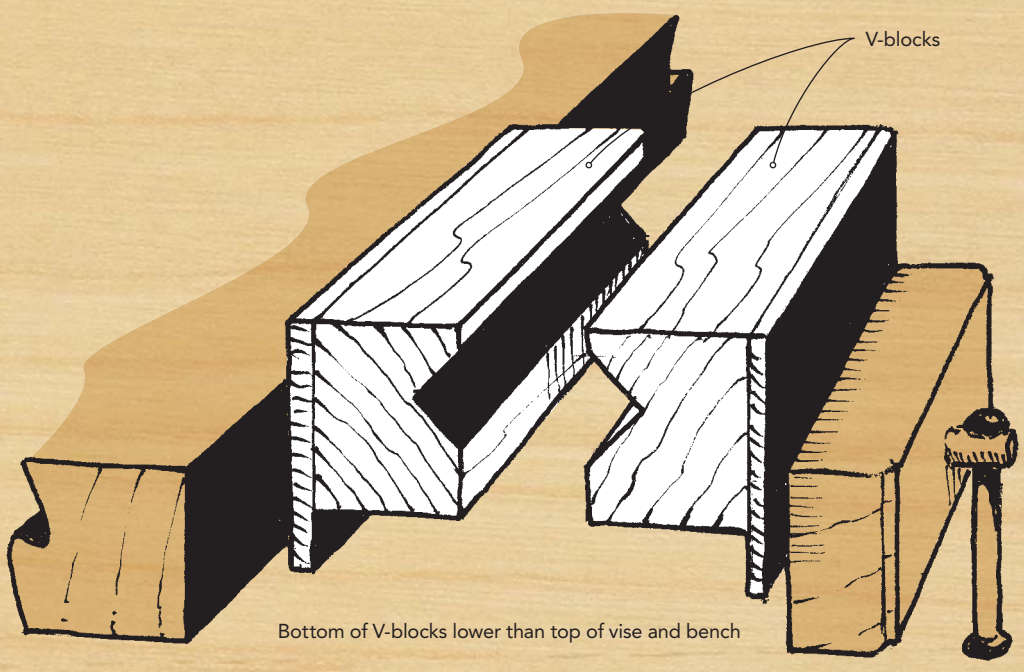


FIGURE 20A: Horizontal cradle jaws

Horizontal Cradle Jaws

To be usefully accessible for planing, sawing, or chiseling operations, it is normally necessary that the upper surface of the workpiece be higher than the top of the bench. Consequently, horizontal cradle jaws need to remain vertically parallel when the vise is closed. One way to do this is by making sure that the bottom of the V-grooved part extends below the level of the top of the jaws (**FIGURE 20B**). Another way is to use them with replacement jaw facings that carry rebated guides so that the lower part is not squeezed and consequently doesn't cause the upper part to open and lose its grip.

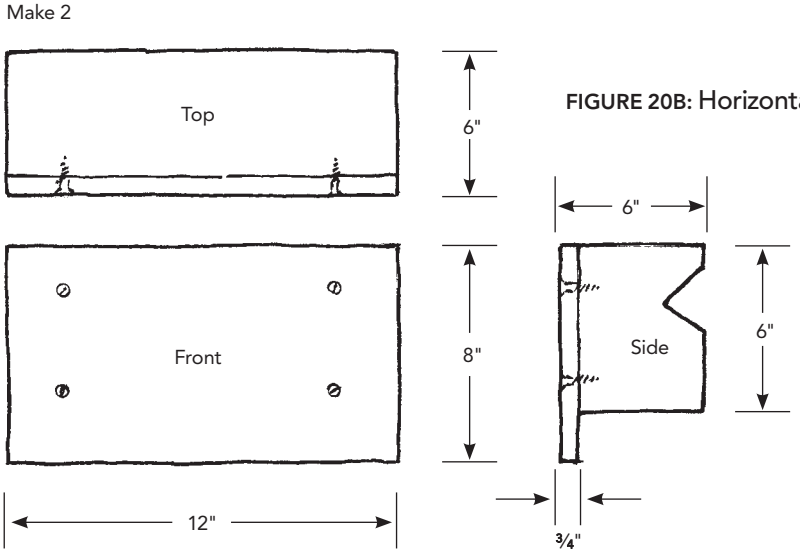


FIGURE 20B: Horizontal cradle jaws

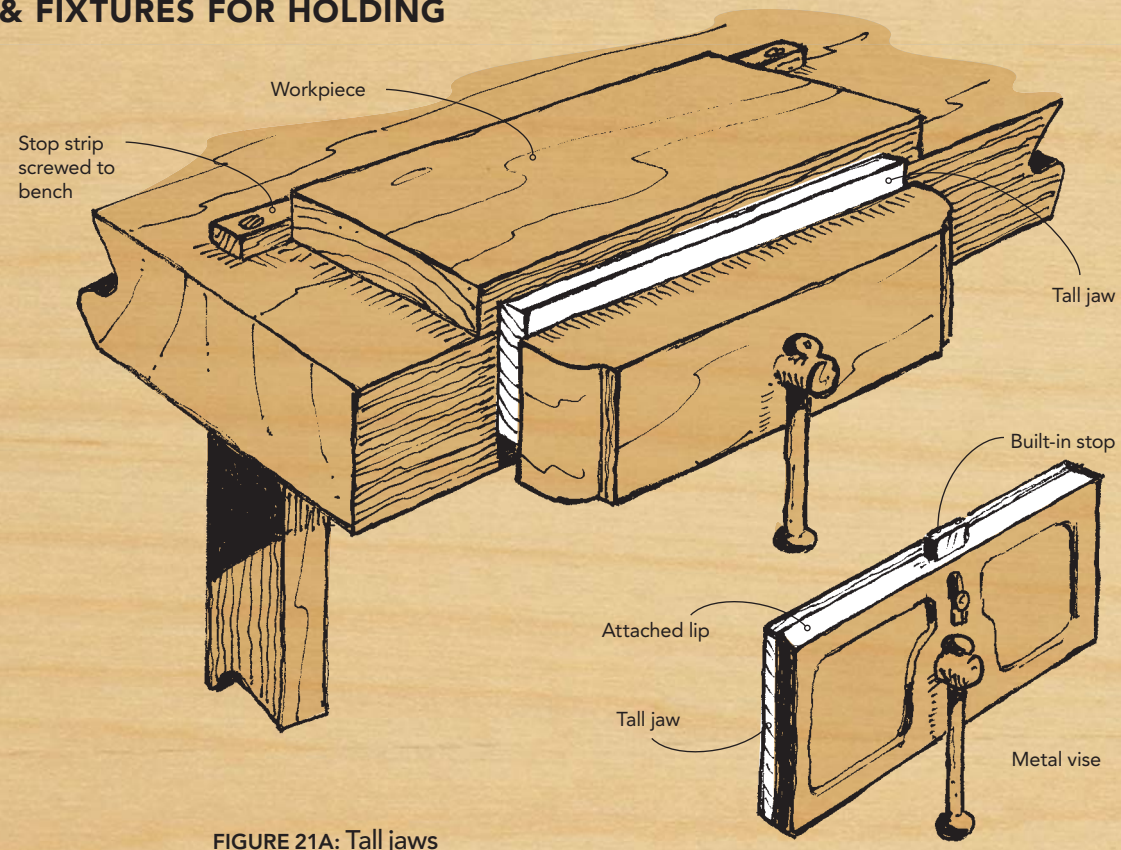


FIGURE 21A: Tall jaws

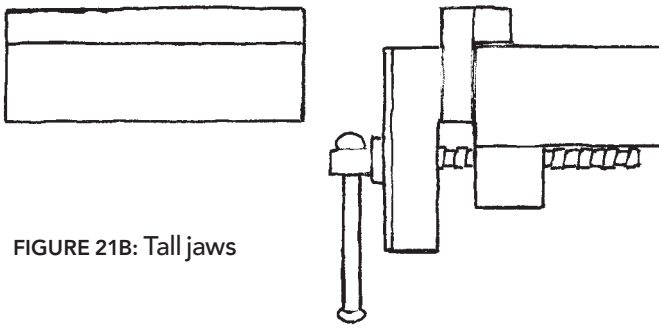


FIGURE 21B: Tall jaws

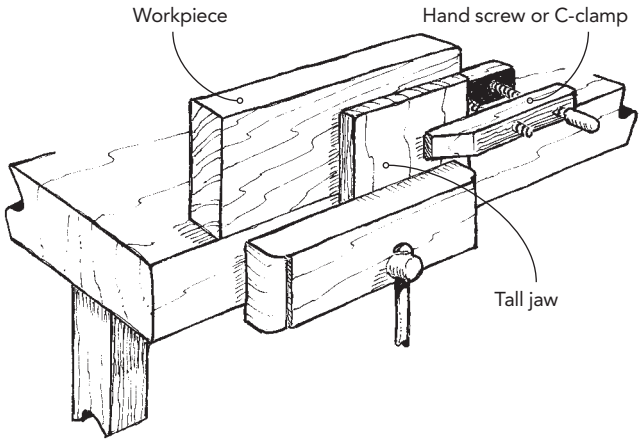


FIGURE 21C: Clamping with tall jaw

Tall Jaws

Some manufactured metal vises have an adjustable depth stop in the outer jaw, but a cabinetmaker's bench usually has wooden vises whose jaws are perfectly flush with the bench top. When dressing the top of such benches to maintain perfect flatness, it is good practice to plane the tops of the (closed) vise jaws together with the bench itself. For such flush-top vises, make an auxiliary jaw as wide as the vise itself, but taller by 1" or so when resting on the vise's guide bars. It can be used like the stop provided in metal vises to secure the workpiece against a stop strip screwed or clamped to the bench (**FIGURE 21A**).

CONSTRUCTION • You can make a tall jaw from almost any board that is wide enough to be higher than the bench top while resting on the vise's guide bars. Alternatively, you can use a narrower board by attaching a lip that rests on the outer jaw or the bench top, also shown in **FIGURE 21B**.

Another way to use a tall jaw is to clamp the workpiece directly to it. This is sometimes more convenient than trying to hold the workpiece either in the vise or on the bench top (**FIGURE 21C**).

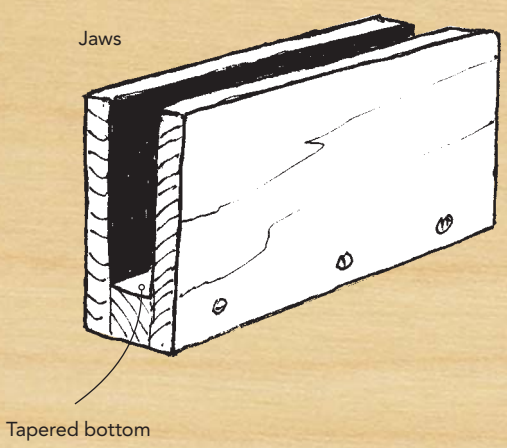


FIGURE 22A: Box jaws

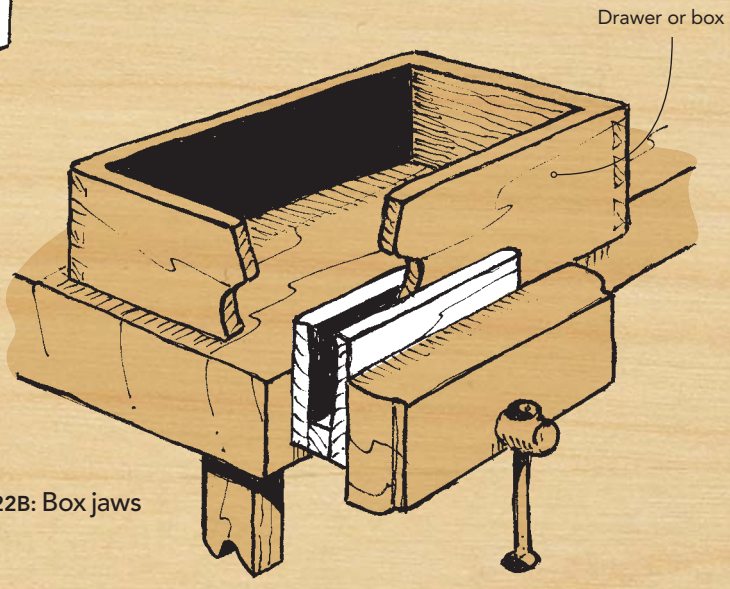


FIGURE 22B: Box jaws

Box Jaws

When you want to plane the top or bottom edges of a partially assembled box or drawer, it is not always possible to secure the box between bench dogs. A better method is to clamp one of the sides between box jaws which, being slightly tapered and standing proud of the bench top, secure the whole assembly without risk of deformation (**FIGURE 22B**).

CONSTRUCTION • Start by preparing a length of stock the same thickness as the box or drawer sides to be held in the jaws. Plane a very slight angle on both sides of this piece so that when you attach the jaws to it they are further apart at the top than at the bottom. This will ensure that when you close the vise, the jaws will grip the workpiece tightly. For this device to work it's important for the jaw material to be stiff enough to not deflect under pressure. Use wood with the grain running vertically, or make the jaws from ¾"-thick plywood.

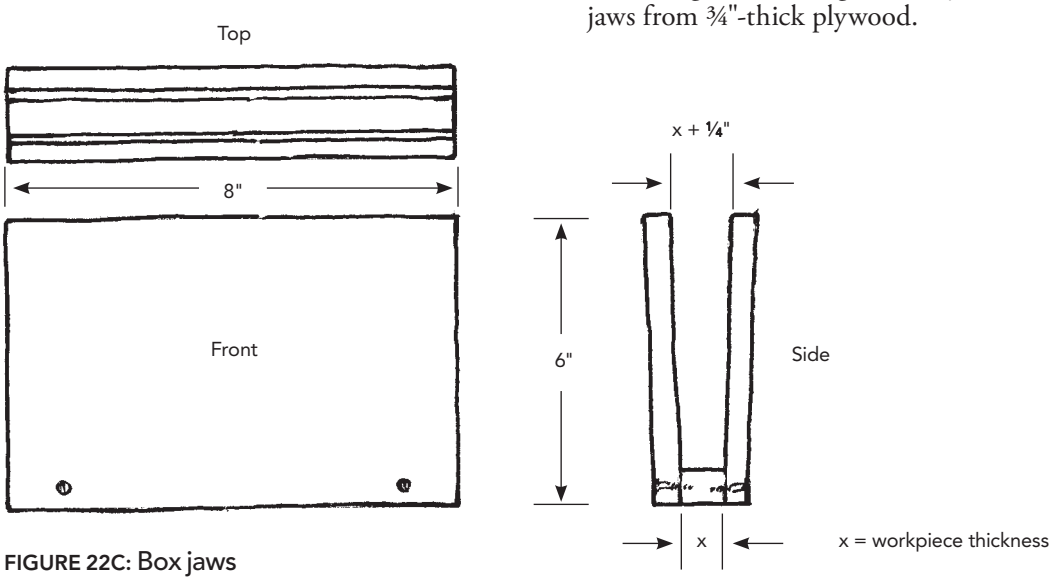


FIGURE 22C: Box jaws

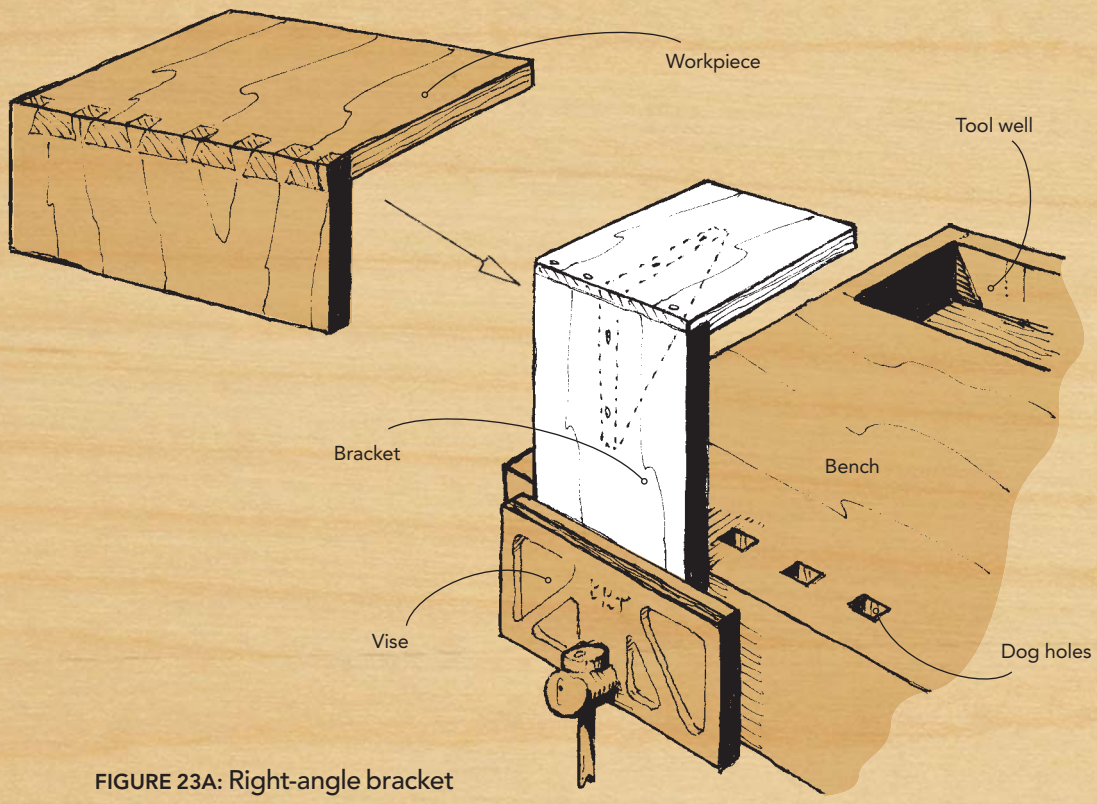


FIGURE 23A: Right-angle bracket

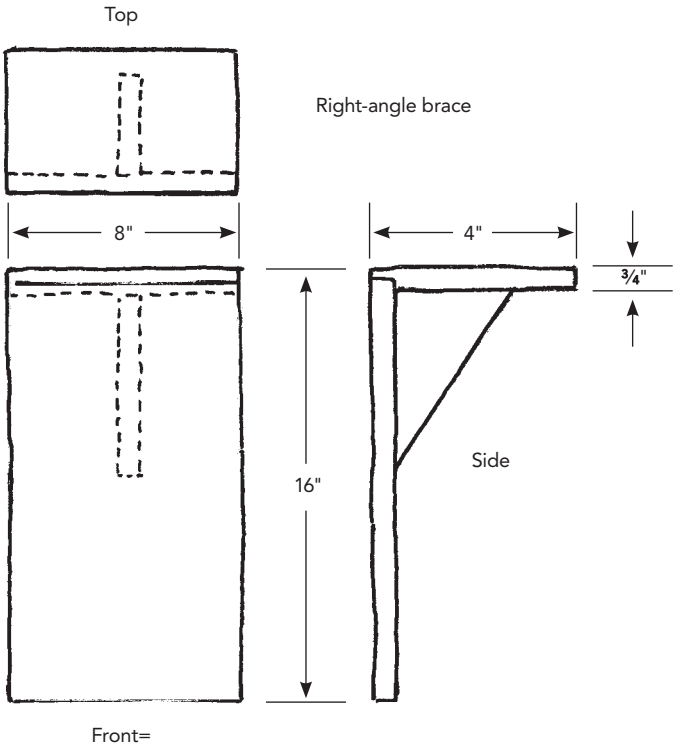


FIGURE 23B: Right-angle bracket

Right-Angle Bracket

It's not always easy to precisely position two workpieces for marking out. One good way is to clamp the workpieces to an exactly made right-angle bracket held at the required height by the vise. The right-angle bracket shown in **FIGURE 23A** is quite similar to the coping or fret saw bracket shown in Chapter 3 and one can double for the other.

If made large enough, such a bracket will greatly improve your ability to lay out dovetails by saving you from having to balance one piece atop the other. To position both pieces accurately and securely, clamp the workpieces to the bracket and use the side of the bracket to align their their conjoined sides.

CONSTRUCTION • Make the bracket from two boards about 8" wide joined together at an exact right angle. The vertical board should be twice as long as the horizontal board. To guarantee and maintain the perfect right angle, glue an exactly cut right-angled brace in the center of the joint.

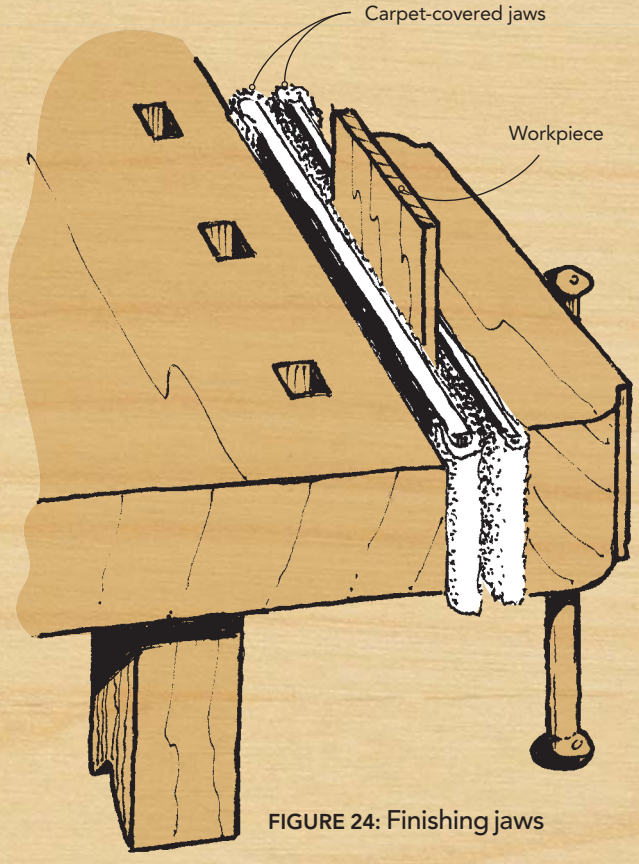


FIGURE 24: Finishing jaws

Finishing Jaws

You'll find a pair of finishing jaws useful for securing finished workpieces without fear of damage to their surfaces. Make the jaws from a pair of boards somewhat larger than the jaws of your vise, covered with soft material such as felt, old but clean toweling, or carpet (**FIGURE 24**).

CONSTRUCTION • It is best to attach the protective material to one side only of the jaws. If the material wraps around the ends, be sure that the center of the finishing jaws are not able to deflect, or the workpiece may not be held securely.

Carpet or other protective material may be quickly attached with small tacks or staples to the back of the jaws as shown, with double-sided tape to the front, or if you have little intention of replacing it, with an adhesive suitable for gluing fabric to wood.

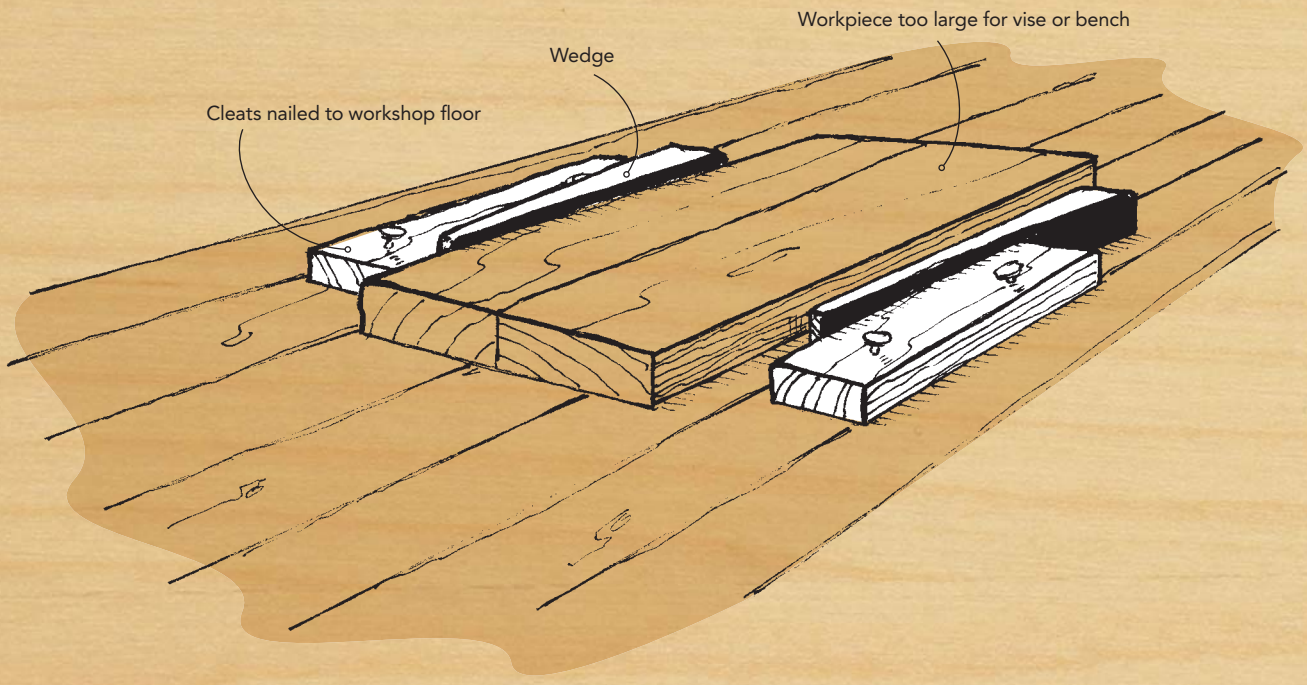


FIGURE 25 : Floor clamp

Floor Clamp

Bodgers and chairmakers used a floor clamp when working on seats with a long-handled adze. This holding method is perhaps most useful for old shops in rough sheds or barns than for modern buildings with finished floors. But there are situations where it is the only thing that works.

The fixture consists of two stout cleats securely nailed to the wooden floor, between which the seat blank could be wedged.

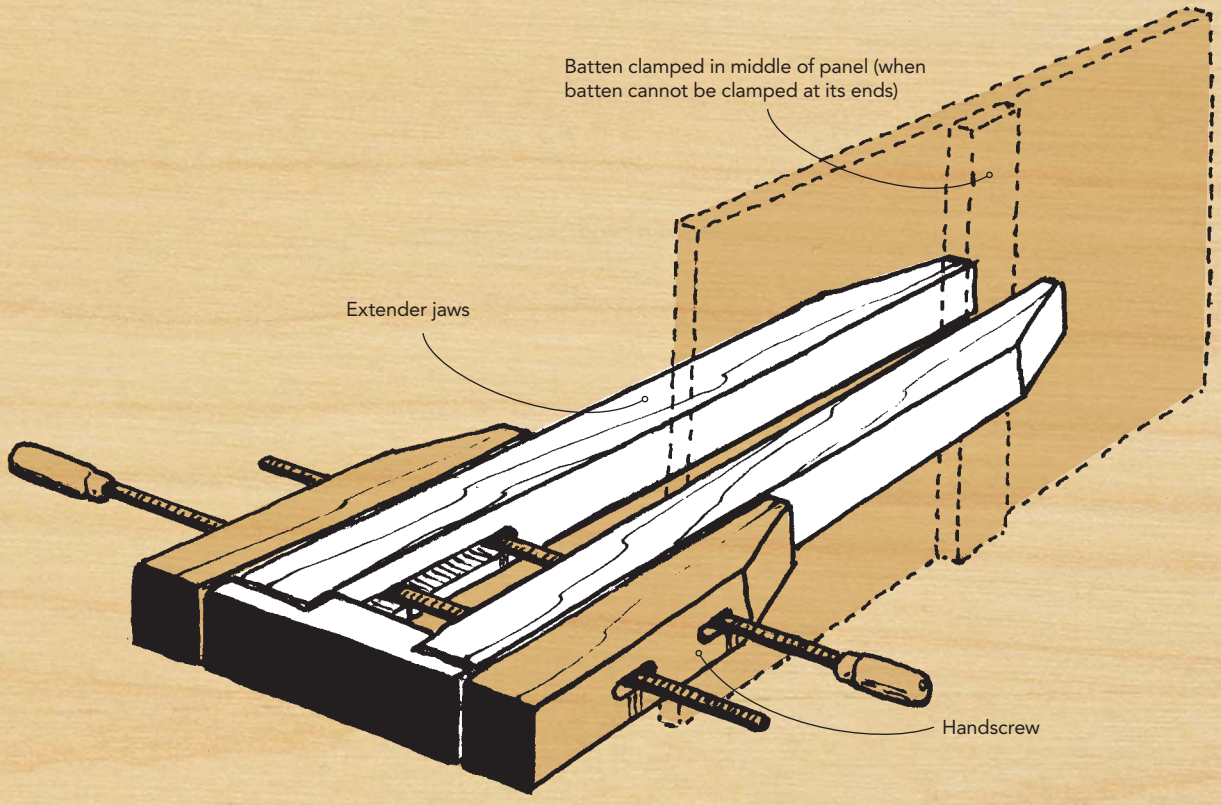


FIGURE 26A: Jaw extender (shown in use)

Handscrew jaw extender

Wooden handscrews are available in various sizes, but unless you are lucky enough to locate an antique tool or are prepared to make your own you will be limited to the modern Jorgensen™ variety with metal screws. While these have the great advantage of strength and the ability to be used with their jaws positioned other than parallel to each other, and furthermore rarely sustain damage to the screws themselves, they can seldom be found with jaws larger than 10" For those occasions where a deeper reach is needed, and when something needs to be clamped at a distance greater than 10in. from its edge, a jaw extender is necessary.

CONSTRUCTION • Two jaws, made to exactly the same width as the jaws they are to extend (in order to prevent any uneven obstruction), and made approximately 2' in length, and finished tapered at their end like the original jaws, are attached by loose screws to a rabbeted center piece about 6" wide. The screws are inserted so as to allow a small amount of sideways movement in order to accommodate the changing angle at the tip of the jaws when in use.

The jaw extenders are fitted over the back end of the handscrew by having the ends of the extra jaws slotted so that they may pass over the metal screws holding the jaws together. Their ends are then attached to the rabbeted ends of the center piece. Just as for the original handscrew, the material used for the jaw extenders should be straight-grained hardwood, such as maple, for optimum strength.

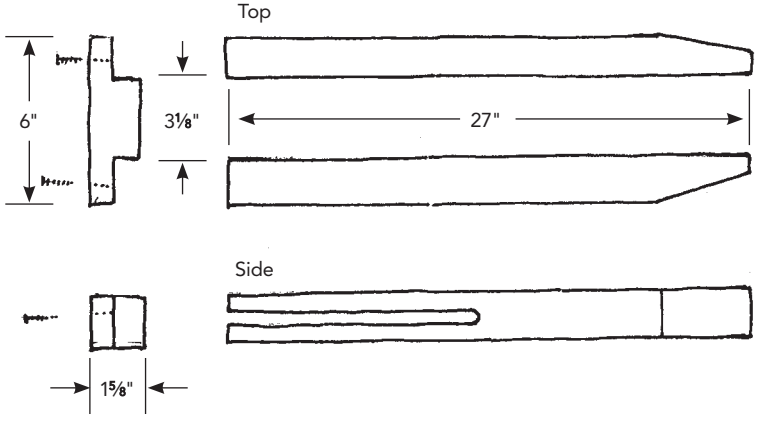


FIGURE 26B: Jaw extender (dimensions and parts)

2

The user-made grasshopper gauge marks a cylinder held in a V-cradle.

CHAPTER 2

JIGS & FIXTURES FOR MEASURING & MARKING

The first operation in most projects generally involves getting out the stock. This typically requires measuring and marking pieces to be sawed or cut out into the various parts, and then testing each piece for shape and size. Flatness, straightness and adjacent surface relationships all need to be checked. For many contemporary woodworkers the tape measure is the chief aid in all this. However, for really fine furniture making, the traditional wooden folding rule is far superior to the tape measure. The reasons why are many, ranging from greater accuracy to additional uses not possible with a metal tape.

For a start, you can use a sharp marking knife or scratch awl to make a precise mark on the workpiece by taking advantage of the incised graduations on a wooden rule. This guarantees greater accuracy than trying to transfer a mark from a tape measure, whose printed markings may themselves be up to a sixteenth of an inch thick. This is not to mention the risk that the hook at the end of the tape (designed to slide to permit inside and outside measurements) is typically worn and no longer accurate. The rule is easier to hold diagonally across a workpiece, it can be used as a depth gauge, or it can be used as a bevel to mark angles – some folding rules have the knuckle joint graduated in degrees for this purpose. Some folding rules are even equipped with a built-in bubble, so they can be used as a level. All of this further illustrates the fact that many traditional hand tools are themselves jigs and fixtures designed to facilitate better woodworking.

Despite the demonstrable superiority of the wooden rule, marks and measurements derived from the clumsy system of inches and feet (and from the superior metric system), although indispensable for gross overall measurements, are not as convenient nor as reliable as marking one piece from another. Many traditional jigs and fixtures ensure accuracy by relying on this kind of relative measure rather than absolute measure. Marking one piece from another is invariably less prone to error than trying to calculate, for example, a third of 14 5/16"! When you use the width of a tenon to mark directly the width of its future mortise, regardless of its actual measurement in fractions of an inch, you will be practicing a form of traditional woodworking that is easier and more accurate than relying on tape measures or calculators.

Although toolmakers are forever enlarging their catalogs with new and improved additions, a number of items that might be thought of as tools must still be user-made, and which therefore qualify as jigs or fixtures. One such group of aids belongs under the heading of gauges used to measure and mark the workpiece.

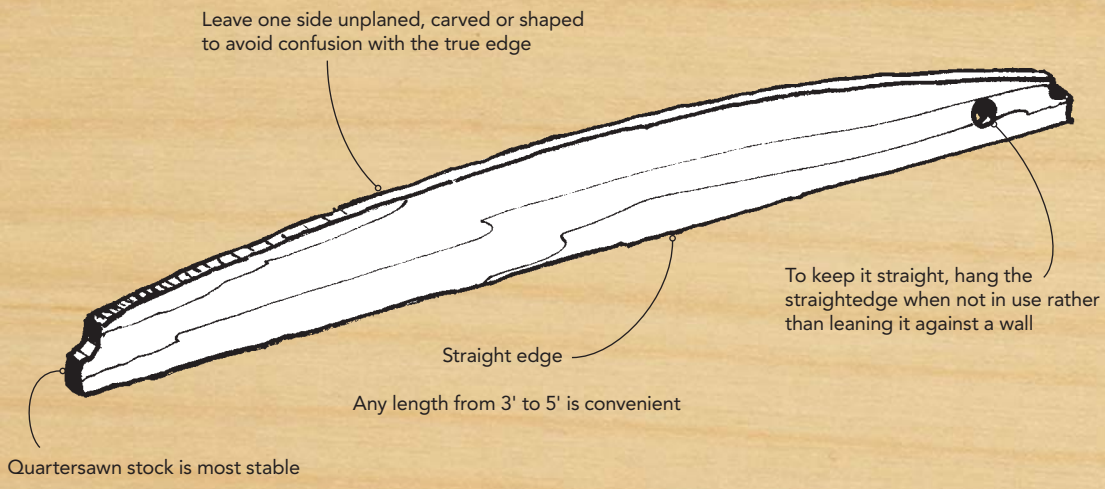


FIGURE 27A: Straightedge

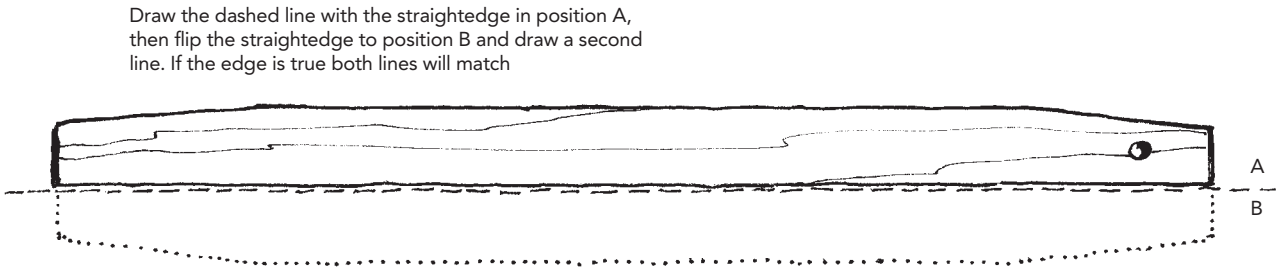


FIGURE 27B: Testing a straightedge for truth

Straightedge

One of the simplest items you can make is a straightedge longer than the typical wooden or metal rule. It is not necessary to graduate it nor indeed make it to any particular length. Anything from 3' to 5' will be of great use in laying out straight lines for sawing and planing. Straight-grained quartersawn hardwood, planed or machined accurately on one edge, will last longest. Shape the back edge to make it obvious which edge is the straight one (**FIGURE 27A**).

Your shopmade straightedge should be checked frequently for accuracy. To check its truth, simply draw a line against the straight side then flip the straightedge over and draw another line. If the straightedge is true the lines will coincide (**FIGURE 27B**). To keep it true longer, varnish or paint it, and hang it up when not in use rather than leaning it against the wall.

Use two straightedges as pinch rods to take an internal measurement

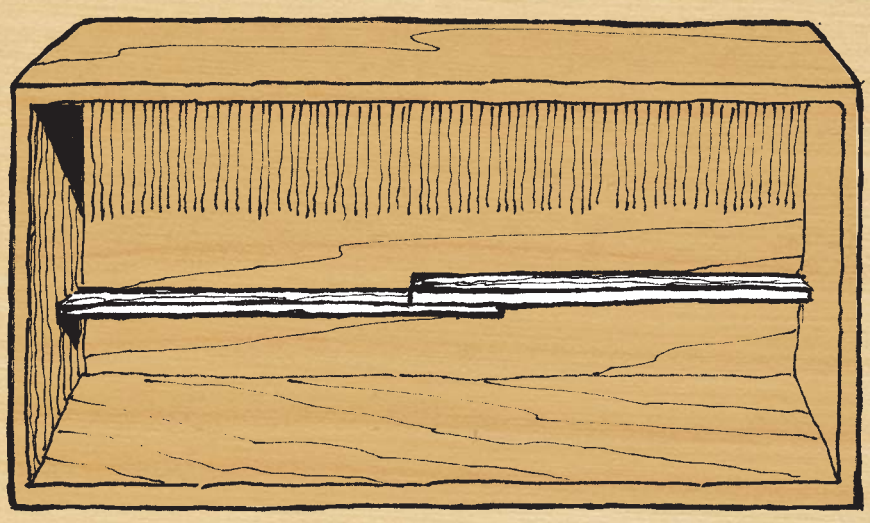


FIGURE 28A: Pinch rods

Pinch Rods

Inside measurements are always tricky. The sliding hook on the tape measure is a problem, as is the thickness of its case. For an absolute measurement, pinch two overlapping lengths of wood together and extend them to fit in the inside the space. Then mark and measure the overlapping rods to get an absolute length without any guesswork.

CONSTRUCTION • Two straightedges (or any other pair of convenient lengths of wood) held together may be used as pinch rods to take an internal measurement, as shown in **FIGURE 28B**. Most shops have plenty of suitable scrap for making pinch rods. To keep them handy, bore a hanging hole in the end of each rod.

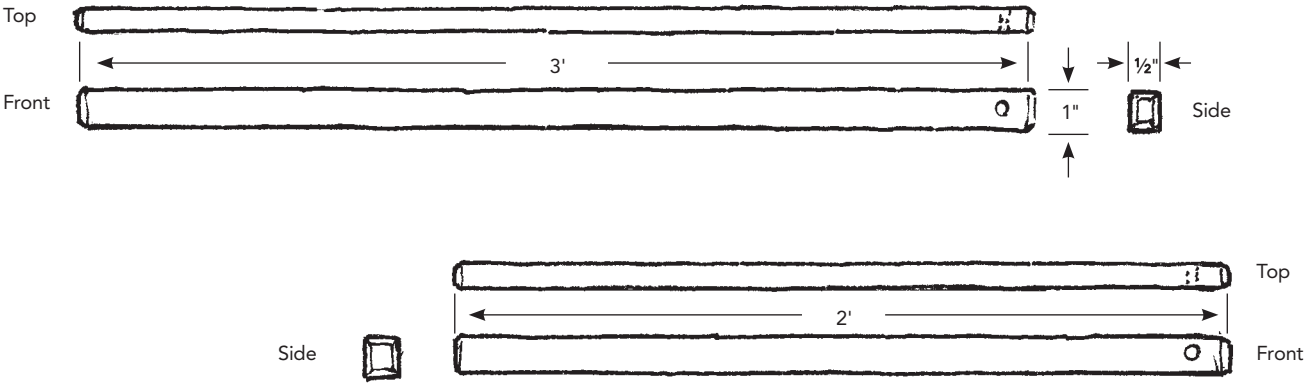


FIGURE 28B: Pinch rods

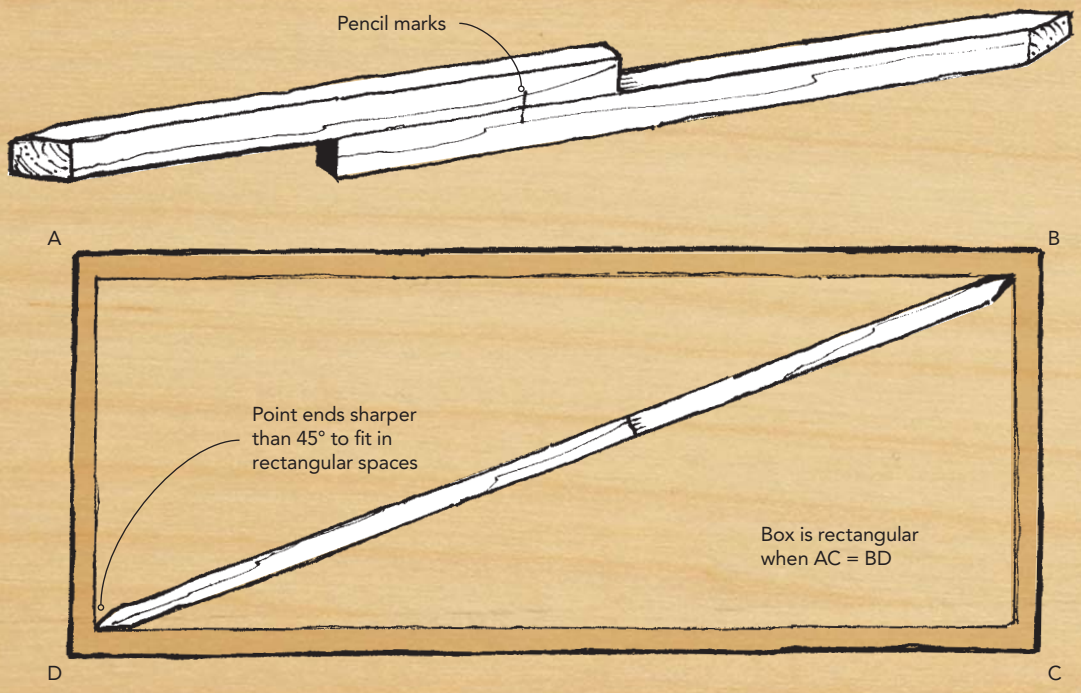


FIGURE 29A: Diagonal strips

Diagonal Strips

A slight modification can turn a pair of pinch rods into a gauge for checking the rectilinearity of carcases, chests or boxes. Boxes with square corners have equal diagonals, whereas rhomboidal constructions do not. Checking the length of diagonals with pinch rods is much easier than trying to measure them with a tape or rule. Make the ends of the pinch rods pointed so that they fit into corners. (**FIGURE 29A**).

For exact measurements the rods should be held one on top of the other and not side by side. When they are fully extended into opposite diagonal corners, draw a line across both sticks. If the object being tested is perfectly rectilinear, this line will still be continuous when you place the rods into the two opposite corners.

CONSTRUCTION • Point the ends more sharply than 45°. If the ends are pointed at 45° they will only fit into the corners of a square; for other rectangles the ends need to be pointed more sharply. Rather than marking directly on the wood, place a small (and easily replaceable) piece of masking tape over both strips.

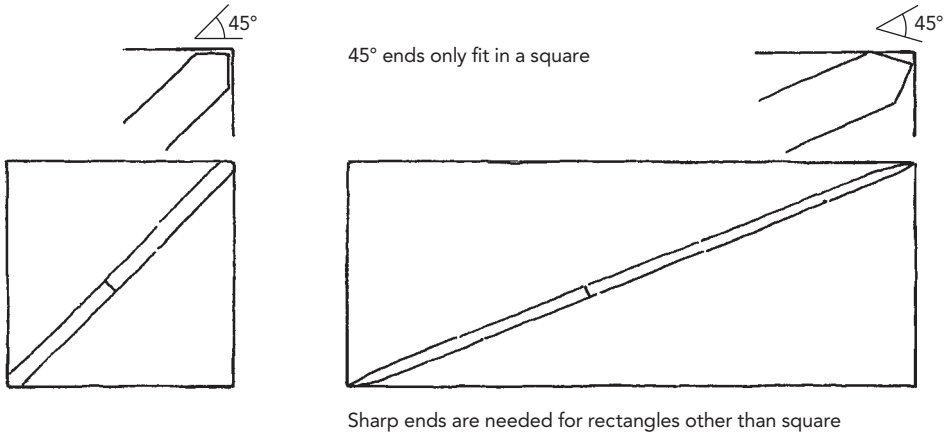


FIGURE 29B: Diagonal strips

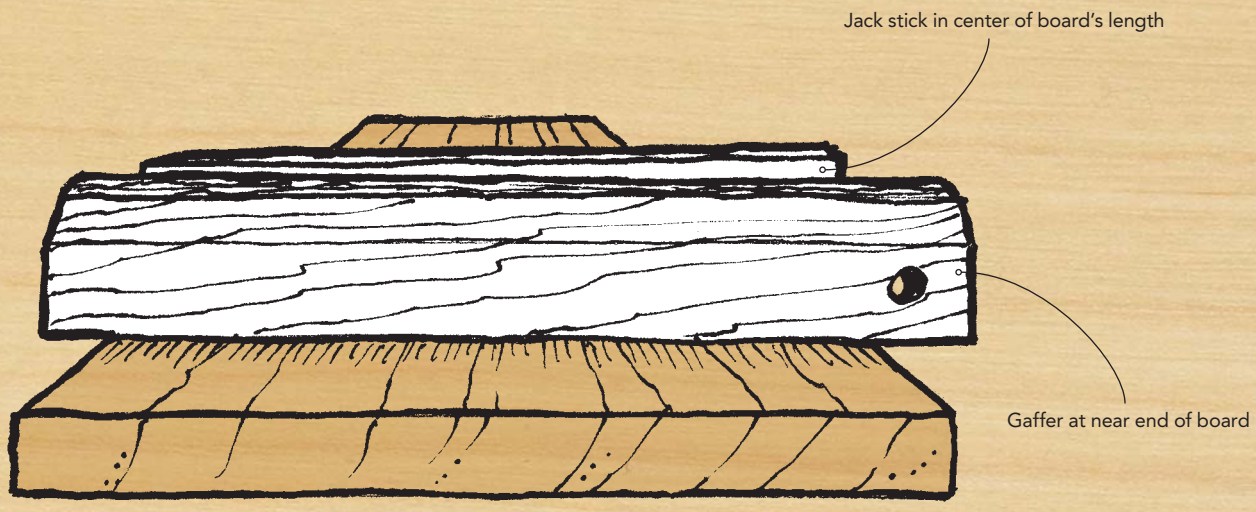


FIGURE 30A: Winding sticks

Winding Sticks

If you have a flat work surface, such as an accurately dressed bench top, it is easy to check whether a board is flat simply by placing it on this surface and seeing if it touches at all points, or if it rocks. But it is not so easy to mark the exact spots where it is a little high or a little low, or to gauge which is the twisted end. What you need is a pair of winding sticks, so-called because they can be used to check not only whether a board is perfectly flat but also whether it is twisted or "in winding."

Place the first stick, known as the gaffer, at the near end of the board and place the other – called the jack – at the far end. When you sight across the top of the gaffer, if the top of the jack appears perfectly parallel to it, the board is straight (**FIGURE 30A**).

Similarly, to discover whether the surface of your workpiece is truly flat, place the sticks parallel to each other and some distance apart at different spots on the workpiece, and sight across the top of one to the other.

In most testing we assume that the workpiece is perfect where the gaffer rests, with the jack demonstrating any imperfection elsewhere. Therefore it is the surface of the workpiece immediately beneath the jack that needs adjusting, usually by planing material away until the tops of the sticks are indeed parallel. Occasionally, however, you might want to use the jack to locate the basic reference point somewhere other than at the end where the gaffer normally resides. In that case, adjust the workpiece beneath the gaffer.

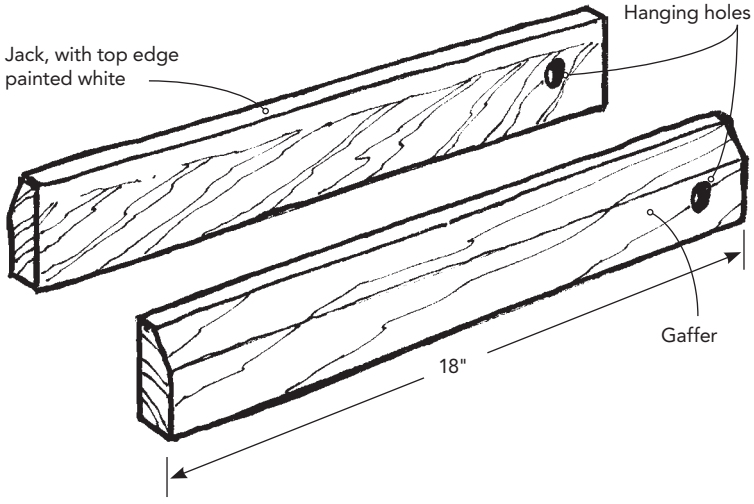


FIGURE 30B: Winding sticks

Yet a further method of using winding sticks to correct winding is to plane a narrow rebate at the near end of the board, making sure that this rebate is perfectly flat and true in relation to the already flattened nether side of the board. Place the gaffer on this spot now established as the datum point before proceeding.

CONSTRUCTION • Make winding sticks from two similarly-sized straightedges about 18" long. Make them thick enough to be stood on edge and bevel their top edges as shown in **FIGURE 30B**. To make sighting easier, paint the top of the jack white so the gaffer stands out against it.

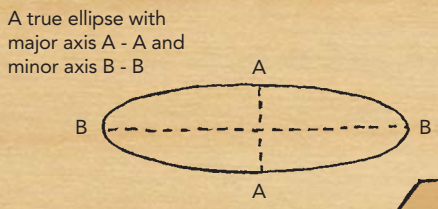
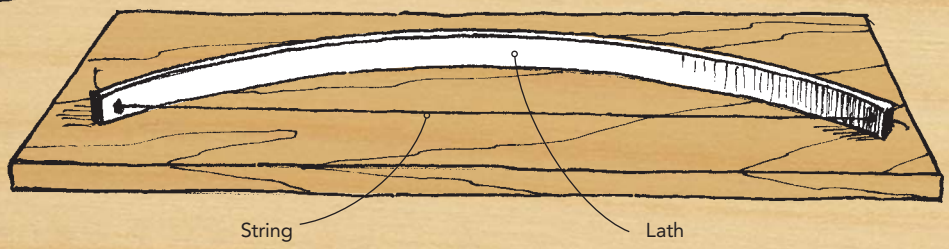
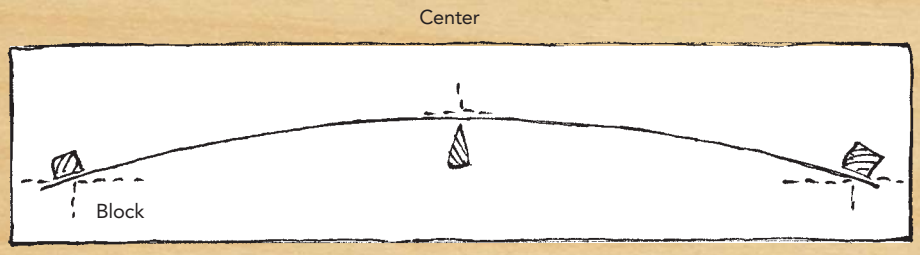


FIGURE 31: True ellipse





For a centered and regular curve, scure the straightedge against blocks fixed to the workpiece

FIGURE 32: Flexible straightedge

Flexible Straightedge

As professional designers know, for a harmonious design all the parts and proportions should relate in some way to one another. This includes curves, which can be exactly designed only if their major and minor axes are known (**FIGURE 31**). The axes can be derived geometrically, but if all that you require is a smooth curve, without regard to relationships with other dimensions, then all you need is a thin lath. Use it to form a fair shape by bending it to the estimated steepness and hold it in place either by a string connecting the ends or with nails or blocks placed on the workpiece. To ensure a fair curve, use a lath or strip of wood of uniform thickness and with as even grain as possible (**FIGURE 32**).

Asymmetrical Flexible Straightedge

Working by trial and error, you can make a lath follow most asymmetrical curves by planing one end thinner than the other. If you require some precise curve such as might have been derived from a tilted ellipse or a parabola or catenary, you might have to begin by geometrically ascertaining the curve on paper, which procedure somewhat undermines the rough and ready quickness of the lath method (**FIGURE 33**).

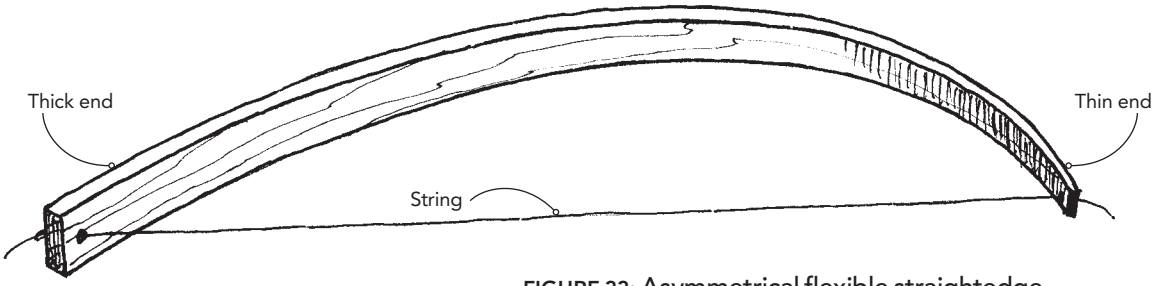
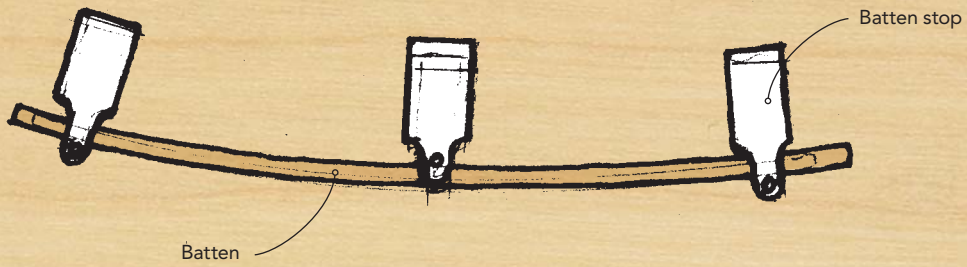


FIGURE 33: Asymmetrical flexible straightedge



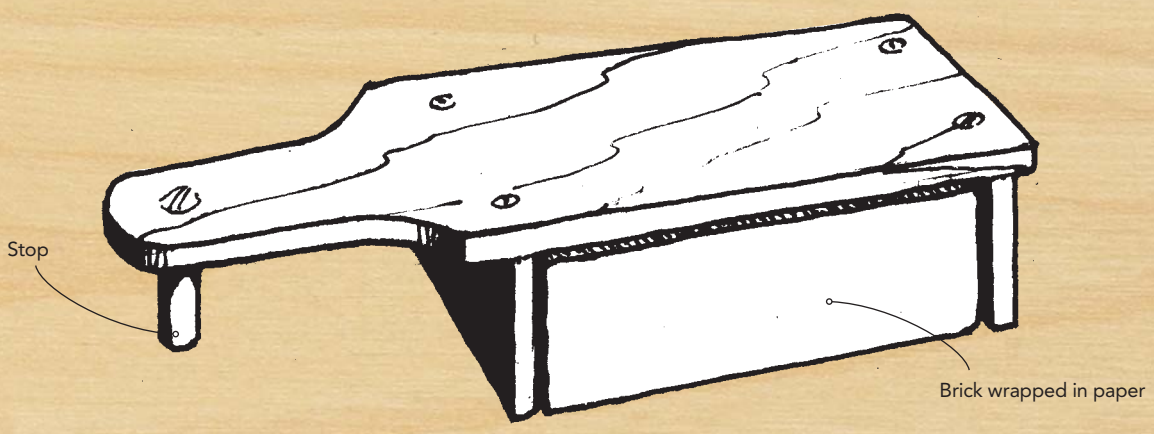


FIGURE 34A: Brick batten stop (three stops in use)

Brick Batten Stop

Self-supporting pivot points can be a convenient way to bend thin strips such as battens into required curves, instead of clamping or nailing such points to the workbench. A short board provided with a pivot point at one end and two stops designed to hold a regular brick will suffice. They are usually used in threes – one at each end of the workpiece and one at the high point of the required curve. For a symmetrical curve, the high point will be in the middle of the batten's length; for an asymmetrical curve, the high point will be somewhere off-center. You can position the stops to produce any degree of steepness, until they begin to move the bricks. Such movement indicates that the curve is too steep for the batten.

CONSTRUCTION • Use three identical bricks to ensure equal resistance against the workpiece. Wrapping the bricks in sturdy paper helps keep things clean, but may increase the likelihood of slipping. A length of ¾" dowel fixed in the end of the stop forms the pivot point, as shown. Make the dowel long enough to span the full width of the bending batten.

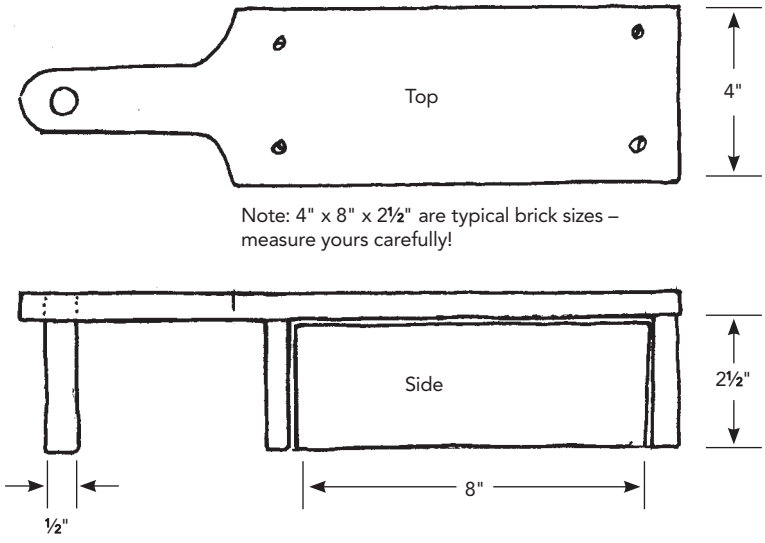


FIGURE 34B: Brick batten stop (dimensions)

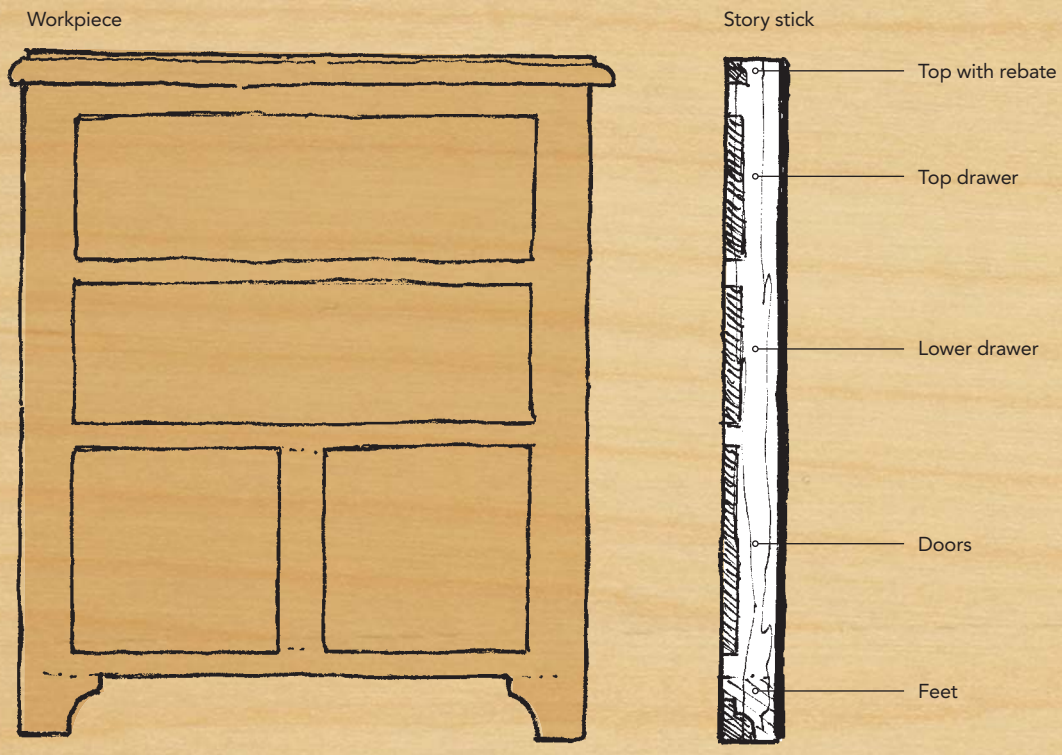


FIGURE 35: Story stick

Story Stick

The story stick is familiar to carpenters who sometimes use one to check the relative positions of window and door openings and different siding elements. However a story stick also can be extremely useful to a woodworker laying out shelves, drawers and mouldings, especially where these things are repeated. The story stick is essentially a custom-graduated rule indicating the relative position of the elements of interest. Its advantage is that exact dimensions need only be measured and marked on the stick once. Then you can lay out the same dimensions on the workpiece as many times as needed, knowing that errors will not occur (**FIGURE 35**).

The woodworker who repeats pieces rather than constructing new designs with each commission will naturally want to keep story sticks carefully labelled and referenced for future use. For large or complicated pieces where a lot of details may need to be noted, use adjacent sides of the stick to separate specific elements, such as keeping vertical dimensions on one face and horizontal details on another. However, the story stick is seldom the most efficient method of indicating joint details, which are more usefully drawn full size.

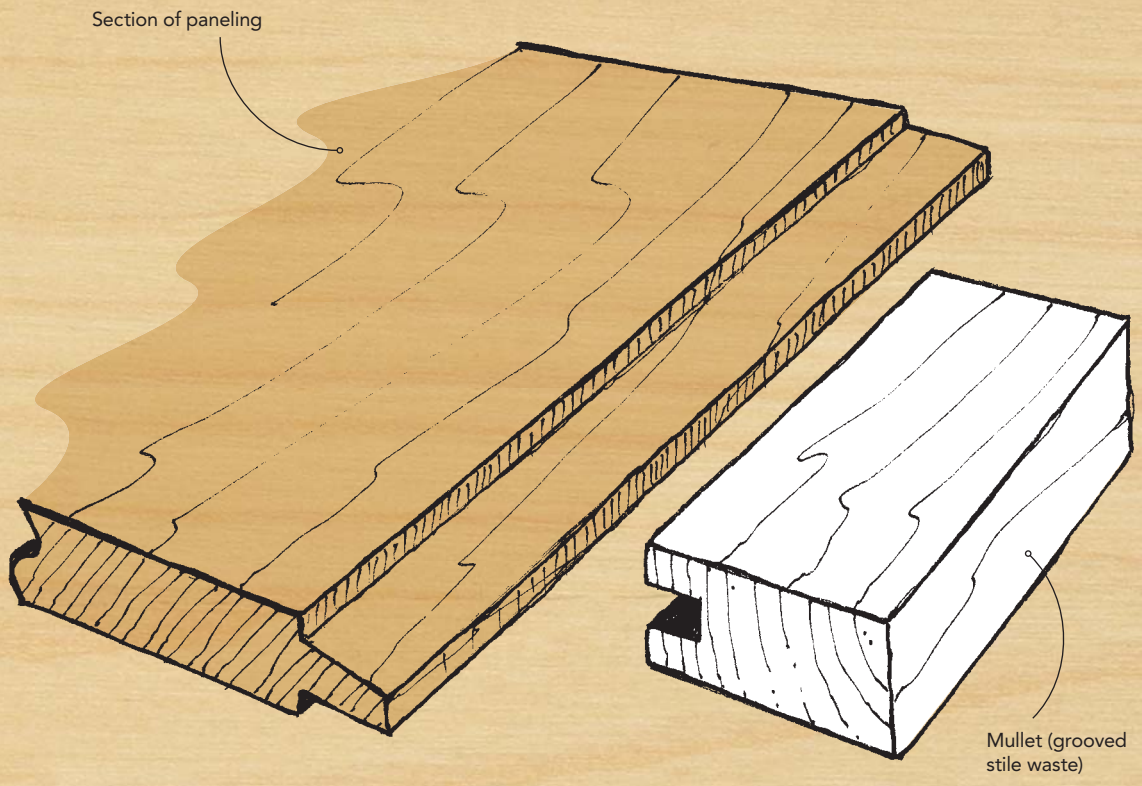


FIGURE 36A: Mullet

Mullet

When you're making panels to fit grooved framing, use a mullet to make sure the panel edges will be a good fit. Running the mullet around the edges of the panel before assembly is a quick way to ensure that the panel edges have been properly thicknessed and will, in fact, fit comfortably into the framing (**FIGURE 36A**).

CONSTRUCTION • A mullet is usually formed from the cut-off end of a grooved framing member, such as a rail or stile, where the groove runs out the end. If you make the mullet from something other than a piece of the actual grooved framing, be sure to note the exact shape of the tongue formed on the panelling that is intended to fit in it. Unless the panel has a parallel edge, make sure that the mullet's groove is wide enough to accommodate the thickest section of the bevel that may enter the groove when the panel is at its widest stage of seasonal expansion.

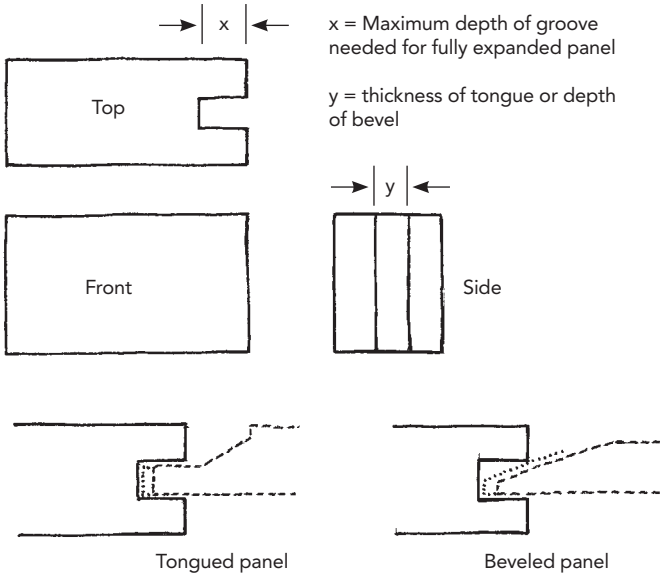
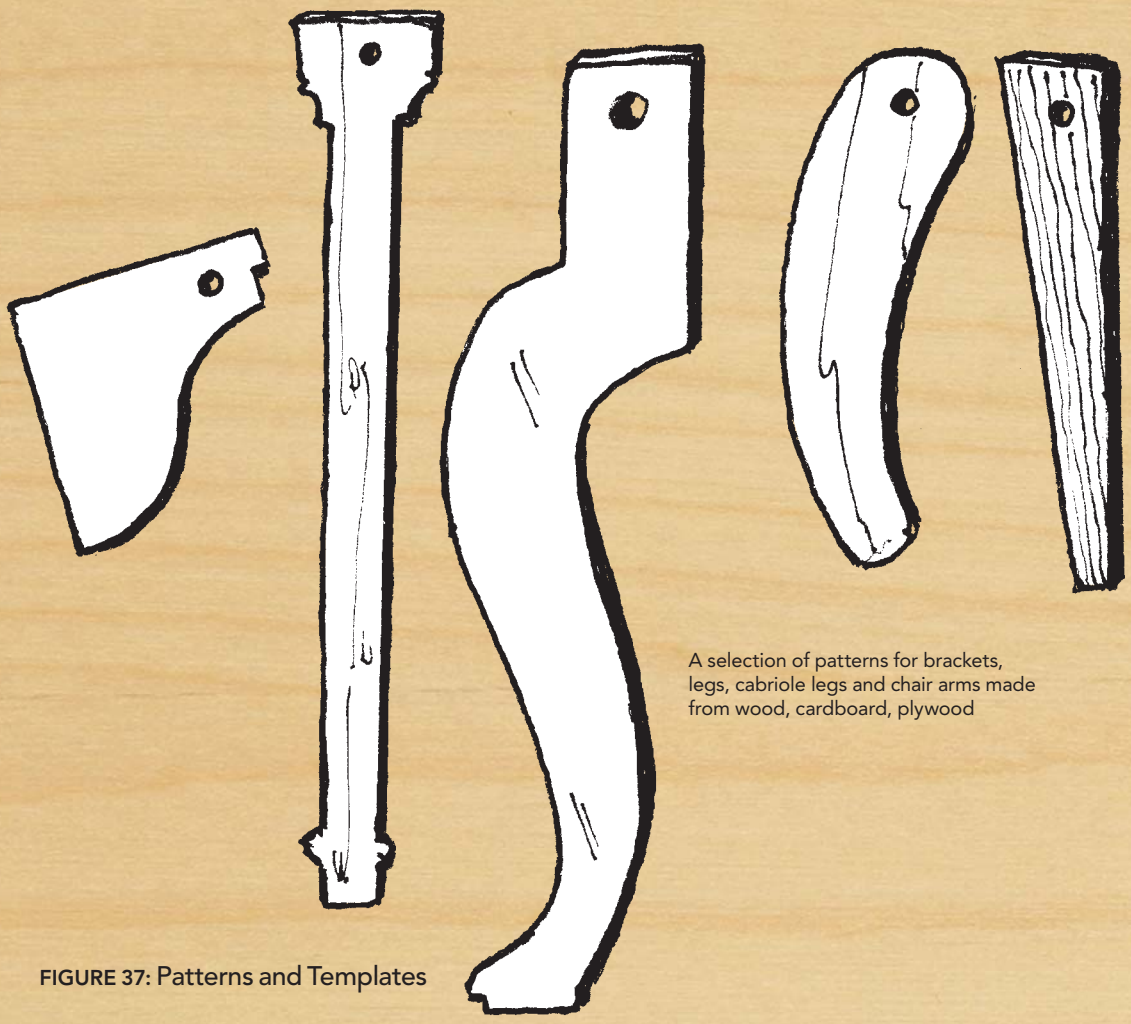


FIGURE 36B: Mullet



A selection of patterns for brackets, legs, cabriole legs and chair arms made from wood, cardboard, plywood

FIGURE 37: Patterns and Templates

Patterns and Templates

The best examples of using a jig instead of repeatedly measuring something are, of course, patterns and templates. These may range from full-size cut-outs of chair backs and cabriole legs to something as small as a paper cut-out of a single dovetail. You can make patterns and templates from wood, cardboard, plastic, MDF or plywood.

Even if your woodworking primarily involves making one-of-a-kind pieces, keep any patterns or templates that you may develop. They'll be very useful when you are developing new but similar projects. To this end it is a good idea always to label patterns and templates with relevant details about what it was used for, and when (FIGURE 37).

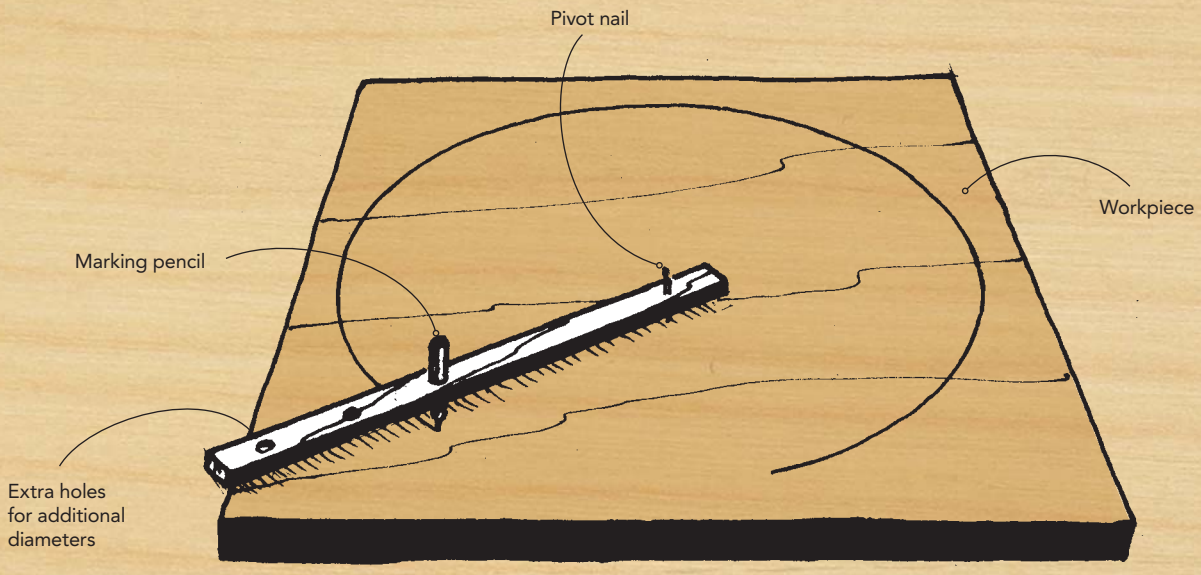


FIGURE 38A: Beam compass (in use)

Beam Compass

The beam compass allows you to describe and lay out large circles or segments of circles. The actual beam may be nothing more than a length of wood not much longer than the required radius. Fit a centering nail at one end and a pencil through a hole at the other.

CONSTRUCTION • The actual beam may be provided by almost any length of wood, provided it is relatively straight and rigid. Use something rectangular in cross-section and bore the small hole for the nail at one end, and the larger hole (or holes, for different radii) for a pencil at the other end.

A store-bought alternative would be a pair of trammel points. Trammels are sharp metal points attached to a body that is designed to slide along the beam – which of course must be of a dimension to accept the trammels.

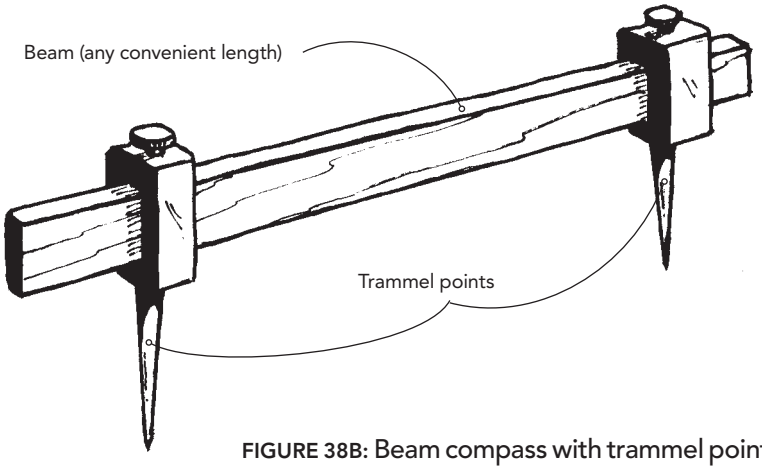


FIGURE 38B: Beam compass with trammel points

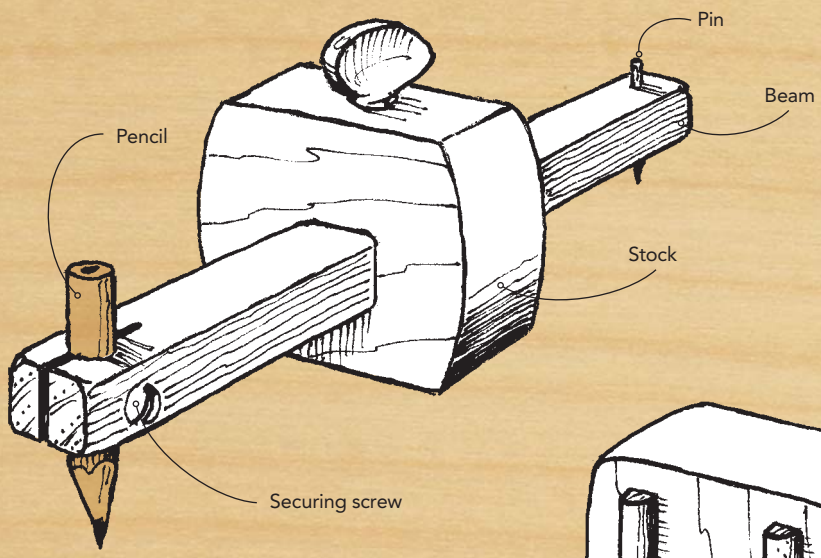


FIGURE 39: Pencil gauge

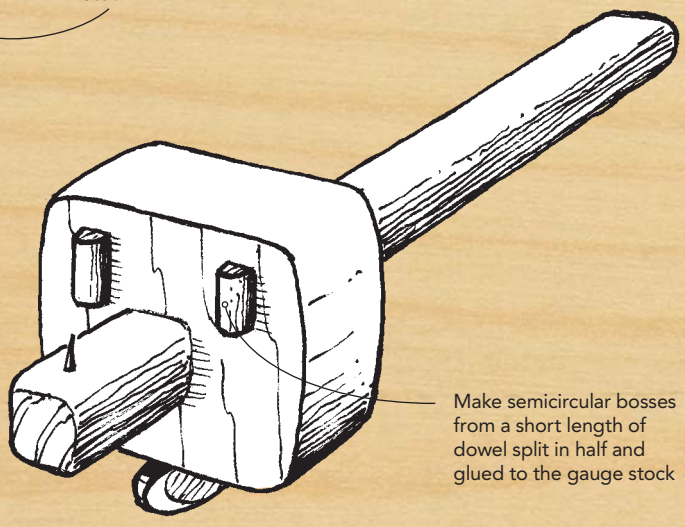


FIGURE 40A: Bossed curve-gauge

Pencil Gauge

A pencil gauge is sometimes more convenient than a regular marking gauge with a pin that leaves a scratched line on the workpiece. While it is not too difficult to make a dedicated pencil gauge along the lines of a standard marking gauge, a quicker solution is simply to modify the marking gauge. Bore a pencil-sized hole in the other end of the beam from the pin, saw a slot from the end of the beam into the hole, insert a pencil into the hole and secure it with a screw from the side (**FIGURE 39**).

Bossed Curve-Gauge

The standard marking gauge is used by holding and guiding the flat stock or head against the edge of the workpiece. This works fine so long as the surface of the workpiece also is flat. However, when you need a marked line at a consistent distance from a curved surface, it can be difficult to keep the pin (or pencil) perfectly tangent to the edge. The solution is to add two bosses or protrusions to the head, spaced equally from the centerline (**FIGURE 40A**). The bosses will bear on the workpiece, keeping the gauge correctly positioned.

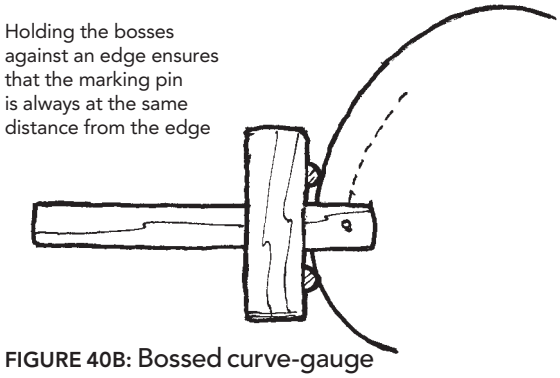


FIGURE 40B: Bossed curve-gauge

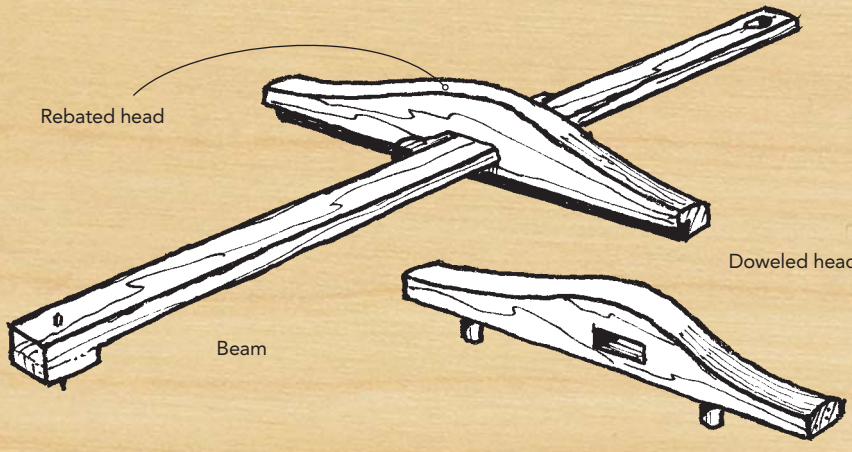


FIGURE 41A: Doweled curve-gauge

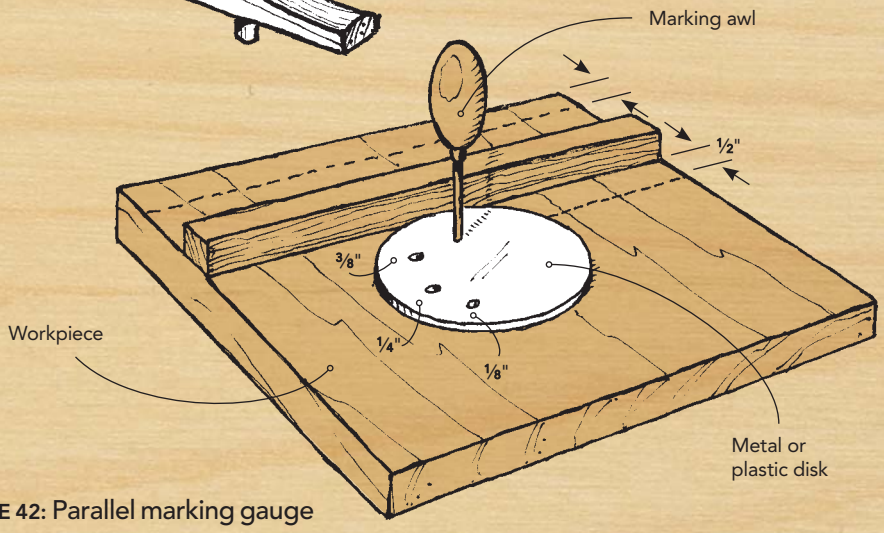


FIGURE 42: Parallel marking gauge

Doweled Curve-Gauge

The much larger panel gauge is less common than the regular marking gauge. With a beam measuring from 18" to 2', its head is usually rebated along the lower edge to help it ride along the edge of the workpiece. As with smaller workpieces this is fine so long as the workpiece is straight, but for any kind of curved edge, either convex or concave, you'll need something else. The solution is an alternate head with no rebate, but provided instead with two dowels inserted in its bottom edge, both the same distance from the center (**FIGURE 41B**). This solution works for smaller gauges should you not want to add the bosses shown in **FIGURE 40A**.

FIGURE 41B: Rebated head

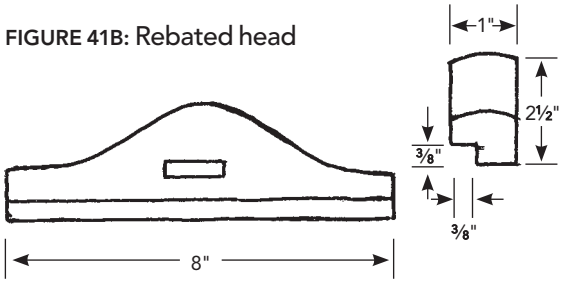
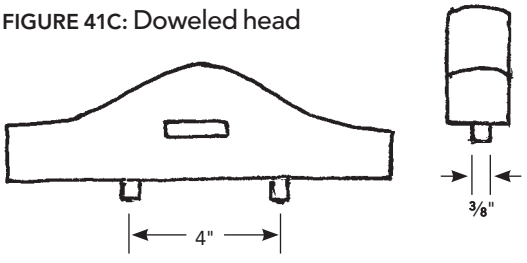


FIGURE 41C: Doweled head



Parallel Marking Gauge

The standard marking gauge needs an edge to work against. Therefore marking a series of parallel lines at a consistent distance apart requires resetting the gauge for every line. A better method is to use a circular disc bored with a hole the required distance from its circumference, through which you can use a marking awl or pencil point. You can achieve consistency without having to reset the tool by running the disc along a straightedge accurately clamped to each succeeding line.

Of course, there is no reason why such a disc may not be bored with a series of holes, each a different distance from the circumference, but to avoid error be sure the different measurements are clearly marked (**FIGURE 42**).

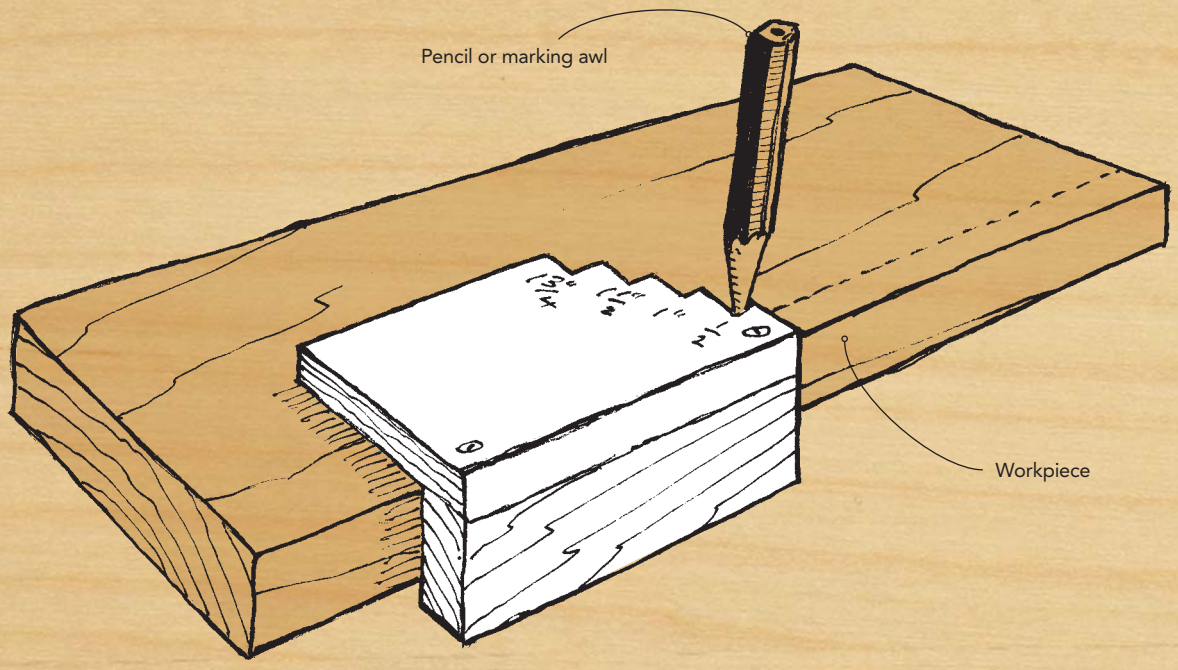


FIGURE 43A: Notched preset gauge

Notched Preset Gauge

Another way to avoid having to reset the standard marking gauge is to use a gauge with a fixed flat head notched at the desired measurements so as to receive an awl or pencil. This is especially useful when you want to mark standard dimensions such as common lumber thicknesses (**FIGURE 43B**).

CONSTRUCTION • All you need is a flat board cut with a series of steps corresponding to standard milled lumber dimensions. Attach a narrow lip that will bear against the edge of the workpiece. Note that if you space the notches equidistant from each other, this gauge becomes another method for marking equidistant parallel lines.

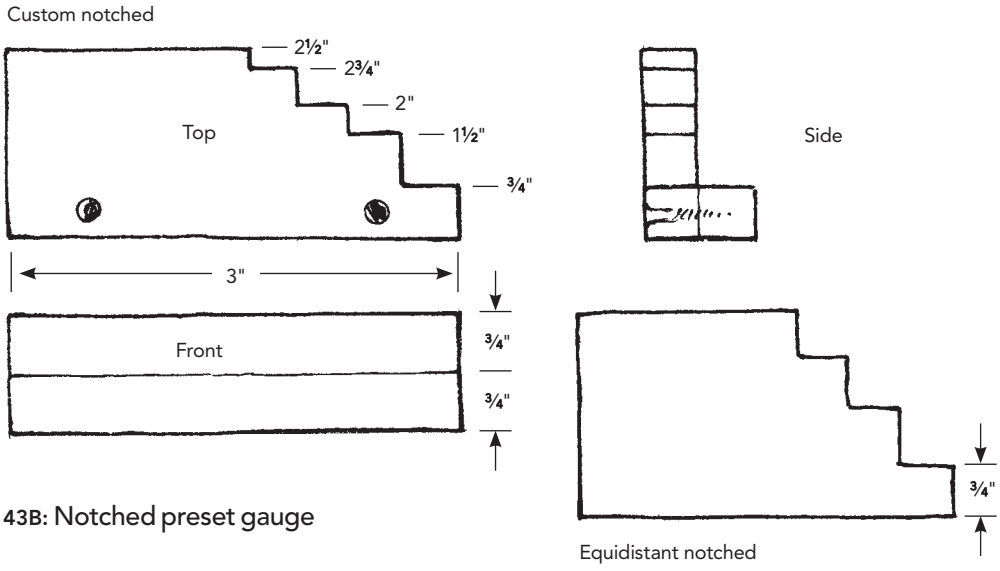


FIGURE 43B: Notched preset gauge

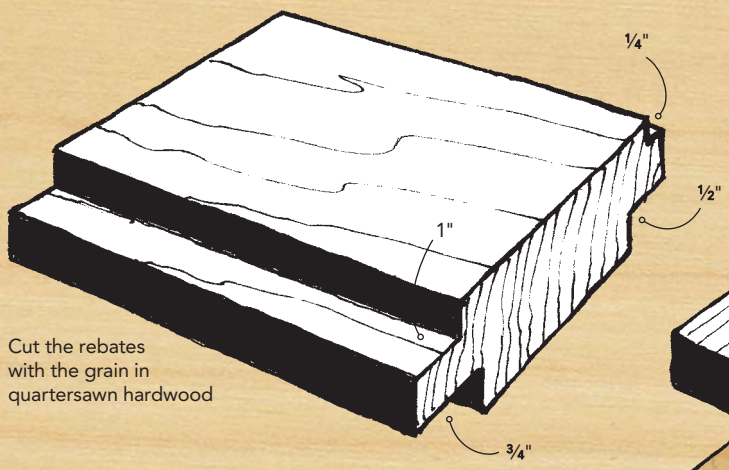


FIGURE 44: Rebated preset gauge

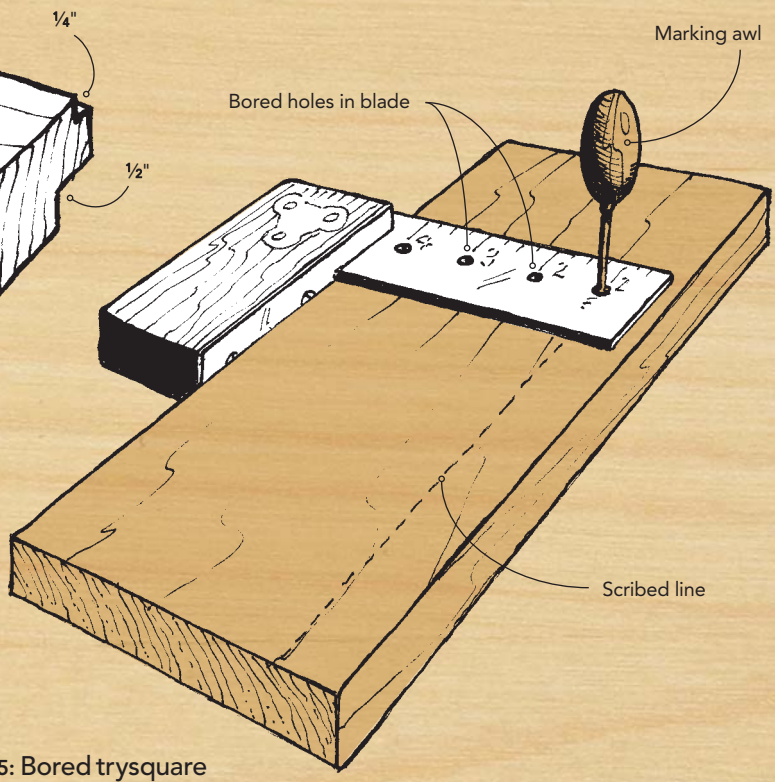


FIGURE 45: Bored trysquare

Rebated Preset Gauge

Another kind of preset gauge is a block of wood with one or more edges rebated to a given width. By holding a pencil, knife or awl against its outer edge while sliding the rebate along the edge of the workpiece, you can easily mark consistent layout lines without having to measure anything (**FIGURE 44**).

An alternative to a preset gauge is a stick of given thickness and width along whose edge, when said stick is held against a straightedge securely and accurately positioned on the workpiece, the required mark may be made.

Bored Trysquare

Although there was a time when every self-respecting woodworker made his or her own trysquares from wood, many woodworkers now use store-bought trysquares, some of which have graduated edges. You can turn the trysquare into another form of preset marking gauge by using the graduations to locate a series of bored holes in the blade. To mark a line, insert a marking awl or pencil point through the appropriate hole and slide the gauge along the workpiece edge.

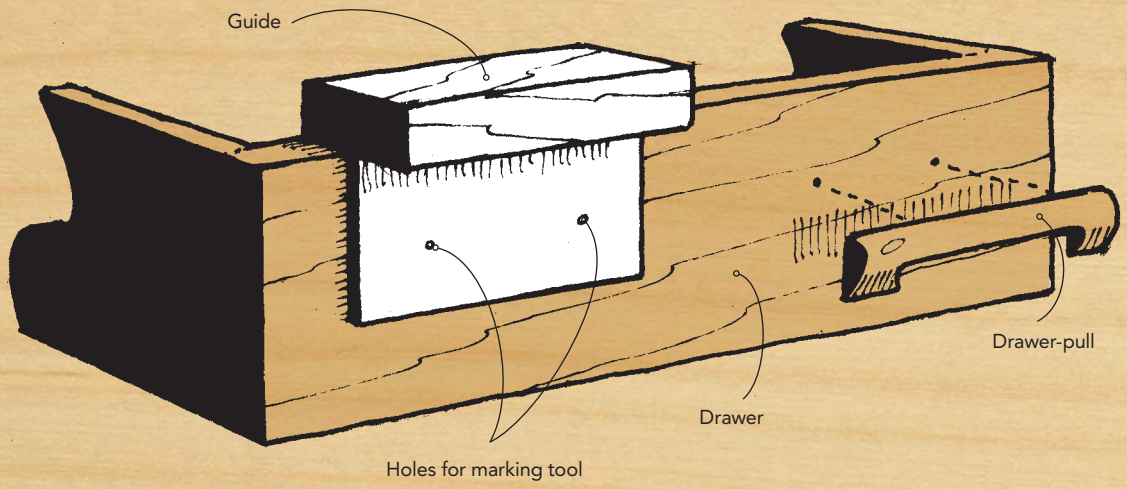


FIGURE 46A: Drawer-pull guide (in use)

Drawer-Pull Guide

When you need to make the same mark multiple times, it is far more accurate to lay out the marks from an exact guide rather than by repeat measurements. This is particularly true in the case of drawer pulls, of which there may be a great many as in kitchen cabinetry or even one chest with perhaps six or more drawers. Each pull may require a measurement from the top of the drawer, a measurement from the side of the drawer, and a measurement of the distance between two screw attachments. A single guide with exactly marked and pre-bored holes will guarantee uniformity.

CONSTRUCTION • This guide is designed not for boring the actual holes but only for marking with a sharp marking or scratch awl, or with a pencil. It can be made out of thin plywood or brass or aluminum sheet stock, though a stiff piece of card will suffice. The width does not need to be much greater than the width of the drawer pulls themselves – 4" to 6" is typical – and the height hardly more than the pull's distance from the drawer top edge. Insert the card in a slot cut in scrap that will act as a lip to be hooked over the top of the drawer front. This lip ensures that a two-screw drawer pull will be aligned perfectly horizontally.

Fix the card in the lip piece simply by a tight pressure fit alone. This is a useful method if you will need different cards to mark pulls that are to be attached at different heights, as might be the case in a series of graduated drawers. On the other hand, a piece of plywood permanently glued into the lip will ensure continued accuracy.

Since the guide is only for positional marking, the holes, which should be very carefully laid out on the card, need only be large enough to admit the tip of an awl or pencil. Sometimes it will be useful to locate more than a single pair of holes in the same card, for pulls of different widths.

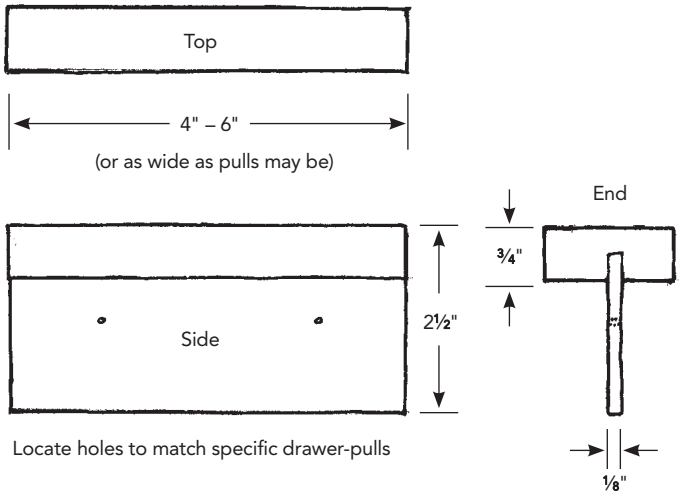


FIGURE 46B: Drawer-pull guide

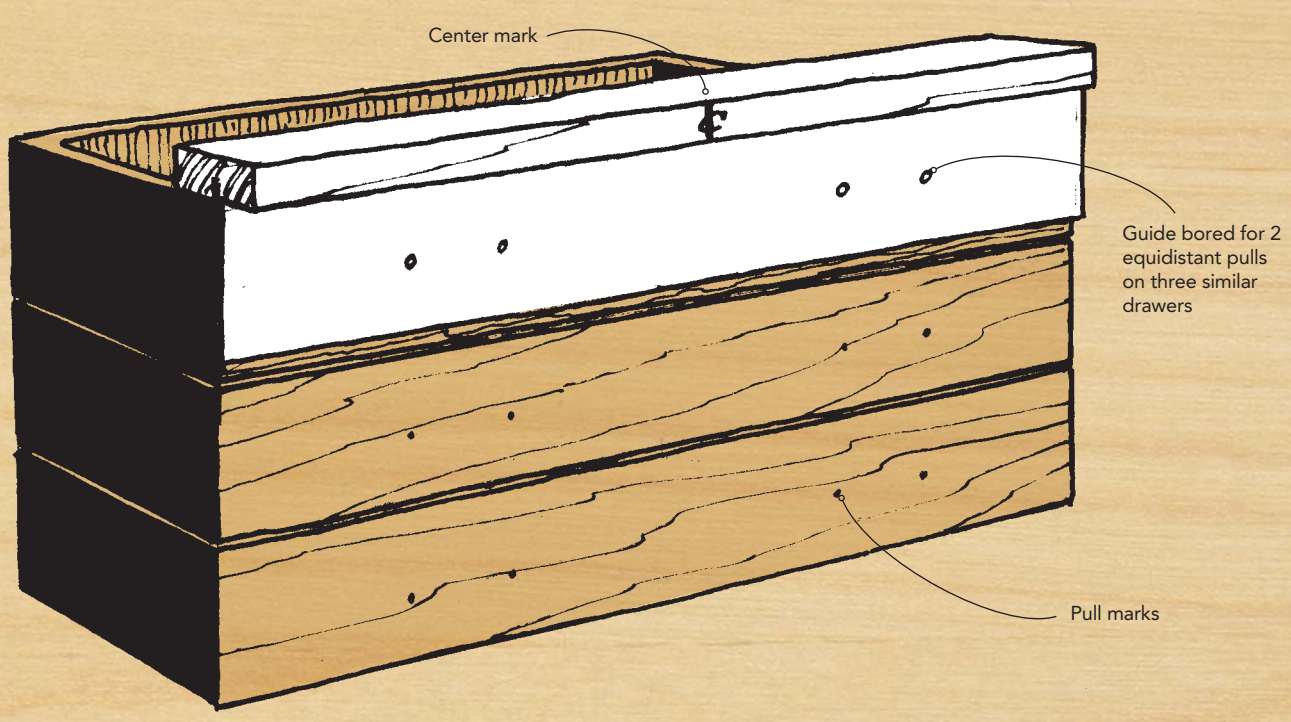


FIGURE 47A: Drawer-pull centering positioner (with drawer front)

Drawer-Pull Centering Positioner

The centering positioner is a slightly more advanced form of the draw-pull guide. It comes in handy when you need to position pairs of drawer pulls on similar-width drawers. The positioner consists of a perforated thin board cut either to exactly the same width as the drawers to which the pulls are to be attached, or to a smaller board divided at its center into two equal halves. Matched pairs of guide holes (for awls or pencils) can be made equidistant from the centerline so that when you center the guide on the drawer front, you'll be able to mark the left and right pulls accurately and consistently.

CONSTRUCTION • Make the guide from ¼" thick plywood or stiff card inserted into a straight lip or fence, same as the drawer-pull guide. To increase the guide's utility for drawers of different heights, make extra strips of varying widths so you can adjust the distance from the bottom of the fence to the actual drawer-pull position.

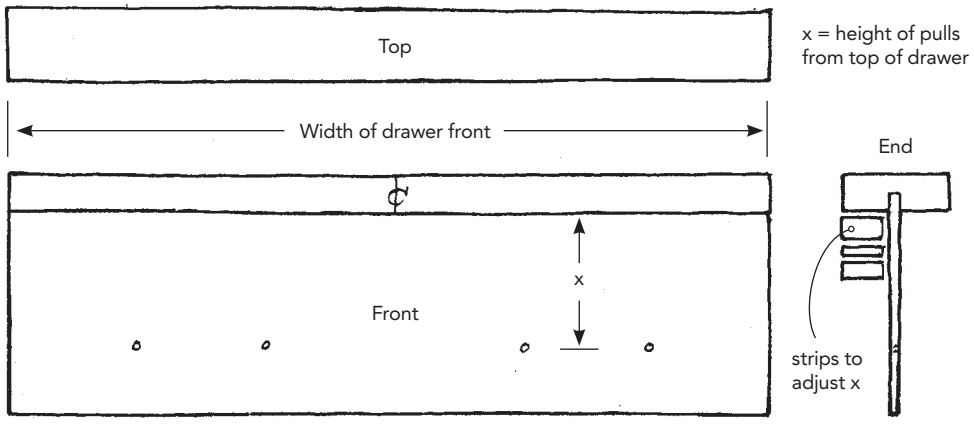


FIGURE 47B : Drawer-pull centering positioner (dimensions, showing extra lips)

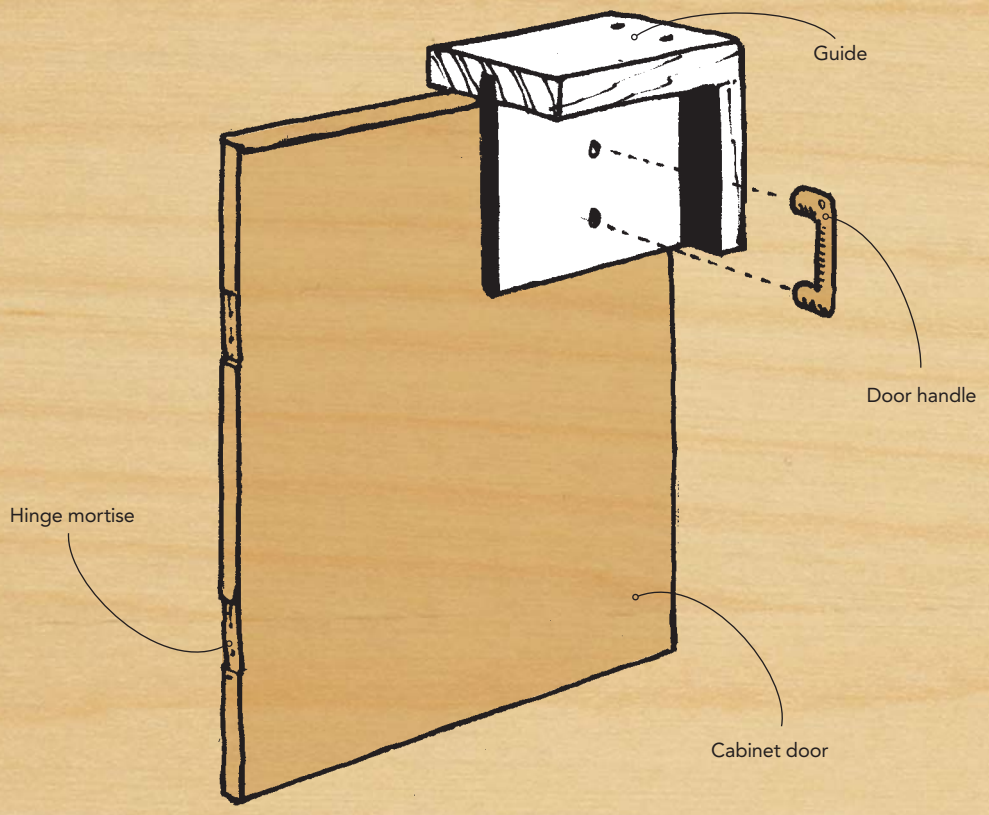


FIGURE 48A: Cabinet door-handle guide (guide on door)

Cabinet Door-Handle Guide

A guide similar to the drawer-pull guide may be made to locate door handles or pulls, whether they are attached by one or two screws. This guide has two lips at right-angles so it can be consistently located by being placed over the top opening corner of each door (or lower opening corner in the case of upper cabinets).

CONSTRUCTION • The card or thin board carrying the guide holes needs to be square, so its two guide lips can be mounted at right angles. It is perhaps easiest to center a slot in one edge of a single piece of lipping and then saw this piece into two equal lengths, to guarantee that the card fits uniformly in both pieces when they are joined at right angles.

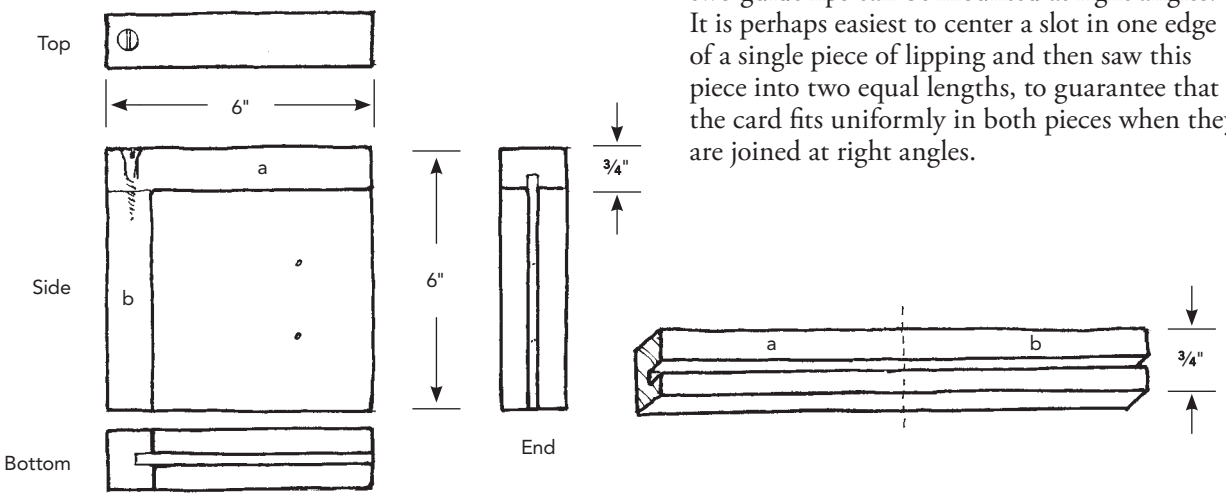


FIGURE 48B: Cabinet door-handle guide (show single lip, cut, and attached)

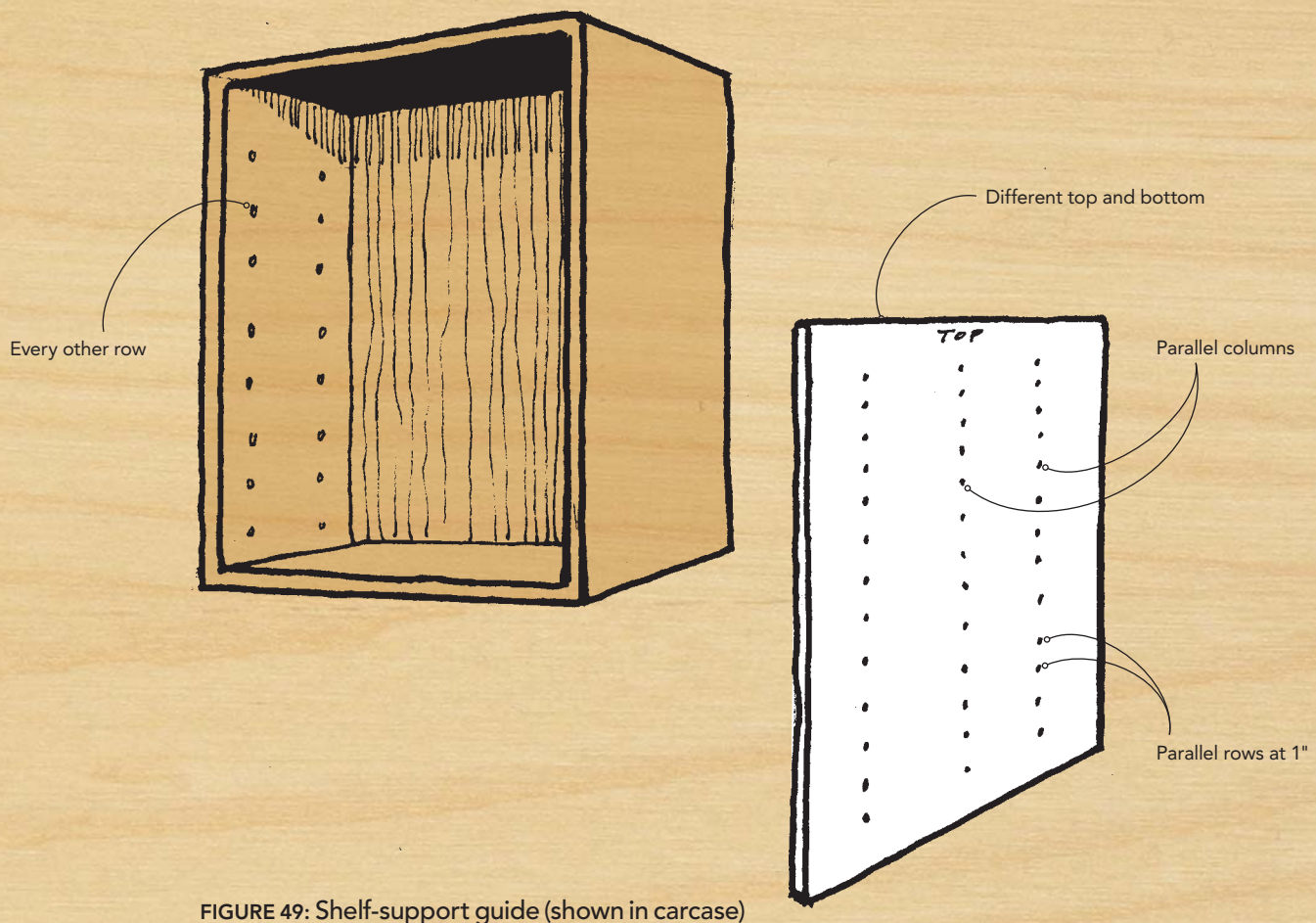


FIGURE 49: Shelf-support guide (shown in carcase)

Shelf-Support Layout Guide

When you are laying out the locations for boring the holes for shelf supports, it's most important to ensure that all four holes lie in exactly the same plane – or the shelf will rock. This can be guaranteed by using a perforated layout guide. Such a guide need not be made for each job if you prepare one with columns of holes no more than 1" vertically apart. This allows you to choose only those pairs necessary for the job at hand. Similarly, while two parallel columns may be most generally useful, you can make a guide with three or even four columns. The outside columns can be located at different distances from the edges of the guide, which can be flipped over if necessary, to mark shelving of various widths.

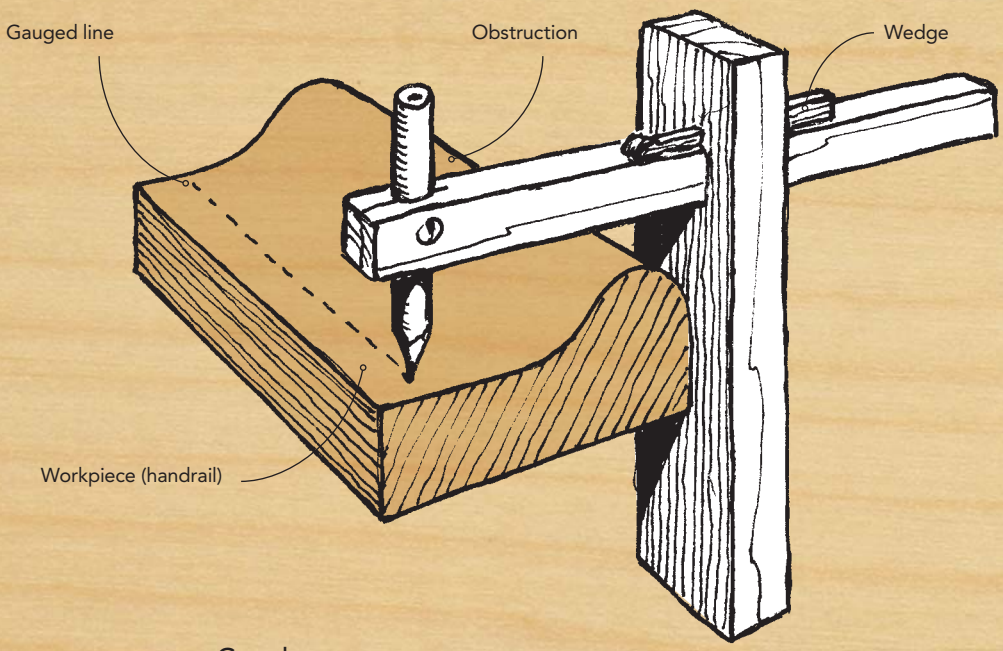


FIGURE 50A: Grasshopper gauge

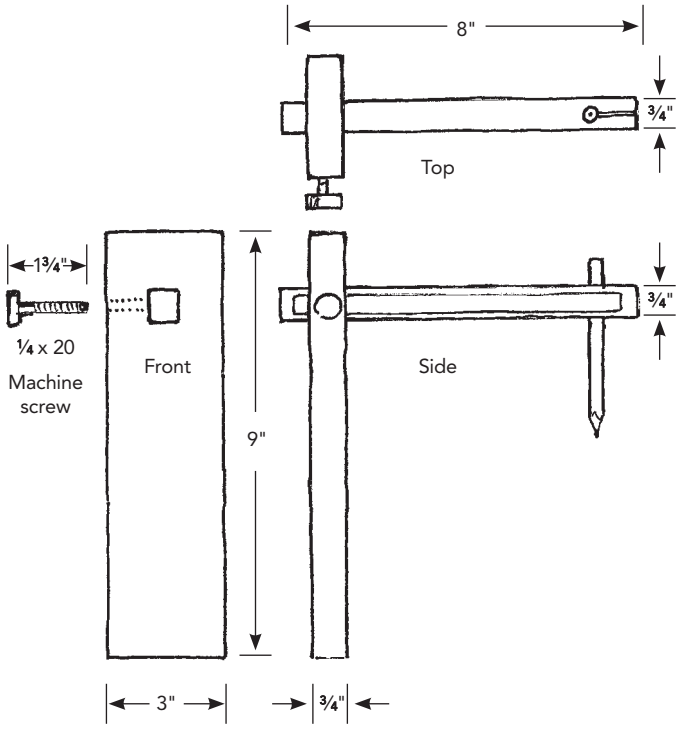


FIGURE 50B: Grasshopper gauge

Grasshopper Gauge (Handrail Gauge)

A surprising omission from the range of generally available manufactured marking gauges is something traditionally known as a grasshopper gauge, occasionally referred to as a handrail gauge. It is designed to mark a workpiece when there is some obstruction – the bulge of a handrail for example – between the bearing surface of the head and where the mark is needed. Its chief feature is an extra-deep head which, sometimes with the help of a spacer block, allows the workpiece to be marked at a consistent distance from an edge that is not immediately adjacent (**FIGURE 50A**).

CONSTRUCTION • Make the head high enough for the beam to clear any given obstruction, and wide enough to bear firmly on the workpiece. A narrow wedge is the traditional way of securing the beam in the head, although a machine screw tapped into the side of the head works equally well. A narrow strip of metal (sheet brass looks particularly fine) fixed to the side of the beam provides a long-lasting bearing surface for the machine screw. Whatever the height of the vertical obstruction, an equally long pencil is generally more useful than a pin. Fit the pencil in a hole bored through the end of the beam and secure it with a screw.

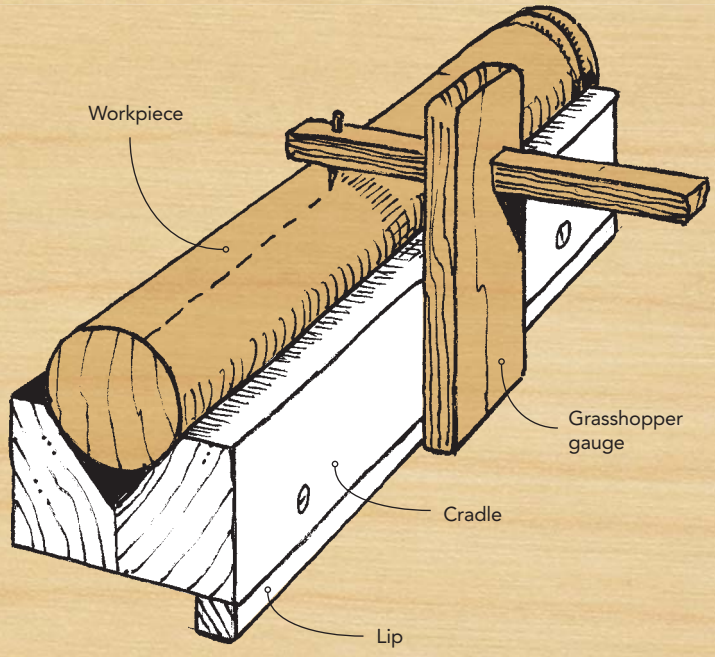


FIGURE 51A: Cylinder gauging cradle

Cylinder Gauging Cradle

While with care it may be possible to use a standard marking gauge to mark cylinders or round workpieces (such as chair legs), a more secure method is to place the object to be marked in a V-block or cradle and use a grasshopper gauge, as shown in FIGURE 51A.

CONSTRUCTION • Make the cradle by beveling one corner of a length of wood, sawing it in half, and fixing the two halves together as shown. Attach a small lip to one side of the bottom of the cradle so you can hold it securely against the front edge of the workbench.

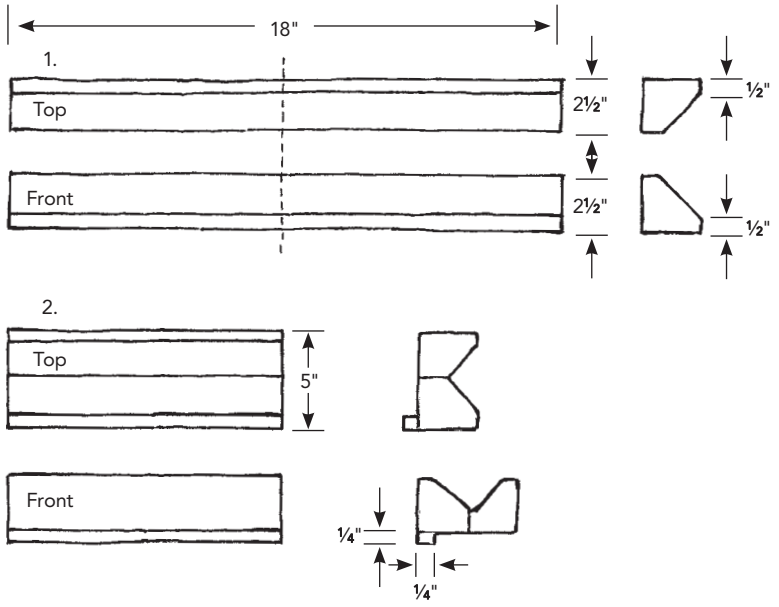


FIGURE 51B: Cylinder gauging cradle

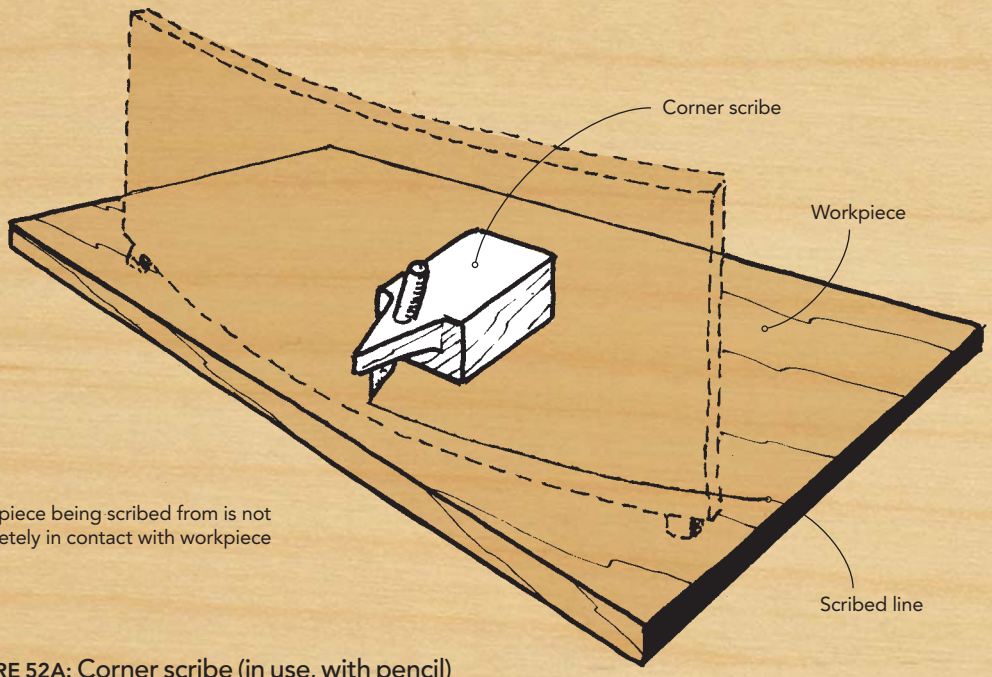


FIGURE 52A: Corner scribe (in use, with pencil)

Corner Scribe

For a good fit, it is important to maintain a consistent angle with the marking tool being used to scribe an irregular profile on any given workpiece. The corner scribe is designed to hold a marking awl, or more typically a pencil, at a precise angle and at a consistent distance from the scribe's origin. The built-in fence formed by the thickness of the jig also guarantees that the scribe will precisely locate the required cut without the marking tool being allowed to intrude into the gap, should the workpiece not meet completely the pattern from which you are taking the scribe.

CONSTRUCTION • Any block of wood thick enough to hold the marker securely will do. Point the end so that the block can follow sharply angled profiles. But be sure to make the back of the scribe block wide enough to be comfortably held. Bore the hole for the marker at approximately 45°, and so that the tip of the marker is exactly in line with the bearing surface of the fence.

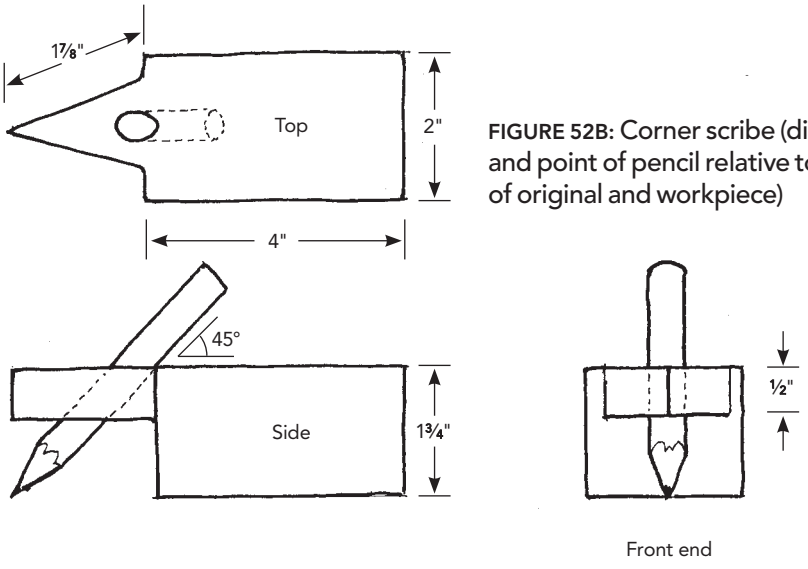


FIGURE 52B: Corner scribe (dimensions, and point of pencil relative to junction of original and workpiece)

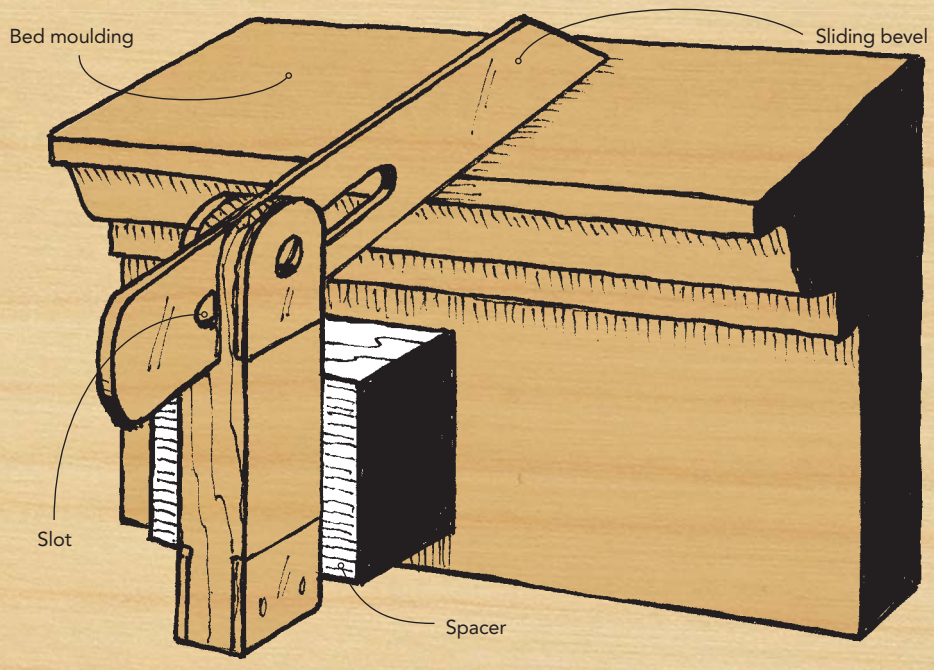


FIGURE 53: Sliding Bevel Spacer

Sliding-Bevel Spacer

FIGURE 53 illustrates the problem you'll sometimes encounter when trying to measure or mark a protruding slope with a bevel. Solve it by adding a spacer block equal to the amount of the obstruction to the stock of the bevel. The spacer can be held by hand against the stock of the bevel, or temporarily attached with double-sided tape.

CONSTRUCTION • The exact width of the spacer block can be difficult to measure from an angled overhang, especially if it's further obstructed by bed mouldings, as shown in FIGURE 53. However, if you use a sliding bevel the width of the spacer need only be approximated because you can make fine adjustments by taking advantage of the slot in the bevel's blade. Therefore, start by estimating the width required with the bevel's blade in its mid-position, and then slide the blade in or out to fit.

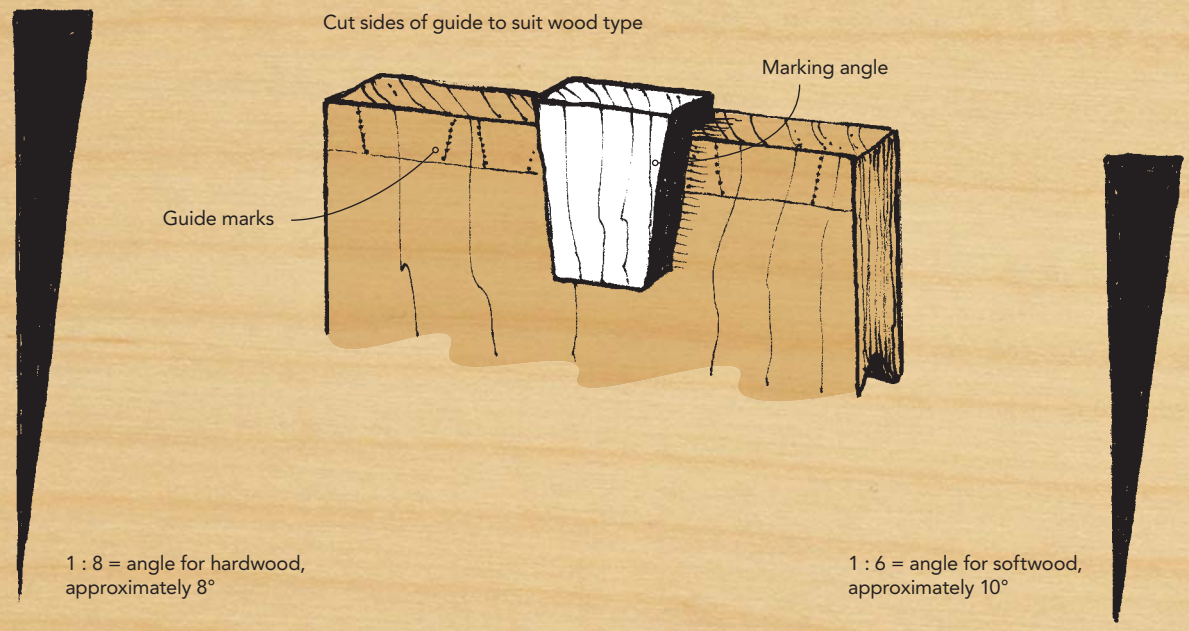


FIGURE 54A: Dovetail marking guide

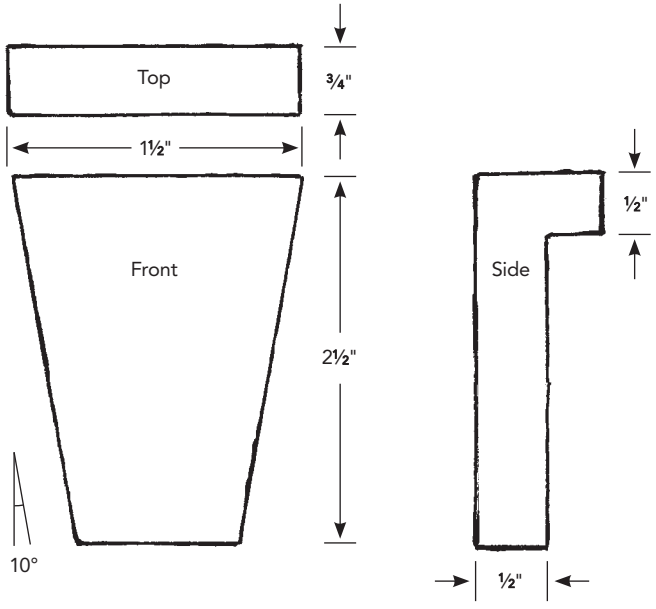


FIGURE 54B: Dovetail marking guide

Dovetail Marking Guide

The experienced woodworker can place the workpiece to be dovetailed in the vise, tilt it to the correct angle for hardwood or softwood, and saw vertically without further ado. The beginner and the more cautious worker will first mark out the tails and then tilt the workpiece to align these lines with a square held on the bench. In either case tilting the workpiece takes advantage of the fact that when sawing, verticality is far easier than other angles to judge and maintain by eye.

The problem for the tyro lies mainly in how to lay out the required dovetail angle. You can do it by setting a sliding bevel to the angle and ratios shown in FIGURE 54A, and then balancing this tool on the edge of the workpiece. A more surefire method is to lay out the required cuts with a purpose-made dovetail guide equipped with a lip that you can hold firmly against the workpiece with little fear of slipping.

CONSTRUCTION • Make a small rebated block of wood a little longer from top to bottom than the proposed dovetails. Cut both sides to the appropriate angle as shown in FIGURE 54B, so the guide can be used equally on either side and at both ends of the workpiece. Make two guides, one for dovetails in hardwood, and the other for softwood.

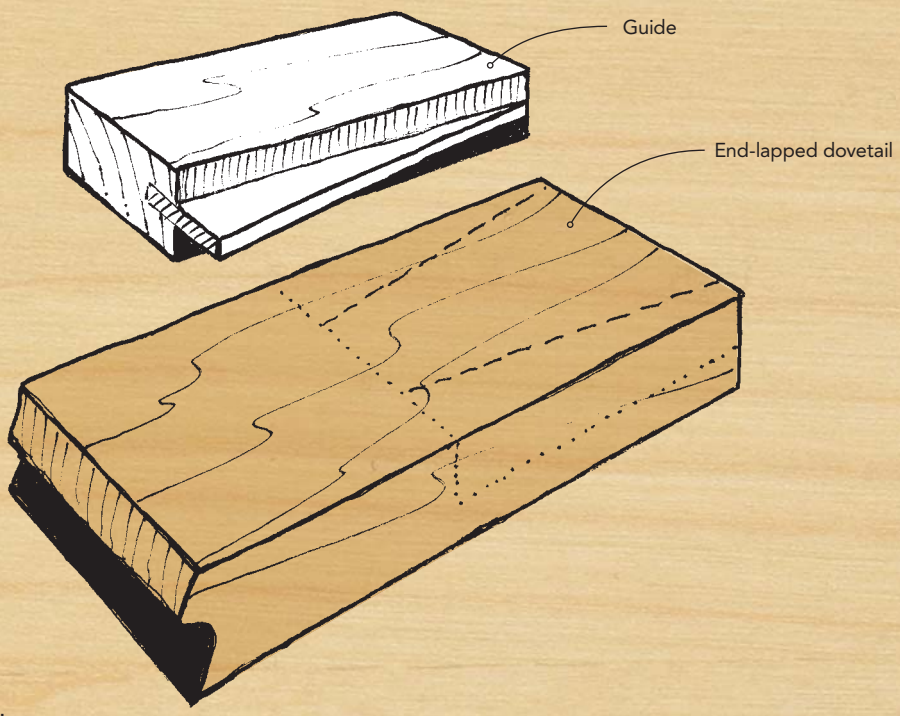


FIGURE 55A: Side dovetail guide

Side Dovetail Guide

A regular dovetail marking guide is not easy to use when laying out lap dovetails in the end of a framing member, because there isn't enough bearing surface for the guide's lip. A better item for this purpose is the side dovetail guide, because it offers more bearing surface (**FIGURE 55A**).

CONSTRUCTION • Make the side dovetail marking guide from a small rectangular block. Groove one side of it to accept a thin angled piece of wood, metal, or even stiff card cut to the appropriate dovetail angle. If you cut the groove in the center of the block's thickness, you'll be able to use the guide on both sides of the workpiece.

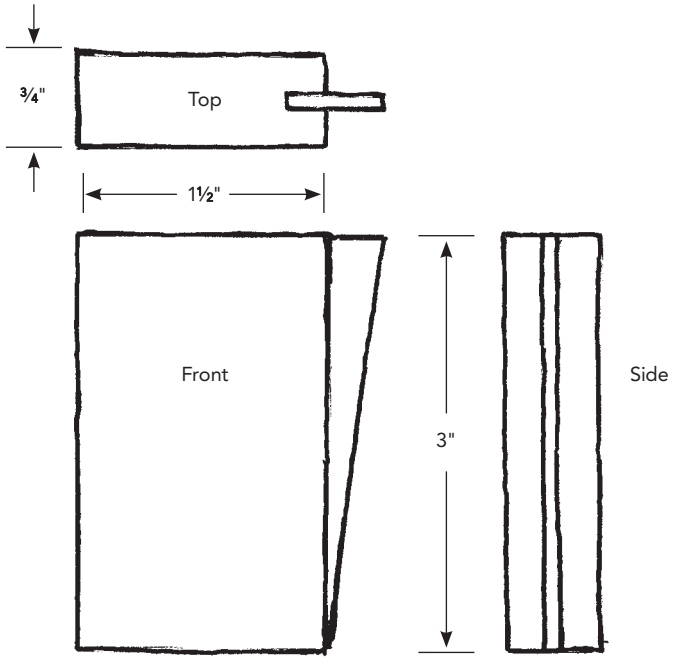
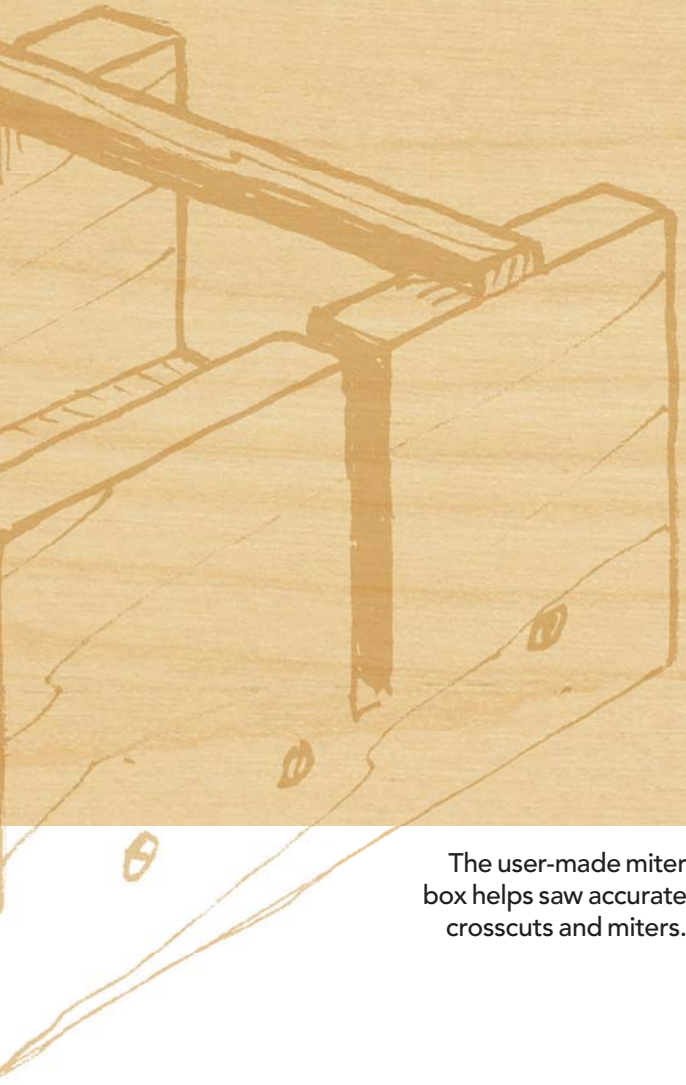


FIGURE 55B: Side dovetail guide

3

JIGS & FIXTURES FOR SAWING



CHAPTER 3

JIGS & FIXTURES FOR SAWING

The user-made miter box helps saw accurate crosscuts and miters.

The modern tablesaw with a powerful motor, a perfectly flat table and accurate fence, plus accessories such as outfeed tables and a variety of jigs designed to make the saw capable of operations such as cutting tenons, tapers, and dadoes, has become the icon of contemporary woodworking – the sine qua non of any respectable shop. Nevertheless, as any experienced woodworker ultimately discovers, a certain amount of handsaw use remains essential. What may be less discoverable, however, is that handsaws, like the tablesaw, also depend on a variety of jigs and fixtures if their use is to be exact and efficient.

For good results with handsaws, it's important to understand the difference between ripping and cross-cutting – a distinction not necessarily vital to users of a tablesaw. Briefly, ripping refers to making a cut more or less along the grain, whether face or side, parallel to the long fibers of the wood. Cross-cutting, in distinction, refers to making a cut across the grain at anywhere from 45˚ to 90˚ to the vertical axis of the tree. This distinction is important because differently shaped teeth on the handsaw are differently effective when performing these two types of cut. Consequently handsaws are made in two varieties: crosscutting and ripping.

There are almost as many different types of handsaw as there are planes, and the traditional woodworker makes much use of them. It doesn't take long to rip a 2' long board by hand if provided with a properly sharpened ripsaw, a place to use it, and a little knowledge of the correct method. It can be just as quick as it is to set up and use a tablesaw. In fact, equipped with user-made jigs and fixtures the handsaw is often faster and more versatile than the tablesaw. In the one-person shop, it is certainly safer and in my view considerably more pleasant to use.

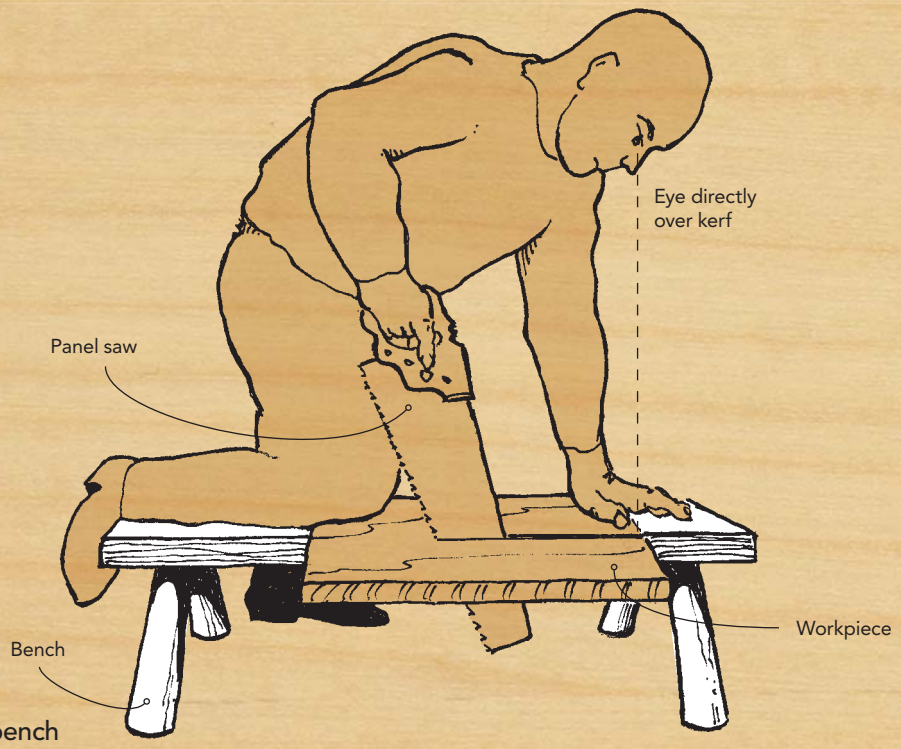


FIGURE 56A: Saw bench

SAWING AIDS

Saw Bench (Saw Table)

One item that shops dependent on tablesaw and chop saw frequently lack is a place where handsaws can be used. A saw bench is one such place (saw horses and workbenches being two others). The saw bench provides support and security, and unless you bury it in clutter, is always ready for use. Its utility is based on the fact that it is sturdy enough for vigorous use. Another part of its convenience is the height: it is easier and more accurate to saw perfectly vertically with one's eye immediately above the saw cut. (**FIGURE 56A**).

Ripping on the saw bench is usually done by aligning the workpiece with its grain parallel to the length of the bench, anchored as shown in **FIGURE 56A** with the part to be sawed off overhanging the side of the bench. When crosscutting it's usually easiest to align the grain of the workpiece perpendicular to the length of the bench and anchor it the same way, with knee and non-dominant hand. When the workpiece is so configured that its width exceeds its length, it will be easiest to saw from the end rather than from the side of the saw bench. In some situations, to avoid taking an awkward stance it may help to clamp the workpiece to the saw bench.

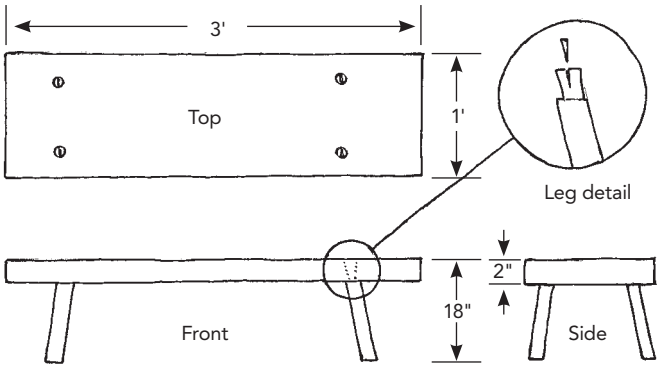


FIGURE 56B: Saw bench

CONSTRUCTION • A substantial board such as a length of 2 × 10 or even a rough-sawn board surfaced on one side only is better than regular ¾" or even 5/4 milled boards from the local lumber yard or home-supply store. Equally important are legs stout enough to provide stability – splayed legs are ideal. It should be low enough to kneel on while supporting the workpiece and at the same to time to keep an eye above the saw when working, but also high enough to permit the full stroke of a 24" handsaw.

Alternate constructions of a saw bench usually omit the splayed leg feature, consequently reducing stability. That's because while it is easy to bore a splayed hole in the top, it is not so easy to splay a leg-and-skirt substructure.

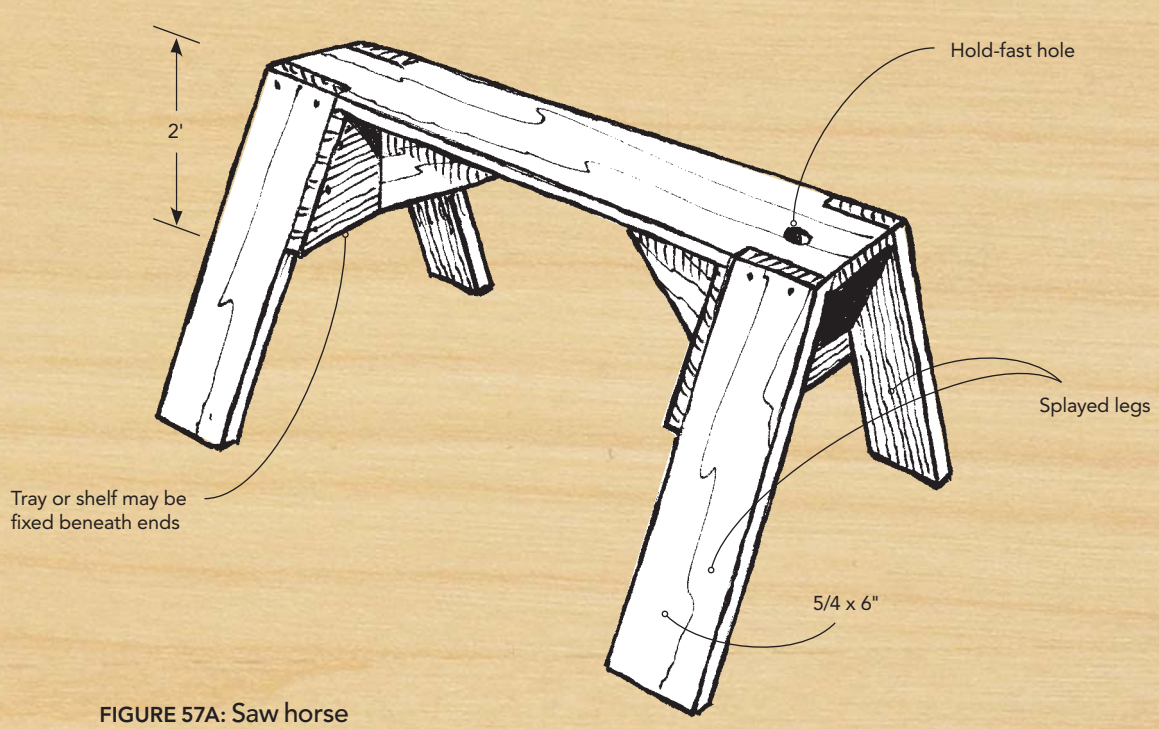


FIGURE 57A: Saw horse

Saw Horse

Saw horses are typically higher than saw benches, and moreover used most commonly in pairs. Carpenters often make them all from lengths of 2 × 4 but more useful in a general woodworking shop are sawhorses made from stock 5/4 thick by 6" wide for tops and 4" wide for legs. These dimensions provide a more useful flat working surface (**FIGURE 57A**). Using them in pairs makes it easy to work sheet materials and long boards, whether cross-cutting or ripping.

CONSTRUCTION • The standard length is about 3', the standard height about 2'. To make the horse very stable longitudinally and laterally, notch the legs into the ends of the top, connect each pair of legs with a brace on the inside, and finally bracket each brace to the underneath of the top. Beveling the top end of the legs flush with the horse top is most easily done with a plane after assembly.

From a traditional point of view you would attach the legs with regular iron nails, but in terms of functionality modern metal fasteners would work as well. These include finish nails, ten-penny common nails (galvanized or not), wood screws or long construction screws designed to be inserted with an electric drill. However, since almost all parts that need to be connected are cross-grain to one another, don't use glue.

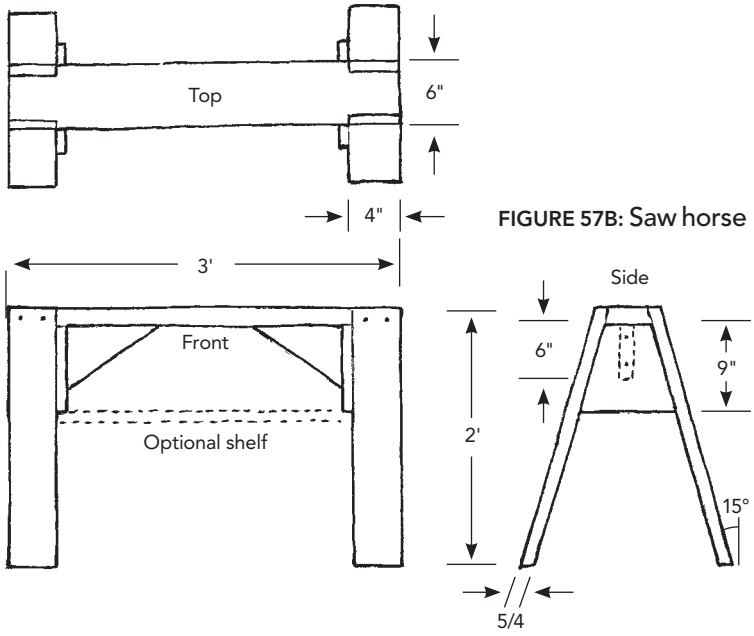


FIGURE 57B: Saw horse

Horses made this way will be easily stackable. Locating the connecting brace on the inside of the legs rather than on the outside makes it possible to use the extreme ends of the tops as a place to attach clamps and bore holes for installing hold-fasts or making glue escapes in dowels. If you keep the bottoms of the connecting braces level then it also becomes possible to attach a tool shelf there. Giving the legs a 15° splay from vertical will be stable enough.

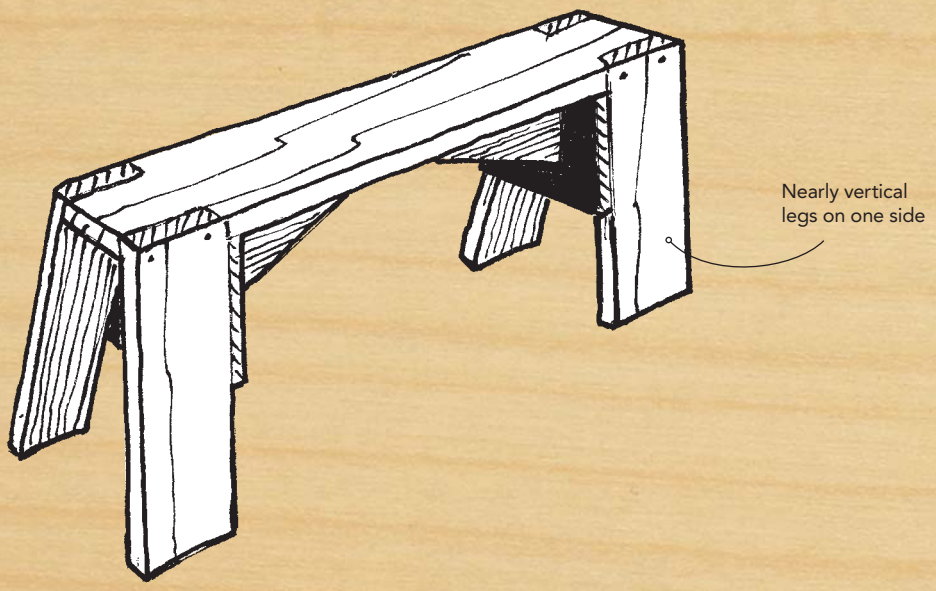


FIGURE 58A: Ripping horse

Ripping Horse

Ripping a board with a hand ripsaw can often be comfortably done at the standard workbench by securing the workpiece vertically in a vise and sawing in an essentially horizontal position. It is sometimes easier to rip by hand using a pair of horses with the workpiece resting perpendicularly to the horses and your knee resting on the workpiece. This, of course, requires periodically moving the board in order to cut its whole length. A better solution is a horse whose legs on one side are vertical rather than splayed. This enables the workpiece to be secured longitudinally by a knee or a clamp, making the saw cut accessible throughout its length, and if the workpiece is not too long, without the aid of a second horse (FIGURE 58A).

CONSTRUCTION • A ripping horse can be made the same way as a saw horse but with the difference that the legs on one side are not splayed – or at least by not more than 5°. It's a little less stable than the regular horse but that doesn't matter because when ripping you typically will be standing on the splayed-legs side and kneeling on the workpiece.

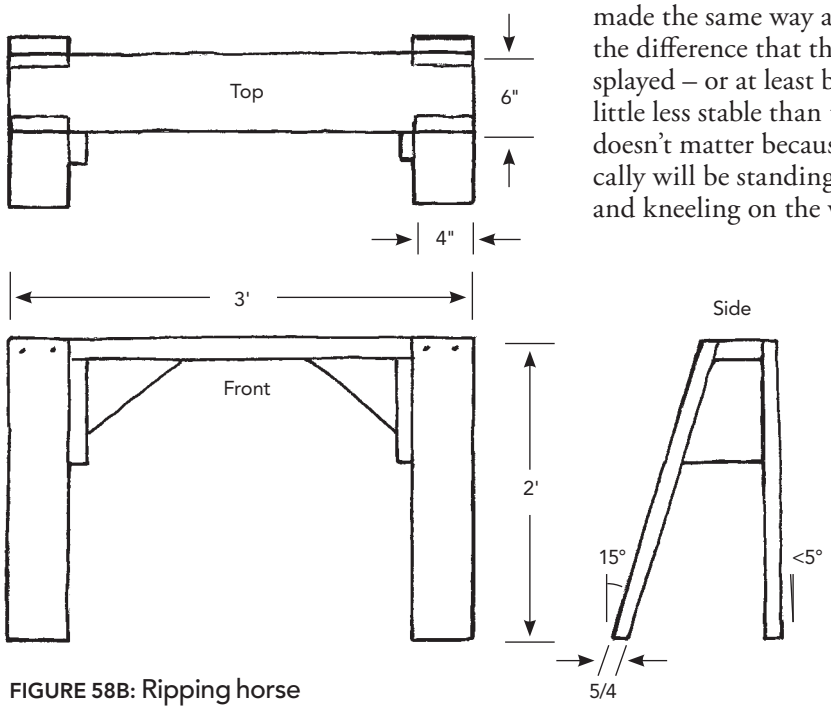


FIGURE 58B: Ripping horse

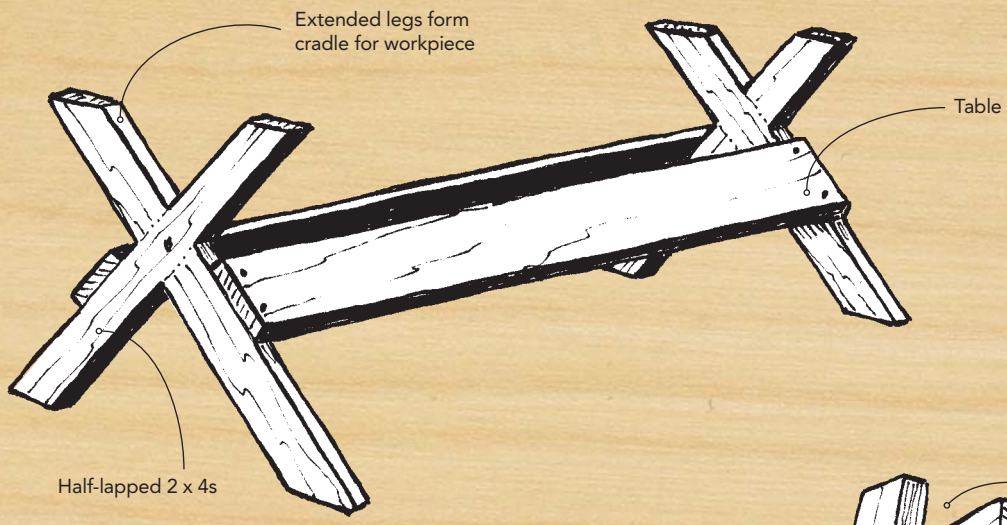


FIGURE 59A: Modern sawbuck

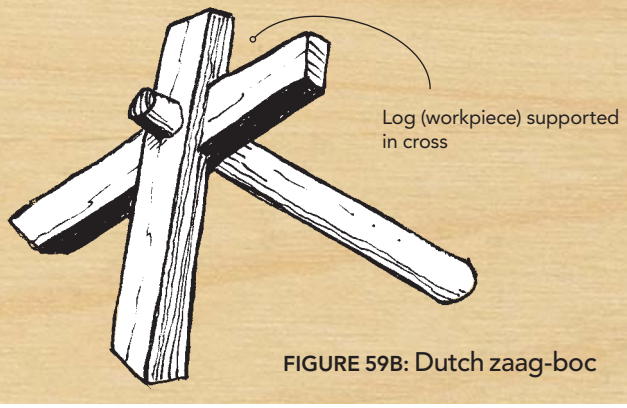


FIGURE 59B: Dutch zaag-boc

Sawbuck (Saw-Goat)

The modern sawbuck, FIGURE 59A, is a form of horse used for sawing short lengths off logs. It is characterized by legs that extend above its table to cradle the workpiece, thereby preventing it from rolling off. The sawbuck originally was made from convenient forked sections of tree, and originally had only one end with the unsupported end of the workpiece resting on the ground. The name derives from the Dutch word *zaag-boc*, which literally translates to "saw-goat" (FIGURE 59B).

CONSTRUCTION • It is not very important how the two ends are connected, other than ensuring some kind of longitudinal bracing, as shown in FIGURE 59C. However, take care in constructing the ends if you want the fixture to have any longevity. Integral extensions are best: legs that are half-lapped where they cross will last longer than legs nailed or screwed together. Unlike a shop saw horse that is best constructed from more finished material, rough-sawn 2 × 4s or similar material, or maybe even actual undressed logs of small diameter, will be perfectly adequate.

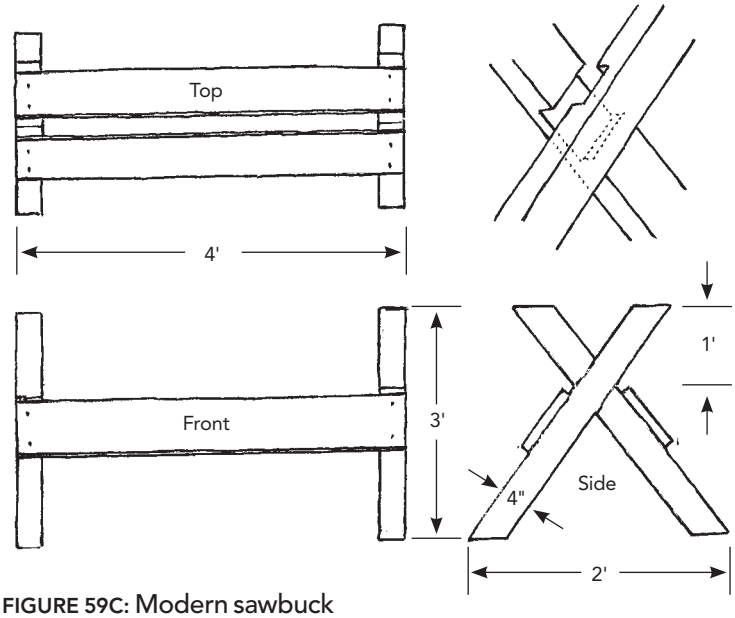


FIGURE 59C: Modern sawbuck

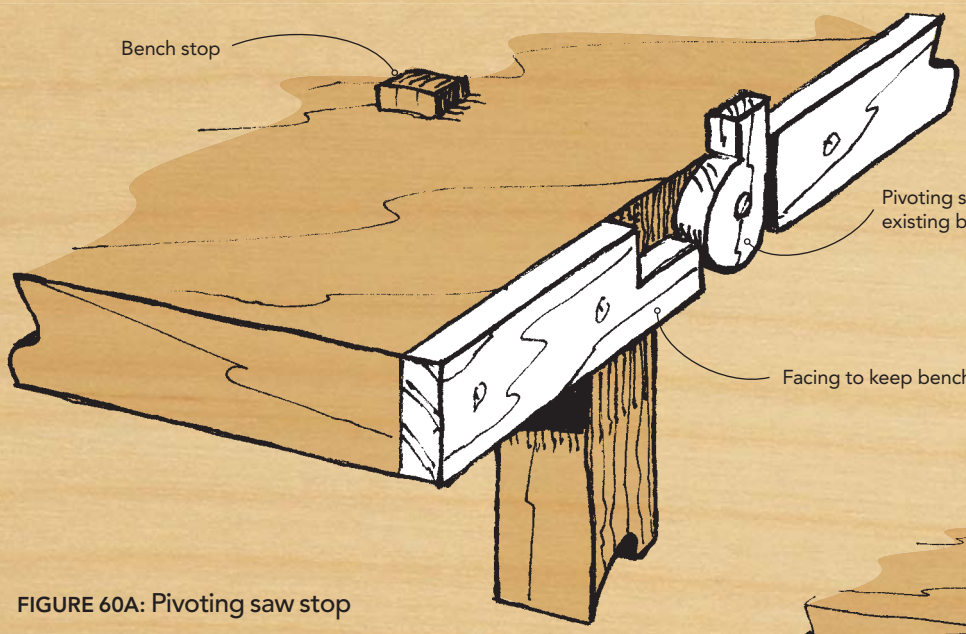


FIGURE 60A: Pivoting saw stop

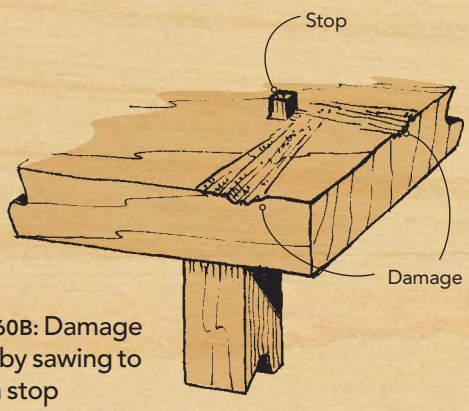


FIGURE 60B: Damage caused by sawing to a bench stop

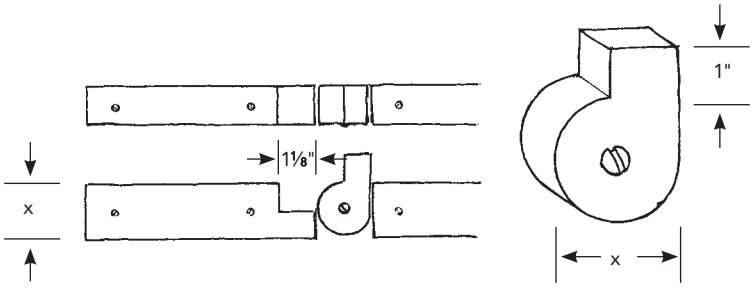
BENCH AIDS

For workpieces smaller than those requiring saw horses for support there exist several fixtures designed to keep workpieces secure for sawing on the bench top. The simplest of these is the bench stop already described in Chapter 1. This, in whatever form and while convenient, has the disadvantage of risking damage to the bench top (**FIGURE 60B**).

Pivoting Saw-Stop

Something that was common many years ago on my school benches is a pivoting stop. You can add one to the end of any bench not having a tail vise (which often makes attachment difficult although not always impossible, some European benches being constructed so as to present no problem). It makes possible sawing off the bench rather than on the bench, because the workpiece braced against it overhangs the end of the bench (**FIGURE 60A**). Such a stop is a quick method of providing for something against which to brace the workpiece, rather than clamping the workpiece to the bench top, although very often the hold-fast as shown in Chapter 1 will be found to be adequate.

CONSTRUCTION • Use hardwood and make sure that the end of the bench is thick enough – by adding extra material if necessary – to locate a pivot point so that the stop can rise high enough to be useful (at least 1") and can return flush with the bench top. Add a facing on both sides of the actual pivoting stop as shown in **FIGURE 60C**, both to protect the pivot and to preserve a smooth benchtop end.



x = thickness of benchtop end

FIGURE 60C: Pivoting saw stop

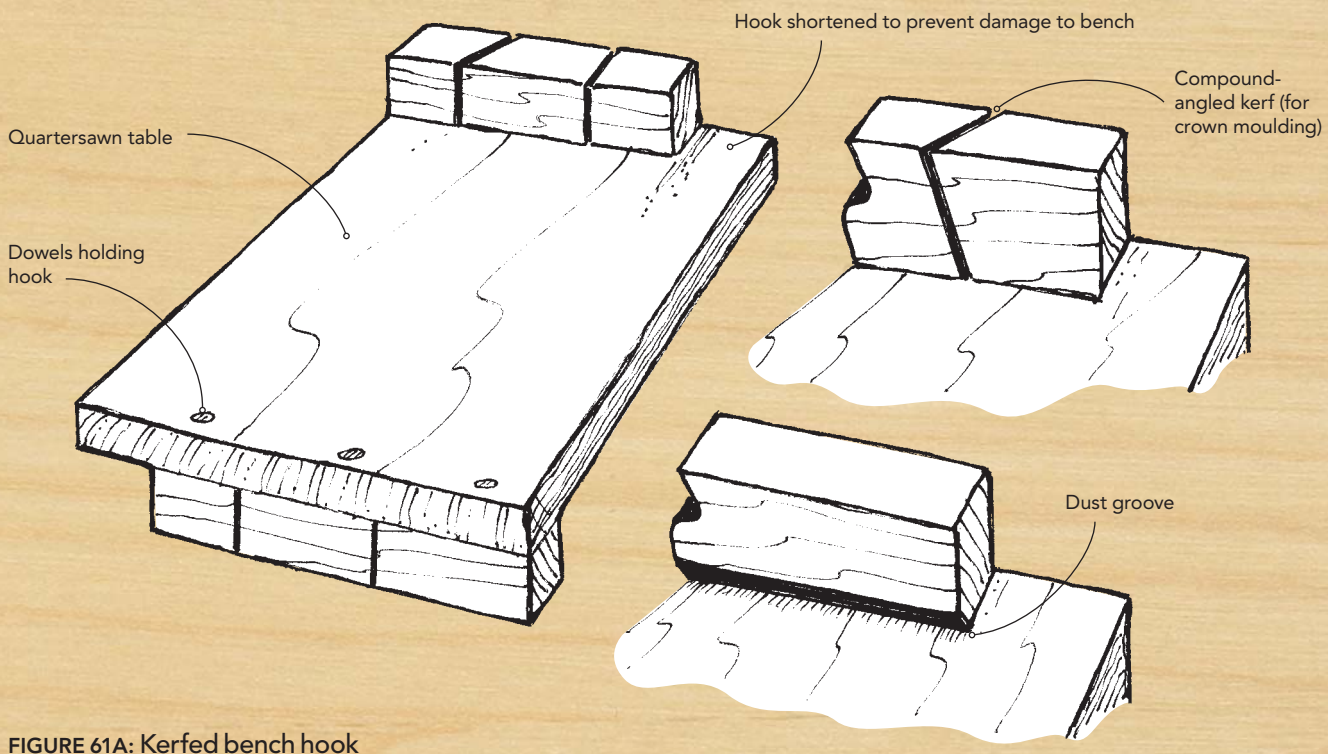


FIGURE 61A: Kerfed bench hook

Kerfed Bench-Hook

By far the best device for accurate, secure, and safe benchtop sawing is a bench hook designed specifically for the task. Such a bench hook will have a shortened back hook so that the bench top itself is in no danger of being gashed by the saw. To help guide the saw, it may also be kerfed – typically at 90°, and often at 45°, both left and right – by the same saw you plan to use in said kerf (**FIGURE 61A**). Make additional guide kerfs at any angle you might require. Guide kerfs will be especially useful when sawing compound angles or the sloping sides of end-dovetails.

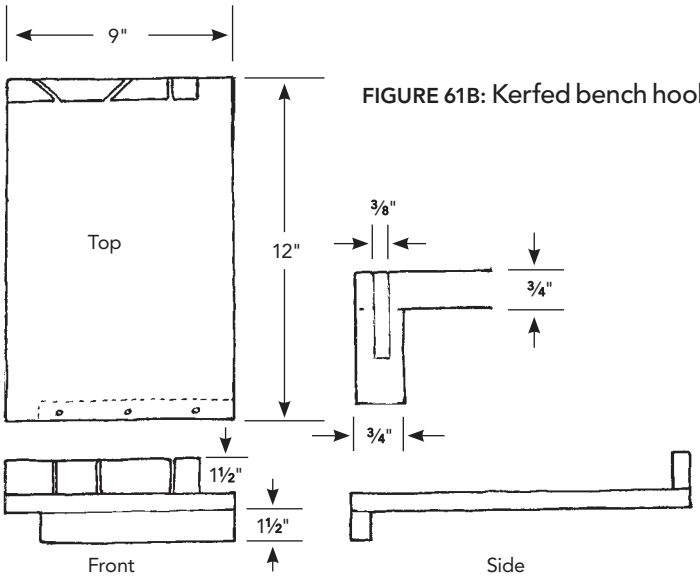


FIGURE 61B: Kerfed bench hook

CONSTRUCTION • This particular fixture is one which with use will eventually wear out, but although inherently disposable you should still make it with care if you are to get worthwhile results. Any bench hook that you intend to saw into should have the hooks affixed with glue and wooden dowels rather than with metal fasteners. Otherwise, it is inevitable that you will one day saw into a fastener and damage the saw.

By planing a small bevel on the bottom inside edge of the hook you will not only avoid the danger of any dust build-up forcing the workpiece away from the hook, but you will also make more secure the holding of small diameter round stock such as dowels. Although you may kerf the hook anywhere you believe is convenient, it often pays to do so – especially with right-angled kerfs designed to produce perfectly square cuts – at a specified distance from the end of the hook so that you also have a built-in length guide.

Although MDF or other forms of manmade board have the advantage of flatness, I prefer to use hardwood for my bench hook's table because it wears better. But for maximum accuracy it is very important to make sure that the table is flat, and that both hooks are affixed true and square. The width of the table may be anything from 6" to 12". Keep handy a piece of scrap the same thickness as the table and use it to prevent long workpieces from sagging, lest they be sawed at other than a perfect 90° vertical angle.

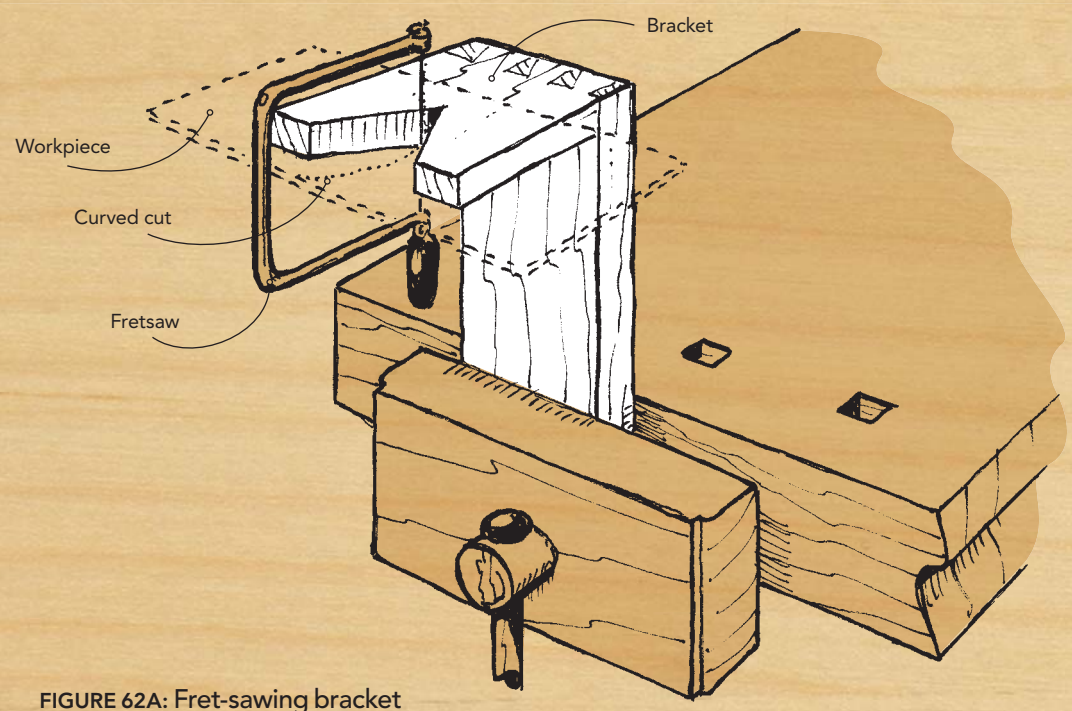


FIGURE 62A: Fret-sawing bracket

Fret-Sawing Bracket

The fret-sawing bracket is designed to be held in a bench vise, raising the workpiece to eye level for a seated worker. Most importantly, it has a deeply notched table that allows the fret saw to work in the center of the table with maximum support for the workpiece (**FIGURE 62A**).

The fret-sawing bracket is designed for use with a fret saw – a tool sometimes confused with the coping saw. The coping saw is used for cope-cutting mouldings and other joinery elements to fit over an adjoining profile, and rarely requires a fixture like the fret-sawing bracket. Fret sawing typically involves long and often intricately shaped cuts in large workpieces such as pierced panels and ornamental trim, which need some kind of support.

One point of similarity between the two saws is that when correctly assembled the saw teeth point toward the handle so the blade remains in tension during the pull cut, for otherwise the blade might buckle and break. The two saws are different in how the blade mounts in the frame. The blade of a coping saw may be turned in any direction with reference to the frame, thereby allowing the tool to be used sideways, as it were. A fret saw most commonly has a fixed blade and is used with the work being turned – and hence the need for a supporting bracket

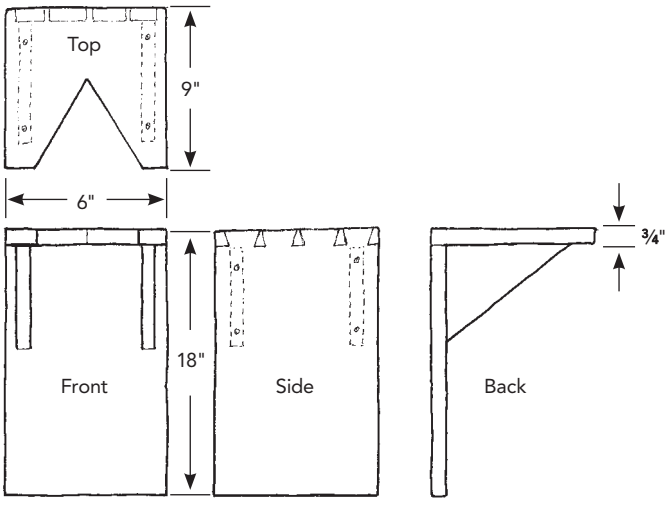


FIGURE 62B: Fret-sawing bracket

CONSTRUCTION • A bracket whose table is exactly perpendicular to its support makes sawing easy, especially when you are attempting to make perpendicular cuts. Ideally the table should be dovetailed into the vertical support, but providing one or two right-angled braces – off-center so as not to interfere with the notch – will both guarantee perpendicularity and provide additional strength.

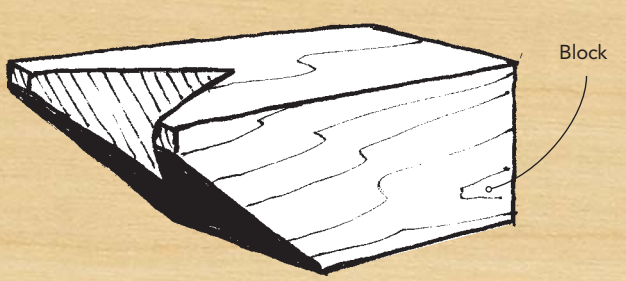


FIGURE 63A: Fret-sawing block

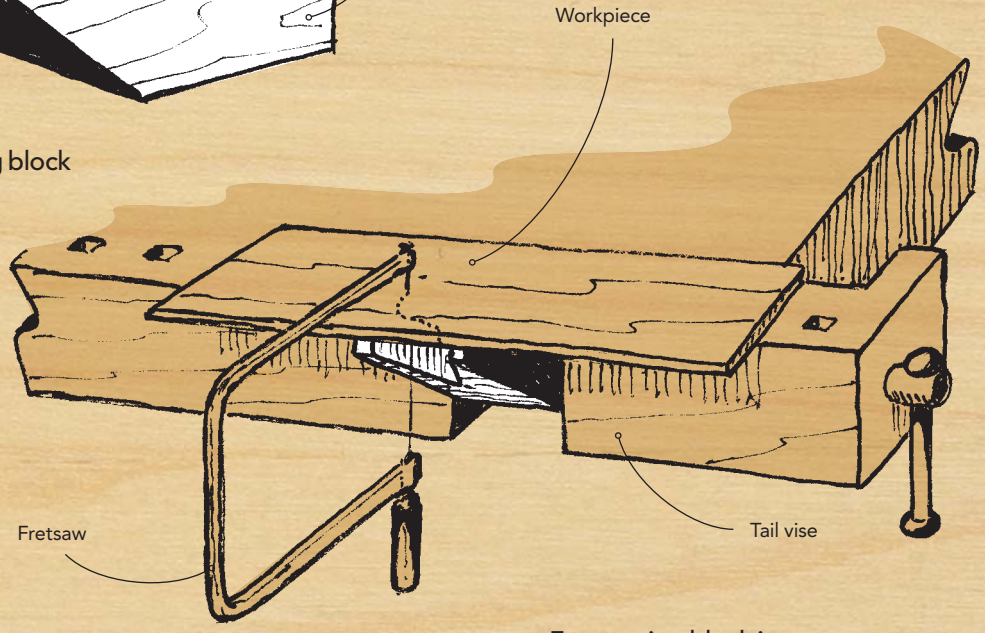


FIGURE 63B: Fret-sawing block in use

Fret-Sawing Block

If your bench has a tail vise you can clamp a substantial V-shaped block in it to support fret sawing. Such a block is much firmer than the fret-sawing bracket, with the disadvantage that you can't adjust its working height (**FIGURE 63B**).

CONSTRUCTION • Cut one end of a 6"-thick block (or two thinner pieces glued together) at 45°, and cut a V-shaped notch into this beveled end. If the block is positioned in a tail vise so that its top is flush with the bench top it does not have to be much wider than the notch, because the workpiece will be supported by the bench itself. As with the fret-sawing bracket, you turn the workpiece and not the saw to follow your layout lines.

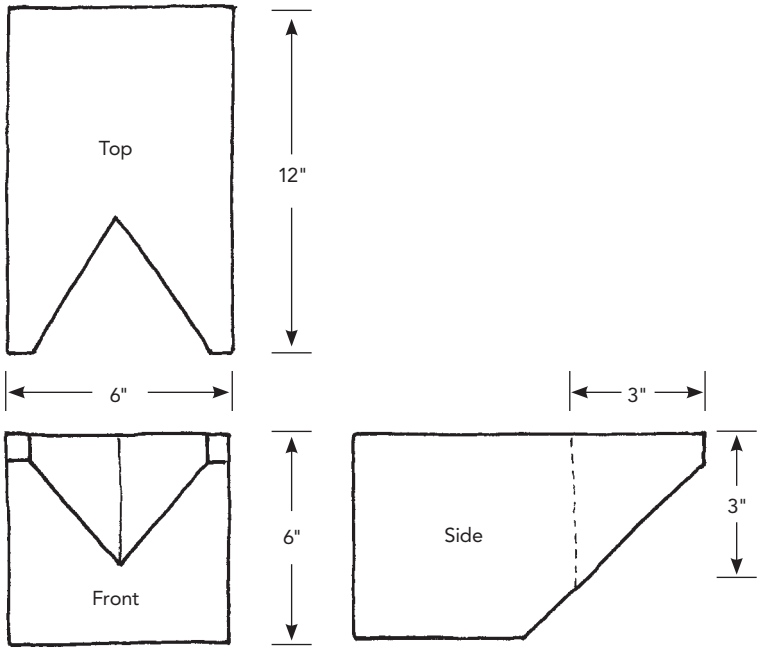


FIGURE 63C: Fret-sawing block

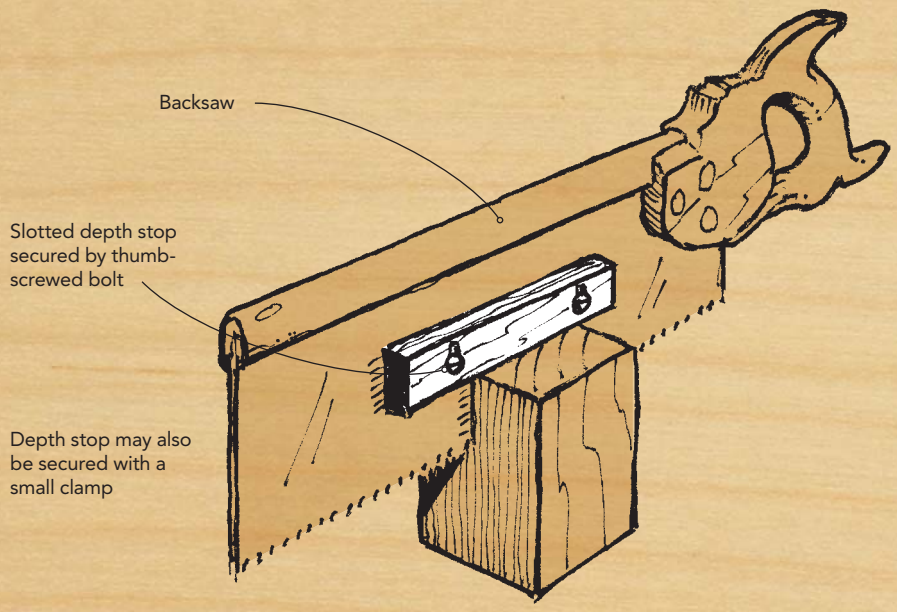


FIGURE 64A: Depth stop

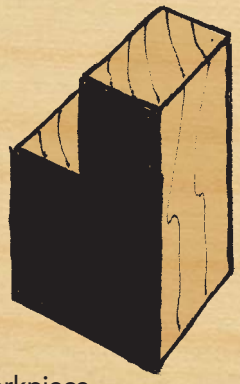


FIGURE 64B: Finished workpiece after having been sawed

SAWING GUIDES

The next group of jigs and fixtures are designed more particularly for ensuring accuracy when sawing specific cuts, and assume that securing the workpiece has already been attended to. There is, of course, a certain element of Catch 22 about such jigs, since they must usually be made without the aid of any jig to ensure their own accuracy. Therefore very careful layout is essential, together with good sawing habits such as preparing a groove with trysquare and marking knife for the saw's initial cuts to run in, and positioning the workpiece so that whenever possible you can saw vertically, with your eye immediately over the saw.

Depth Stop

Much hand woodworking, sawing in particular, depends on working carefully to accurately laid out lines, penciled or scribed, but this advice is useless if you can't see the layout marks. This is often the case when sawing to a specified depth. Rather than attempting to see the impossible, limiting the saw's travel is a better idea. The simplest solution is a stop block fixed to the side of the saw, whether it is a 26"-long crosscut saw or a small, fine-toothed dovetail saw (**FIGURE 64A**).

CONSTRUCTION • The simplest depth stop for almost any kind of saw is simply a straight scrap clamped to the side of the sawblade with any convenient clamp. More useful is a broader piece of wood slotted so you can attach it with nuts (preferably wingnuts) and bolts inserted through the sawblade. If you bore through the sawblade halfway between the teeth and the back, and make a long enough slot in the stop, you will maximize the possible adjustment range. While you may not want to bore through the blade of every saw you own, equipping at least one backsaw with an adjustable stop will prove very useful for repetitive jobs such as sawing tenons.

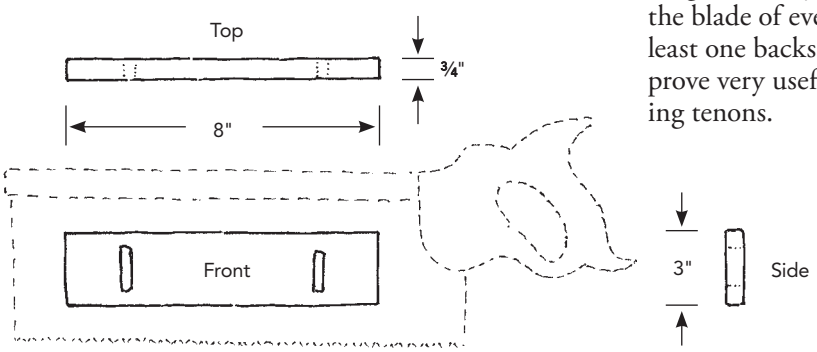


FIGURE 64C: Depth stop

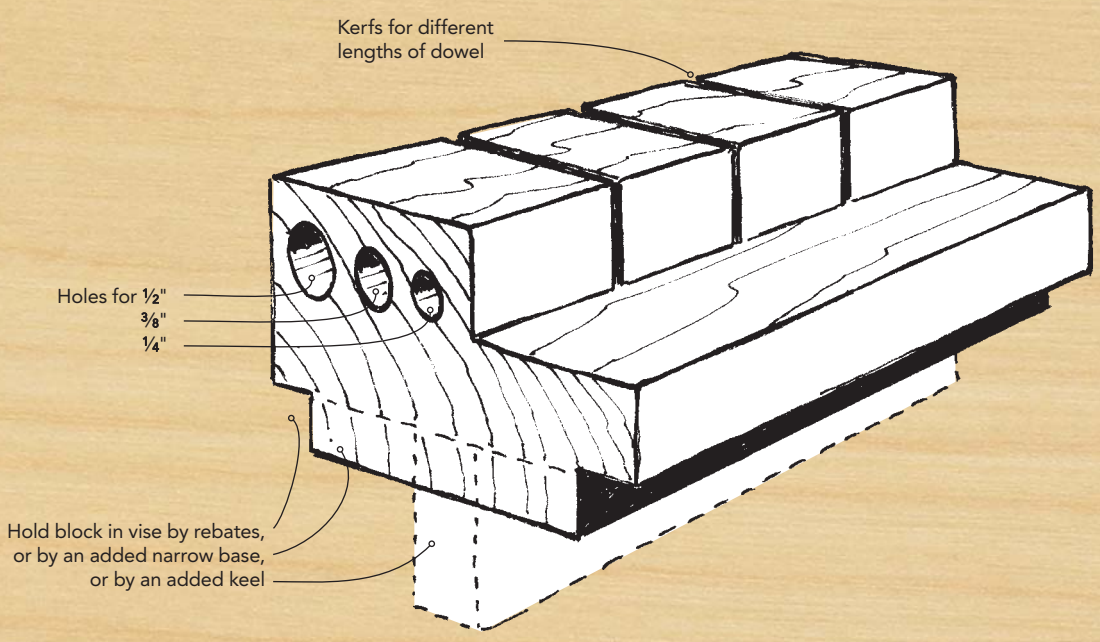


FIGURE 65A: Dowel length stop

Dowel Length-Stop

Dowels are commonly used in groups, all of which may need to be cut to the same length. Rather than measure each length individually the most efficient method is to use some form of pre-measured length stop. It is not difficult to clamp a stop block to the back hook of a bench hook, but an even easier method is a stop block bored with several holes, each slightly larger than the most common diameters you may need for dowels. By kerfing this block at various lengths you may slide a dowel rod into one of these holes until its end is flush with the opposite end of the block and then use the appropriately marked kerf to produce the required length dowel (**FIGURE 65A**).

CONSTRUCTION • While it might be tempting to bore more than three or four different diameter holes, and to make the stop block longer than necessary for three or four kerfs, such maneuvers will prove to be too many and too much for convenience. When you want to trim a short length of dowel to exact length, use another dowel rod of the same diameter to push it into position. The block can be held in the bench hook, rebated to be held in a vise, or provided with its own lip or keel, as shown in **FIGURE 65B**.

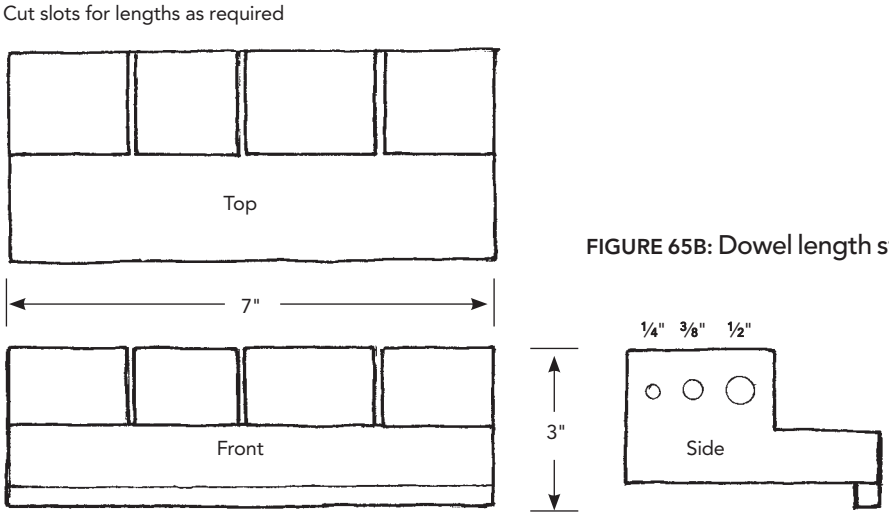


FIGURE 65B: Dowel length stop

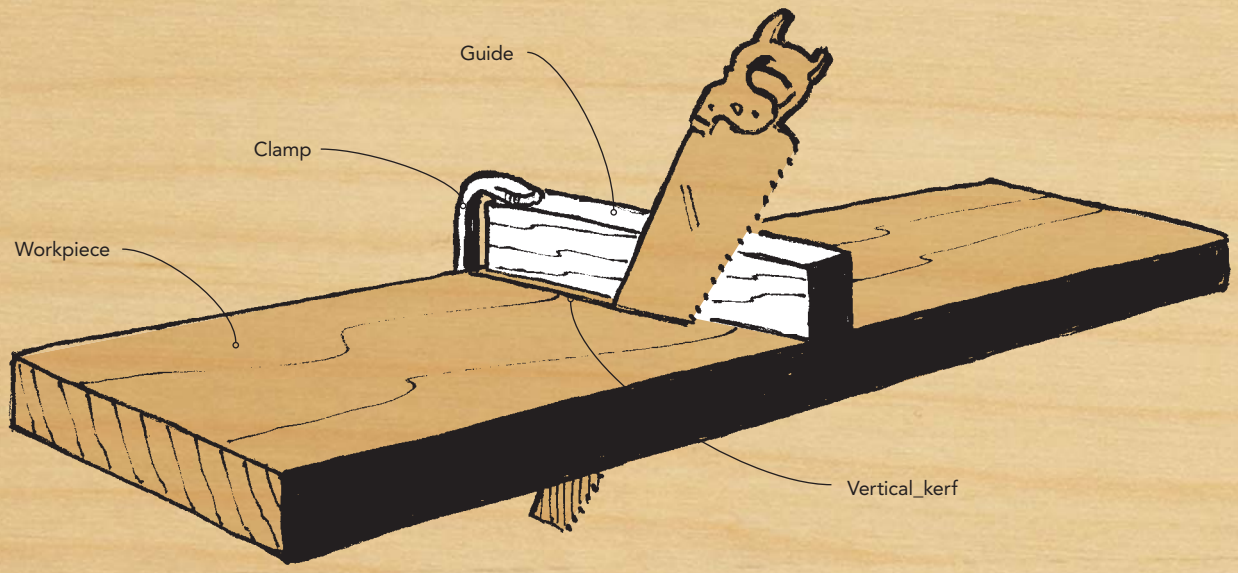


FIGURE 66: Shoulder guide

Shoulder Guide

A kerfed bench hook is good for angle-sawing relatively narrow workpieces, but wider workpieces such as the sides of shelving or cabinet carcases cannot be brought to the bench hook. Instead you can temporarily fix a guide to the workpiece so that holding the saw against it ensures that the saw enters the workpiece perfectly perpendicularly. Assuming that the workpiece and the guide are secured so that you have a hand free, you can help guarantee accuracy by using the thumb of your free hand to press the blade lightly against the guide block. This is much more reliable than the commonly recommended practice of attempting to sight the perpendicularity of the saw against a trysquare.

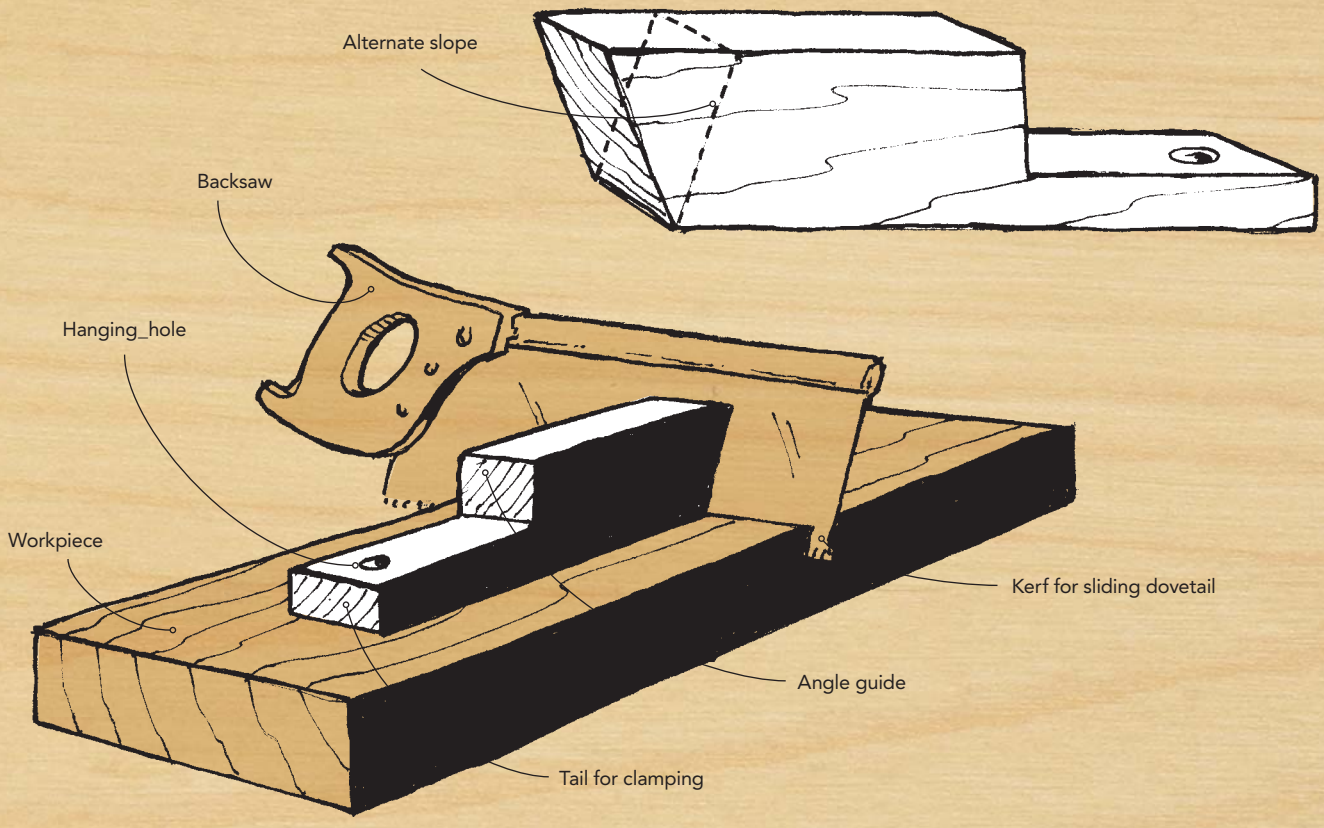


FIGURE 67A: Angle guide

Angle Guide

An angle guide is only slightly more advanced than the shoulder guide. The most common example is a block of wood whose end, against which you hold the saw, is cut to the angle you need. Such a block may be held to the workpiece with the aid of a hold-fast. Several variations are possible, each of which may be more convenient in a particular situation. One is to provide the angle block with a tail for easier clamping. Another is to cut the angle up or down, as shown. Yet a third is to use two identical blocks clamped together or spaced apart across the width of a wide workpiece or when using a larger saw.

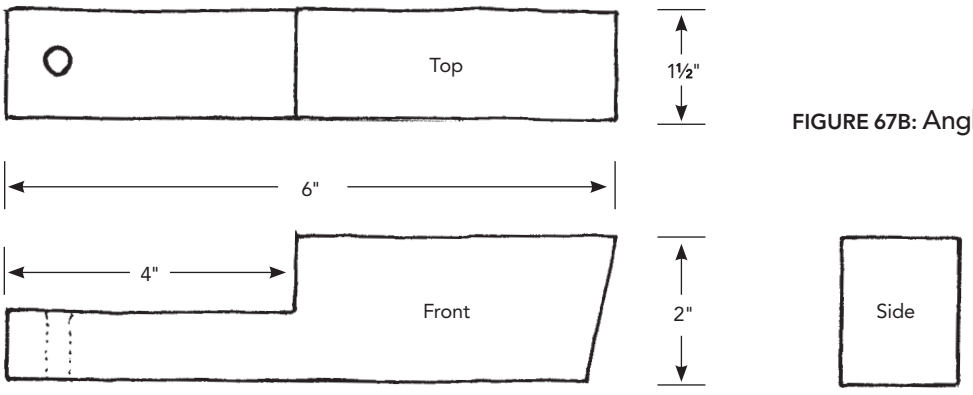


FIGURE 67B: Angle guide

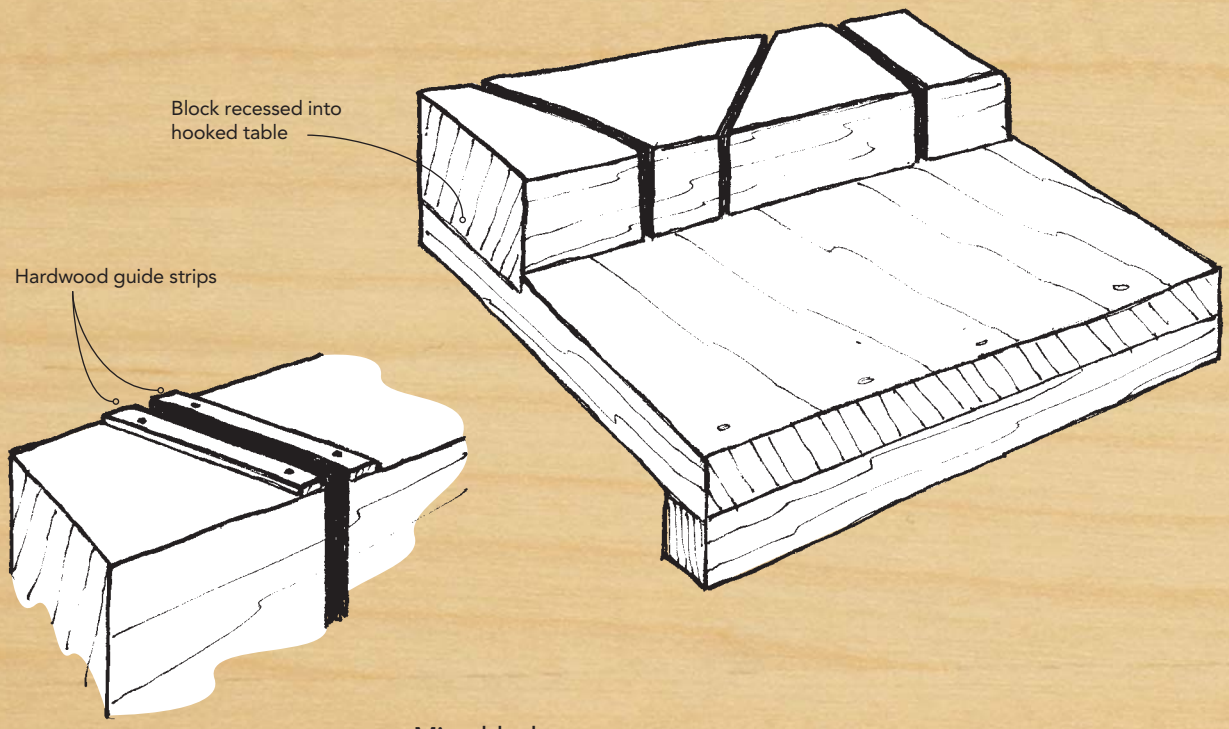


FIGURE 68A: Miter block

MITERING AIDS

Miter Block

The miter block is nothing more than a bench hook intended solely for sawing miters. The hook is usually higher and wider than the one on a regular bench hook, the better to guide the saw. Although the kerf should be very carefully cut with the same saw that will be used to cut miters, it is still liable to wear with use and become less than perfectly accurate. If you attach hardwood strips to the top of the block, close against the sides of an inserted saw, the jig's useful life will be greatly extended. However, you must be sure to always insert the saw into the block through the front of its kerf and not from the top down, otherwise you would eventually wear the strips.

CONSTRUCTION • The miter block is much wider than a kerfed bench hook, thereby providing more guidance to the sawblade. Another fundamental difference is that the block itself should be let into its hooked table, so that the various kerfs cut in it do not completely cut it into separate pieces.

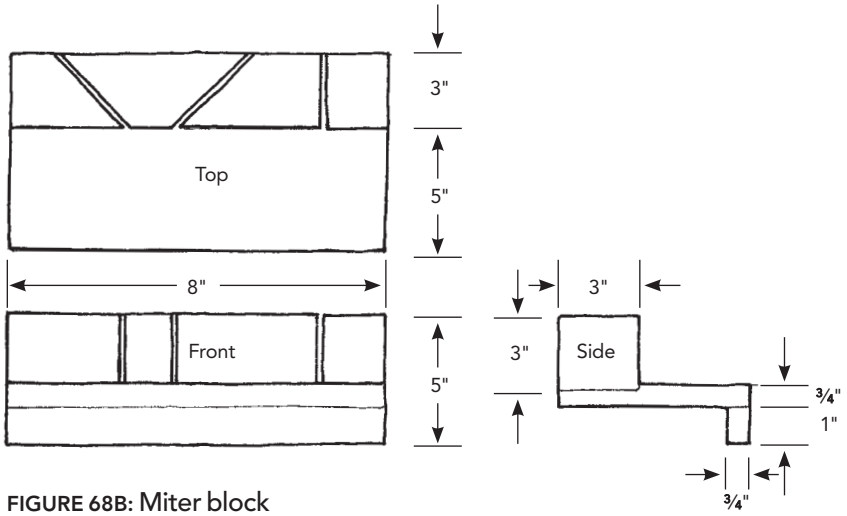


FIGURE 68B: Miter block

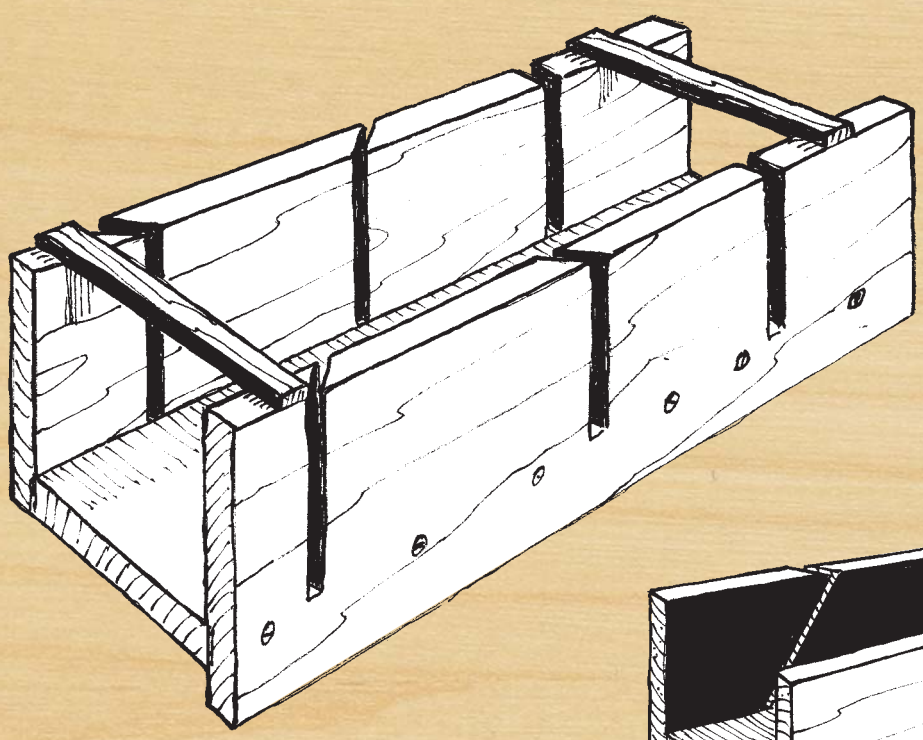


FIGURE 69A: Simple user-made miter box

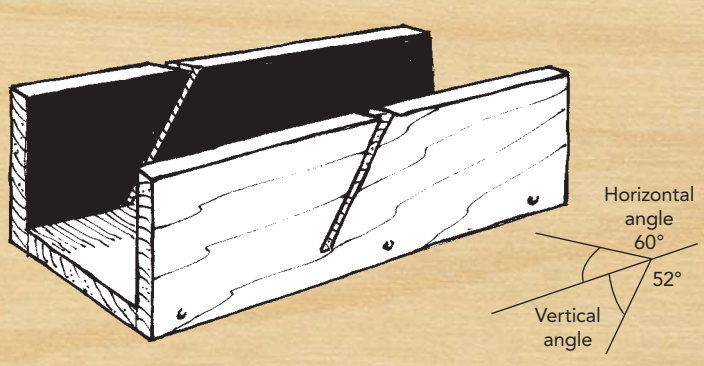


FIGURE 69B: Compound miter box

Miter Box

Although a miter box is one of the few jigs and fixtures readily available as a manufactured item, a miter box that is user-made will often be necessary for workpieces too large to fit into a store-bought model. Furthermore, although some manufactured miter boxes are adjustable, and have movable saw guides that allow sawing at any angle from 0° to 90°, they cannot cut compound miters that slope perpendicularly (as might be necessary for slope-sided hoppers and knife boxes). A user-made miter box, however, is easily made, provided that you lay it out with care. A worthwhile addition to any user-made miter box is a deep front that can act either as a hook against the front of the bench or as a keel to be held in the vise.

As with the miter block, strips attached to the two sides at the top of the box either side of the kerfs will not only prevent the kerfs from wearing wide too fast, but also will keep the front and back aligned (**FIGURE 69A**).

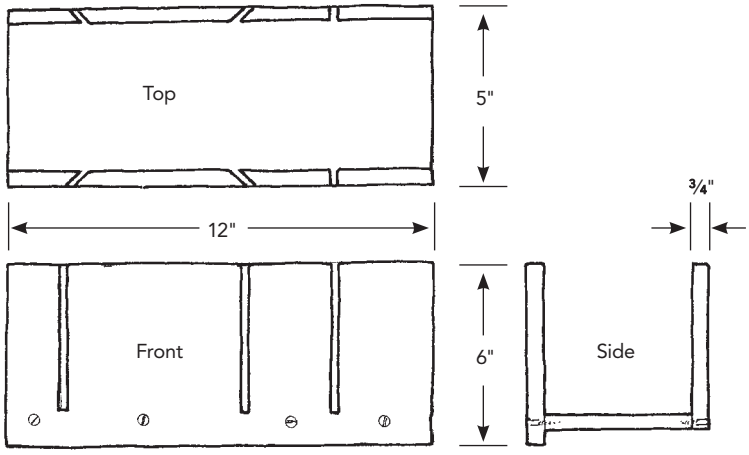
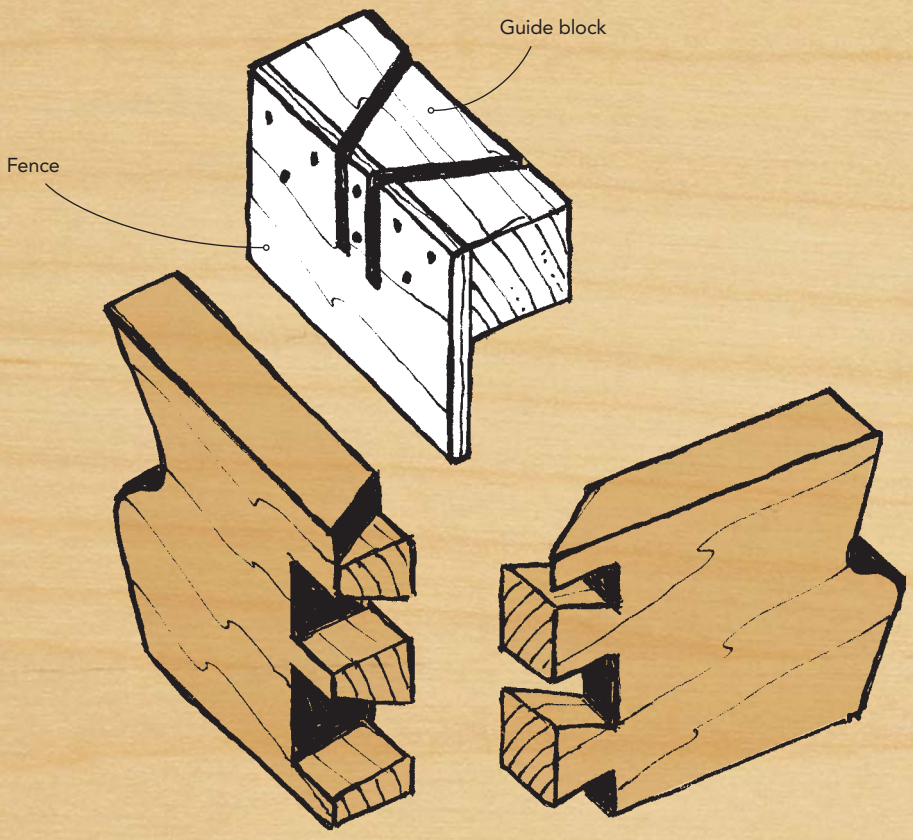


FIGURE 69C: Sipmle user-made miter box



The two parts of a mitered corner dovetail

FIGURE 70A: Mitered dovetail block

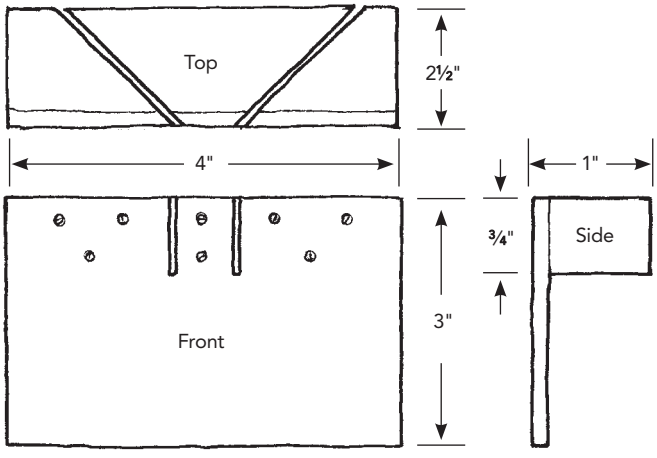


FIGURE 70B: Mitered dovetail block

Mitered-Dovetail Block

The sides of chest carcases and other case pieces that are dovetailed together are often finished with a miter at the exposed upper end of the joint. Such a miter cannot be sawed in a regular miter box because the workpiece is invariably too large. The solution is to attach a mitered block to a fence that can be clamped to the workpiece, as shown in **FIGURE 70A**. This is also an operation where a depth stop may be usefully affixed to the saw.

CONSTRUCTION • While this little jig does not have to be very large it is important not to make it too small, or to cut the angled kerfs too close together. Otherwise, the guide block parts cannot be securely fixed to the fence. Use glue and secure each part with at least two nails or screws.

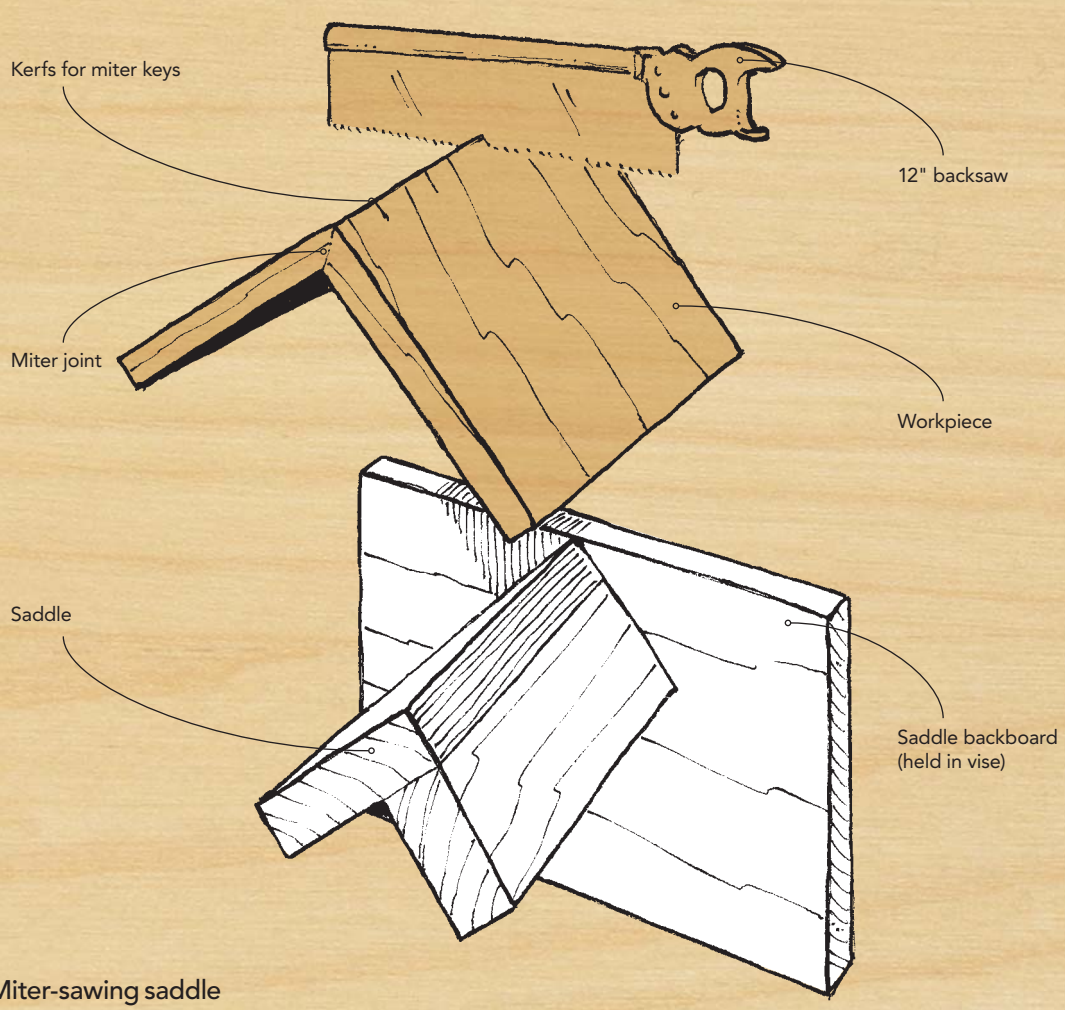


FIGURE 71A: Miter-sawing saddle

Miter-Sawing Saddle

Mitered joints, being fundamentally poor candidates for a secure glue joint, are often strengthened with keys or feathers inserted across the miter. You can easily cut the kerfs for these keys if you clamp the two mitered pieces to a sawing saddle – essentially the opposite of a cradle.

CONSTRUCTION • Make the saddle as wide as the mitered pieces to be feathered so that they will be easy to clamp. Take care to make a perfect right-angled joint, and fix a backboard to one end of the saddle so that it can be held in the vise.

The horizontal pieces may be simply glued together – thereby eliminating any possibility of damaging whatever tool you use to cut the feathers – rather than joining them with nails or screws. On the other hand, these horizontal pieces are most easily fixed to the backboard by screws inserted through the back.

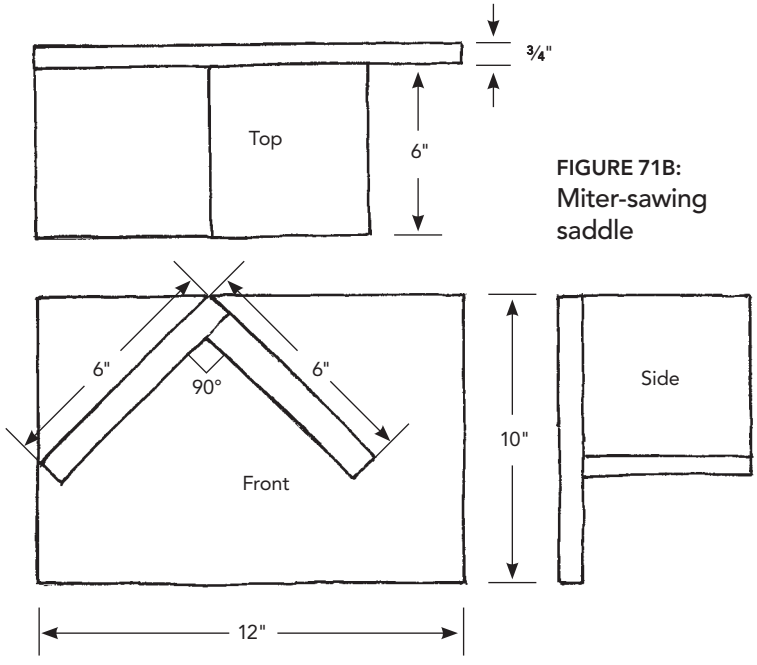
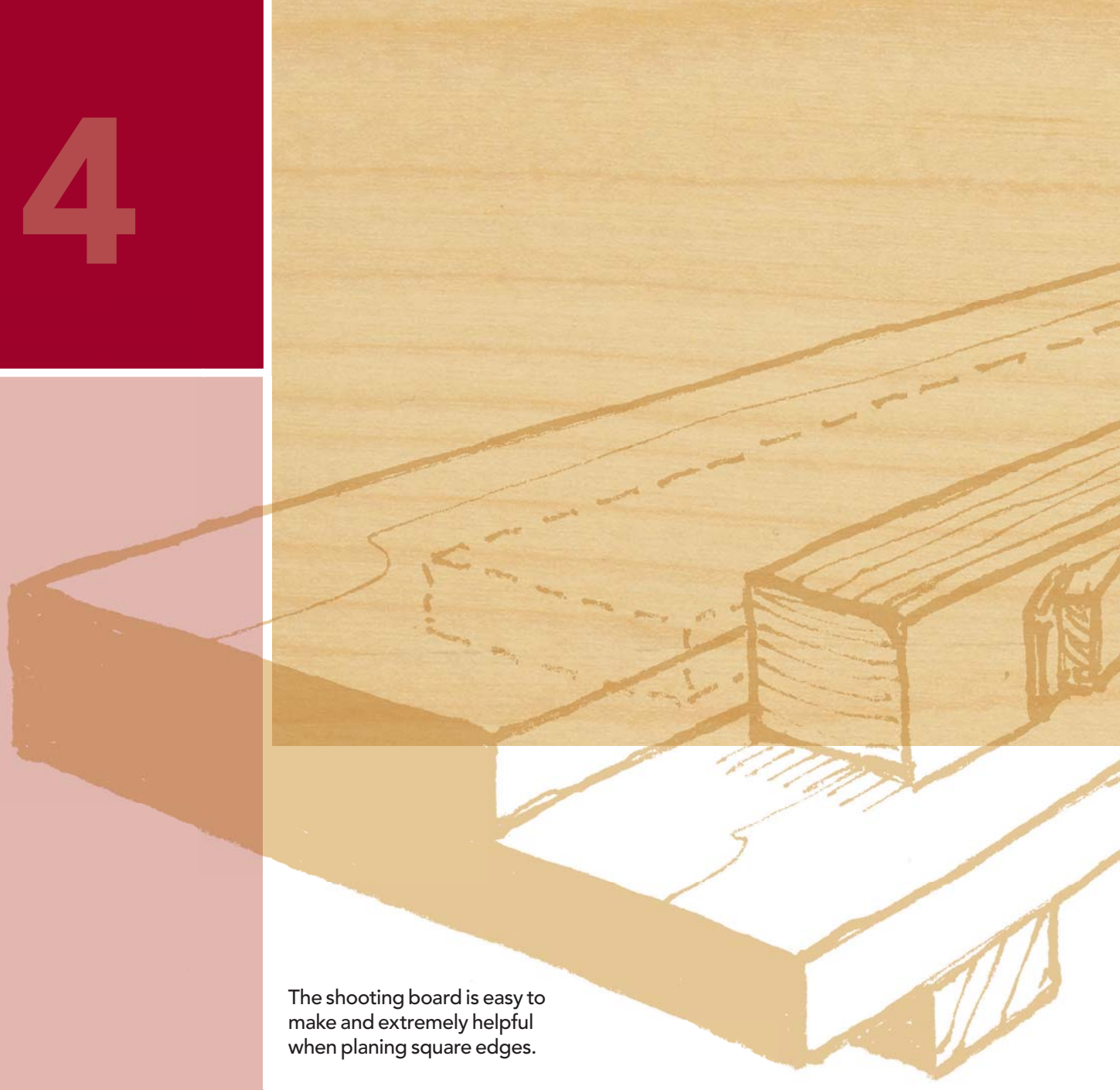
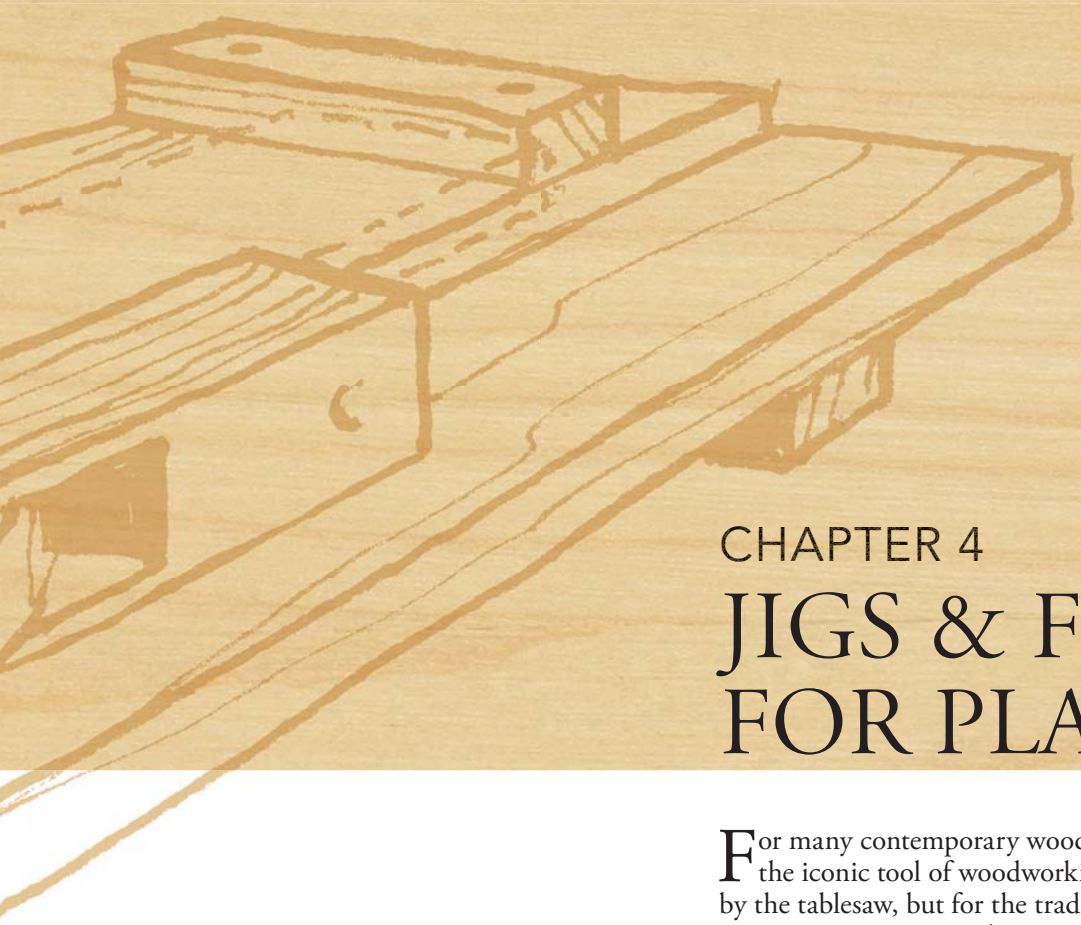


FIGURE 71B: Miter-sawing saddle

4



The shooting board is easy to make and extremely helpful when planing square edges.



CHAPTER 4

JIGS & FIXTURES FOR PLANING

For many contemporary woodworkers the plane's position as the iconic tool of woodworking has long since been replaced by the tablesaw, but for the traditional woodworker it remains our most important and most varied tool. One special advantage – apart from the pleasure and safety in using a plane rather than a machine – is that many of the jigs and fixtures needed by tablesaw and router woodworkers are unnecessary. Rather than spend time jigging the machine to make a particular operation possible, the traditional woodworker can simply reach for the appropriate plane and get on with it, without further ado. Nevertheless, there are a number of jigs and fixtures that can make planing both faster and more accurate. You can use them with metal-bodied planes as well as with wooden ones.

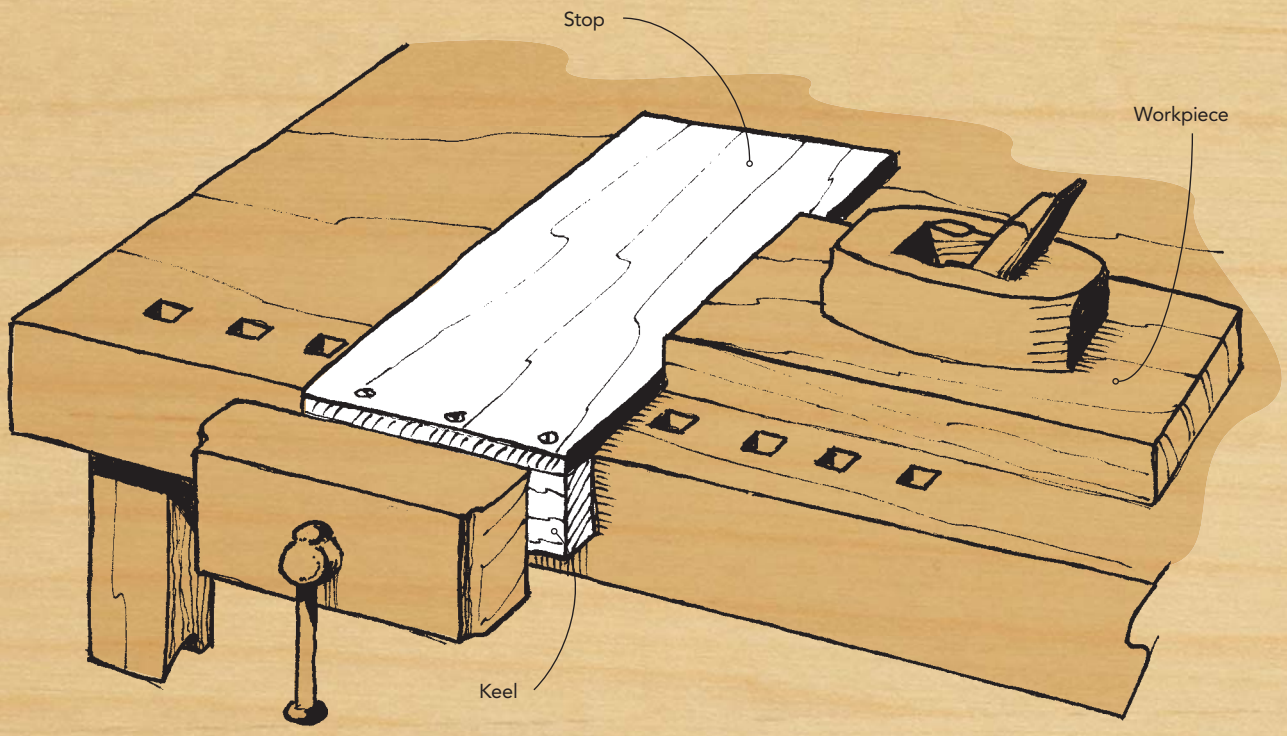


FIGURE 72A: Face-planing stop

HOLDING FIXTURES

Many holding fixtures also useful for planing have already been mentioned in Chapter 1. What follows is a selection of fixtures designed specifically and solely for planing.

Face-Planing Stop

Faster to set up than using a pair of regular bench stops (Chapter 1) – which in any event presupposes a tail vise that not all benches may have – is a single wide stop held by a keel in the face vise. You simply butt the workpiece up against the stop, and proceed with confidence (**FIGURE 72A**). In situations that also require cross-planing, see the planing board described later in this chapter.

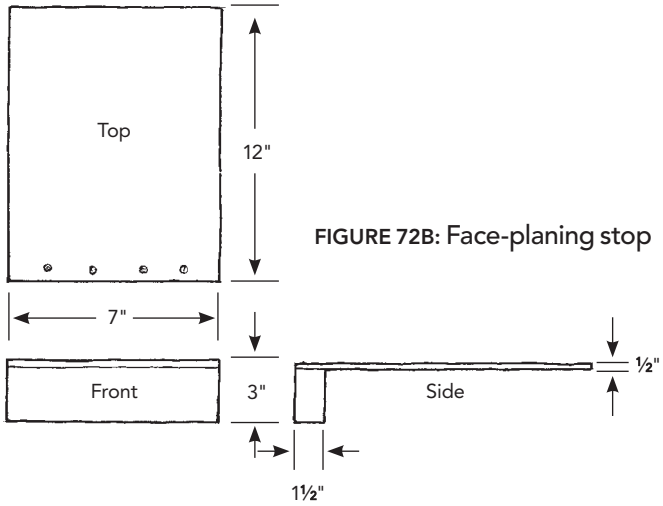


FIGURE 72B: Face-planing stop

CONSTRUCTION • The actual stop can be quite thin. Assuming your bench is as flat as it should be, and further assuming that the workpiece has already been made flat, something no thicker than ½" will work well. Note that for maximum utility the stop should not be thicker than the workpiece or it will be in the way and you will need constantly to turn the workpiece end-for-end. Attach the stop to a substantial keel and note that the longer the keel the wider the stop will be, and the wider the stop the less it will deflect under pressure.

Although the stop is cross-grain to the keel, the thinness of the stop makes it unimportant to worry about any difference in seasonal wood movement. A small crack or two will hardly affect the utility of the fixture.

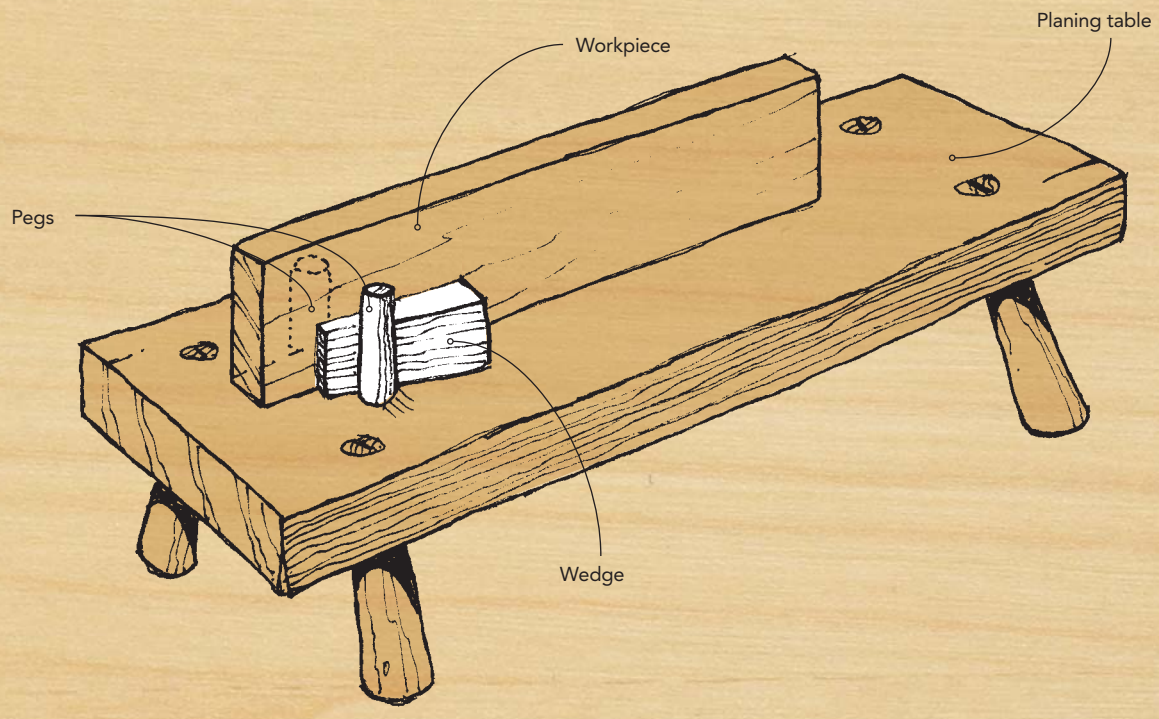


FIGURE 73: Roman pegs

EDGE-PLANING FIXTURES

If the face vise is in good condition with parallel and level jaws, you'll be able to secure many workpieces for planing with various fixtures illustrated in Chapter 1. The following three items – Roman pegs, strip clamps and the edge-planing clamp – deserve special mention because they are intended exclusively for planing.

Roman Pegs

Roman pegs dates back to Roman times when boards were held on a low planing table by being wedged between two upright pegs fixed in the surface of the bench. Modern woodworkers will probably find this peg system more useful on a higher bench or sawhorse (**FIGURE 73**).

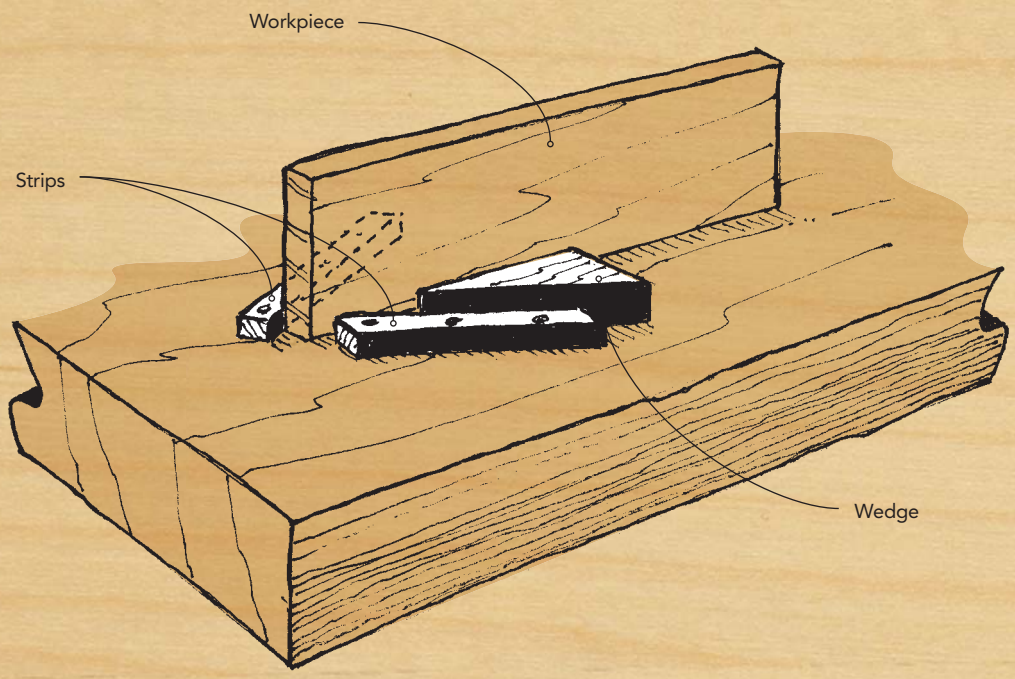


FIGURE 74A: Strip clamp

Strip Clamp

The strip clamp is perhaps most useful on a jobsite or in a shop that lacks a regular bench equipped with vises and bench dogs, but which may nevertheless possess a flat work surface. Angled short strips fixed to the work surface replace the Roman pegs, with the workpiece secured in between by wedges (**FIGURE 73**).

CONSTRUCTION • To form the clamp securely glue, screw or nail two 6"-long strips in V-formation, no more than 2" apart at their narrow end, each at an angle approximately 15° from the center line. Hold the workpiece in the clamp with two wedges cut with matching angles. Make the wedges thicker than the strips so they will hold better and it will be easy to knock them out when the work is completed. This is a better technique than knocking the workpiece itself out.

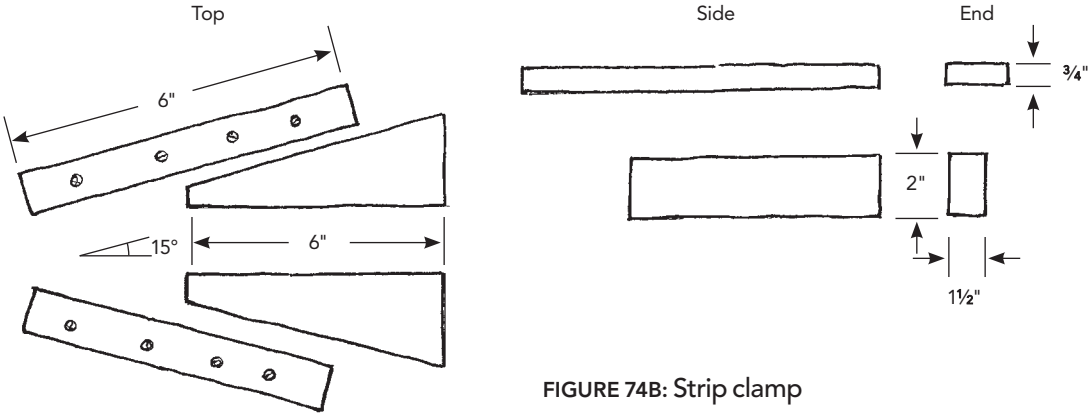


FIGURE 74B: Strip clamp

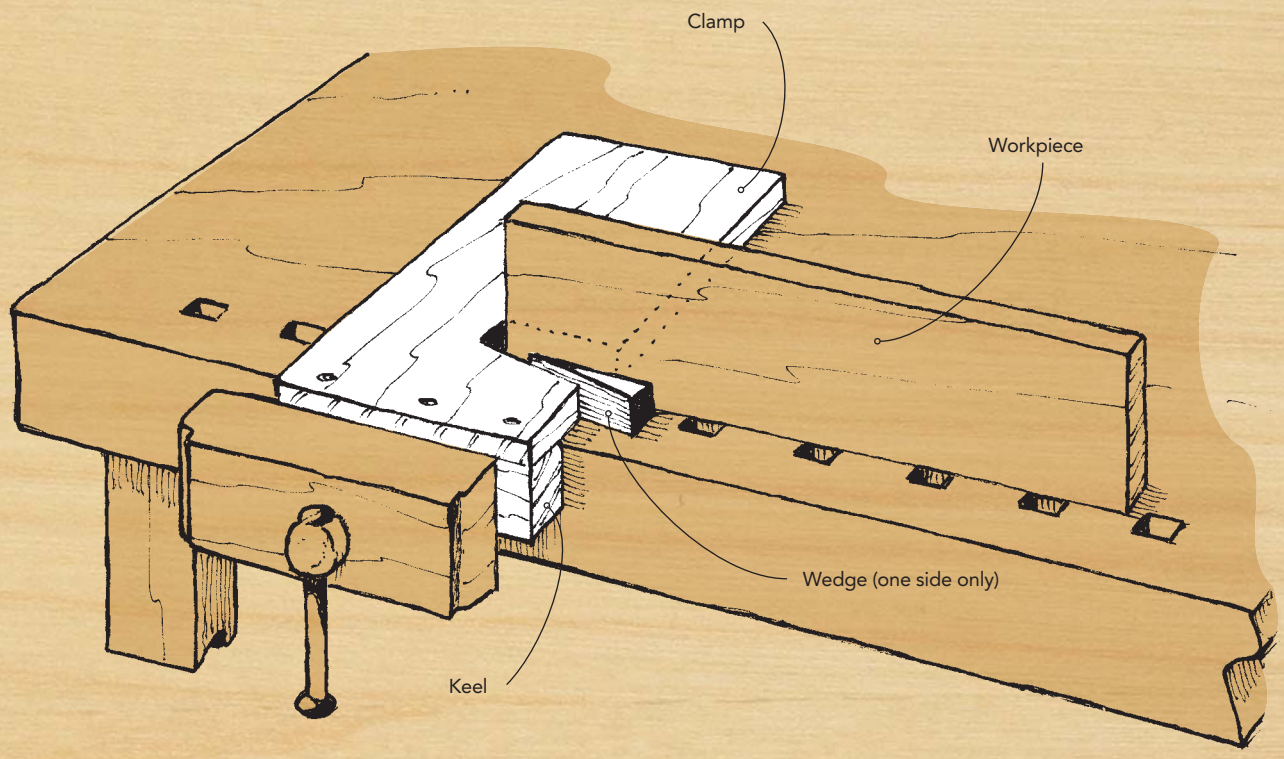


FIGURE 75A: Edge-planing clamp

Edge-Planing Clamp

The third aid in this series, the edge-planing clamp, is an improvement on the V-clamp shown in Chapter 1. One side of the notch is straight, and the other is angled to accept a matching wedge. The great advantage here is that the workpiece receives sideways support while it is being held vertically in place. Unlike strip clamps you don't need to attach anything to the bench because this clamp is held in the vise by a keel (**FIGURE 75A**).

CONSTRUCTION • The board that forms the clamp should be at least ¾" thick, and the wedge that secures the workpiece somewhat thicker. It is the thickness of the clamp that grips the workpiece well enough to make two wedges unnecessary. For maximum strength cut the notch for the workpiece and wedge in the center of the clamp's length, and no more than halfway across its width.

As with the face-planing stop, any cracking that might appear on the clamp as a result of seasonal wood movement is inconsequential and in no way affects the utility of the piece.

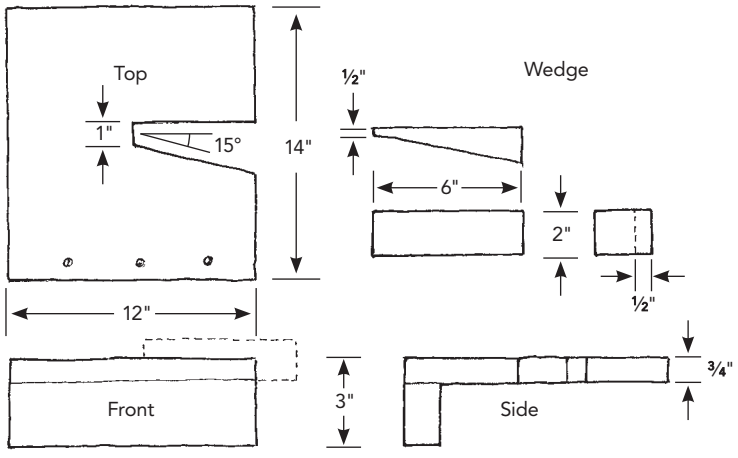


FIGURE 75B: Edge-planing clamp

JIGS & FIXTURES FOR PLANING

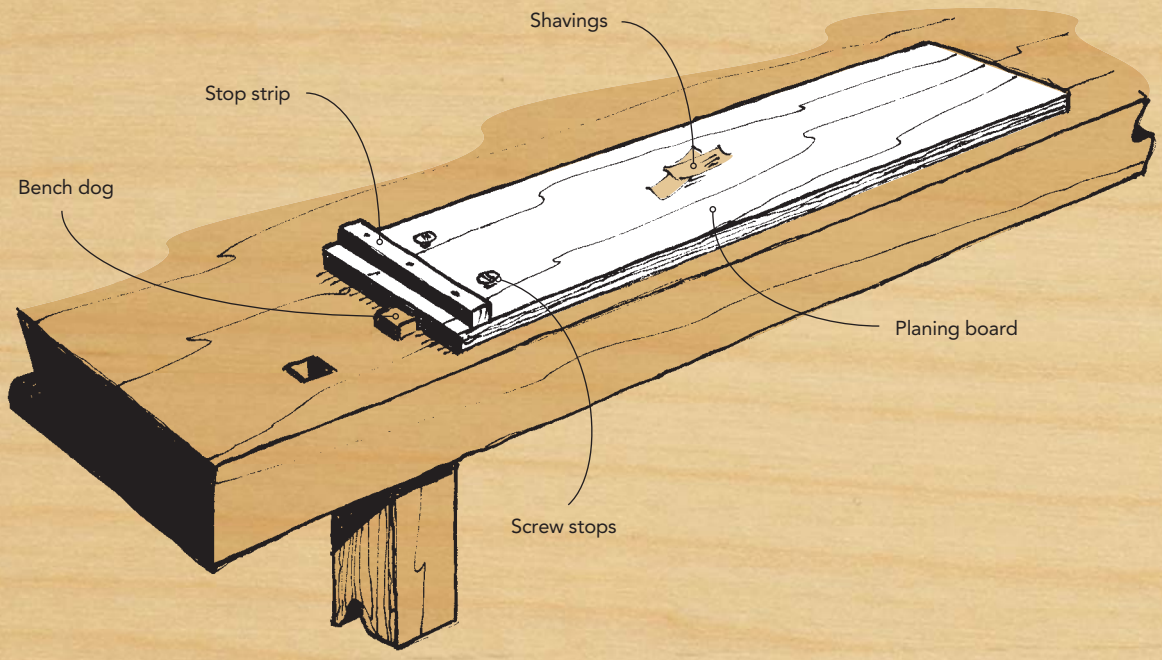


FIGURE 76A: Planing board

Planing Board

Should your bench top not be perfectly flat, or if the board being planed is slightly bowed, when you attempt to plane the high side the pressure of the plane may cause the end of the workpiece held against the bench stop to rise – and no longer be held in place. The solution is to use a specially prepared, perfectly flat board, at least as big as the workpiece to be planed, which can be more easily held against the stop. A couple of flathead woodscrews (which may be raised or lowered according to the thickness of the workpiece) will act as stops. If you have any concern about the screws damaging the end of the workpiece, attach a small stop strip to the board as well. As a further precaution against the workpiece lifting clear of the stop (or of the screws) when you apply pressure to its center, place a shaving or two under the high spot.

CONSTRUCTION • The planing board is one example where medium density fiberboard (MDF) is perhaps the best material since it is not likely to warp. However, he use of a thin stop strip rather than screws is a better idea with MDF since constant adjustment of the screws will eventually cause them to fall out.

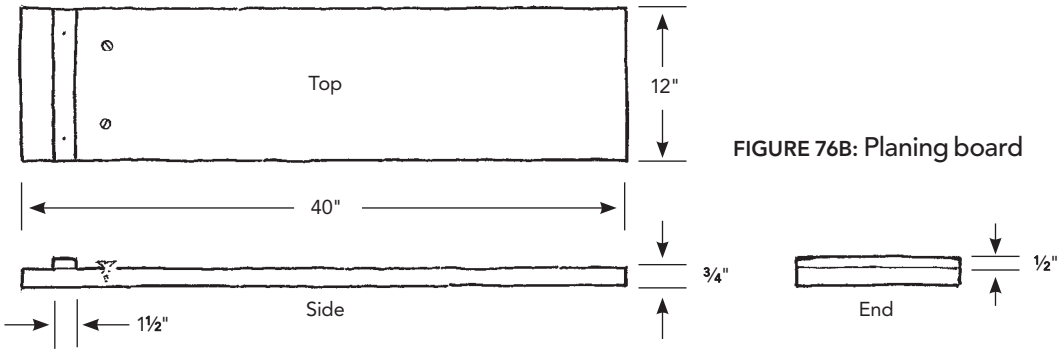


FIGURE 76B: Planing board

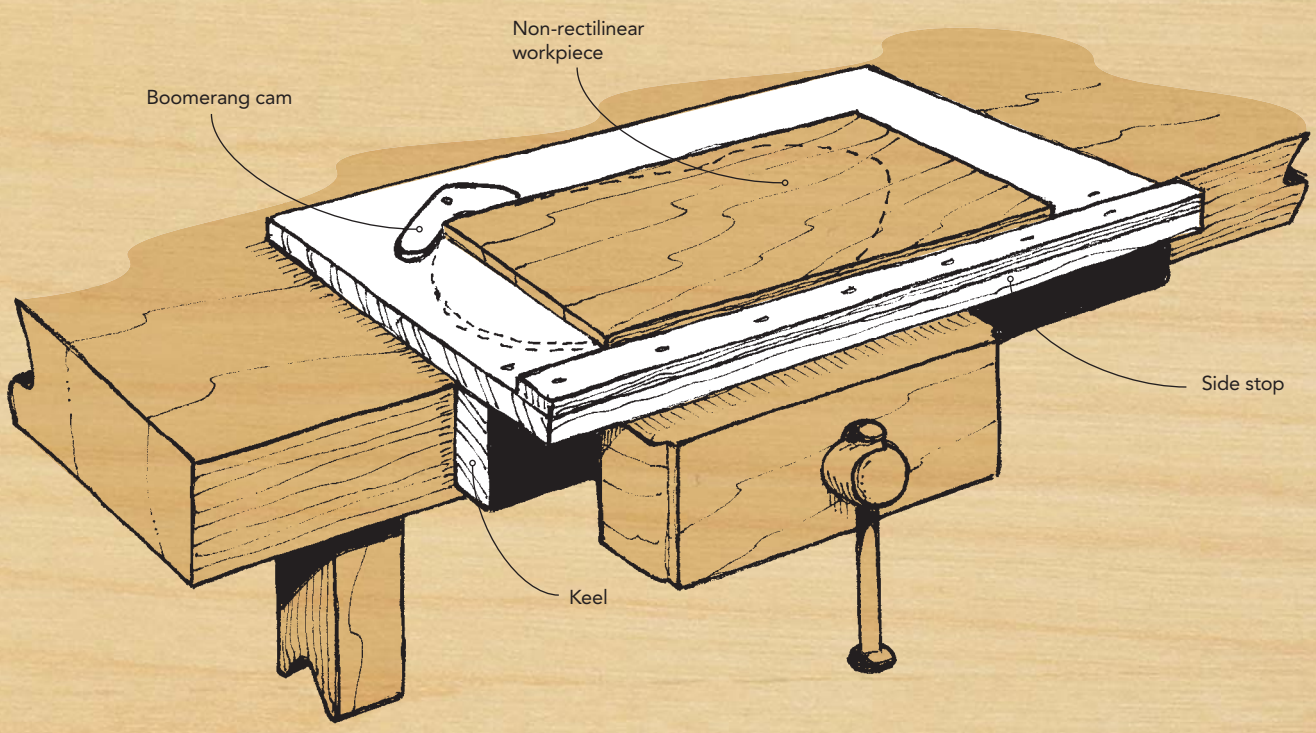


FIGURE 77A: Cammed planing board

Cammed Planing Board

For small and irregularly shaped workpieces, you can make a special cammed planing board, fitted with a keel that may be held in the vise. A stop on one side and a boomerang-shaped cam on the other side will hold most pieces. The cam is attached to the board by a screw and a washer so it turns easily, and so it's easy to move and remount wherever it's needed. The harder you press the workpiece against the cam, the more firmly it presses against the workpiece (**FIGURE 77A**).

CONSTRUCTION • On a base of plywood fix a long holding strip along one side, and on the other attach a keel that may be held in the vise. Offset the keel as shown in **FIGURE 77B** so the edge of the board may rest on the top of the vise's outer jaw, assuming the jaw is flush with the surface of the bench. Attach the boomerang-shaped cam opposite the holding strip at the far corner. Both the holding strip and the cam should be thinner than the workpiece. In order to avoid weak cross-grain, make the cam out of plywood, and be sure to countersink the screw (and washer) holding the cam so that there is no danger of damaging the plane iron. Relocate the cam to accommodate differently shaped workpieces as required.

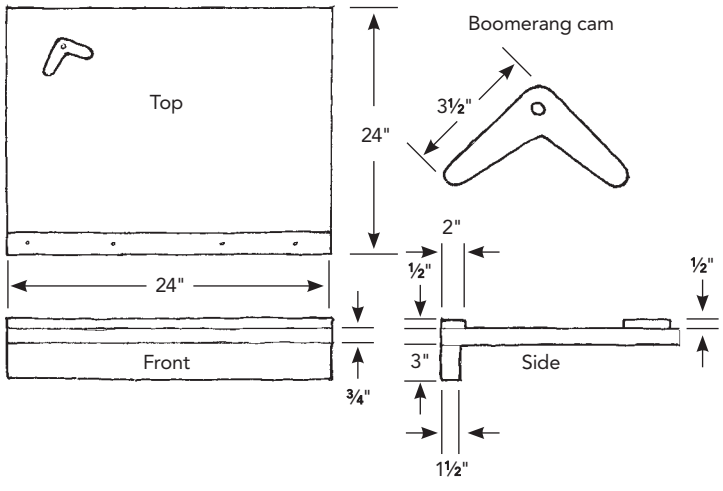


FIGURE 77B: Cammed planing board

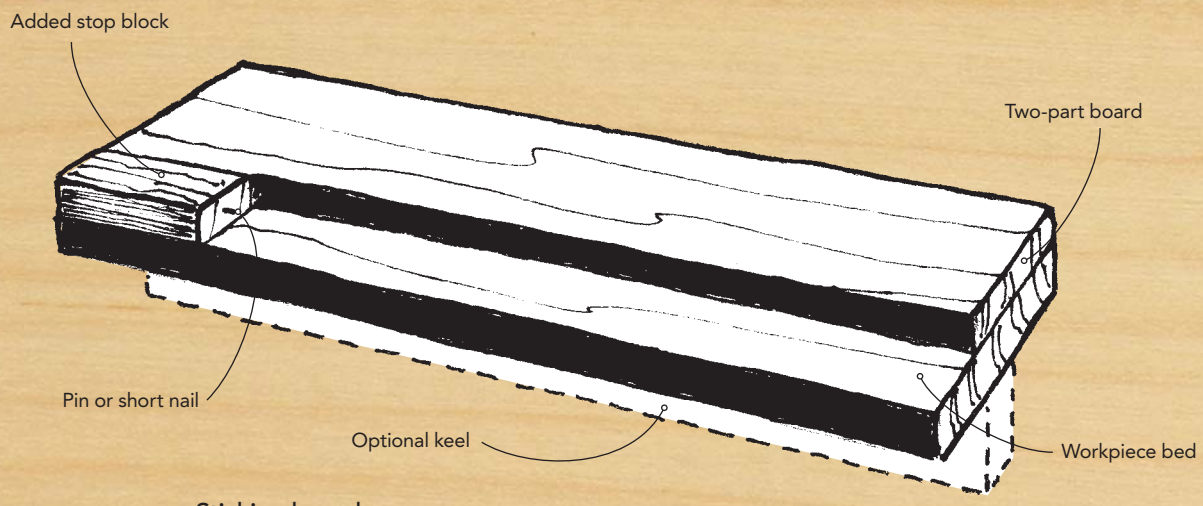


FIGURE 78A: Sticking board

Sticking board

Sticking boards are one of the oldest fixtures used by traditional woodworkers, references to them being found in very old texts. They are most useful for small narrow pieces that need to be plowed, moulded or rebated, and may be made in various sizes ranging from 1' to 2' in length. They may be built-up or rebated. Smaller ones commonly are furnished with a short nail or pin to hold the workpiece in place. Sticking boards may be held in the vise by a keel or simply fixed between bench stops (**FIGURE 78A**).

CONSTRUCTION • The most common form of sticking board consists of a single narrow rebated board with a stop at one end of the rebate. There is, however, no definitive shape or form for a sticking board, for once you grasp the principle you can make them in a variety of shapes and sizes to suit the workpiece to be held and the job you plan to do on it.

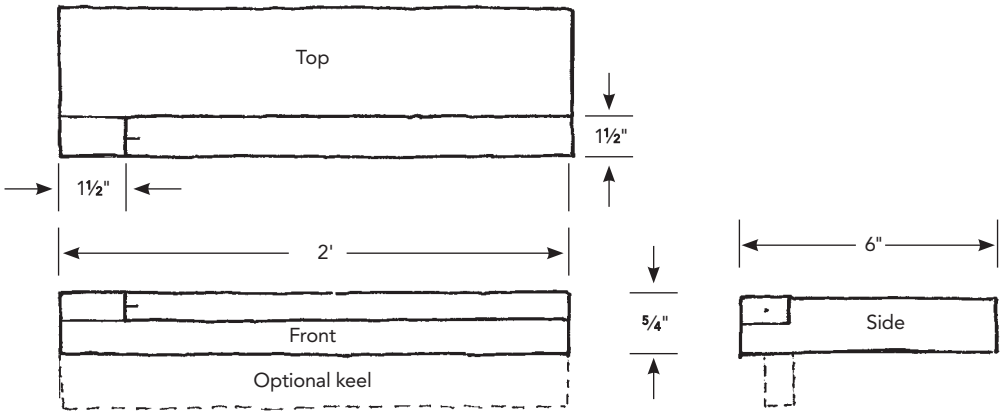


FIGURE 78B: Sticking board

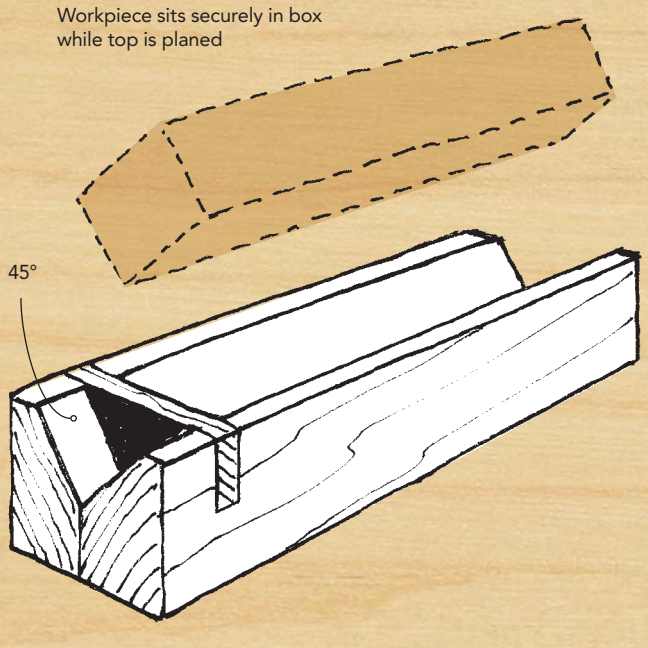


FIGURE 79A: Dowel box

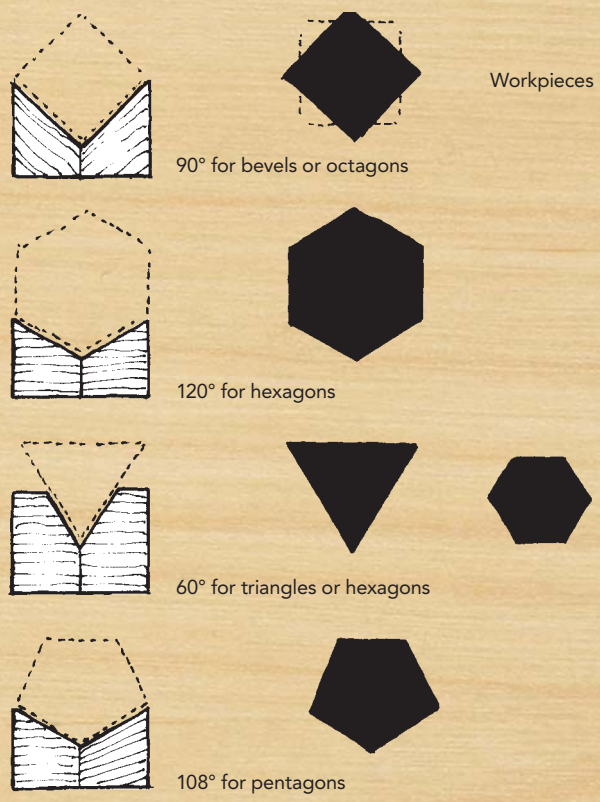


FIGURE 79B: Planing cradle internal angles

Dowel Box (Rounding Cradle)

For planing small pieces of square or octagonal stock to a round profile, whether for use as dowels or other rounded items, a V-shaped box fitted with a stop at one end will not only hold the workpiece securely but will also prevent it from rotating (**FIGURE 79A**).

CONSTRUCTION • This is typically a small fixture – common sizes are from 6" to 9" long – so it's easy to plane a 45° bevel on one side of a length of scrap. When the bevel is complete saw the scrap into two equal lengths and glue or screw the pieces together with the bevels facing each other. The stop may be simply nailed to one end, although for greater permanence you can cut a narrow slot across the bevels and glue it in. Be sure to plane its top level with the sides.

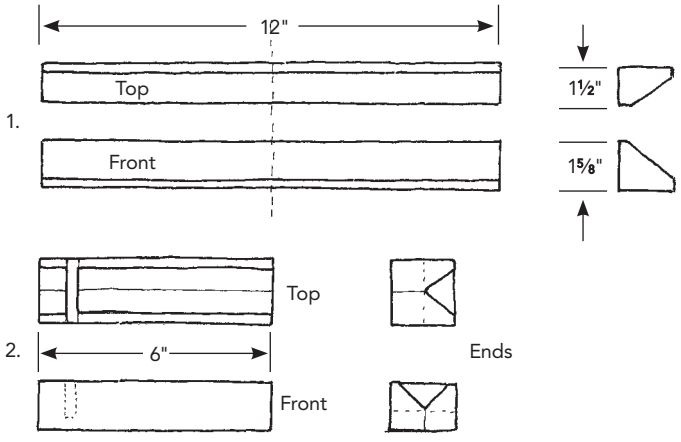


FIGURE 79C: Dowel box

Planing Cradle

You can improvise a quick planing cradle by clamping a small piece of scrap, perhaps less than 2" wide, in the vise and then resting the workpiece between the jaws so that one end bears against the stop and one corner is centered in the gap. For more exact work and for larger workpieces that must be planed to specific profiles, make a stopped cradle like the dowel box but with sides corresponding to the shape you want. **FIGURE 79B** gives the angles you'll need for specific cross-sections such as octagons, hexagons and pentagons, but you can make any other regular, not-square shape you might want. Make the cradle longer than the workpiece, anywhere from 1' to 4' long.

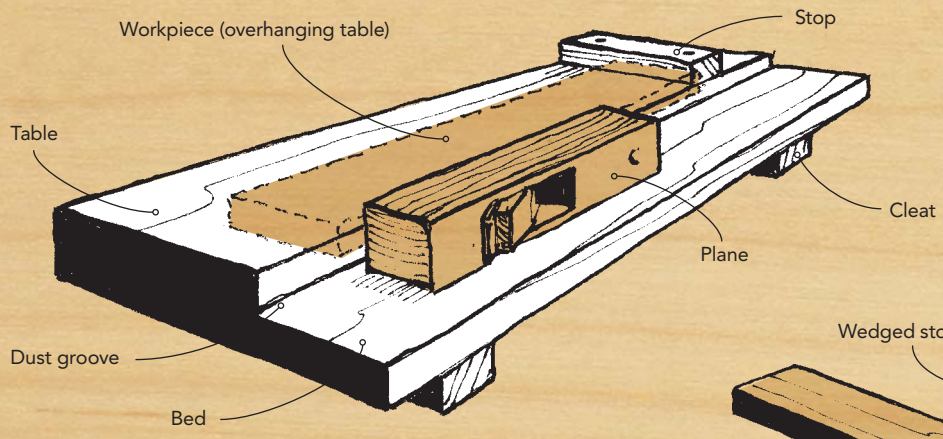


FIGURE 80A: Shooting board

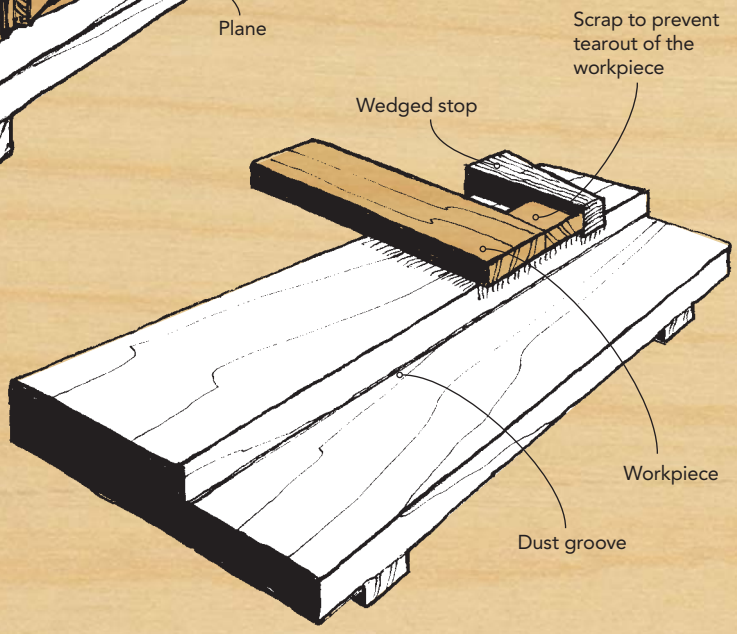


FIGURE 80B: Shooting end grain

SHOOTING BOARDS

Shooting boards (chute boards) help you accomplish edge or side planing with high accuracy because they provide a consistent relationship between the tool and the workpiece. They combine both fixture and jig in a single piece of apparatus.

Most shooting boards require that the sole and sides of the plane are at perfect right angles to one another. This presented little problem when planes were made of wood, because you could always maintain truth and flatness by shooting (planing) the sole of a plane with another plane . But poorly made metal planes whose sides are not exactly 90° to their soles can be difficult to use with shooting boards unless you pay attention to the relationship between sole and side and make allowance for anything less than perfection.

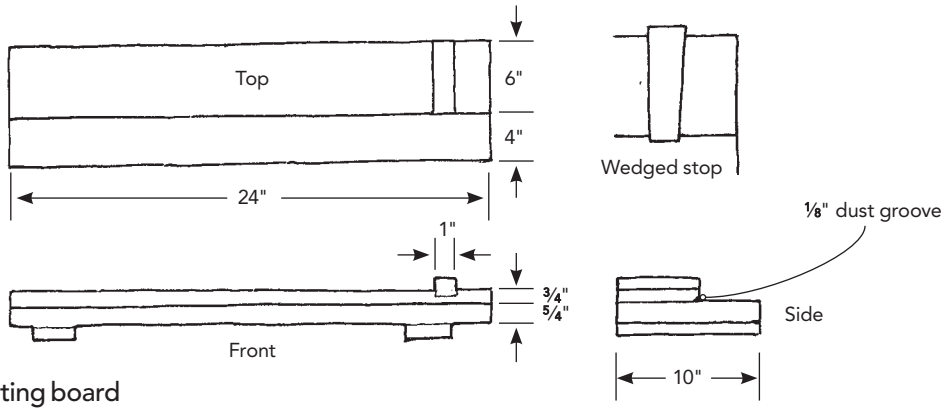


FIGURE 80C: Shooting board

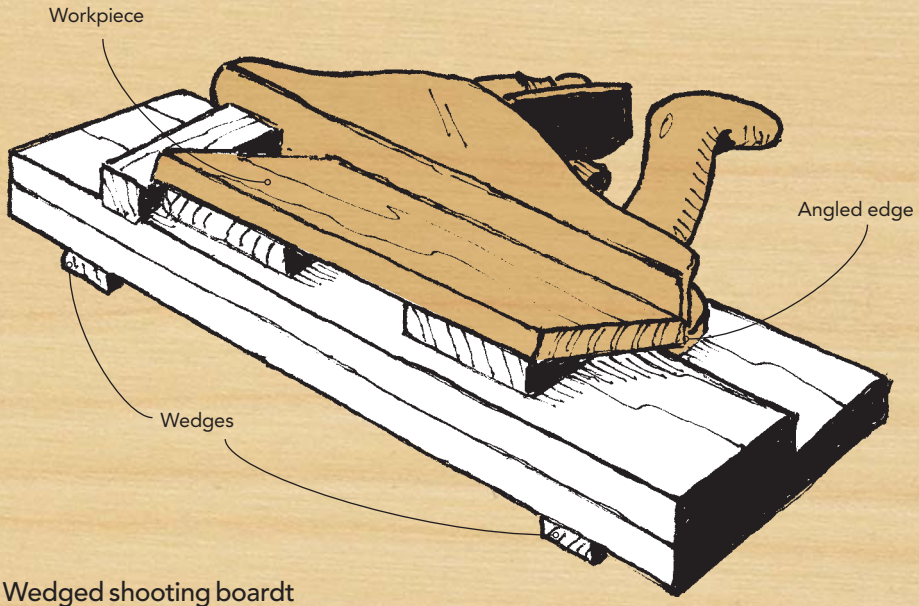


FIGURE 81: Wedged shooting boardt

Basic Shooting Board

The basic shooting board is little more than a stopped, two-part shelf, one level for the workpiece to rest on and another level for the plane, used on its side, to ride on. If the boards are perfectly flat and the plane body is perfectly square, it is virtually impossible to plane anything other than a perfect right-angled edge. With the plane being run on its side, the shooting board ensures that it meets the workpiece at exactly 90° – something that is frustratingly difficult if attempted freehand (**FIGURE 80A**).

CONSTRUCTION • Shooting boards are typically made from two flat boards about 24" long, the upper one 6" to 8" wide and the lower one sufficiently wider to accommodate a plane resting on its side. The only critical aspect is that the boards be kept flat, usually by fixing a couple of transverse cleats to the bottom, positioned so that they also act as hooks to secure the shooting board transversely across the bench top.

A stop (often wedge-shaped) to prevent the workpiece being pushed off the board is usually rebated in a similarly wedge-shaped dado in the top board. The stop may instead be screwed onto a flat surface, thereby allowing it to be fixed at an angle other than the usual 90°. If the stop is made a little longer than the width of the board into which it fits, it can be used to support an end being trimmed, and then be simply pushed further across as its own end is worn, splintered, or planed off.

A dust groove cut on the bottom edge of the top board is helpful but not necessary, since the plane is not run against this edge or it would soon be cut away. The workpiece should be placed on the upper bed against the end stop but slightly overhanging the edge, as shown in **FIGURE 80A**. This way the plane can cut the workpiece without trimming the jig itself.

The basic shooting board is equally useful for trimming the ends of workpieces when they are held against the stop. To prevent the back corner of the workpiece being torn out, add a scrap piece between the stop and the workpiece (**FIGURE 80B**).

Wedged Shooting Board

Edges other than those at 90° to the face may be accurately planed by the simple expedient of altering the angle of the bed on which the workpiece rests. You can do this simply by placing a wedge or wedges under the workpiece, or by making the bed adjustable with a longitudinal hinge (**FIGURE 81**).

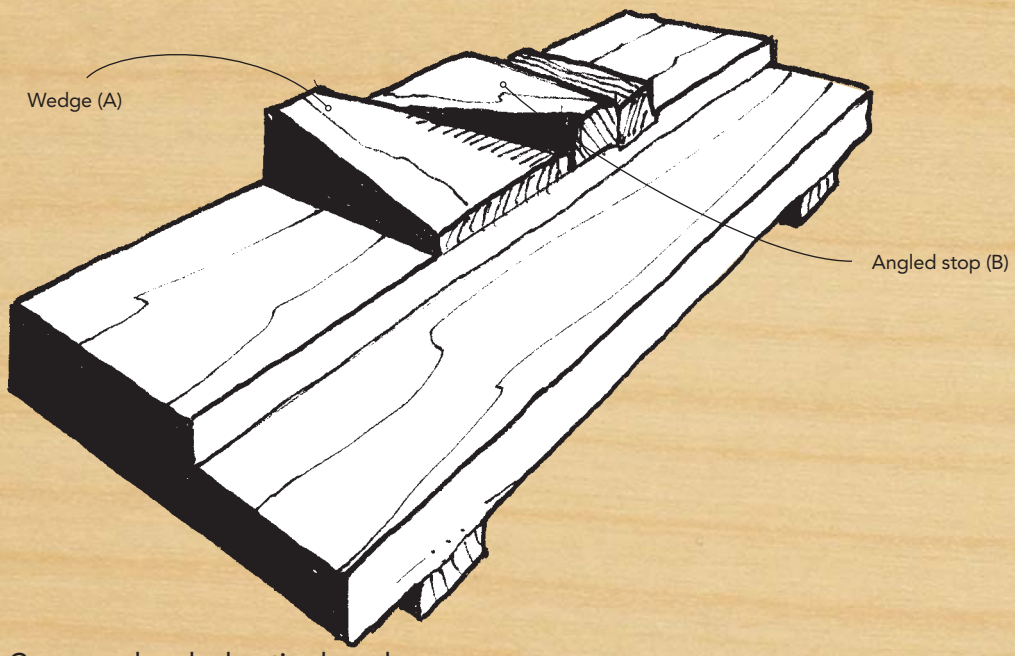


FIGURE 82A: Compound angle shooting board

Compound-Angle Shooting Board

To trim splayed joints or angled crown moulding, you'll need to accurately plane compound angles. Do it by supporting the transversely held workpiece on a tilted bed (or on wedges) against an angled stop, as shown in **FIGURE 82A**. Depending on the size and weight of the workpiece it may be necessary to secure it on the compound-angle shooting board with clamps or a hold-fast, bearing against similarly angled scraps to achieve a perpendicular hold. Most of the time, however, it will be sufficient simply to hand-hold the workpiece. The work rests on block A, which is cut to match the thickness angle 'a'. Block B provides the width angle 'b'. These angles are illustrated in **FIGURE 82B**.

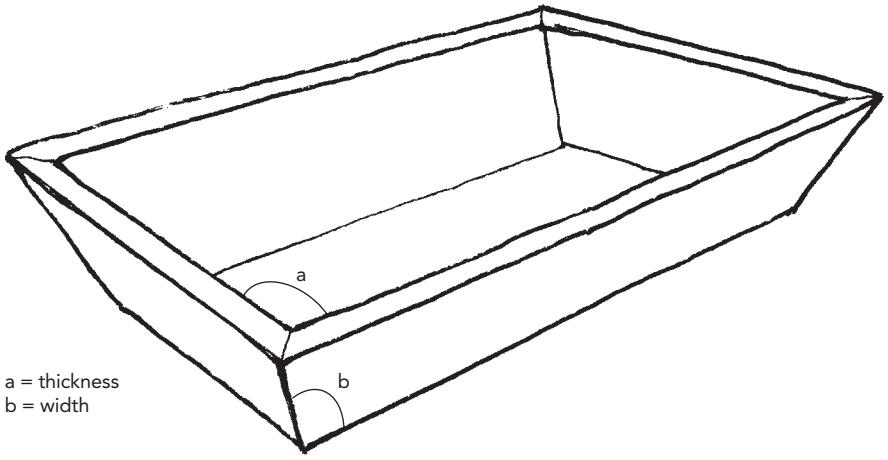


FIGURE 82B: Compound angles in width and thickness

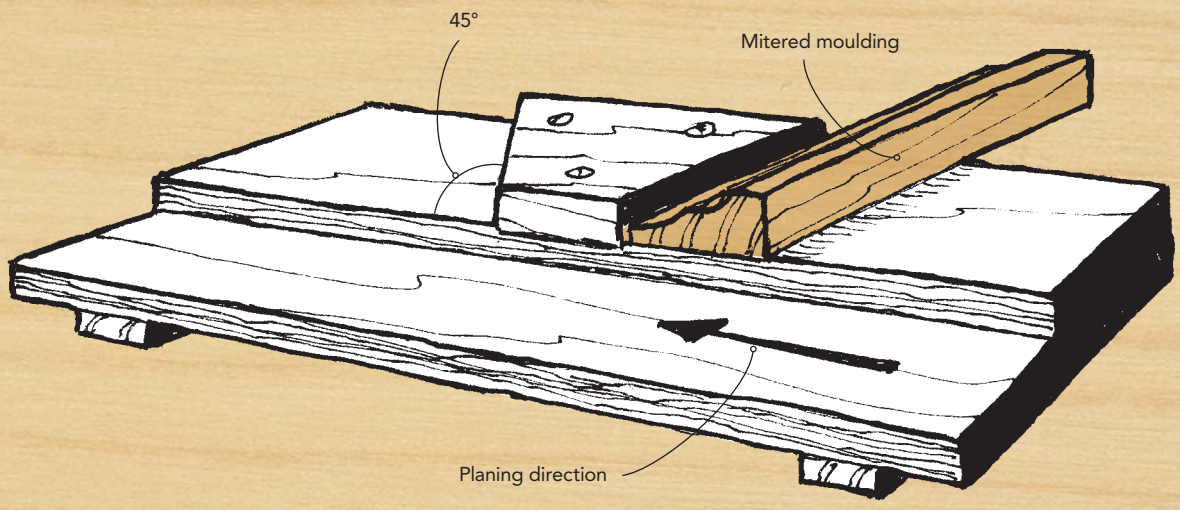


FIGURE 83A: Miter shooting board

Miter Shooting Board

You can make a specialized shooting board for accurately trimming miters by using a broad stop with sides cut at complementary 45° angles. Locate the stop in the middle of the shooting board's upper bed. To avoid splitting the workpiece, take care always to plane uphill into the sharp angle of the miter, for which reason the stop needs both angles (**FIGURE 83A**). When trimming miters it goes without saying that a sharp plane is essential.

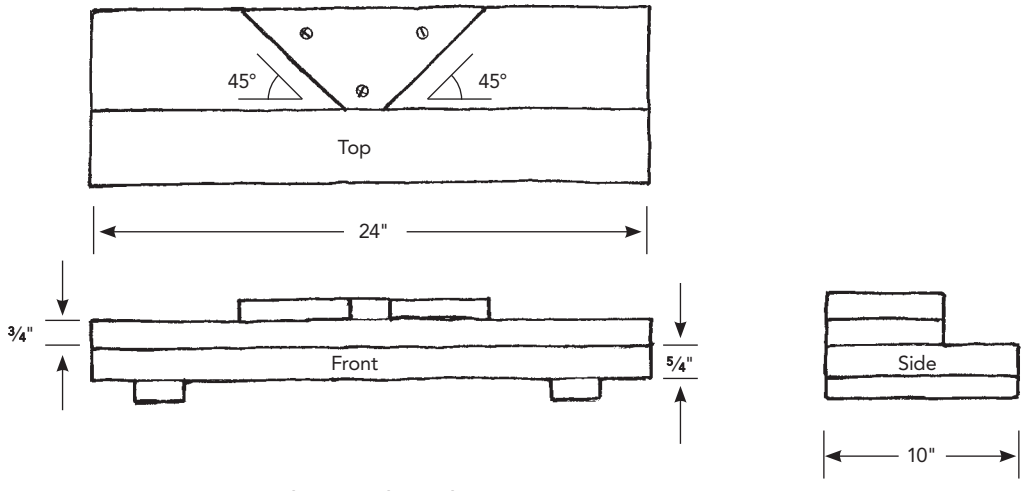


FIGURE 83B: Miter shooting board

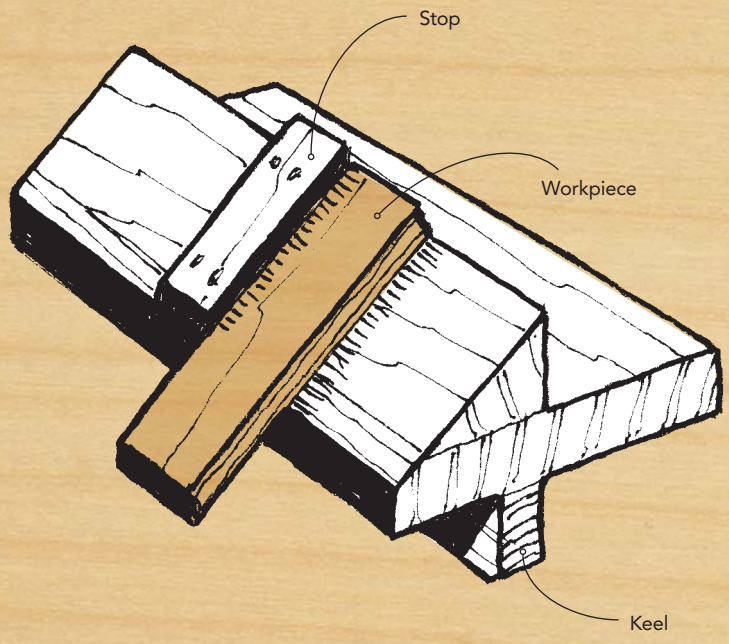


FIGURE 84A: Donkey's ear shooting board

Donkey's Ear Shooting Board

The donkey's ear shooting board is especially useful for planing wide miters, such as across the end of a wide board intended for baseboards or skirting. Its distinguishing feature is an upper bed built at a 45° angle to the lower bed on which the plane runs. The stop is most usefully located in the center of the bed rather than at one end, so it can support the plane beyond the cut. Because the workpiece is likely to be long, the device is most conveniently held in the bench's vise by means of a keel. The length of the workpiece usually makes it impossible to use this device tranversely across the bench (**FIGURE 84A**).

As the size of this jig indicates, it is best suited for relatively small workpieces that you should be able to hand-hold. When there is so much trimming as to require additional support, it is probably because the piece has been sloppily produced in the first place, and it would be best to recut it.

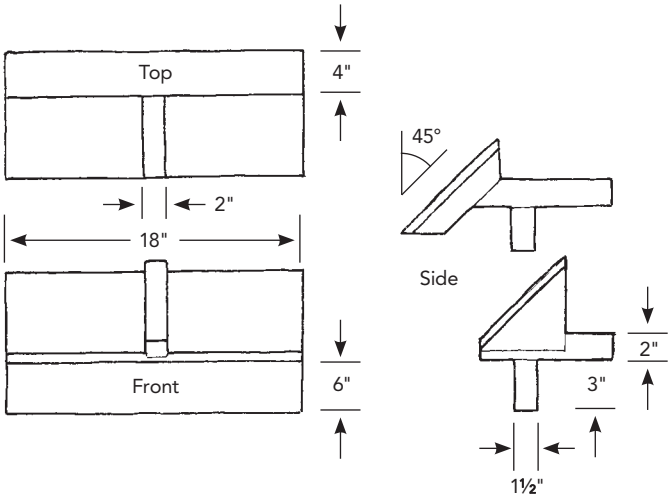


FIGURE 84B: Donkey's ear shooting board

CONSTRUCTION • There are a variety of ways to make an upper bed at 45° to the plane bed: a single wide board can be fixed at a 45° angle to the plane bed; several boards can be joined to produce a half-pyramid, or a square block can be diagonally cut along its length (**FIGURE 84B**). But whichever method you choose, note that although the upper bed should be wide enough to support the workpiece, it should not be so wide that it raises the end of the workpiece above the level that the plane's iron can reach. If you do find yourself in this situation, raise the plane by adding pieces to the lower (plane) bed.

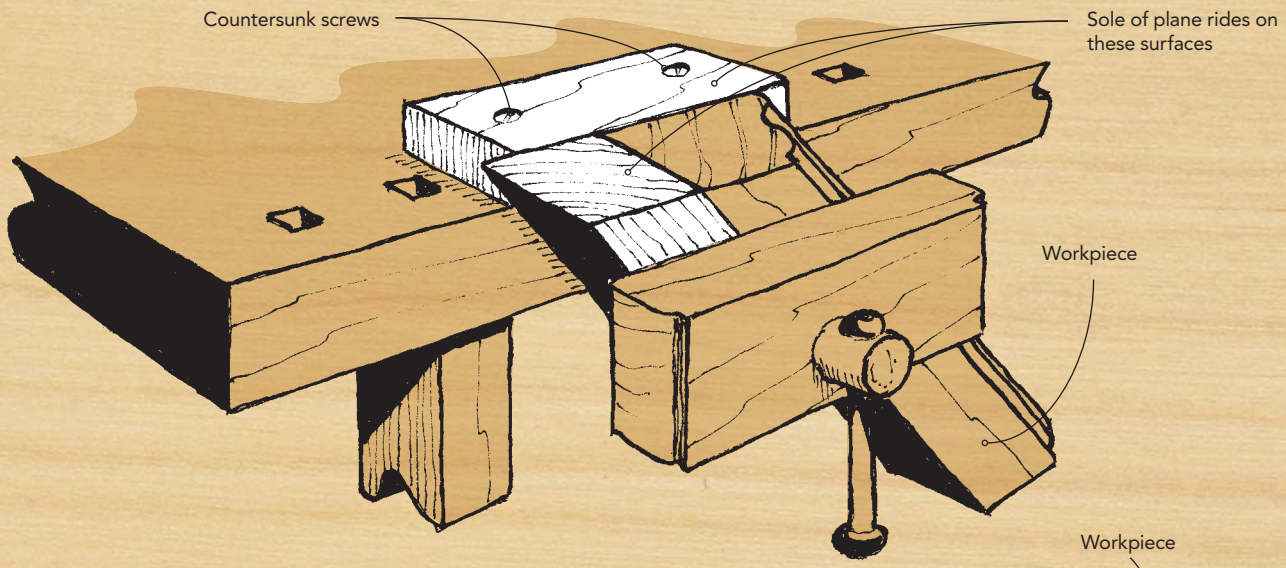


FIGURE 85A: User-made shooting block

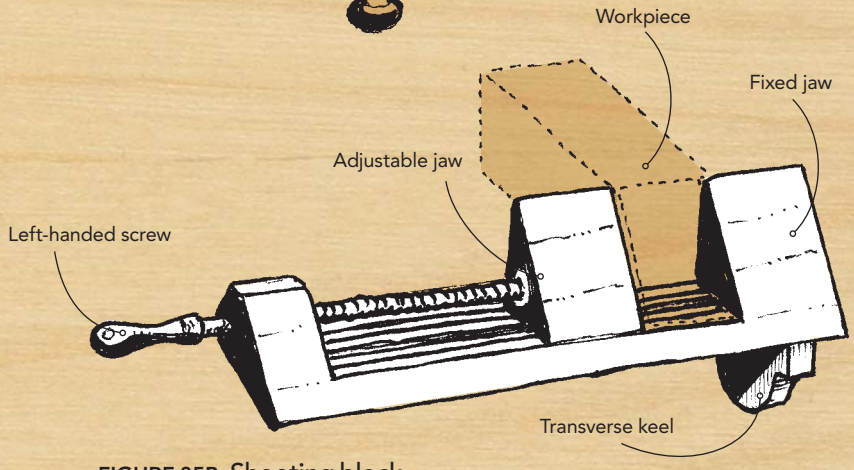


FIGURE 85B: Shooting block

Shooting block

A shooting block is used for miters that are both long and wide because such workpieces need a large area of referenced support for the plane. The shooting block shown in FIGURE 85B commonly was manufactured. It consisted of two large jaws on which the plane's sole could run, shooting (trimming) the mitered end of the workpiece held between the two jaws. It was made left-handed and right-handed, depending on which end the adjustable jaw was found, and typically was held in the vise by either a transverse or longitudinal keel. It was used with the plane held askew so that the cutting edge of the iron only contacted the workpiece and not the jaws Nevertheless, the surface of the jaws is usually protected by thin card, even though these are intended only for the part of the plane's sole not containing the mouth.

You can make a simple shooting block by fixing a bed for the plane to ride on to the bench top in front of the vise, as shown in FIGURE 85A. Clamp the workpiece to a 45°-angled stop which is itself held in the vise and whose angled upper end is flush with the planing bed, FIGURE 85B. Run the plane askew so it cuts only the end of the workpiece while resting equally on the piece attached to the bench and the stop clamped in the vise. The only difficulty in the setup is the stop: it needs to be exactly the same thickness as the workpiece so that the two may be equally securely held.

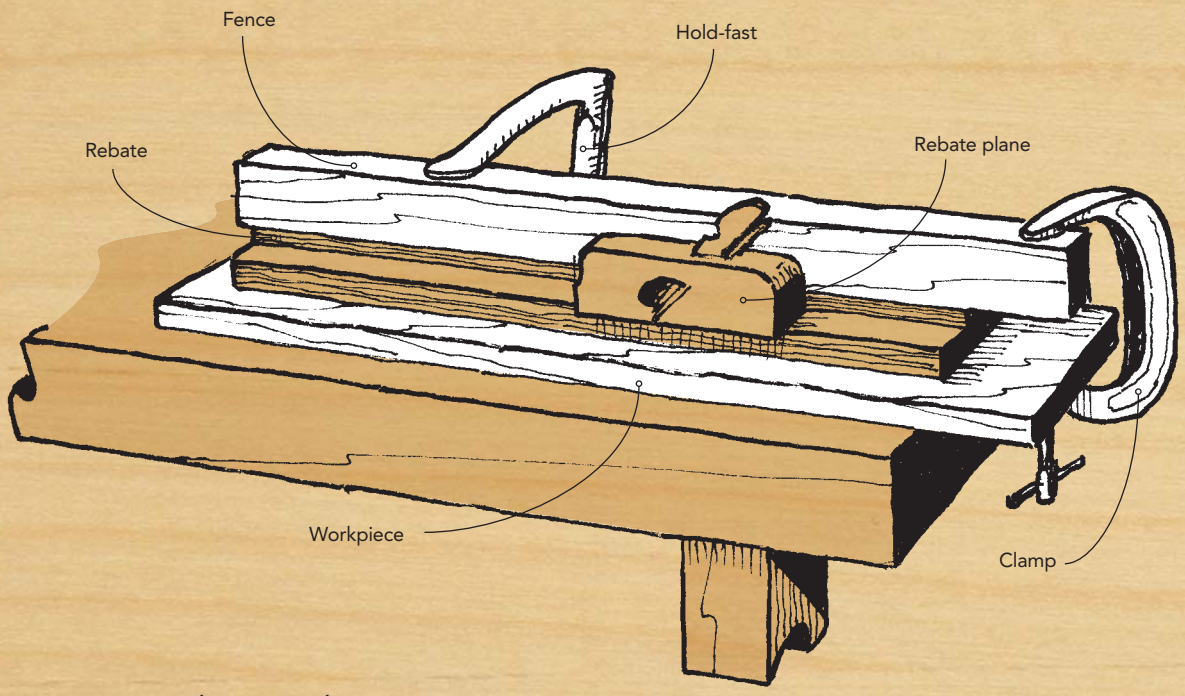


FIGURE 86: Rebating guide

FIXTURES FOR ACCURACY

There are a number of easily-made fixtures that can be used to guarantee the accuracy of various planing procedures. These all work by limiting the amount that can be planed and by controlling how the plane is presented to the work. It might be argued that their chief advantage is that they make it unnecessary to buy more expensive tools already fitted with fences and depth stops, but these sometimes get in the way and have to be removed anyway. Nevertheless, even if you do choose simpler tools, it is well to remember that most planing will be more accurate if not performed completely freehand.

Rebating Guide

The simplest plane used for forming a rebate is one whose iron extends across the entire width of the sole. Such a plane will require some form of fence if the rebate is to be cut to a consistent width – at least at the start of the cut. Both fences and depth stops may be easily fixed to a wooden plane (holes in the sides and soles of old wooden rebate planes bear witness to this), but this is not the case with metal-bodied planes such as newer shoulder planes. One solution is to fix a temporary guide to the workpiece itself, but if this is not possible because unsightly nail holes might be the result, try clamping the workpiece between two boards so that the upper board acts as a fence to guide the plane (**FIGURE 86**). Once the rebate has been started it becomes to some extent self-jigging, with the plane guided against the already-cut shoulder.

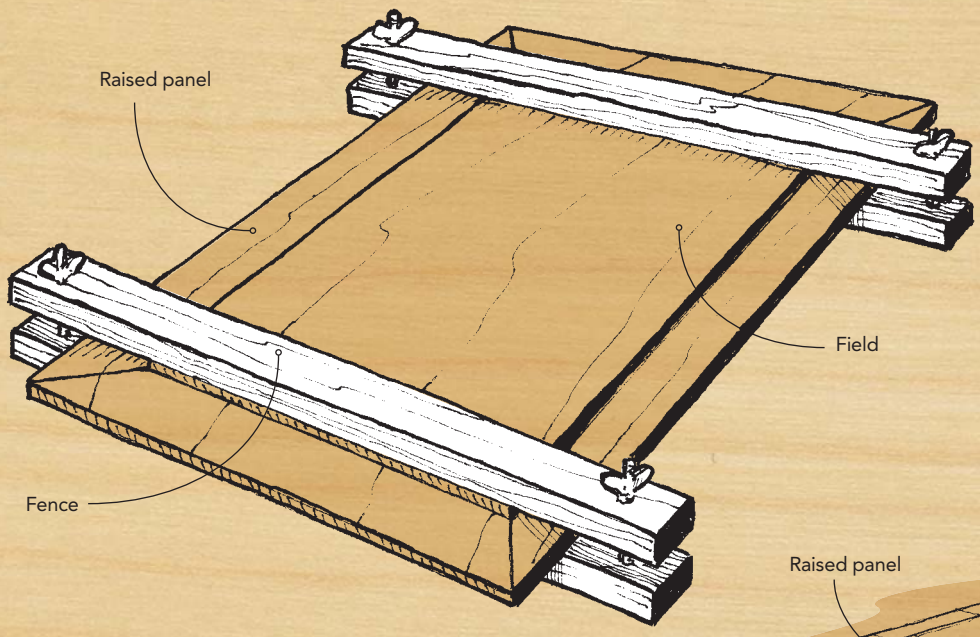


FIGURE 87A: Fielding guide

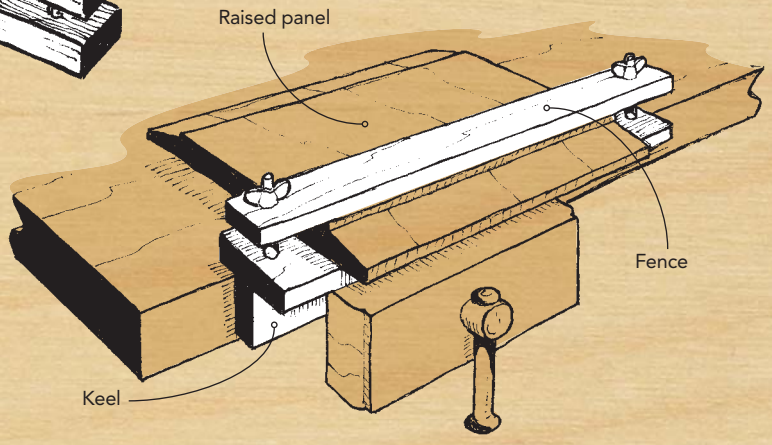


FIGURE 87B: Keeled fielding guide

Fielding Guides

Fielding a panel poses the same problem of starting an exactly located cut. Fenced fielding planes do exist but they are both expensive and rare, and in any event only capable of a single profile and likely not the one you wanted. The usual method is to use any plane whose blade extends flush on at least one side, such as a badger plane or a regular jack rebating plane. Guide the plane against a fence held in place by bolts with wingnuts to a second piece under the panel (**FIGURE 87A**).

If fences are used in pairs, the panel may be stopped or clamped level on the bench. If the bottom piece of one fence has a keel this may be held in the vise, thus preventing the entire assembly of workpiece and guides from moving while you work on it (**FIGURE 87B**).

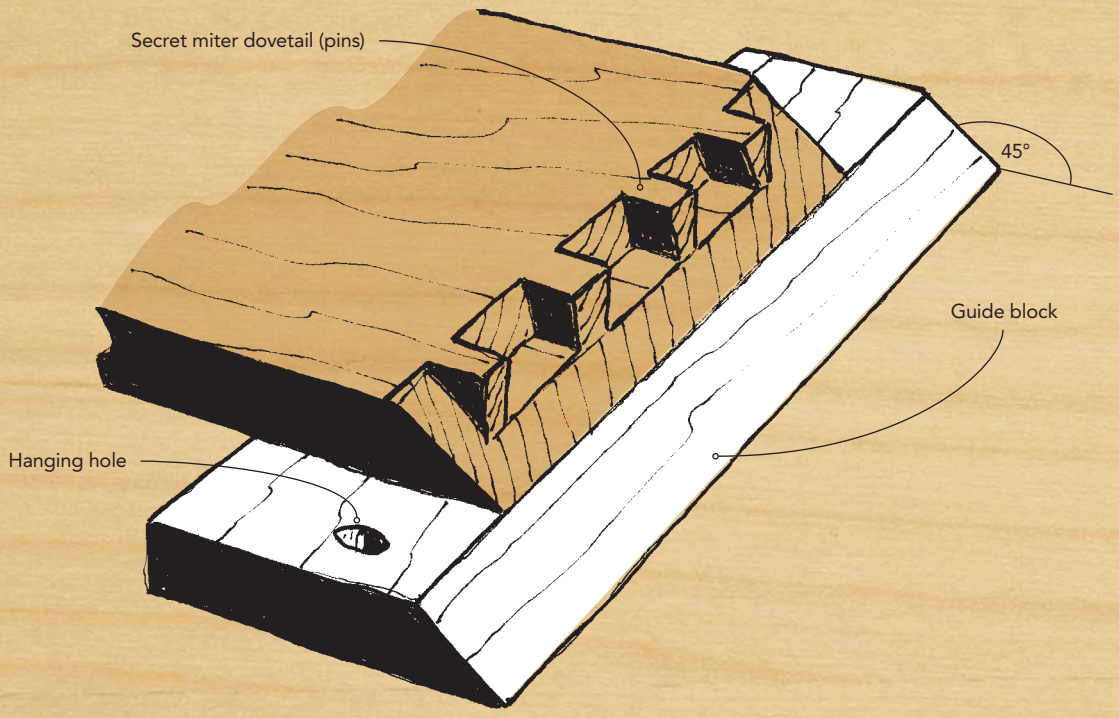


FIGURE 88A: Mitered dovetail guide

Mitered Dovetail Guide

The so-called secret mitered dovetail actually contains two secrets. The first is that when assembled the dovetail portion of the joint is hidden. The second is that contrary to what the beginner might fear, this joint is easier to make than you might expect, because when assembled no-one can observe the neatness of the dovetails. The only essential is that the mitered sections fit neatly, easy if you run the plane on a guide that has one edge cut at 45° (**FIGURE 88A**).

CONSTRUCTION • One of the easiest jigs to make, the guide for trimming miters consists of nothing more than a length of wood longer than the miter to be trimmed and thick enough when beveled to 45° to support the rebate plane, which must of course be sharp.

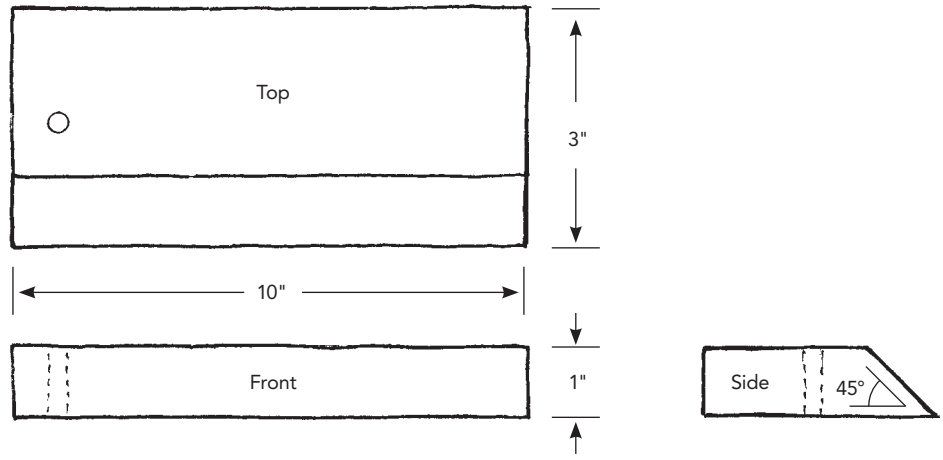


FIGURE 88B: Mitered dovetail guide

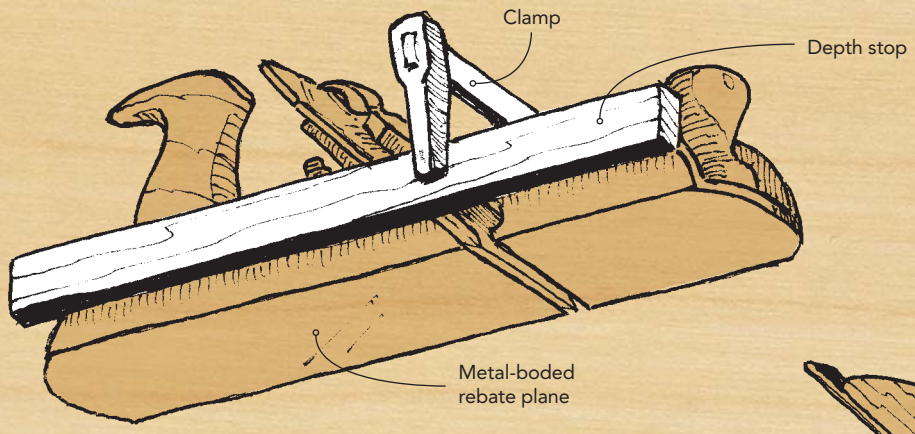


FIGURE 89A: Depth stop

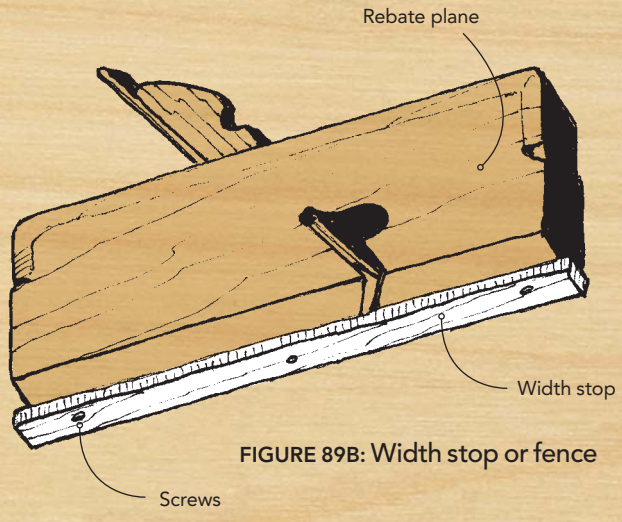


FIGURE 89B: Width stop or fence

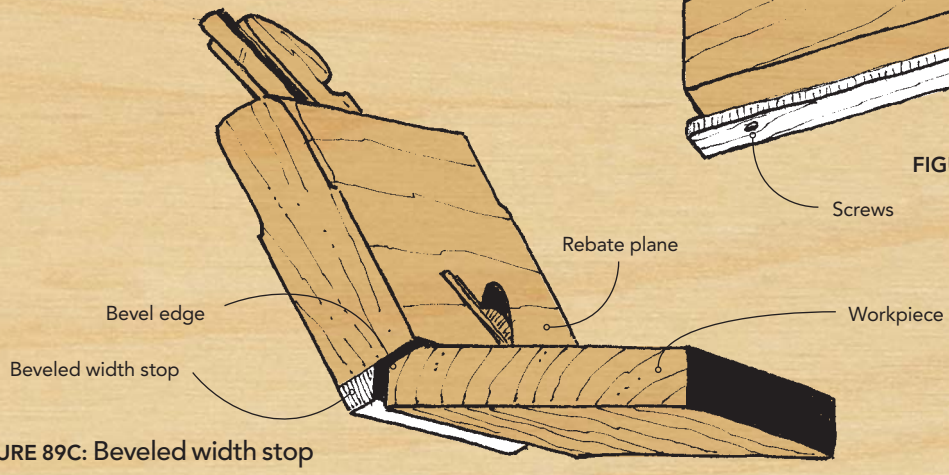


FIGURE 89C: Beveled width stop

Plane Depth/Width Stop

When planing a rebate to some a specified depth or width, it's quite tedious and not too accurate to peer constantly at the difficult-to-see layout line. A simple guide strip fixed to the side or sole of the plane is all you need to limit planing to the required amount. This is similar to the depth stop fixed to the side of a saw in Chapter 3.

Attach the guide strip with screws if it is a wooden-bodied plane – as the holes in many second-hand wooden planes will attest – or with a small clamp if it is a metal-bodied plane.

CONSTRUCTION • One detail that should not be forgotten when fixing a width stop to the sole of any plane is to make a small groove in the stop beneath the cutting edge of the plane's iron. Otherwise, it will prove impossible to extend the iron beneath the sole and cut anything. Locate the groove by temporarily affixing the width stop and lightly tapping the iron to bite into it.

It is also important to ensure that the edge of the width stop is square and perfectly perpendicular to the sole of the plane. Otherwise, repeated passes of the plane will produce a sloping-sided rebate.

A corollary of this unintended mistake is that a purposely beveled edge on the width stop can turn the plane into a guided beveling plane. For this to work, be sure to hold the plane so that the beveled side of the width stop always bears fully against the square edge of the workpiece (**FIGURE 89C**).

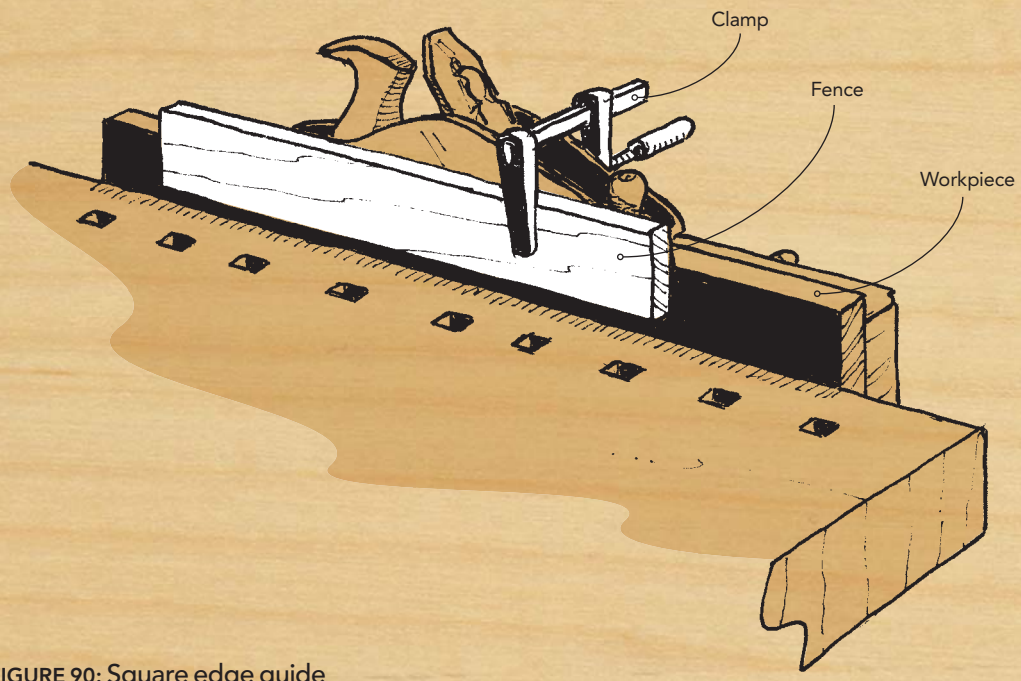


FIGURE 90: Square edge guide

Square Edge Guide

For workpieces too large to be conveniently worked on a shooting board it is only necessary to remember the proverb: If the mountain won't come to Muhammad then Muhammad must go to the mountain. Clamp a long straight strip to the side of whatever plane you're going to use and hold the plane so that this strip bears securely against the side of the workpiece. This effectively turns the plane and its guide strip into a moving shooting board, and guarantees that the edge being planed will be perfectly square (**FIGURE 90**).

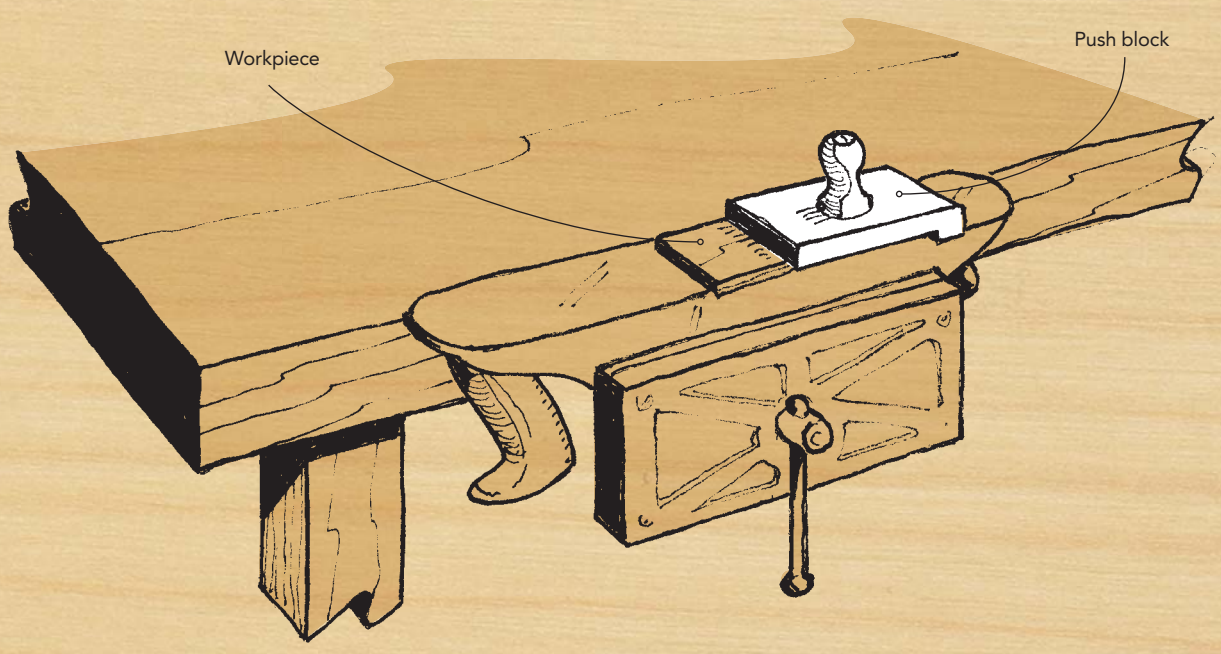


FIGURE 91A: Planing push block

Planing Push-Block

Although it is a dangerous practice to attempt to move very short pieces over a power jointer, this is precisely what should be done with a hand plane. If a very small piece needs to be planed it is often safer and easier to push the workpiece over an upside-down plane held in the vise than it might be to attempt to secure the workpiece and plane over it. It would be risky to move the workpiece across the plane's blade with your fingers, but much better to hold and move it under a stopped push block (**FIGURE 91A**).

CONSTRUCTION • This is a small jig, since most planes' soles are not very wide, but it is still worthwhile to include a handle in the center of the block. The handle will help you apply secure and uniform pressure on the workpiece. The underside of the block needs a thin fence. You could cut a shallow rebate, or attach a thin strip, no more than ¼" thick. Mount the strip with glue rather than small nails that could damage the cutting edge of the plane iron.

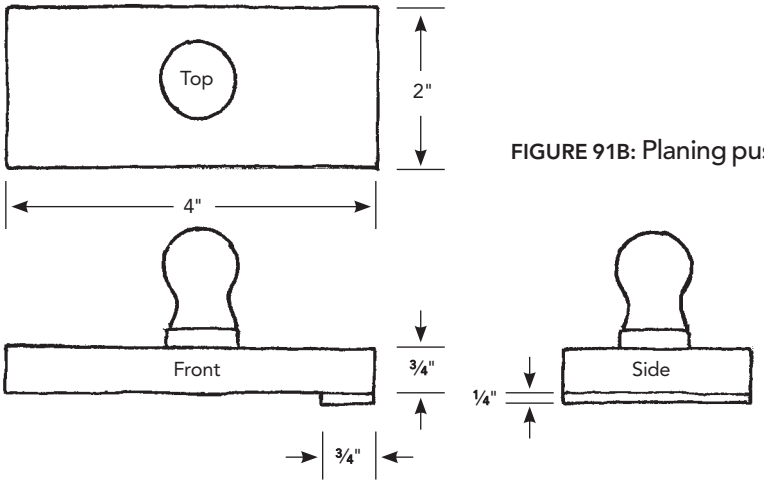
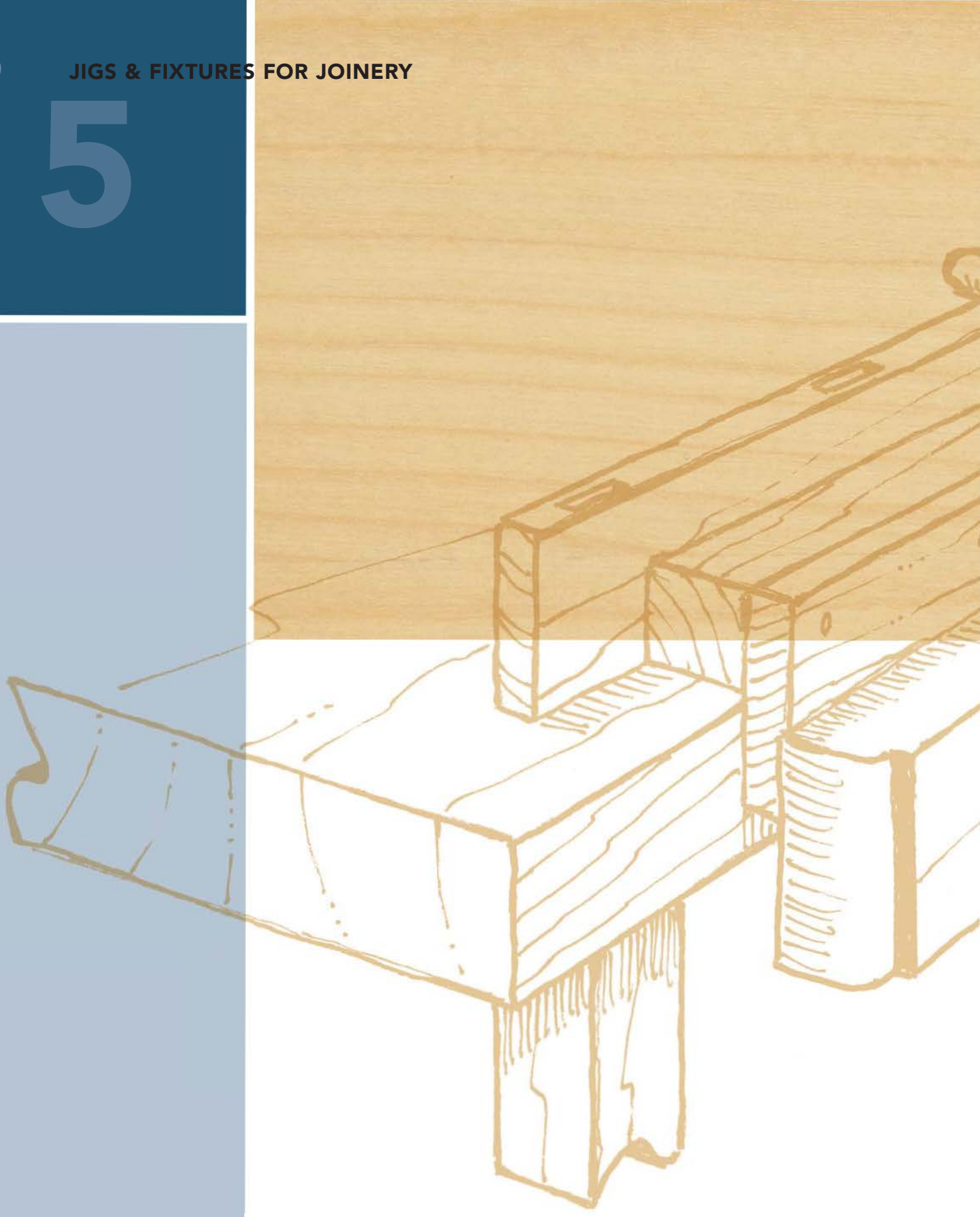
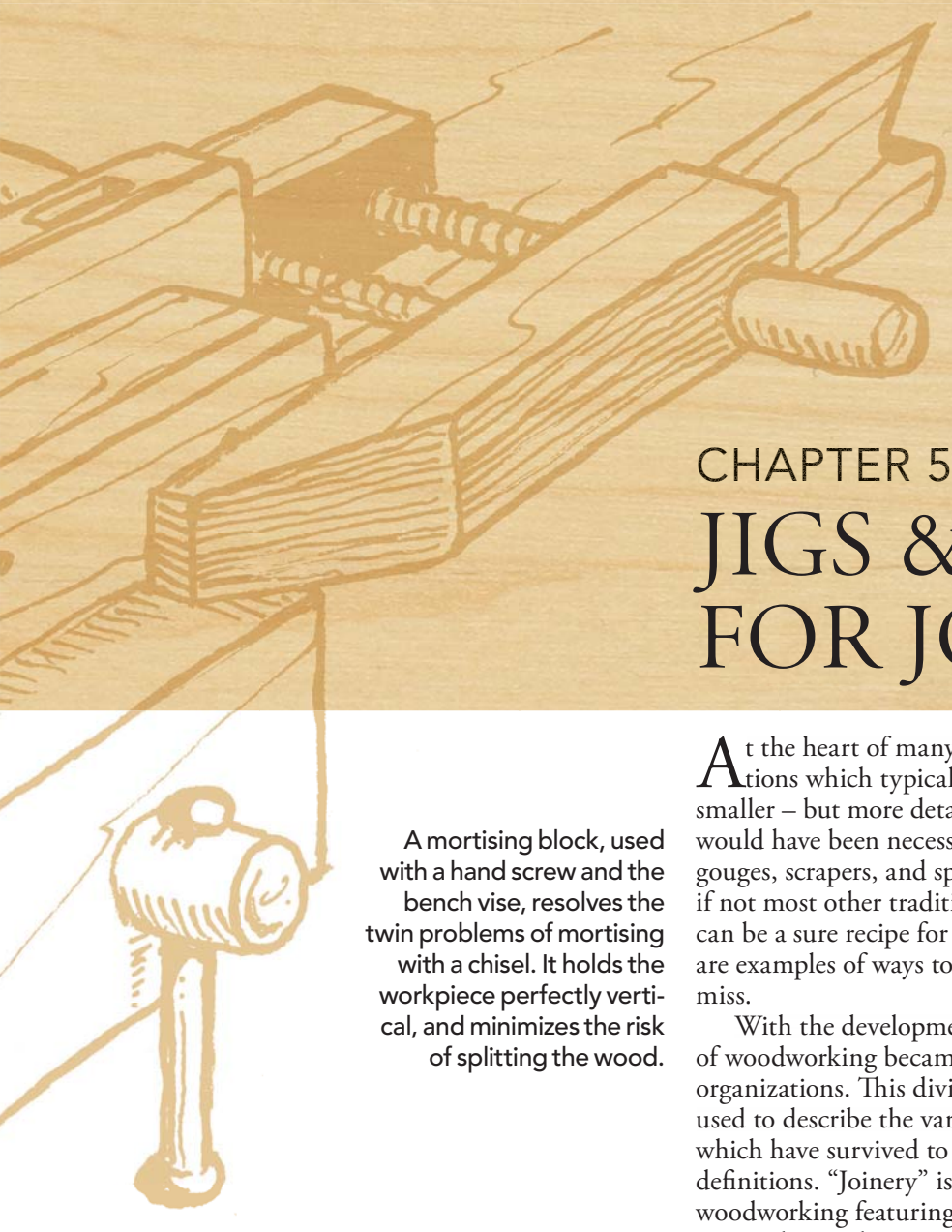


FIGURE 91B: Planing push block

5

JIGS & FIXTURES FOR JOINERY





A mortising block, used with a hand screw and the bench vise, resolves the twin problems of mortising with a chisel. It holds the workpiece perfectly vertical, and minimizes the risk of splitting the wood.

CHAPTER 5

JIGS & FIXTURES FOR JOINERY

At the heart of many projects lies a number of joinery operations which typically involve cutting and shaping on a much smaller – but more detailed and often more exacting – scale than would have been necessary up to this point. Tools such as chisels, gouges, scrapers, and spokeshaves come into play. As with many, if not most other traditional hand tools, using these freehand can be a sure recipe for disappointment. The aids in this chapter are examples of ways to make this part of any project less hit and miss.

With the development of medieval trade guilds, various kinds of woodworking became the preserve of distinct and separate organizations. This division of labor was reflected by the terms used to describe the various woodworking disciplines, some of which have survived to this day, albeit with sometimes altered definitions. "Joinery" is one such term. Originally it meant woodworking featuring the paneled frame, in contrast to turning or chairmaking. In contemporary America "joinery" more generally means the making of any and all joints. In Britain, by contrast, the term still refers to what Americans would understand as "finish carpentry." City and Guilds training and certification is offered specifically for "bench joinery" as required by the construction industry.

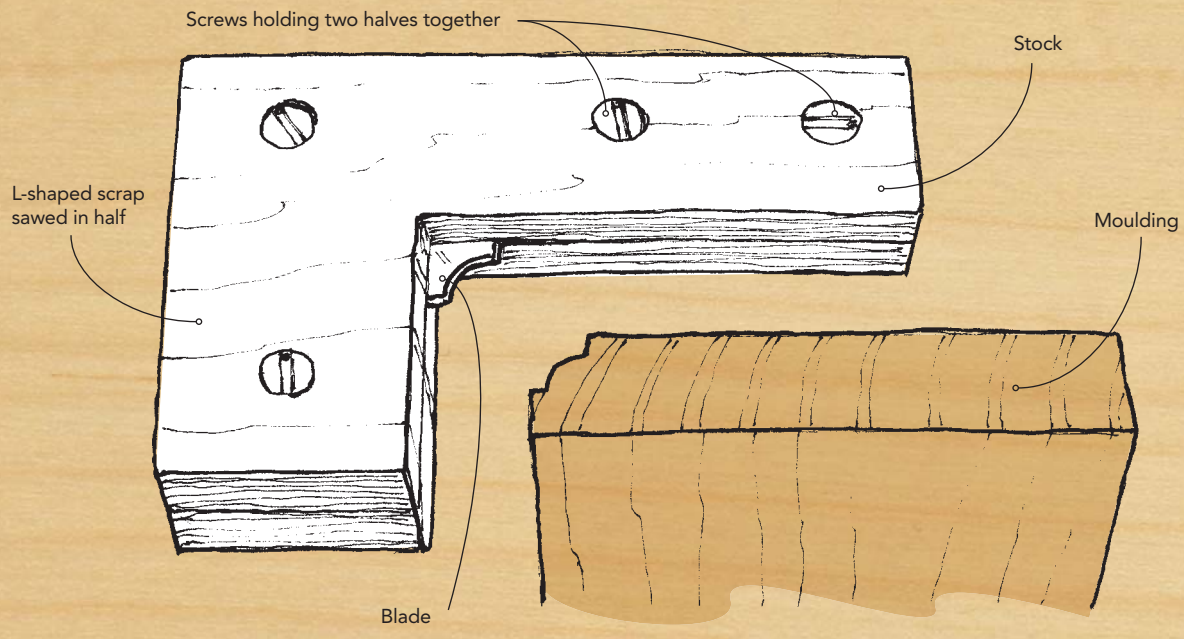


FIGURE 92A: Scratch stock

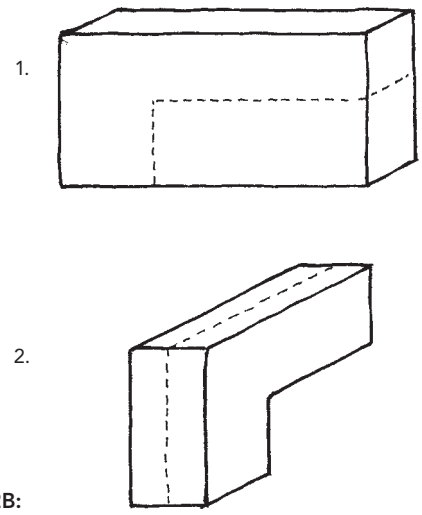
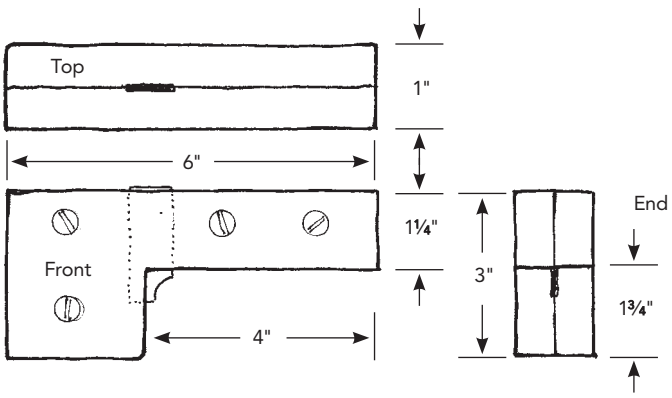


FIGURE 92B: Scratch stock



Scratch Stock

By filing a small piece of thin metal such as a piece of old bandsaw blade to a required profile (**FIGURE 92A**) and then securing it between two matching shouldered pieces of scrap, you can make a jig that will produce a moulded edge. Such a jig can create a profile for which there may be no available moulding plane or even – should you be tempted for a moment to abandon traditional woodworking methods – a router or shaper bit.

CONSTRUCTION • One of the simplest forms for this user-made tool is a sideways L-shaped block about 3" to 6" long. Saw the block in half and then screw the two halves back together with the filed metal blade in position. Because you drag or push the scratch stock along the workpiece (hence the name), the blade does not need a bevel and after having filing it to the required profile, simply stone it flat on both faces (**FIGURE 92B**).

Although other patterns exist, making the stock L-shaped forms a fence that may be held against the workpiece so that the profile is scratched at a consistent location – either right on the edge or some distance away from it – depending on exactly where in the stock you secure the blade.

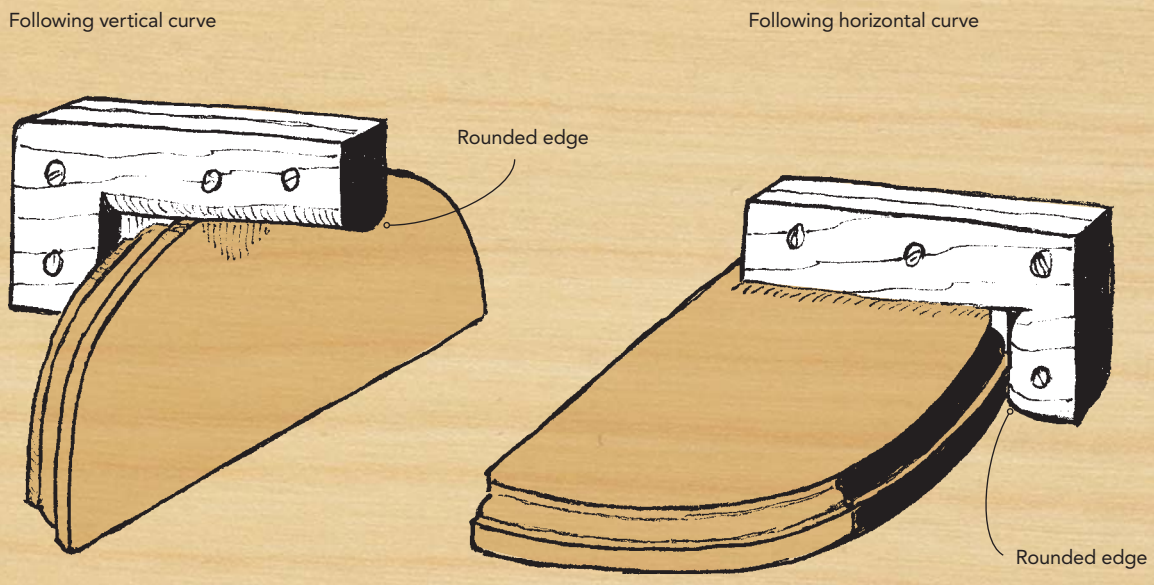


FIGURE 93A: Rounded-edge scratch stock

Rounded-Edge Scratch Stock

If you round the fence portion of the stock instead of leaving it square, it will better follow a horizontal curve. If you round the under portion of the stock it will better follow a vertical curve (**FIGURE 93A**). The advantage of a scratch stock over an electric router is thus clearly demonstrated, for a router cannot safely or accurately follow rounded edges in two planes simultaneously.

While the primary purpose of a scratch stock may be to create or match a unique moulded profile, with an appropriately shaped blade (**FIGURE 93B**) it also can form simple grooves or rebates. This jig can therefore go a long way to substituting for older traditional tools such as hand routers, hand beaders, moulding routers, and quirk routers – tools that are invaluable for making such items as curved glazing bars or window sash.

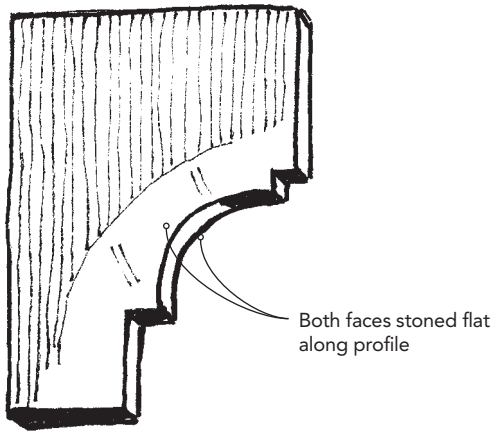


FIGURE 93B: Scratch stock blade

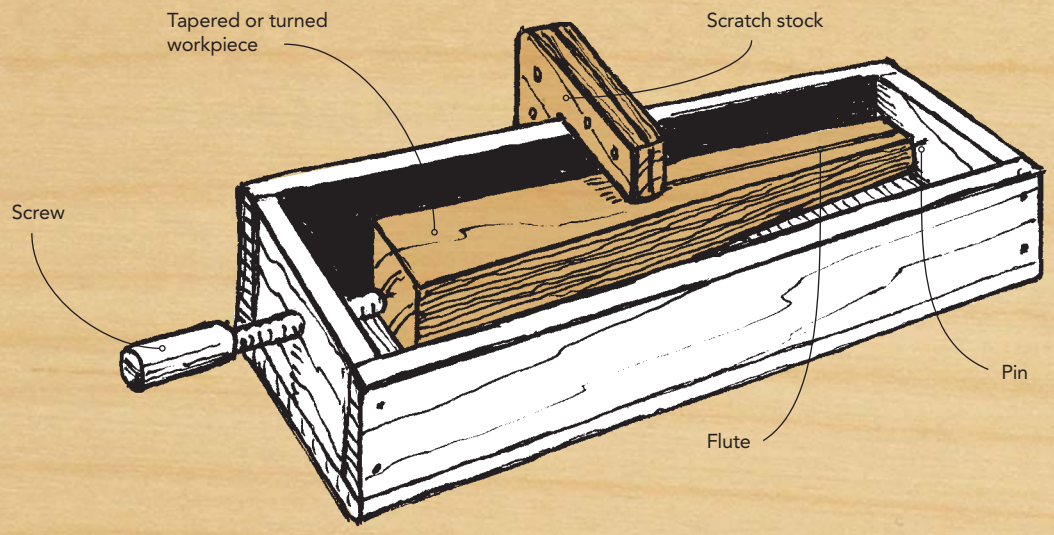


FIGURE 94A: Turning box

Turning Box (Moulding Box, Fluting Box)

It can be difficult to cut moulding on non-rectilinear workpieces such as round legs or tapered sections, even when the workpiece can be firmly held in a vise or cradle. A turning box makes this and other operations, such as fluting, planing and even mortising, easy, since the box both secures the workpiece and provides a means of centering (or off-centering) it for using other tools such as scratch stocks (FIGURE 94A).

CONSTRUCTION • Make the box large enough to contain the workpiece, and provide a screw at one end that can be tightened against the workpiece to prevent it from rotating. Install a pin or short nail at the other end against which the workpiece can be centered, and rotated when necessary.

A further refinement known as a clock can be added to function as an index plate. It enables rotating the workpiece either in regular increments or according to the number of finished faces it might have. The clock is a simple disk fixed to the same end of the workpiece as the centering pin. Its circumference is bored with equally spaced holes corresponding to the number of facets required. The workpiece can then be rotated a controlled amount and held in place by a pin passing through the appropriate hole in the index plate into a receiving hole in the end of the box.

In order to use a scratch stock to make beads or reeds or to produce a longitudinal moulding on the workpiece, make the sides of the box perfectly straight and parallel. For tapered workpieces, all that is necessary is to reposition the centering pin on which the workpiece rotate so that the sides of the workpiece are parallel to one side of the box.

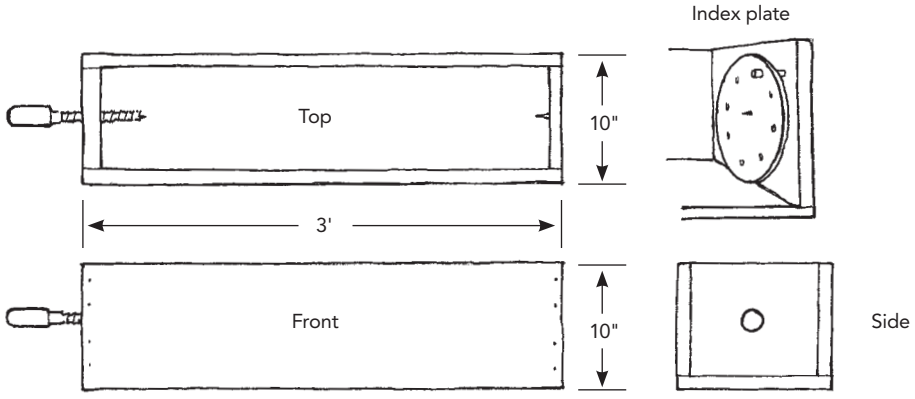


FIGURE 94B: Turning box

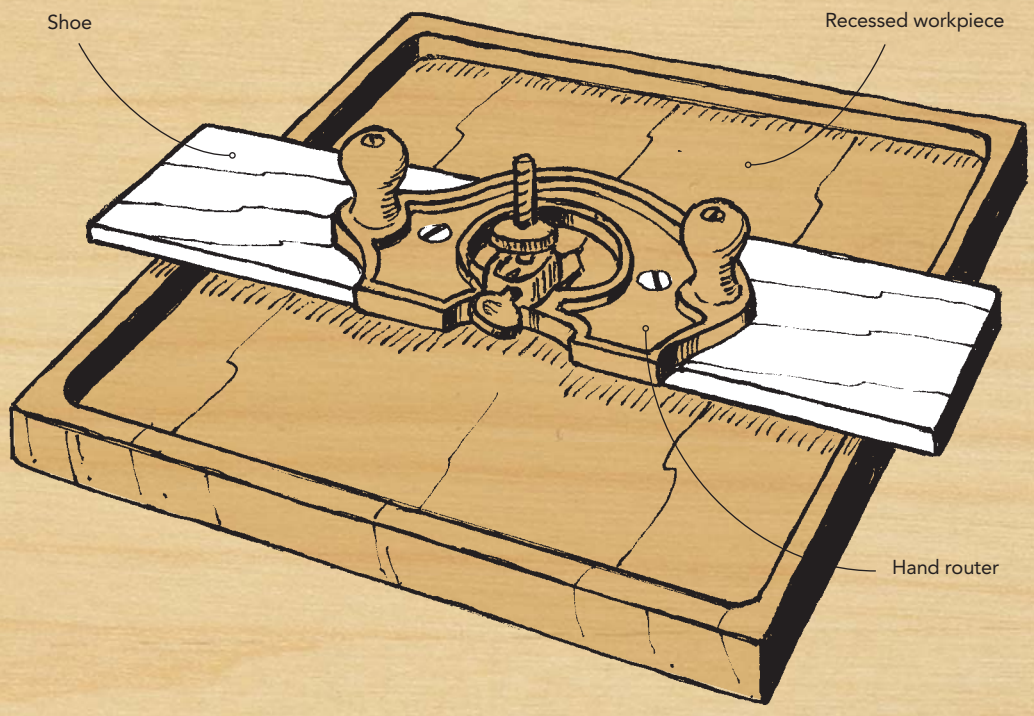


FIGURE 95: Hand-router shoe

Hand-Router Shoe

The electric router having usurped the name of the original hand tool, the latter must now be distinguished by being called a hand router. The common metal versions which are made in several sizes descend from a simple wooden design known as an old woman's tooth. They are usually provided with depth gauges, fences, and variously shaped irons. But one thing these modern tools all lack is the ability to work an area larger than the base that constitutes their sole.

To make the hand router capable of flattening a recessed or sunken surface much wider than the tool itself, attach a wide wooden shoe with screws through holes (often provided for this purpose) in the tool's base, as shown in FIGURE 95. Make the added shoe big enough to bridge the workpiece. In the setup as shown, the tool is positioned in the center of the shoe. It might need to be repositioned closer to one end should you need to work into a corner or along an edge.

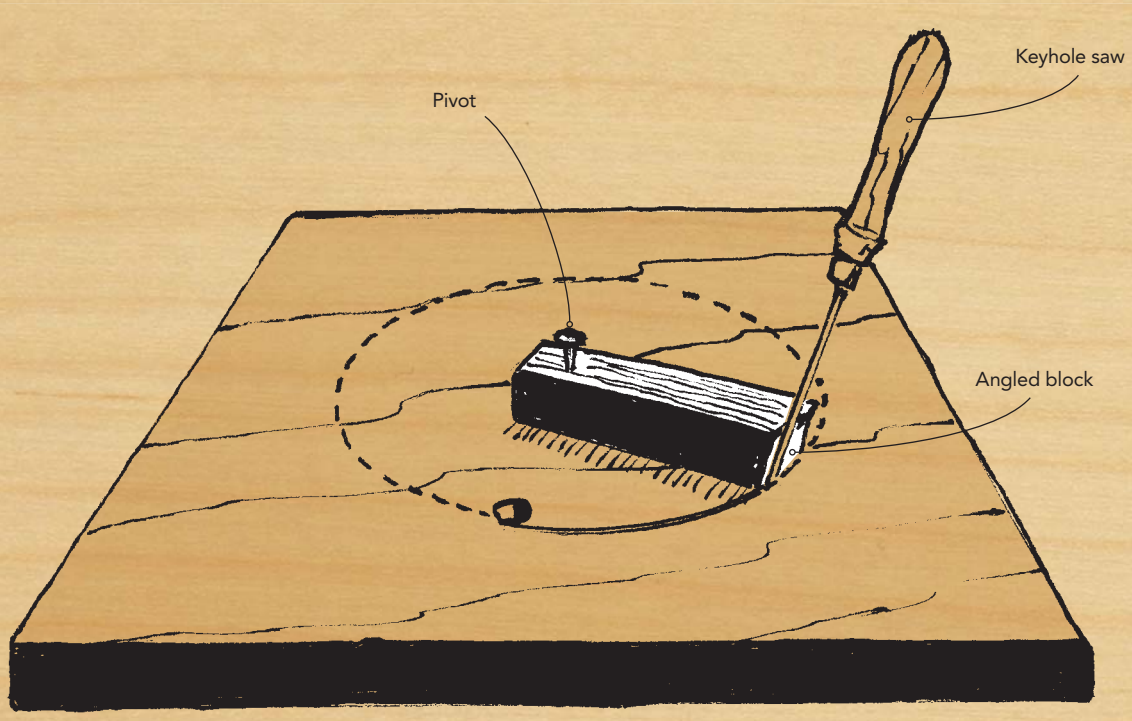


FIGURE 96: Angled circle-cutting guide

Angled Circle-Cutting Guide

A consistently angled-edge circle, either interior or exterior, partial or complete, is extremely difficult to cut freehand. The job is made much easier by fixing an angled block with a radius equal to the required radius of the circle, or part circle, and using the outer angled face as a guide for a keyhole saw. The radius of this jig is the distance from the pivot point to the angled edge.

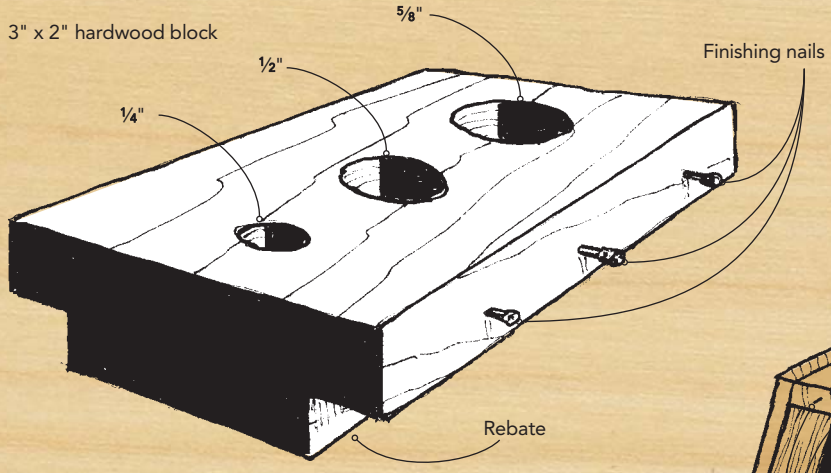


FIGURE 97A: Dowel groover

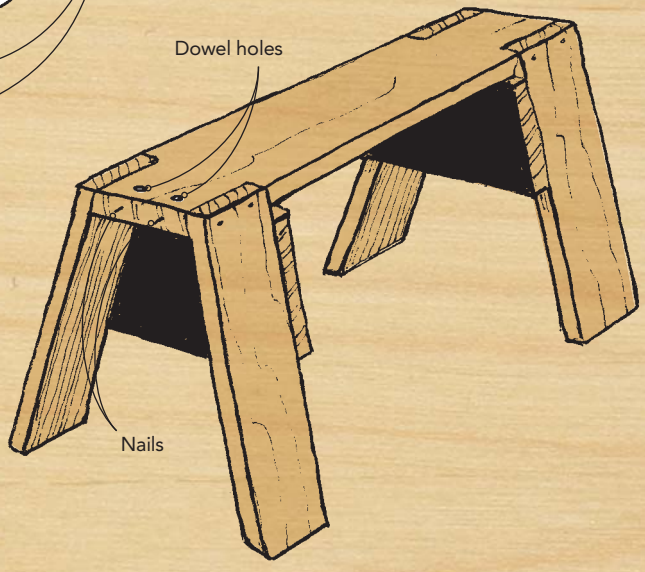


FIGURE 97B: Saw horse dowel groover

DOWELING

Dowel Groover

Except perhaps for aligning long edge joints, dowels are not ordinarily used in good quality joinery – mortise-and-tenons, tongue-and-groove joints, and splines normally being preferred. When dowels are used, success does require a little attention. For trouble-free insertion the dowels should be slightly rounded at each end, and it is also good practice to provide them with longitudinal grooves so that excess glue may escape. The easiest way to cut these grooves is to drive the dowel through a matching hole with a small nail driven into its side (**FIGURE 97A**).

CONSTRUCTION • Bore a small hardwood block with two or three holes corresponding to the most common dowel diameters. Drive 1" or 1½" finishing nails into the side of the block so that their tips protrude enough to leave a small groove when you drive the dowel stock through the hole. This usually is done with the help of another length of dowel that remains in the hole until the next dowel is needed.

Cut a ½" rebate on either side of the block, so it may be held and not be knocked out of the vise when you drive a dowel through it. Close the vise against the rebates so that the block rests on top of the vise jaws.

Instead of a separate block, it once was common simply to bore appropriately sized nail-pierced holes in one end of the shop saw horse (**FIGURE 97B**). Although some woodworkers bore dowel-grooving holes in bench tops and other surfaces around the shop, a separate small hardwood block is generally more convenient.

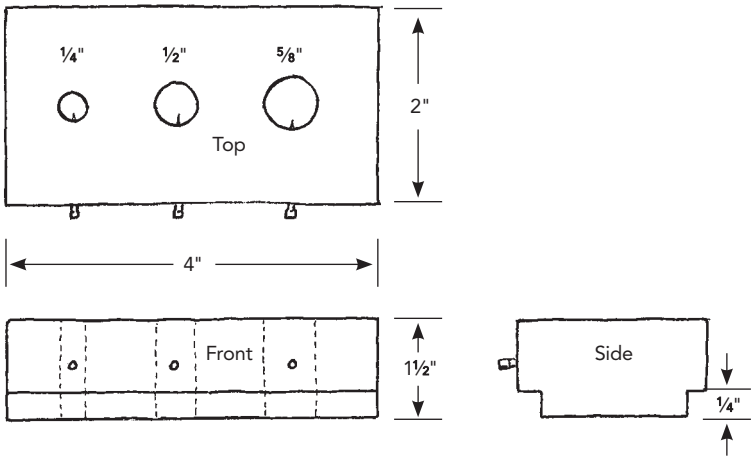


FIGURE 97C: Dowel groover

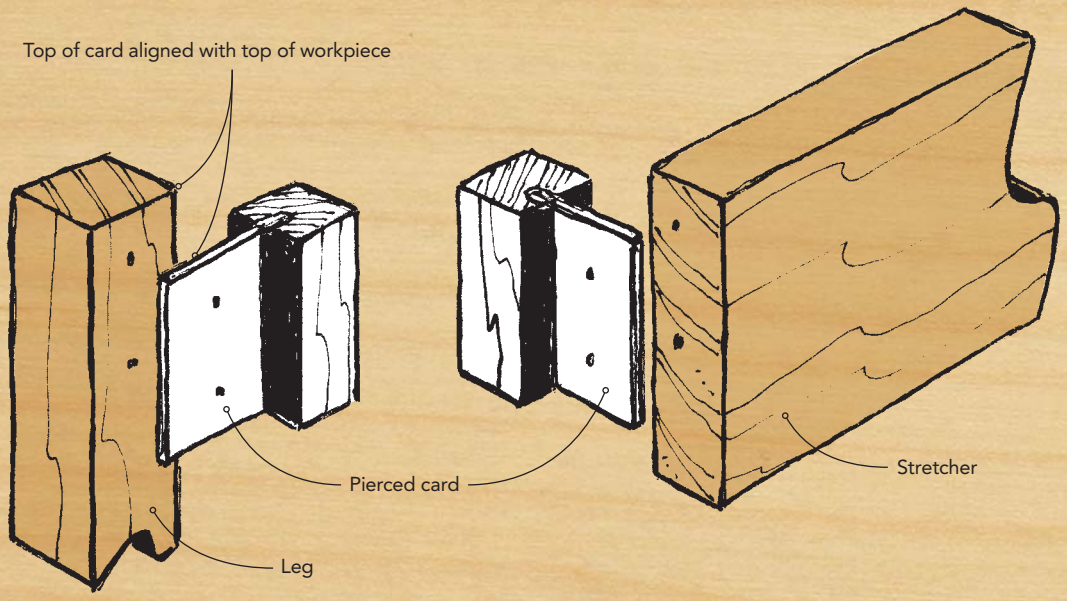


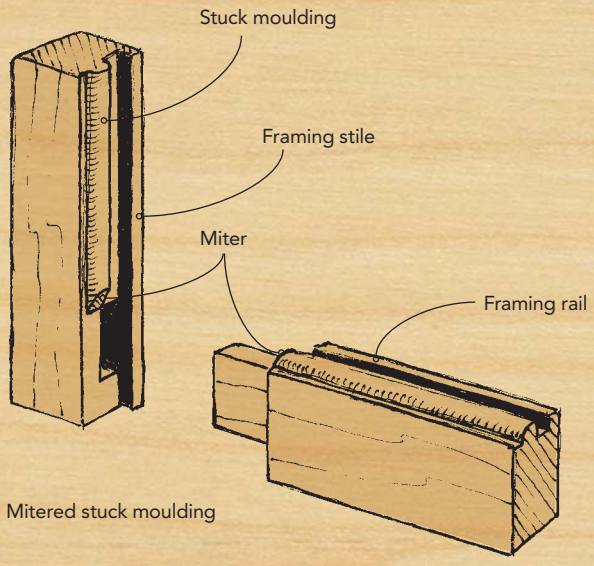
FIGURE 98: Dowel marker

Dowel Marker

After having decided where to bore holes for dowel joints, this particular jig can quickly be made to assist in marking out. It will both save time and guarantee accuracy, and will be particularly useful for such items as tables, chairs or boxes with several identical dowel joints.

CONSTRUCTION • To make it, groove any flat face on a small piece of scrap to receive a piece of stiff card. Install the card and pierce it at the point or points where dowel holes will be bored in the workpiece. Pierce the holes at the correct distance both from the edge of the block and the end of the card. This makes it simple to hold the jig on the matching parts of the workpiece with your thumb aligning the end of the card with the end of the workpiece. Now you can insert a marking awl through the pierced holes to locate where holes must be bored, without having to measure every instance.

If you take enough care to make the groove exactly fit the card, a spressure fit might be possible. Otherwise you can shim the card with more paper, glue it in place, or retain it with removeable screws, which would make the card replaceable. This goes to your taste in making jigs: some woodworkers find even the tiniest jig an opportunity to make something special, while most woodworkers would be content to quickly make something simple, discard it when done, then make another as the need next arises.



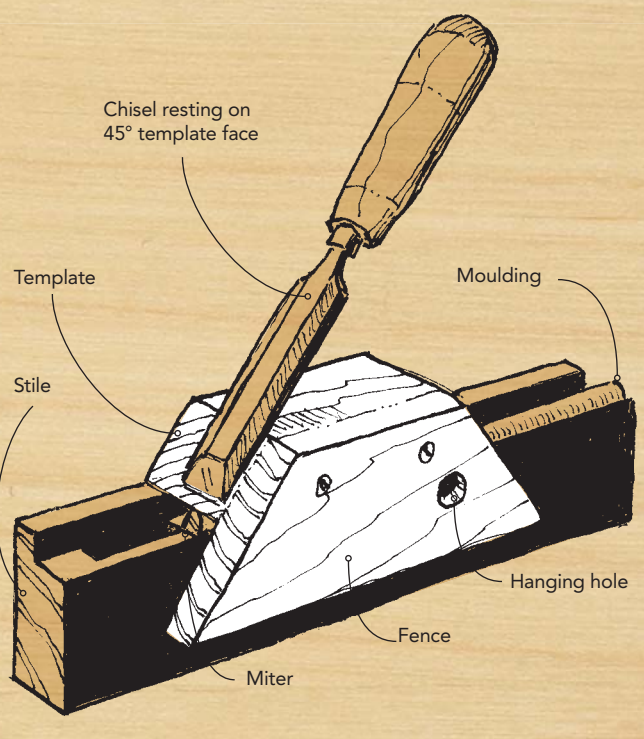


FIGURE 99A: Mitered moulding guide

MITERS & DOVETAILS

Mitered Moulding Guide (Miter Template)

The mitered moulding guide is used to guarantee a perfect fit for moulded profiles which form only part of the workpiece and which have to be mitered. You would use it, for example, on the inner edge of frame-and-panel members made with integral moulding. Moulding formed on the edge of the workpiece itself is also known as "stuck," as opposed to "applied" as a separate piece (**FIGURE 99A**).

To use the guide, first clamp its fence to the work so that its angled part lines up with the line of the desired miter. Then, while holding a paring chisel's back tightly to the sloping part of the guide, take light, paring cuts through the moulding until its entire surface becomes flush with the slope of the guide (**FIGURE 99A**).

CONSTRUCTION • Cut a piece of scrap with two 45° angles, and then attach this piece to a fence which continues the slope of the angled ends. By making both ends 45° the guide can be used to trim miters at both ends of a framing member.

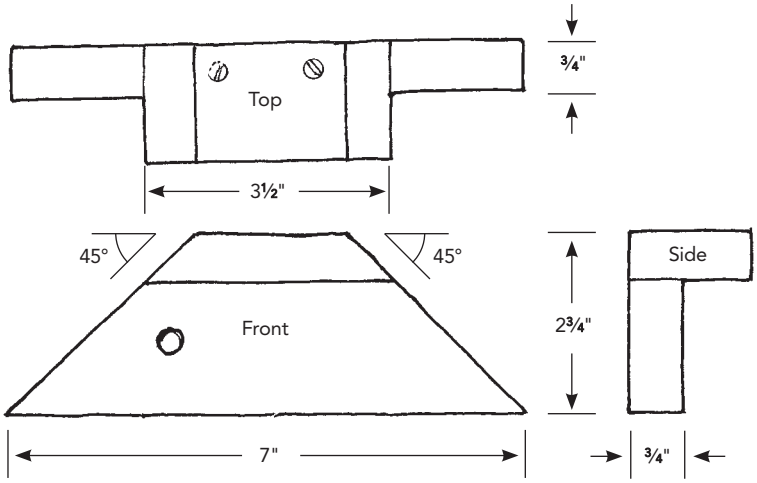


FIGURE 99B: Mitered moulding guide

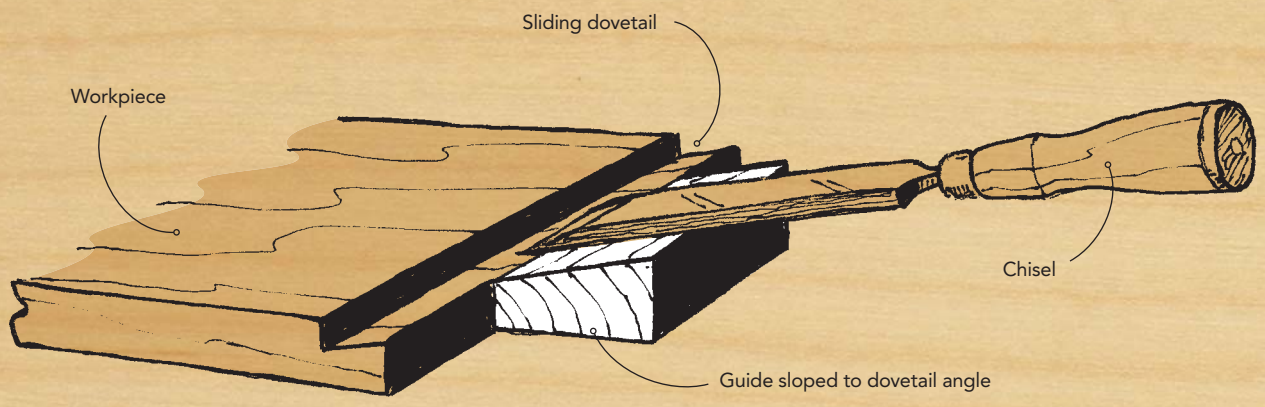


FIGURE 100A: Dovetail paring guide

Dovetail Paring Guide

A longitudinal dovetailed housing is an excellent joint for attaching shelving and carcase rails to uprights and sides, but the dovetails are difficult to trim. The fundamental difficulty lies in maintaining the correct dovetail angle over the entire length of the joint. Stanley Tools once made a specialized plane for this purpose but it has now become an expensive collector's item. Forming the tail can be made much easier by first cutting a simple rebate and then trimming it to the correct angle using a wide guide block to support a wide paring chisel (**FIGURE 100A**). A guide like this will help trim both male and female parts of the dovetail, whether it is through, stopped, or tapered.

CONSTRUCTION • The guide should be wide enough to support the back of your widest paring chisel and long enough for paring at least a few inches at a time without having to be repositioned. The slope of the guide should match the dovetail angle. The critical dimension is the low edge of the guide, which should match perfectly the high edge of the male dovetail. This dimension may be arrived at differently depending on whether you cut the male portion or the female portion of the joint first, but in either event take care not too make 'x', as shown in **FIGURE 100B**, too small. It is much easier to remove a little more wood than it is to replace it.

Stanley Tools once made a specialized plane for this purpose but it has now become an expensive collector's item. In any event, although the operation has its roots in traditional joinery, both for tapered and stopped varieties, such a plane was a short-lived and expensive substitute for the far simpler traditional rebate plane – most commonly user-modified.

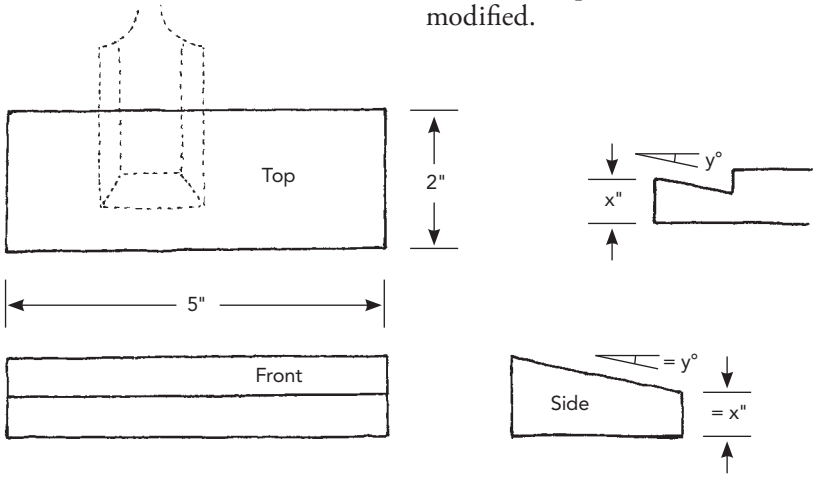


FIGURE 100B: Dovetail paring guide

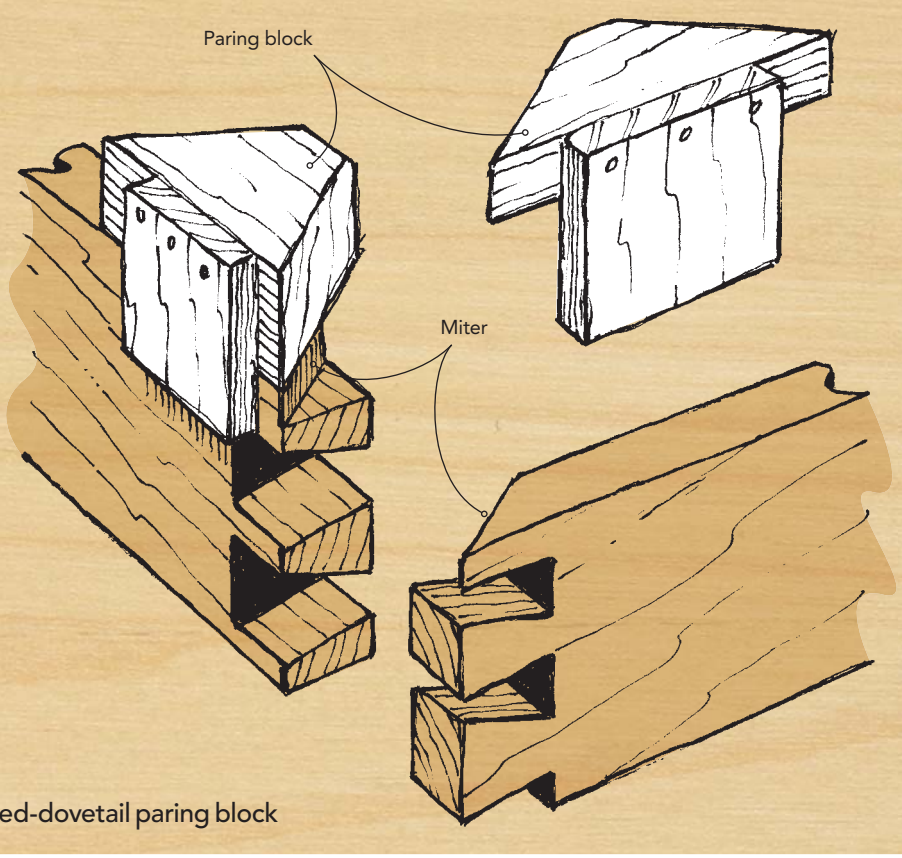


FIGURE 101A: Mitered-dovetail paring block

Mitered-Dovetail Paring Block

For a neat appearance, the top ends of case pieces such as tool chests, blanket chests and trunks that have sides joined with various kinds of dovetails (lapped, half-lapped, full, or blind, etc.) are often finished with miters. However, cutting this miter can be a risky operation after having spent so much time on carefully cutting pins and tails. The usual method is to saw this part oversize, then assemble the joint and saw through the miter in the hope that the new kerf will allow the two parts to fit perfectly. The better solution is to saw close to a carefully scribed layout line so that the joint will almost close with no undue strain on the pins and tails, and then pare to perfection using a paring block. The block shown in **FIGURE 101A** is mitered on both sides so it can be held or clamped to each side of the joint in turn.

CONSTRUCTION • While the previous jig – the dovetail paring guide – could be used for this operation, it usually will be too large and clumsy. A smaller jig, made with a thinner fence and a shorter paring block, will be easier to use. Cut a short length of 1 × 2 with 45° angles at each end, and attach a fence that you can hold with one hand against the side of the workpiece.

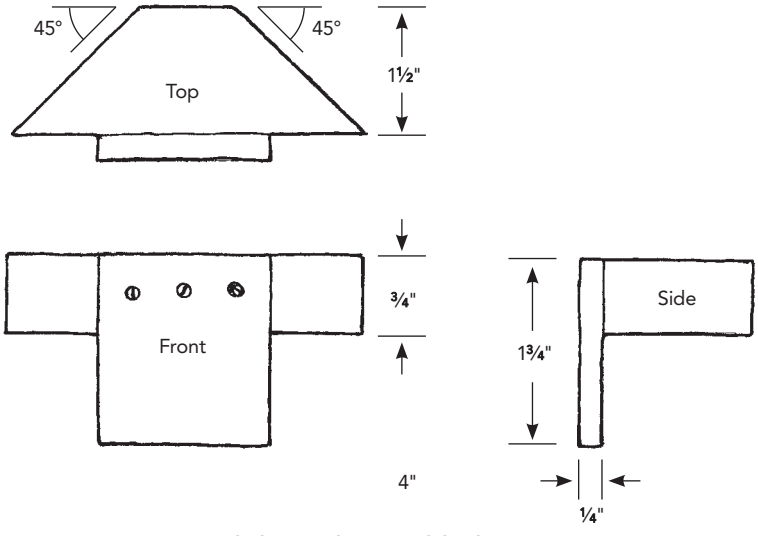


FIGURE 101B: Mitered-dovetail paring block

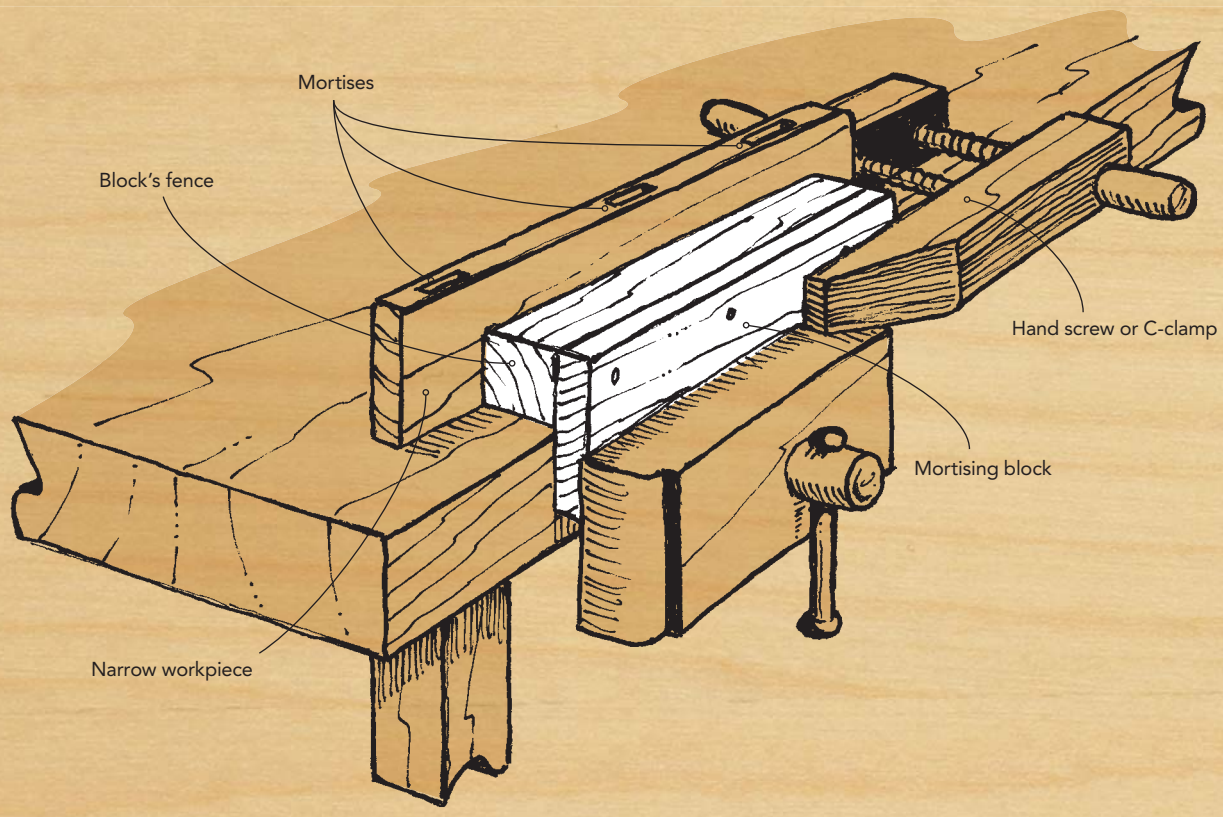


FIGURE 102A: Mortising block

MORTISING

Mortising Block

Chapter 1 describes various ways of securing a workpiece for different operations, including mortising, but depending on the size of the workpiece not all these may be ideal. For example, a hold-fast, although capable of holding a workpiece securely when mortising, may have problems keeping a narrow workpiece perfectly vertical. Clamping the workpiece in the vise might preserve verticality, but it could prove difficult to prevent the workpiece from being knocked downwards between the jaws, with possible damage to its sides. A better solution is to clamp the workpiece to a mortising block. The block has a fence that can be held in the vise while the workpiece, its verticality maintained by the block, rests on the bench.

CONSTRUCTION • Any square-sided block sufficiently large to offer substantial bearing surface to the workpiece can be used, attached to a fence deep enough to be securely held in the vise. Of course you must take care to make the block square in the first place.

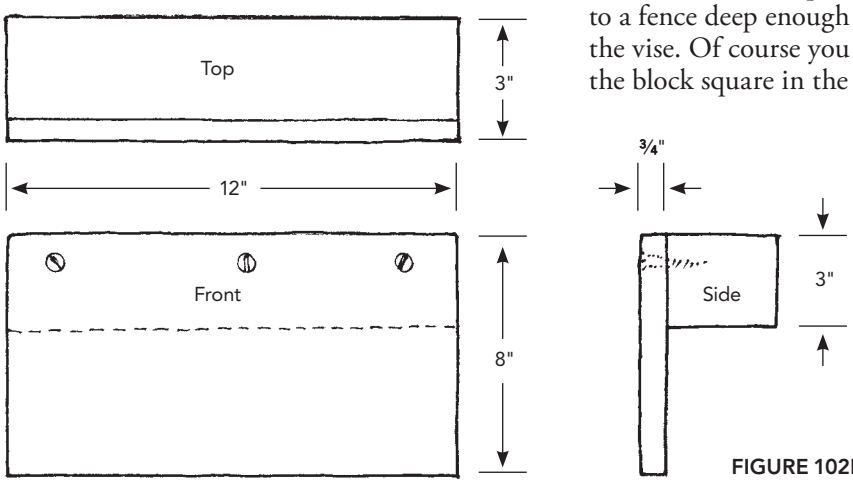


FIGURE 102B: Mortising block

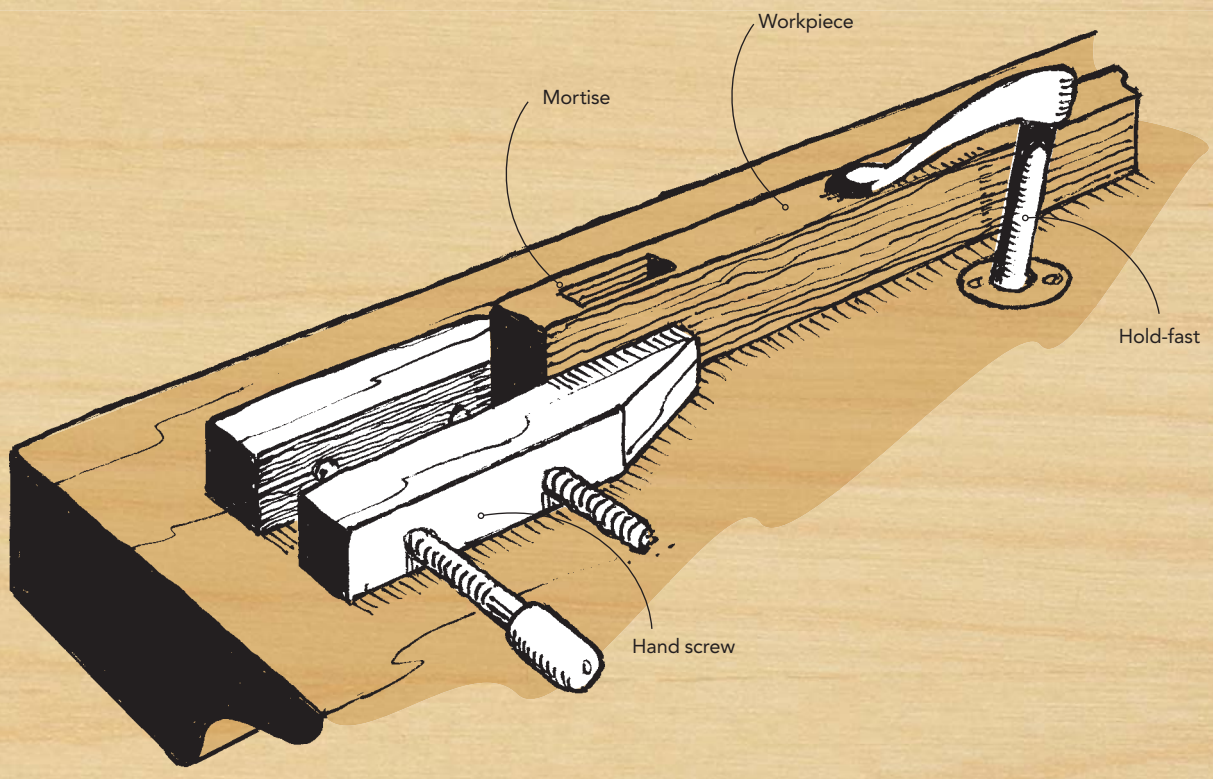
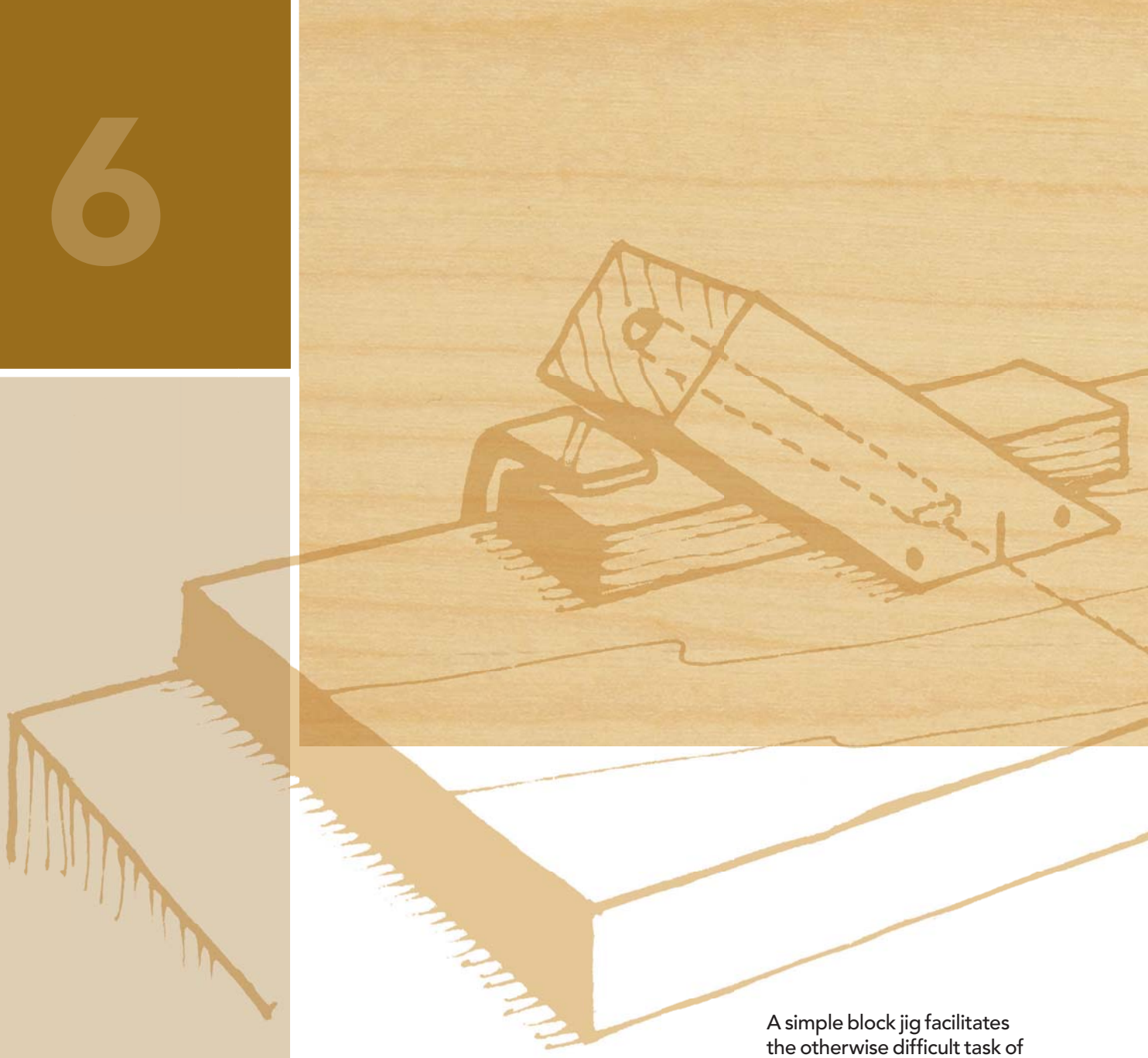


FIGURE 103: Mortising hand screw

Mortising Hand Screw

Cutting mortises by hand with sash mortise chisels or registered mortise chisels near the ends of narrow workpieces – such as at the ends of stiles – often runs the risk of splitting the wood sideways, even if you take care only to drive the chisel perfectly vertically. While this danger can be minimized by first boring most of the waste away with a bit slightly smaller than the width of the desired mortise, the danger can be effectively eliminated by clamping the mortise end with a hand screw, itself held to the bench by a hold-fast or another clamp. If the workpiece is taller than the jaws of the hand screw are wide, add extra scrap pieces that match the width of the workpiece between it and the hand screw jaws. A further advantage of this method is that clamping the hand screw flat against the bench top holds the workpiece perfectly vertical. It is one more way to minimize splitting the mortise and at the same time guarantee a properly aligned joint (**FIGURE 103**).

6



A simple block jig facilitates the otherwise difficult task of boring a hole at an angle.

CHAPTER 6

JIGS & FIXTURES FOR BORING

Traditional woodworking, which relies on the brace and the hand drill for most boring operations, uses a wide variety of bits including center bits, spoon bits, half-twists, shell bits and auger bits. Since electric drills, both corded and cordless battery-run models, are now almost universally used by even the most diehard traditionalist, this is an area of woodworking less furnished with jigs and fixtures than most. Nevertheless, a number of devices can improve the accuracy if not necessarily the efficiency of some boring operations, especially for the woodworker without a drill press. These aids can be used with both wooden and metal braces, and most will prove equally useful for electric drills as well as for traditional tools including push drills, hand drills, corner braces and T-augers.

JIGS & FIXTURES FOR BORING

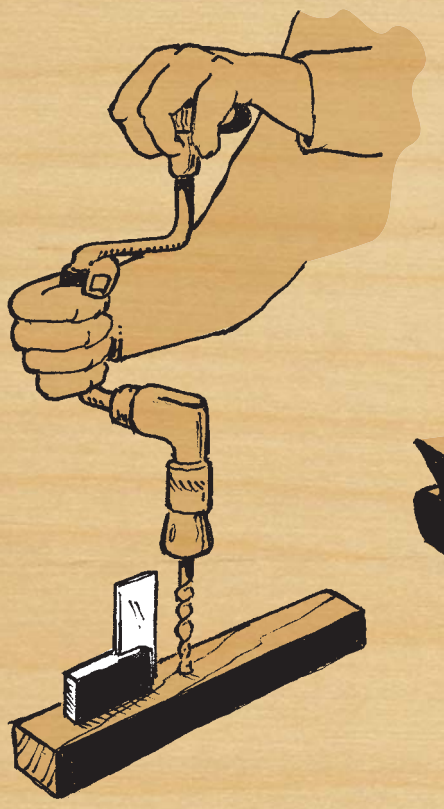


FIGURE 104: Trysquare guide

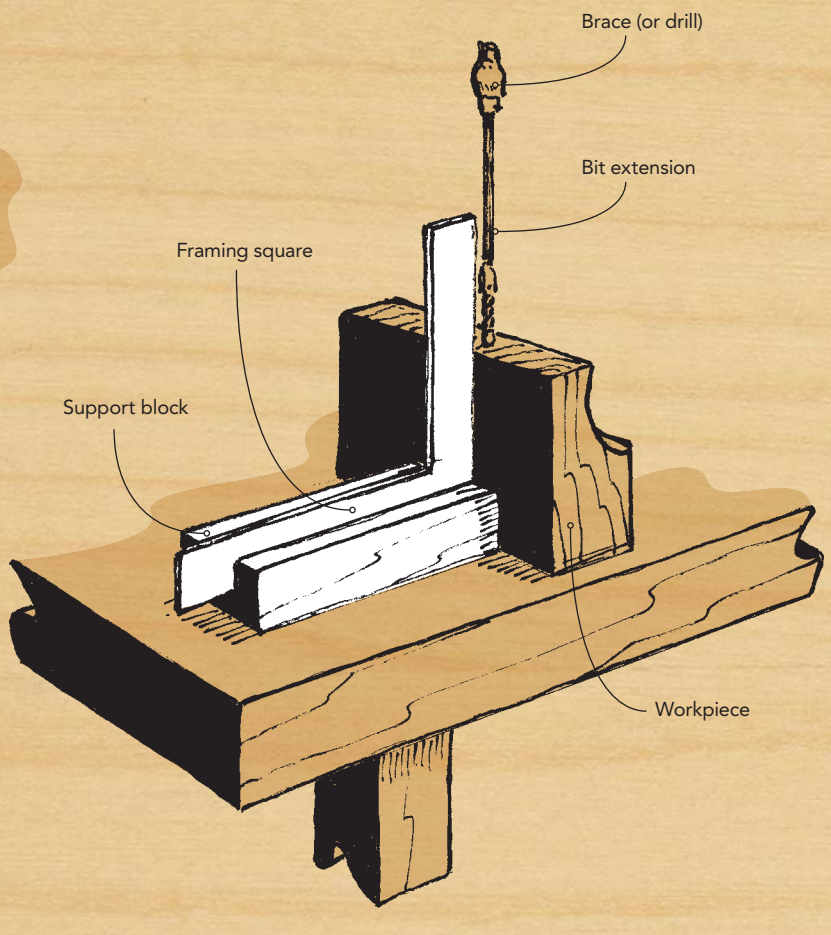


FIGURE 105A: Framing square guide

Trysquare Guide

No matter what tool you use, boring perfectly perpendicular to the workpiece can be difficult without some form of guide, even if only visual. Depending on the length of the bit, a large or small trysquare stood on end next to the desired entry point is a useful visual guide (**FIGURE 104**).

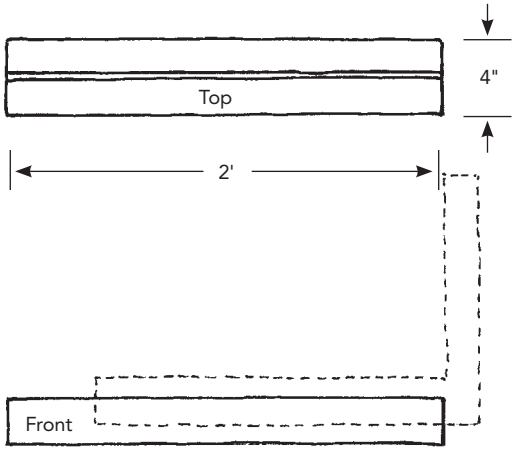
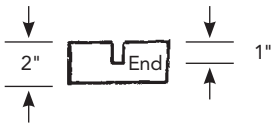


FIGURE 105B: Framing square guide

Framing Square Guide

For especially deep holes that may require being bored with a bit extension, a carpenter's framing square mounted in a grooved support block provides great visual reference (**FIGURE 105A**).

CONSTRUCTION • Choose a length of 2 x 4 long enough to support either the short arm (typically 18") or the long arm (typically 24") of a standard framing square. Make a groove in the center of its 3½" width that is deep enough to support the square so that the free arm stands up straight. Make sure the groove is absolutely perpendicular to the bottom of the 2 × 4, and also narrow enough to hold the square upright with no sideways wobble.



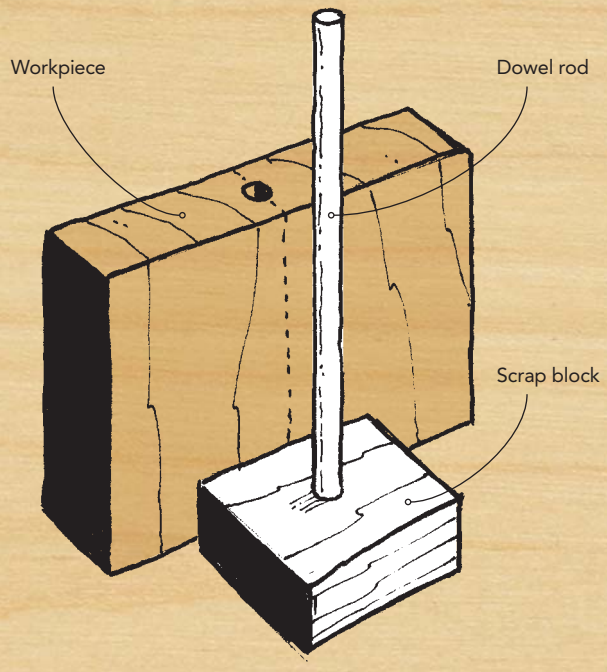


FIGURE 106: Vertical boring guide

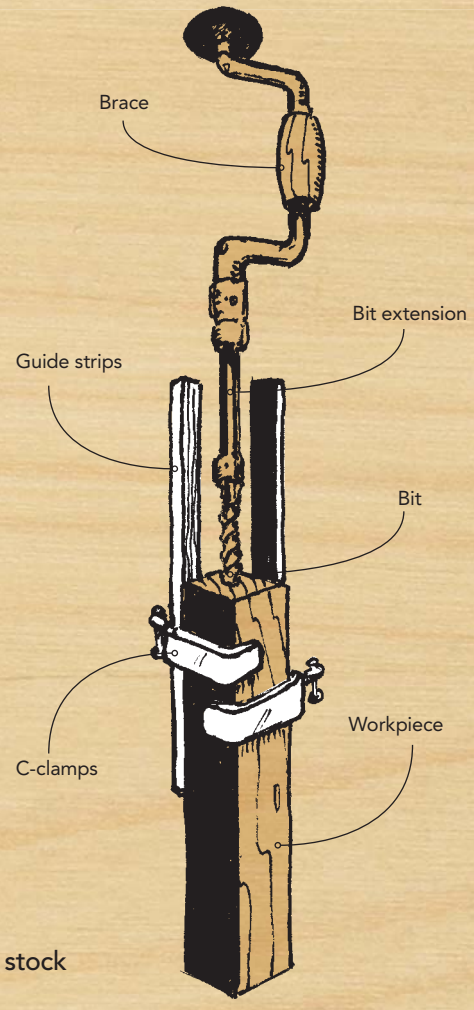


FIGURE 107: Thin stock boring guide

Vertical boring guide

In the absence of a framing square a suitable length of ½"-diameter dowel can be quickly bored (perhaps using a block boring guide to ensure verticality) into a piece of scrap that is substantial enough to hold it upright (**FIGURE 106**).

Thin-Stock Boring Guide

For boring into workpieces no more than 2" or 3" square, the thin-stock boring guide provides visual reference in two planes, side-to-side as well as front-to-back. This is a better solution than using a single framing square, which only provides a visual reference in one direction. The guide consists of two guide strips of thin, flat stock clamped to the workpiece 90° apart so that the bit (especially if mounted in a bit extension) can be fed directly into the workpiece while you check both sideways and back-and-forth positioning. Take care to ensure that the strips not only are straight, but also are clamped to the workpiece so that they are indeed parallel and perfectly vertical (**FIGURE 107**).

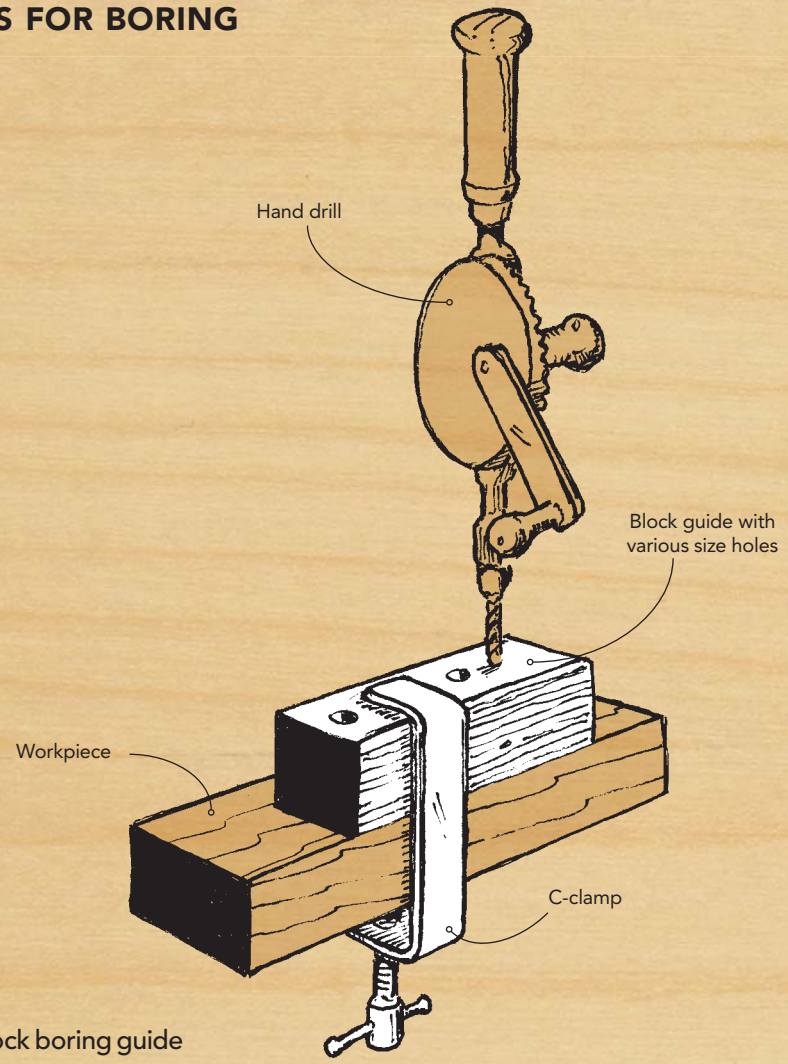


FIGURE 108: Block boring guide

Block Boring Guide

Manufactured doweling aids are often furnished with short tubes or sleeves of various diameters to guide drill bits into the workpiece. A block of wood, bored with the right size hole and large enough to be clamped to the workpiece, will do the same thing. While the taller the block the better the guide, its height is limited by the need to have the bit actually penetrates the workpiece. It is therefore most useful for guiding auger bits mounted in a brace, although extra-long twist bits are obtainable that can be used with hand drills and electric drills (**FIGURE 108**).

CONSTRUCTION • This is the very jig that should be used to make itself. Therefore, take extreme care when making it without such a jig. Start by preparing a block of the hardest and densest wood available, the better to withstand wear, to be perfectly rectilinear. The traditional worker would shoot all four faces with the aid of a shooting board. Next, square around the block where you want to make the guide holes and use a marking gauge (always registered against the same face of the block) to locate the entrance and exit points. Using a bit smaller than the size hole ultimately required, bore in from both sides until both holes meet in the middle. If they meet perfectly aligned you can now change to the right-sized bit and enlarge the hole to the required diameter. If the meeting points are offset, use either a round file or another bit one size smaller to align them, taking care not to alter the entrance and exit points. Then use the right-sized bit to enlarge the hole to the required diameter.

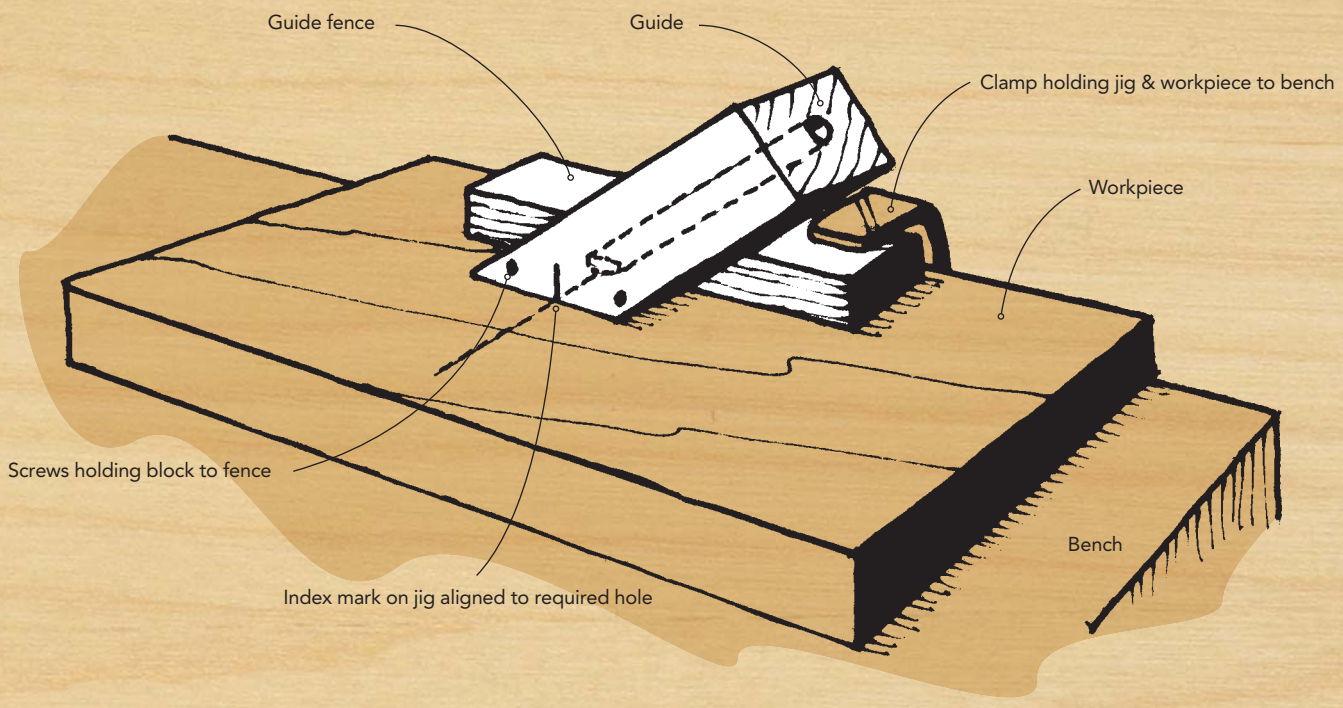


FIGURE 109A: Angle-boring guide

Angle-Boring Guide

It is far more difficult to judge an angled operation than one that is perfectly vertical or horizontal. That's why it is good practice whenever possible to secure the workpiece at an angle so that the desired operation can be done either vertically or horizontally. Should this not be possible, prepare a guide block to lead the bit at the required angle by boring a vertical hole in a rectangular block, and then sawing the bottom of this block at the required angle. To use this guide, attach a fence that may be clamped either to the top of the workpiece as shown in Figure 116, or alternatively to the side of the workpiece. To align the guide hole with the required position in the workpiece, square a line from the center of the bored hole in the jig to the side of the jig and align this with the layout lines. Such a jig will also help start the angled hole correctly – something that is difficult to do with most bits.

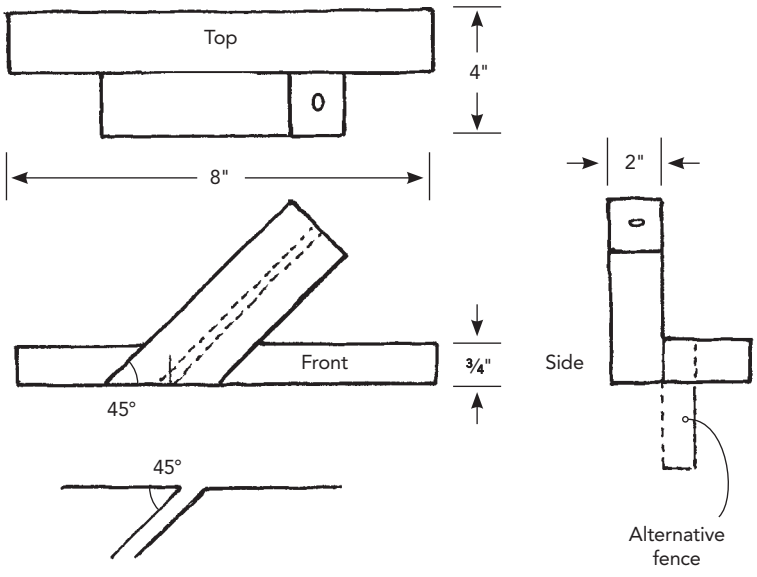


FIGURE 109B: Angle-boring guide

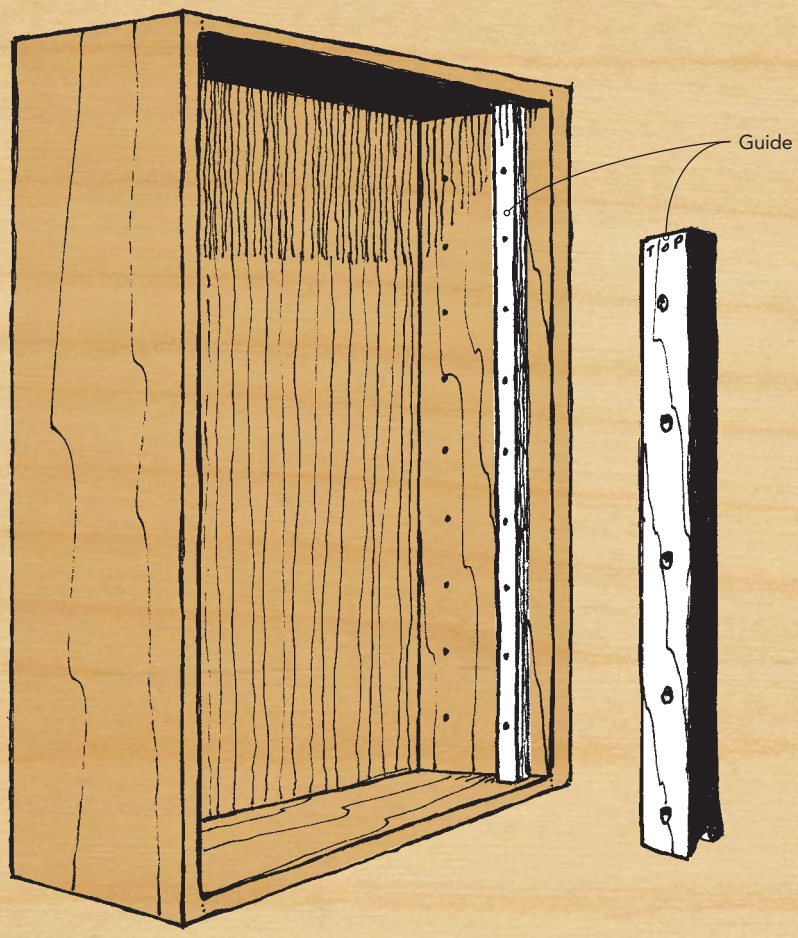


FIGURE 110: Spaced hole guide

Spaced Hole Guide

The problem of boring a line of holes at a predetermined distance from one another, as might be needed for shelf supports in a cabinet or bookcase, is slightly more complicated than boring a hole at the correct angle. The problem is further compounded by the fact that four such lines of holes may be needed, all of which must match, or else the shelving is liable to rock. The solution is to bore a line of holes in a strip of hardwood, spaced one from the other as required.

CONSTRUCTION • Lay out the guide as carefully as possible, and if the holes are not evenly spaced, be sure to mark one end so you can always orient the guide in the same direction. In order to extend the life of this guide when using an electric drill, be sure to insert the bit into its hole before you start the drill. Excess wear is not a problem with a hand drill or brace, because you have to insert the bit before you can turn it.

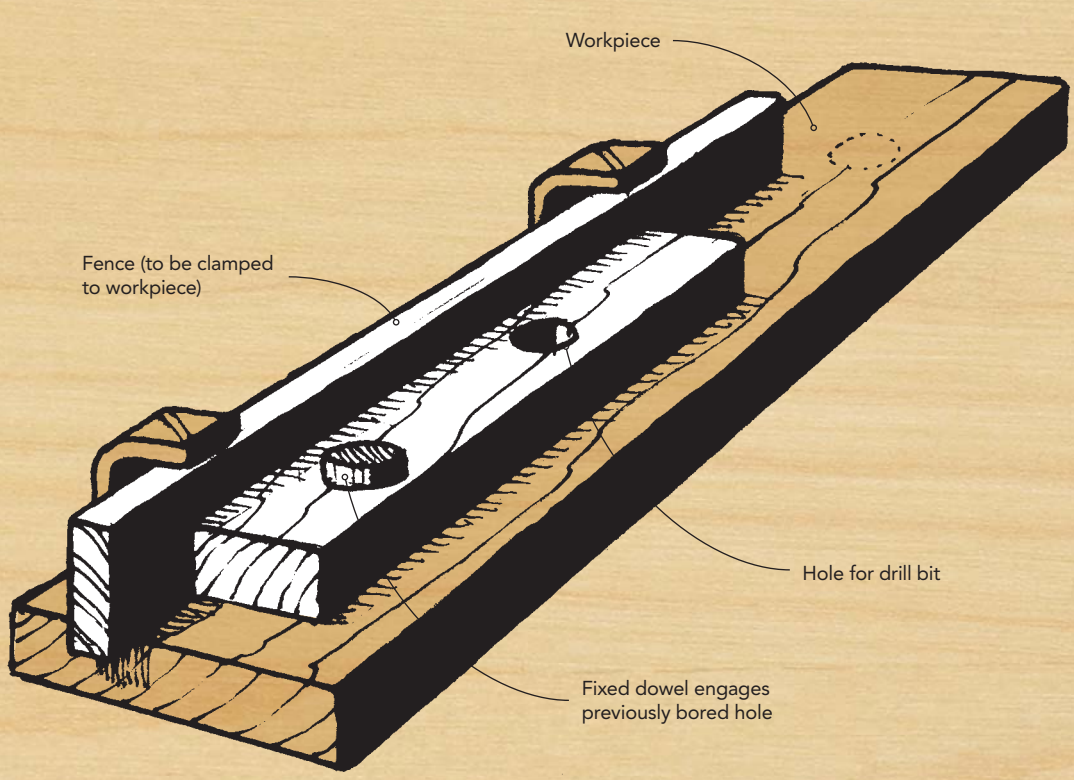


FIGURE 111A: Evenly spaced boring guide

Evenly Spaced Boring Guide

To ensure that repeated holes are the same distance from one another, make an indexing guide. Bore two holes the required distance apart in a block of hardwood, and insert a dowel into the first hole. Make the dowel protrude a little so it acts as an indexing pin that you can insert into each previously bored hole. To keep all the holes aligned on a straight line, press this guide against a separate fence clamped to the workpiece. In order not to damage previously bored holes, gently round the bottom edge of the indexing dowel – a good habit to get into when inserting any dowel.

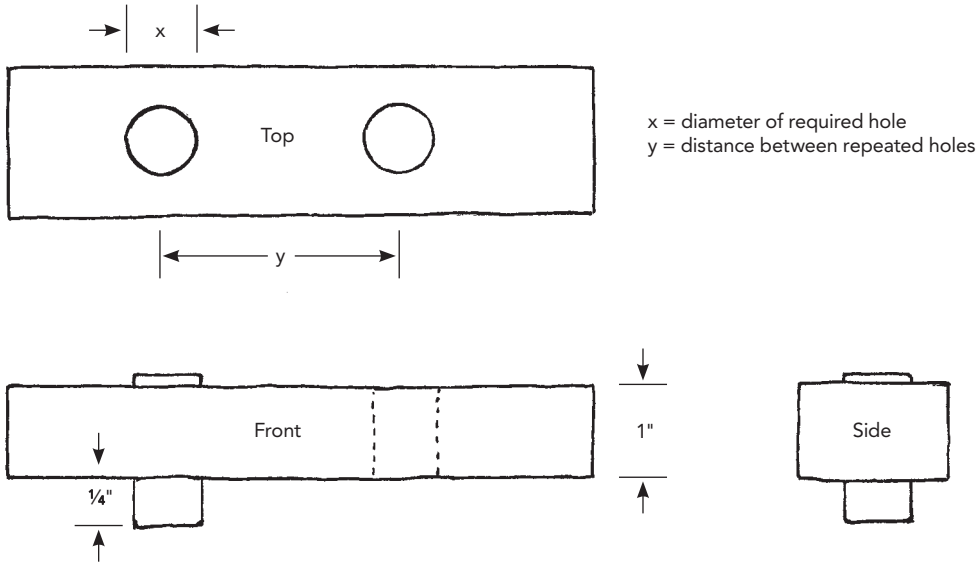


FIGURE 111B: Evenly spaced boring guide

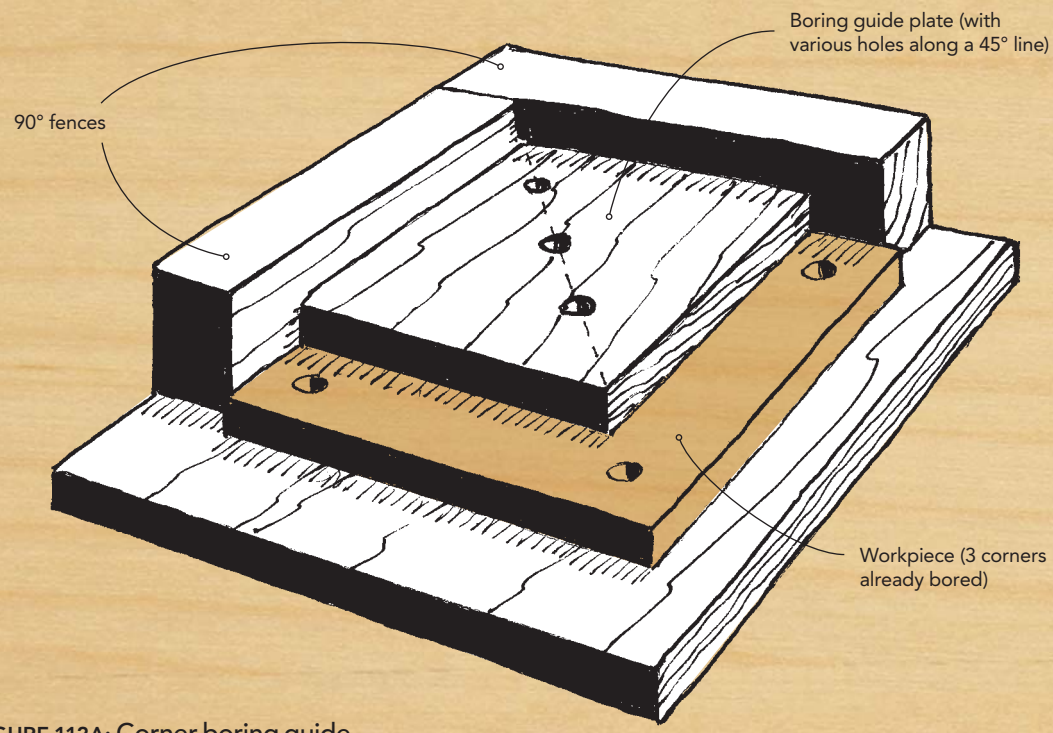


FIGURE 112A: Corner boring guide

Corner Boring Guide

A corner boring guide will ensure that corner holes – such as might be needed for doweling or screwing a lid or base to a rectilinear carcase – are all bored the same distance from each corner. To use it, place the lid or base to be bored into the corner of the fixture and then plant the prebored platen on top, pressing the platen firmly into the corner as well. If the platen is perfectly square, you can bore a series of guide holes of various diameters along its diagonals (**FIGURE 112A**).

CONSTRUCTION • Attach two guide strips or fences at a right-angle on the base. Make the guide strips high enough to contain both the workpiece and the prebored platen. To make the platen, prepare a square of hardwood at least ¾" thick. On a 45° diagonal drawn from one corner to the opposite corner of the platen, bore a hole of the required diameter and at the required distance from the corner.

The entire fixture need not be much larger than is sufficient to contain the platen, regardless of the size of the workpiece, though you may need spacer blocks to support and secure the workpiece. Then clamp the whole assembly to the workbench.

Once you grasp the principle of this jig, you'll understand how to prepare similar corner-boring guides for shapes other than rectilinear, such as triangles or pentagons. Simply alter the angle of the corner fences and prepare appropriately angled platens to fit in them.

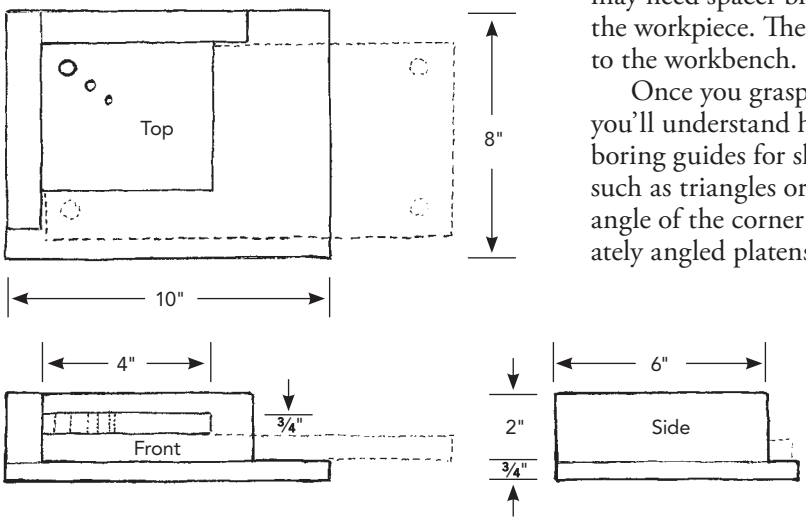


FIGURE 112B: Corner boring guide

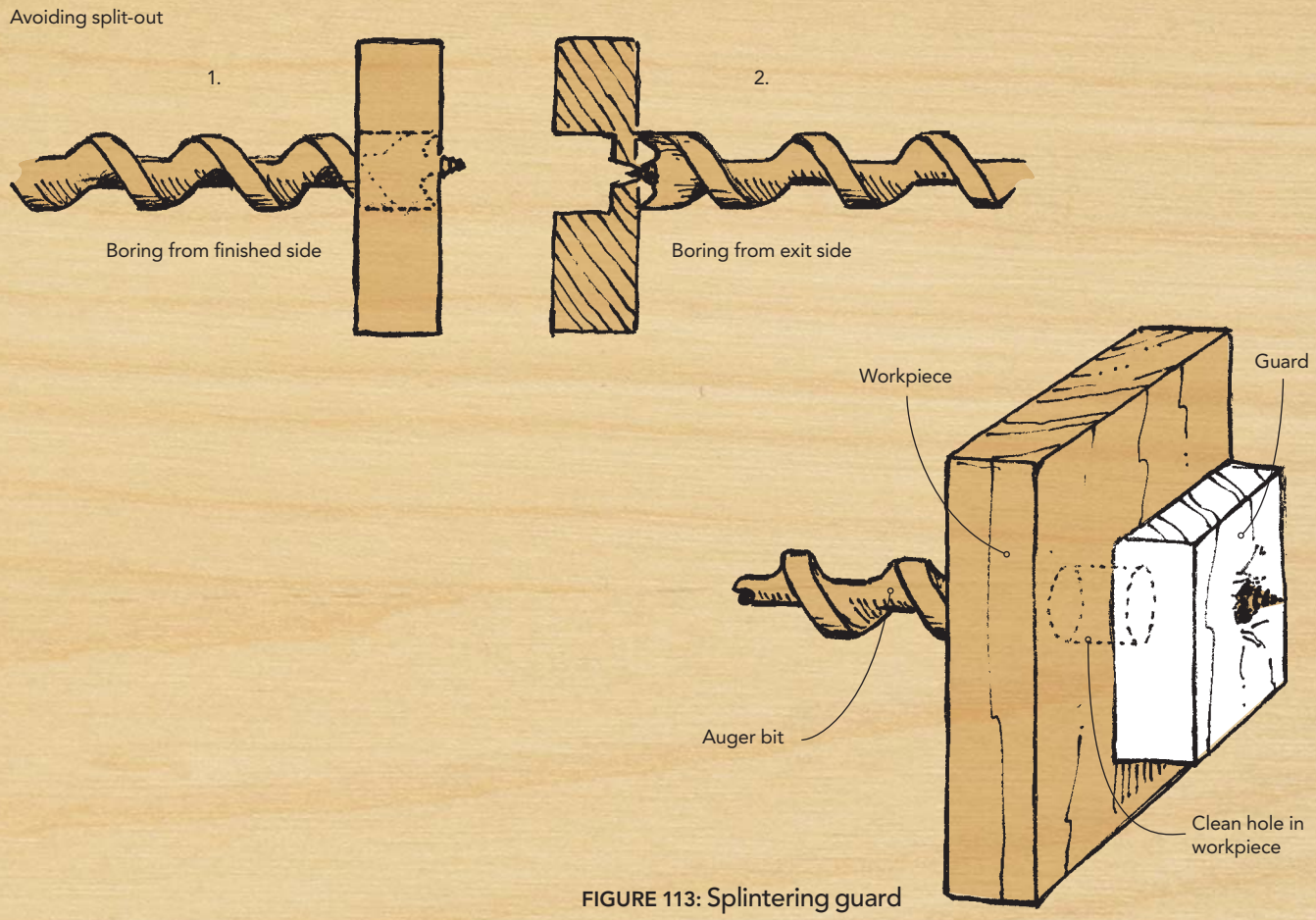


FIGURE 113: Splintering guard

Splintering Guard

Whenever you are boring holes in wood, the problem of clean penetration is next in importance to angle and location. With almost any kind of bit, if any given hole is to penetrate completely and cleanly through the workpiece, something must be done to prevent the exit hole from splintering out. When boring with auger bits that have small lead screws or center bits that have a sharp center, it is possible to bore from the exit side the moment the lead screw or center is seen exiting the hole. Simply use the exit point as a guide to reposition the bit for boring back into the cavity shown above.

If boring from both sides is not possible, or if it is simply more convenient just to bore all the way through the workpiece from one side, clamp a sacrificial scrap piece tightly to the exit side of the hole (**FIGURE 113**).

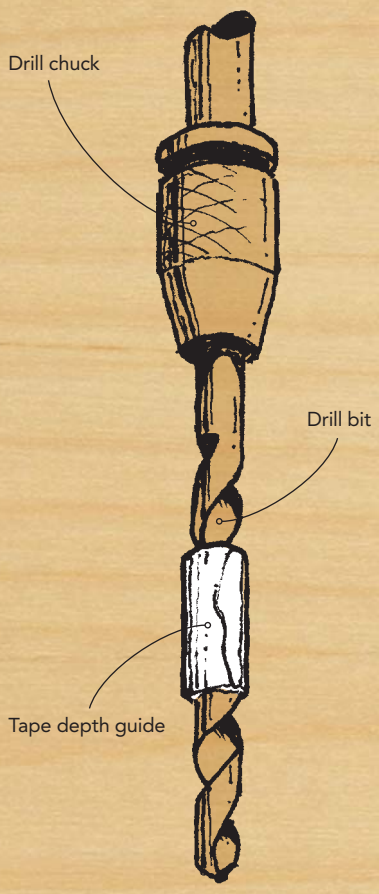


FIGURE 114: Tape depth guide

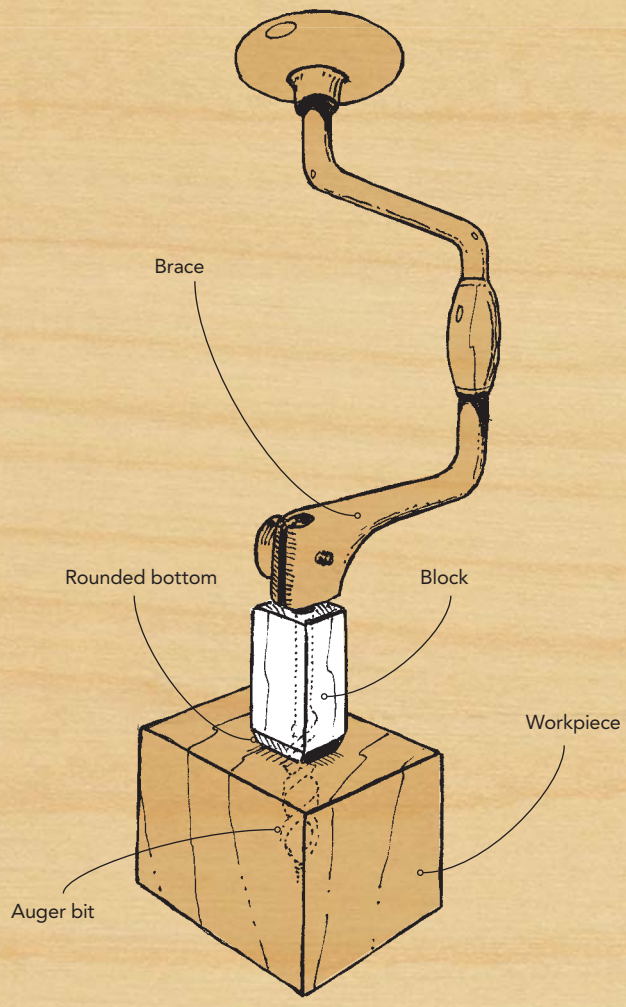


FIGURE 115: Block depth guide

Tape Depth Guide

Not all holes need to be completely through-bored. For holes to bored to a precise depth, you need some form of depth guide or stop. This is one case where user-made guides are superior to manufactured metal guides, because there is always the danger of damaging the surface of the workpiece with metal depth stops, especially when boring at an angle. The simplest jig, especially useful with small twist bits, is simply to wrap tape around the bit while leaving the required depth exposed (**FIGURE 114**).

Block Depth Guide

To drill to a precise depth with larger bits, such as auger bits held in a brace, make a wooden depth stop. Bore a block of wood to fit the bit and cut it to a length that will stop the bit entering more deeply than wanted. This is a one-time jig and you would need to make a new one for each different hole depth.

To minimize any damage to the workpiece, gently round the outside edges of the bottom of the guide. To avoid having the block revolve against the workpiece and perhaps scuff it, secure the block in its final position against the drill chuck by inserting a blunted screw through its side to bear against the auger bit's shank (**FIGURE 115**).

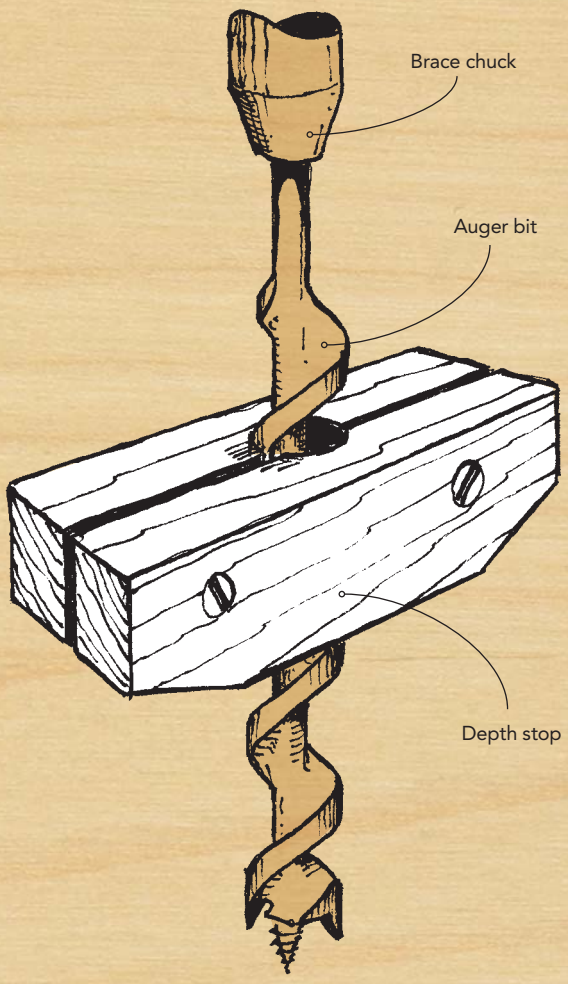


FIGURE 116A: Adjustable depth stop

Adjustable Depth Stop

For different boring depths, make an adjustable depth stop that may be secured at any point along the bit's twist section.

CONSTRUCTION • Bore a hole the same size as the diameter of the auger bit into a narrow piece of scrap and then saw this piece in half through the center of the hole. The saw kerf will have removed enough wood so that the two halves, when place over the bit and screwed together, will tighten securely enough not to move. Be sure to round the bottom of the stop as well as to bevel the outside ends, so that even if boring at an angle the stop does not damage the workpiece.

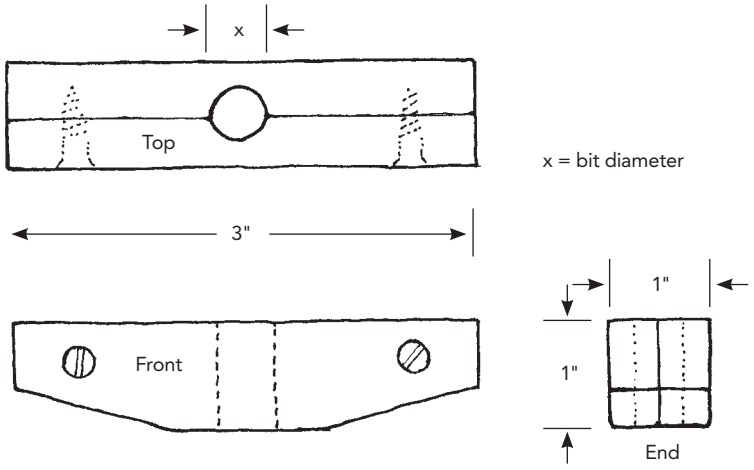
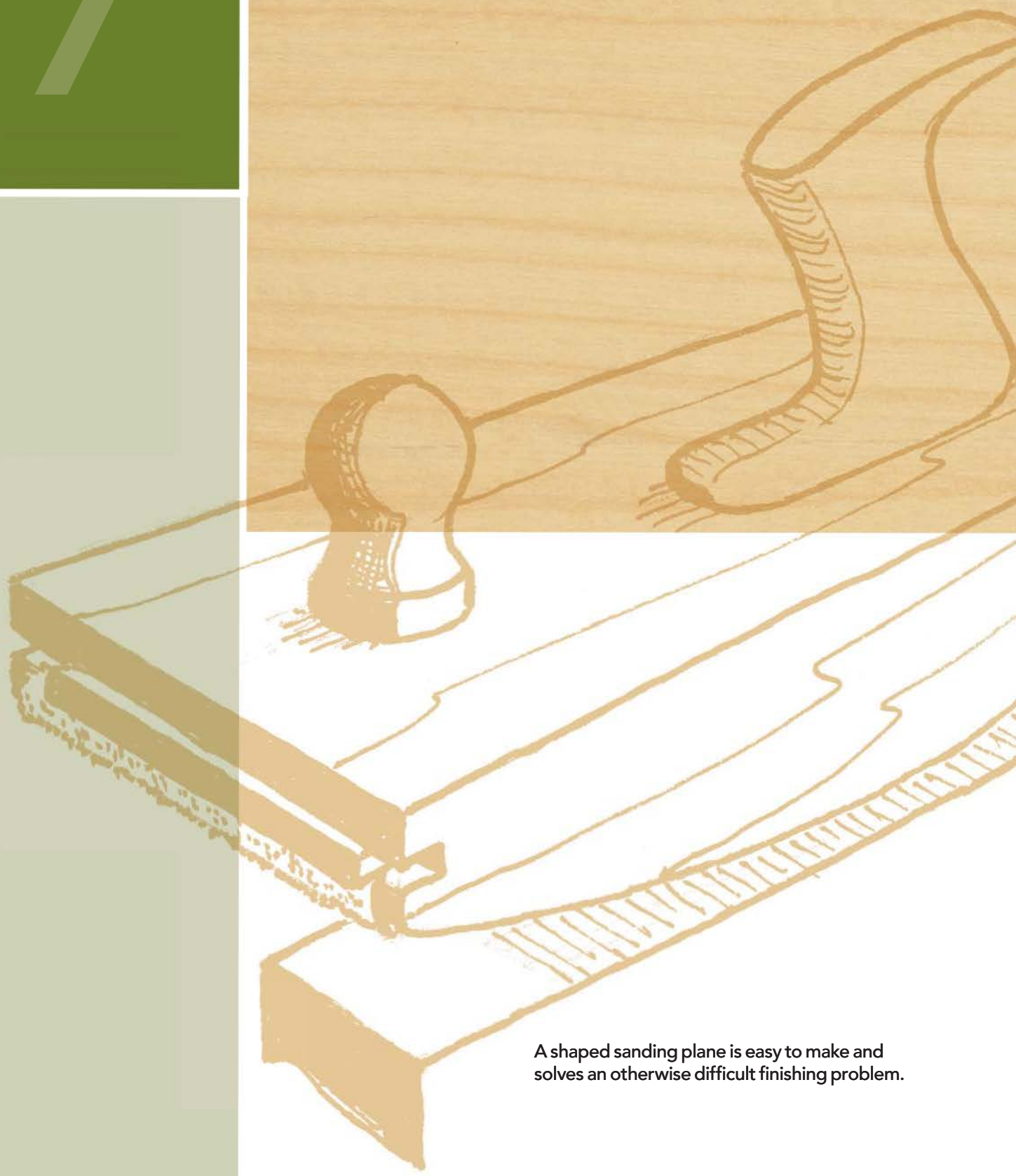


FIGURE 116B: Adjustable depth stop

7 JIGS & FIXTURES FOR ASSEMBLY & FINISHING



A shaped sanding plane is easy to make and solves an otherwise difficult finishing problem.

CHAPTER 7

JIGS & FIXTURES FOR ASSEMBLY & FINISHING

By the time you have chosen the wood, prepared it accurately to size, cut and fit the joints, you will have invested some considerable number of hours, not to mention expenditures for materials. When assembling parts and gluing subassemblies together, it behooves you to protect the work you have already done even as you finish-sand the surfaces, add any finishing touches and apply the finish itself.

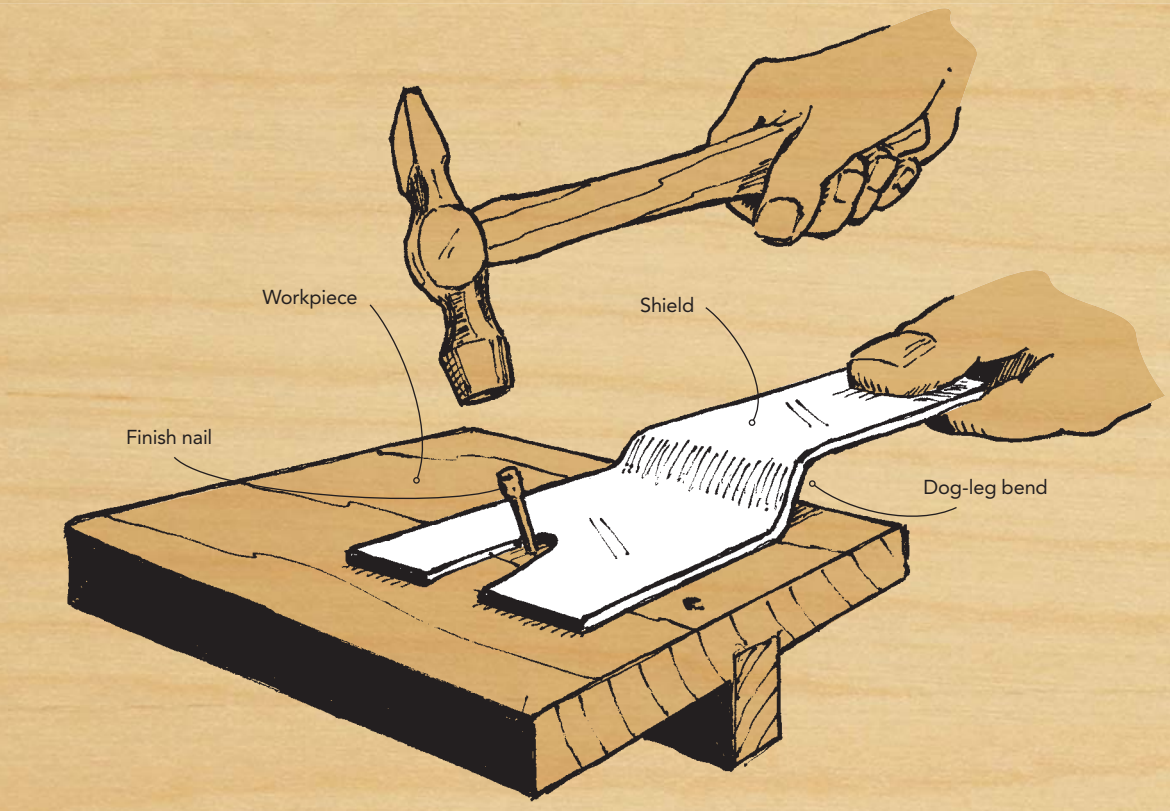


FIGURE 117: Hammer shield

DENT PROTECTION

From a 2oz. tack hammer to a 10lb. commander, we have numerous tools designed to assemble parts of a woodworking project. At this late stage in the project it makes no sense to jeopardize successful completion by risking dents and dings. The following simple fixtures can prevent such mishaps.

Hammer Shield

It is worthwhile to use some form of guard to protect the surrounding wood from dings caused by misplaced or missed hammer blows. It's true that a properly designed hammer will have a slightly crowned face that makes it possible to bounce the nail below the surface of the surrounding wood without the face of the hammer actually touching the wood. But that is no help against misplaced or miscalibrated blows.

CONSTRUCTION • You can protect the wood with a slotted piece of thin metal that can be placed around the fastener. Make it from aluminum flashing or thin tin, broad enough to span the danger zone and with softened edges that can't dig in. Give it a handle to make it easier to use, by dog-leg bending upwards the edge opposite the slot, as shown in **FIGURE 117**.

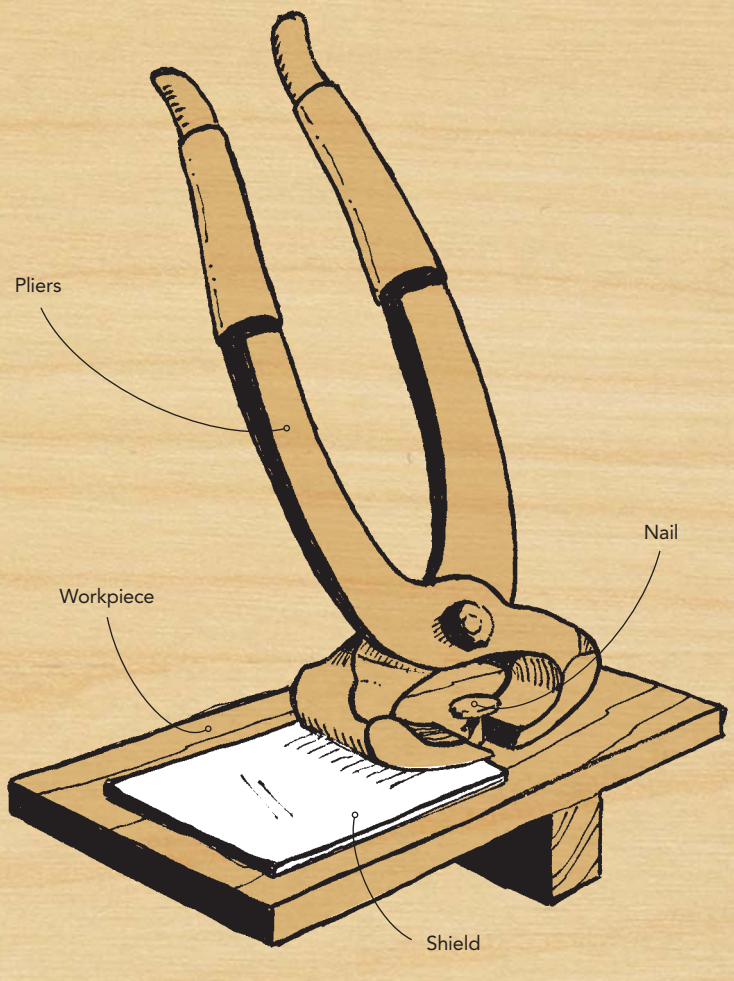


FIGURE 118: Pliers shield

Pliers Shield

Round-faced pliers may be very efficient when removing small nails, tacks, brads, and even staples that have not been completely buried in the wood, but if used without any protection they will invariably damage the surface. Claw hammers (not normally part of any fine woodworker's toolkit) will do the same when levered against the workpiece. To avoid dents, always use as a shield a thin piece of scrap wood that is sufficiently broad to spread the pressure (**FIGURE 118**).

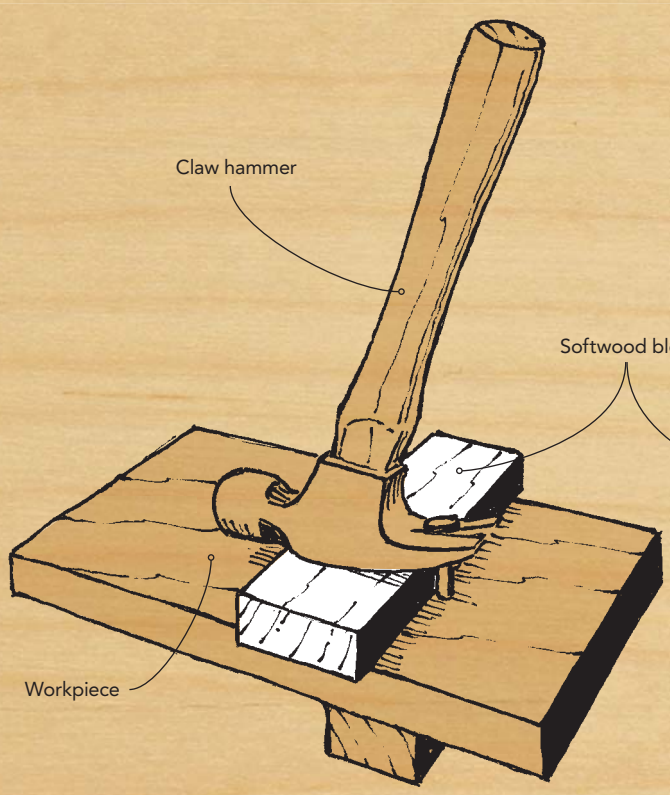


FIGURE 119: Fulcrum raiser

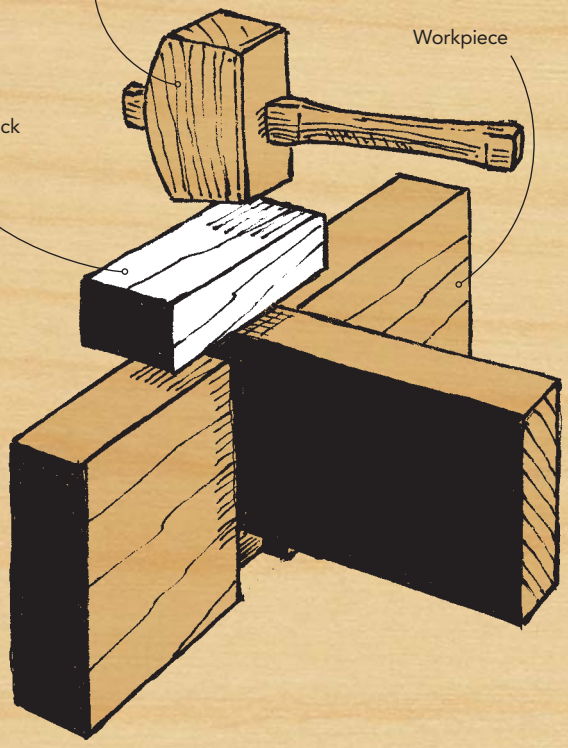


FIGURE 120: Striking block

Fulcrum Raiser

Sometimes the claw hammer is the only tool that will extract a stubborn fastener. On such occasions, both to prevent damage as well as to increase efficiency, it is essential to raise the tool's fulcrum as the extraction proceeds, especially if the nail sticks and you need extra force. A small block of scrap softwood such as pine is ideal (**FIGURE 119**).

CONSTRUCTION • Make the block large enough to spread the pressure evenly Soften the block's edges so they do not dig into the surface of the workpiece. Even though the block may be dented by the levering action of the hammer's claw, softwood is preferable to hardwood because it is less likely to transmit damage to the underlying workpiece.

Striking Block

There are various tools specifically designed to knock components together without damage, such as rubber mallets, brass hammers and shot-filled plastic hammers, but often you need a heavier tool such as a large mallet, a framing hammer or even a commander. When using these heavy tools, you can protect the surface of the workpiece with an intermediate striking block.

CONSTRUCTION • Make the striking block of softwood with dimensions proportionate to the parts being assembled, as illustrated in **FIGURE 120**. If you plane the block accurately smooth and flat, it will also help you align adjacent parts, such as shelving in casework, to a perfect flushness. Whether or not you need to spend time preparing the block to perfect and parallel thickness and to an exact rectilinear shape will, of course, depend on the configuration of the parts being assembled.

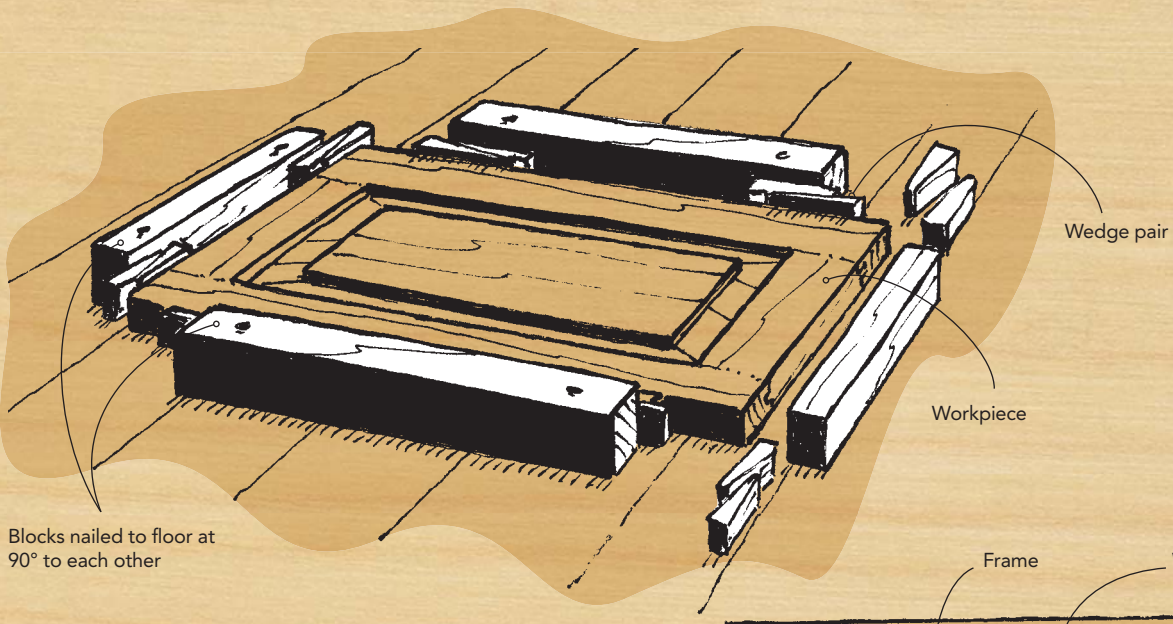


FIGURE 121A: Floor frame-container

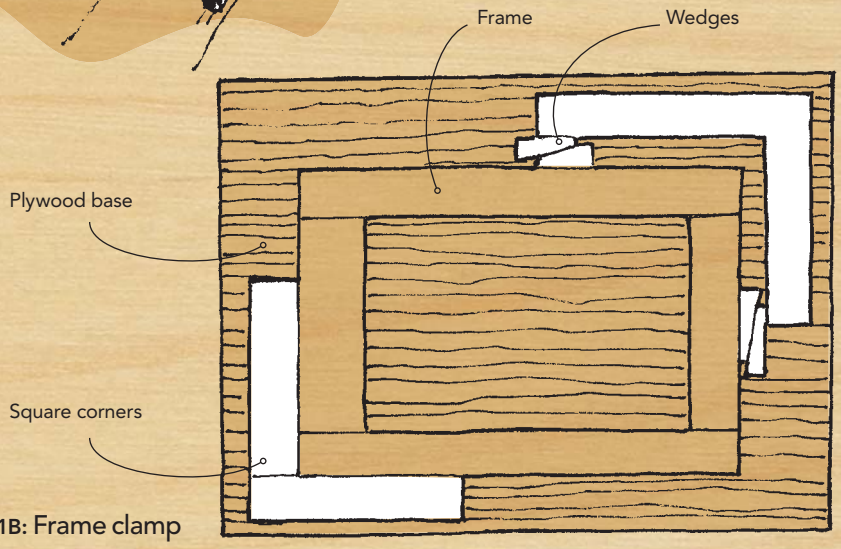


FIGURE 121B: Frame clamp

ASSEMBLY AIDS

Floor Frame-Container

When assembling framework it's not always easy to ensure and maintain rectilinearity. Simply applying clamps across an assembly pulls joints together but does little to avoid pulling the piece out of square. A better method is to place the workpiece inside a slightly larger fixed frame, and to drive pairs of wedges to close up the parts and to maintain a perfect rectilinearity.

CONSTRUCTION • To accommodate large assemblies, lay out blocks at exactly 90° to each other and securely nail or screw them to the shop floor. To avoid denting the workpiece, it is important to use wedges in pairs so their faces are always parallel to the adjacent block and workpiece, as shown in **FIGURE 121A**. Pairs of wedges also helps avoid jamming the frame out of rectilinearity, a risk with a single wedge. Don't make the wedges so small that you can't easily set and adjust them.

Frame Clamp

If blocks nailed to the floor are not an option, consider something similar on a large base such as a sheet of plywood or a large assembly table. For workpieces measuring no more than 2' or 3' on any side this fixture may be simplified by making one corner closed and using wedges only on the opposite sides (**FIGURE 121B**).

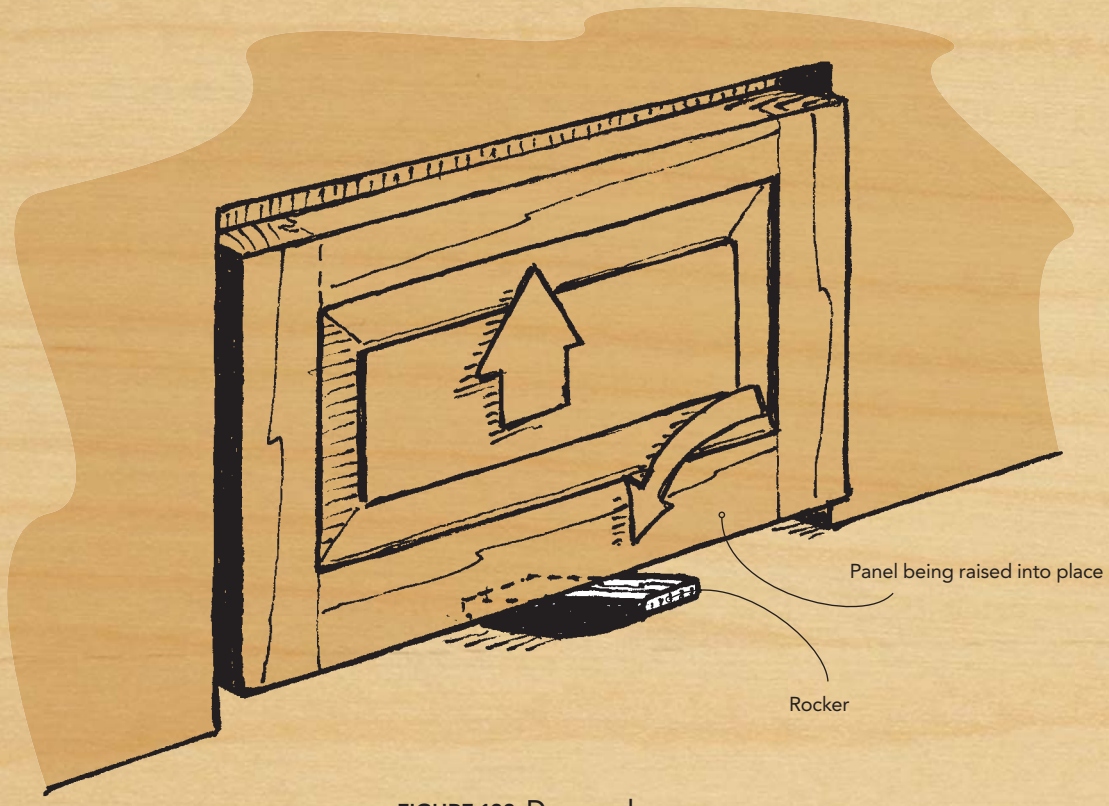


FIGURE 122: Door rocker

Door Rocker

The door rocker is a very simple aid that can be invaluable in the assembly of large pieces, especially when an extra pair of hands is unavailable. Depending on the size of the piece being assembled it consists of a larger or smaller crowned length of scrap that can be inserted crown-down under or between adjacent parts, and then stood upon to lever the workpiece to its correct position (**FIGURE 122**).

Its most obvious use, and the use for which it is named, is to raise heavy doors to the required position within their frames so that they may be marked for hinges. It's also extremely useful when positioning paneling, framing parts, or sections of large casework such as tallboys, highboys and armoires.

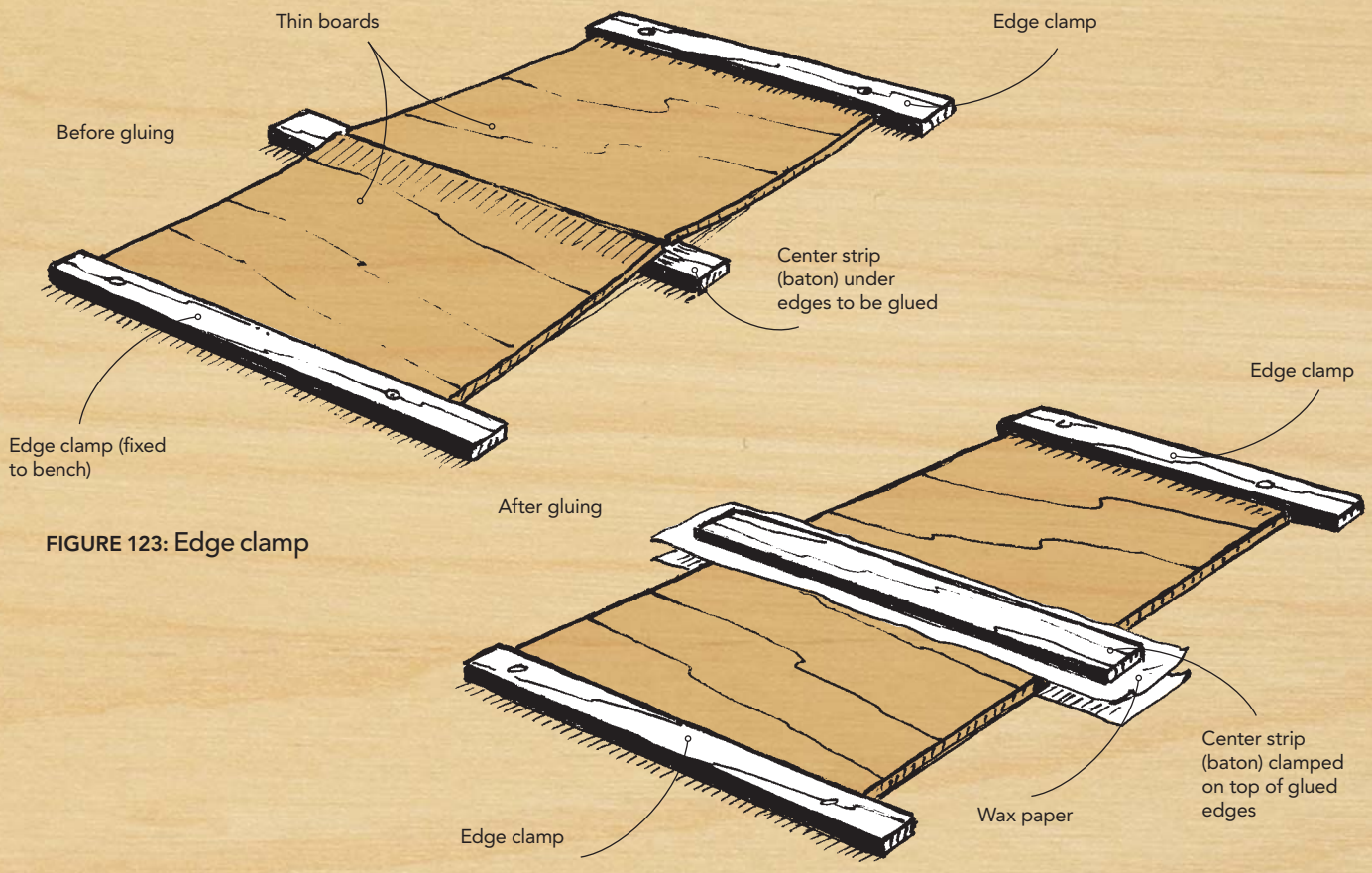


FIGURE 123: Edge clamp

GLUING AIDS

Although properly surfaced edges should need little clamping when glued, it is sometimes necessary to hold the two parts in position while the glue cures. Glue is not any more effective under pressure because the strength of the joint primarily depends upon how well the glued surfaces mate. For the traditional woodworker, perfectly mating surfaces are easier to achieve with a hand-plane than with a jointer because the machine's rotating knives, no matter how sharp or finely adjusted, necessarily leave a surface of minutely repeated cups rather than continuous smoothness.

Edge Clamp

Holding the parts in position while the glue cures becomes critical when the pieces are very thin, since they don't have enough mass to maintain position on their own. The solution is an edge clamp like the one shown in **FIGURE 123**.

The edge clamp is a three-part fixture consisting of two outside strips fixed to the bench against which the outside edges of the workpieces bear, and a broad but relatively thin (½") piece called the baton.

When you are ready to glue, start by positioning the outside strips against the workpieces with the thin broad baton placed under the joint. If the two workpieces touch lightly with the baton underneath, when you remove the baton the outside strips will force them together in what is now slightly less space.

After applying glue remove the baton from beneath the workpieces and use it to press the edges down flat and together, keeping it in position with weights or by clamping it to the work surface (**FIGURE 123**). Be sure to use wax paper immediately above and below the glued joint so that the baton does not become part of the assembly. After the glue has cured first remove one of the outside strips before removing the baton, or the workpiece may spring up and damage the joint.

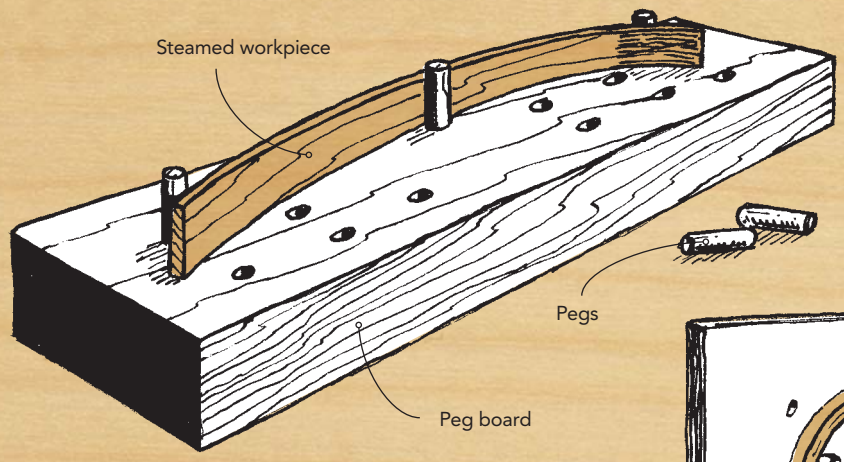


FIGURE 124A: Peg bending form

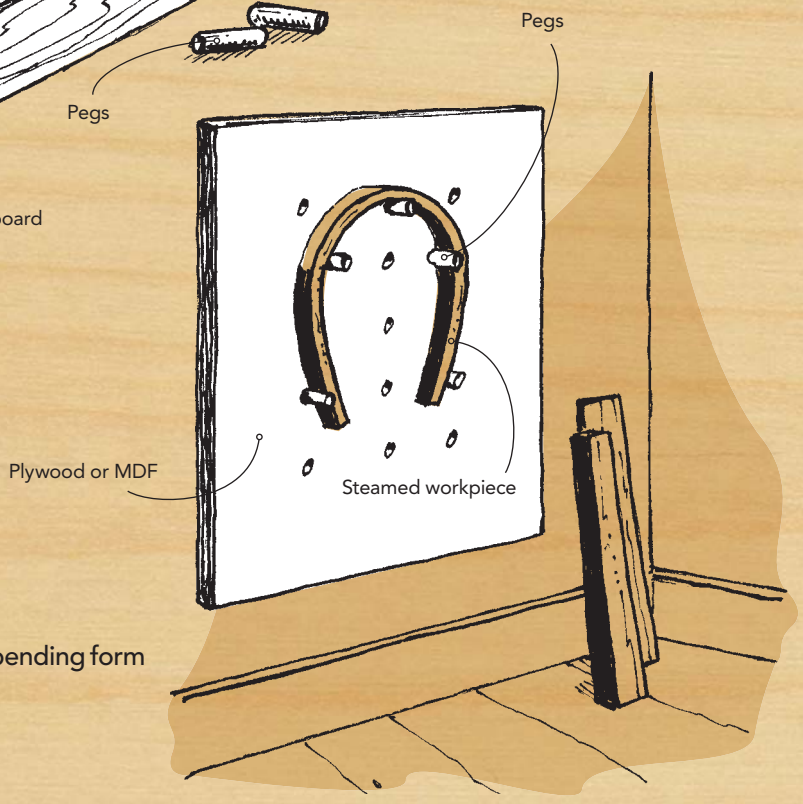


FIGURE 124B: Wall bending form

Bending Forms

A bending form is essential when gluing up laminate strips or holding steamed wood in position while it dries. The simplest device is a backing board as large as the workpiece, bored with a variety of holes for pegs that can be moved incrementally until you attain the desired shape (FIGURE 124A).

CONSTRUCTION • As well as being large enough to contain the entire workpiece, the backing board must be thick enough to hold the pegs. Since flatness is essential, medium density fiberboard (MDF) can be a good choice. However, solid wood may be better for a fixture you intend to re-use, to minimize wear on peg holes that could make them too sloppy to hold in position. If the backing board is not massive enough to remain stable, add cleats to keep it flat. This particular fixture can be used vertically as well as horizontally, thus taking up less space in the shop. (FIGURE 124B).

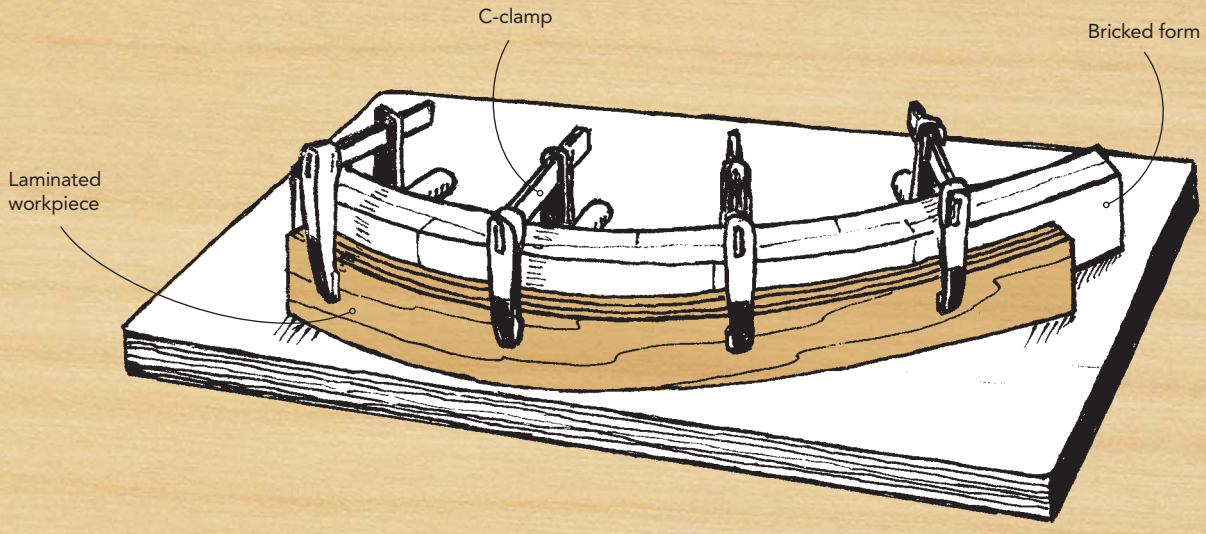


FIGURE 125A: Solid bending form

Solid Bending Form

While an all-purpose peg form might be generally useful for a variety of projects, when you need the same shape repeatedly – as when forming bent backs for a set of chairs – it's better to make a purpose-built form. Such a form will provide a solid shape against which you can clamp the workpiece, eliminating the need to measure repeatedly or provide more peg holes (FIGURE 125A).

CONSTRUCTION • A solid form can be sawed from a solid block of wood or a laminated stack of plywood or MDF. Alternatively, it can be built up from brick-like sections glued into a rough approximation of the required shape, which is then sawed and sanded to the finish profile.

Mount the entire form on its own backing board which, of course, should be perfectly flat. Make the actual form part strong enough and wide enough to clamp to it any steamed workpiece or glued-up laminates without risk of deformation.

When gluing up many thin layers of wood, it's not always easy to fit enough clamps onto the form. In some situations it may be better to design the form for clamping the assembly to the inside of the curve rather than to the outside. In extreme cases the ultimate solution may be to make a sandwich by clamping the workpiece between two bricked forms.

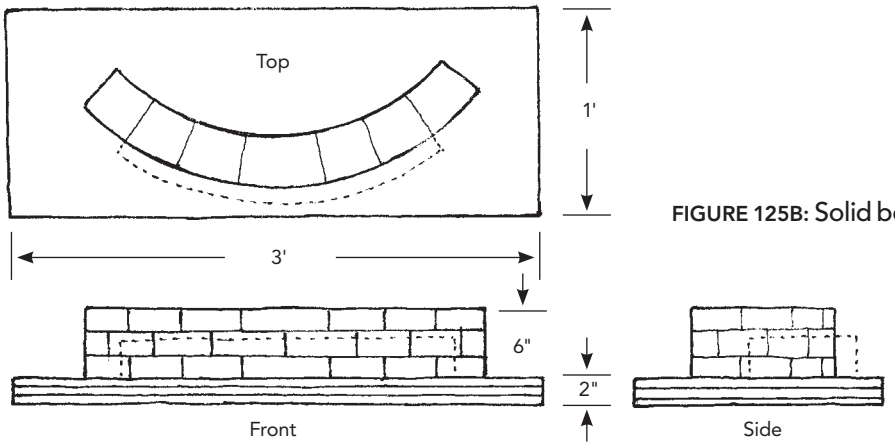


FIGURE 125B: Solid bending form

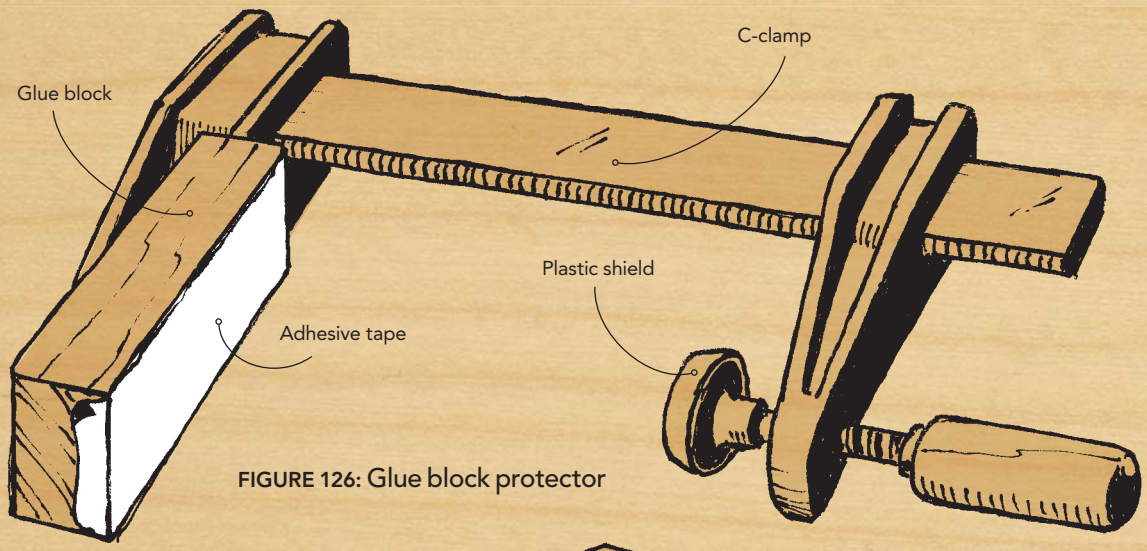


FIGURE 126: Glue block protector

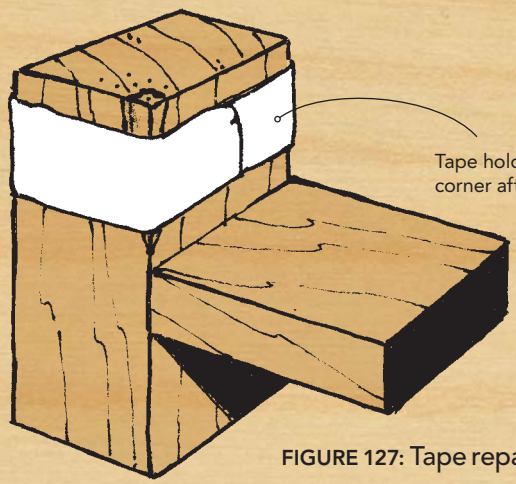


FIGURE 127: Tape repair

ADHESIVE TAPE

Waterproof adhesive tape has many uses connected with glue-up and assembly, and as such adhesive tape may be thought of as multi-purpose disposable shop jig.

Glue Block Protector

Tape's primary use is to prevent glue from inadvertently attaching parts not required to be attached – such as blocks and cauls used in glue-up – where the use of wax paper is not possible (**FIGURE 126**).

Tape Repair

Tape can also be used to keep parts together that are too small to be clamped. It can be especially useful for gluing small repairs such as splinters that may have been inadvertently chipped off during assembly (**FIGURE 127**).

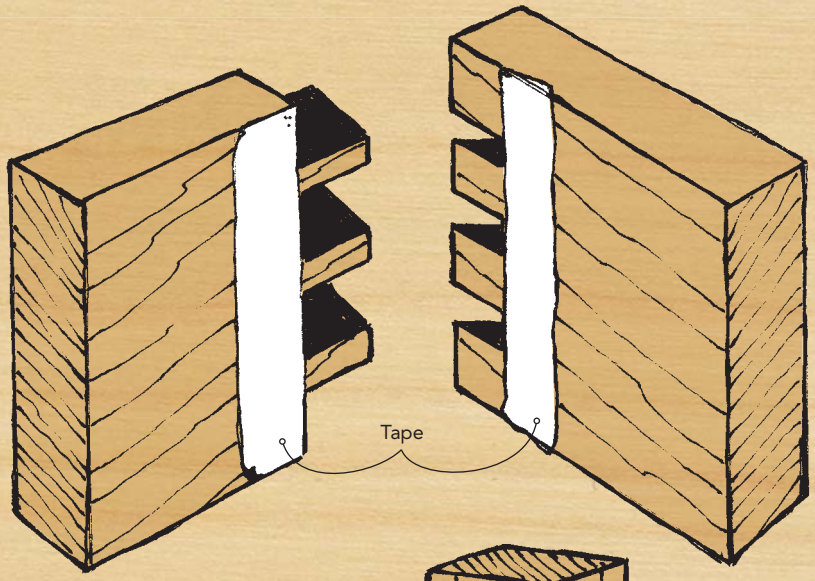


FIGURE 128: Squeeze-out protector

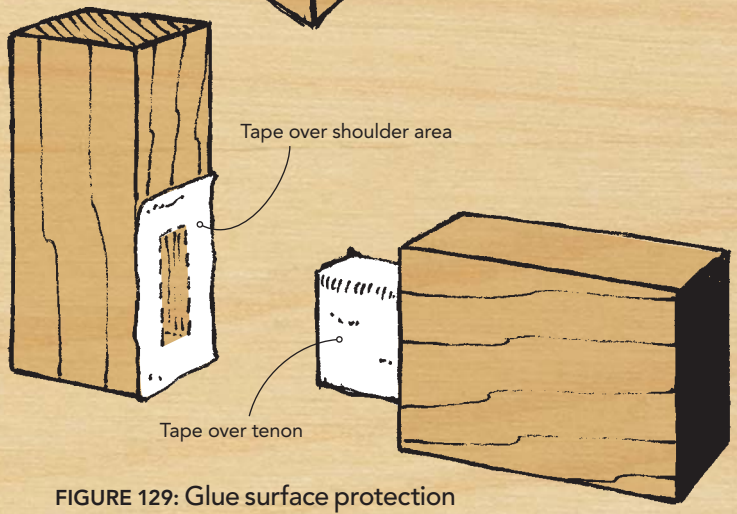


FIGURE 129: Glue surface protection

Squeeze-Out Protector

Equally objectionable to gluing your glue-up blocks or clamp spacers to the workpiece is finding glue squeeze-out in hard-to-clean corners such as interior areas of dovetailed casework, partition joints and the insides of small drawers. Tape applied in these places before assembly can be more easily removed than squeezed-out glue (**FIGURE 128**).

Glue Surface Protection

It is often easier to apply finish to constituent parts of a project before assembly, but finish in the wrong place can impair glue adhesion. Tape applied in areas to be glued can protect them from excessive finish. The tape should be removed before glue-up, perhaps to be replaced by more tape now protecting the finished areas from glue (**FIGURE 129**).

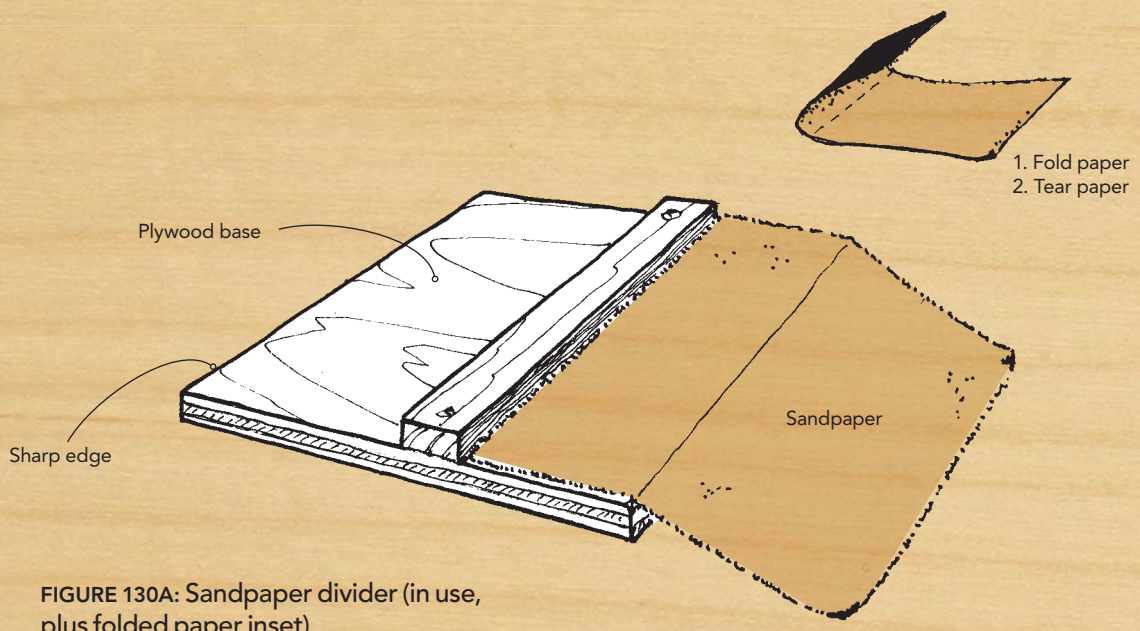


FIGURE 130A: Sandpaper divider (in use, plus folded paper inset)

SANDING

The traditional woodworker may eschew electric sanders in favor of the superior finish obtainable by proper planing but still occasionally find reasons to use abrasive paper. Rather than being sanded freehand, almost all surfaces will benefit from the use of shaped rubbers to distribute the pressure evenly. In the case of flat surfaces, to maintain flatness the abrasive paper should be wrapped around a flat block. Sanding blocks need be nothing more than any convenient piece of scrap that is large enough to present a usable surface to the workpiece, and small enough for the abrasive paper to be wrapped around it.

Sandpaper Divider

You will often find it convenient to use abrasive paper in smaller pieces than whole sheets, with quarters and transverse thirds being the most common sizes. Separating sheets by hand risks torn and uneven pieces, but this simple jig greatly improves speed and consistent uniformity. Place the sheet of abrasive paper against the fence and then fold it before placing it face down on the base to tear it against the edge.

CONSTRUCTION • Not all abrasive-paper manufacturers produce sheets to the same size, so measure those you use carefully before making this jig. One of the more common sizes will use a jig that measures 12" long by 4½" wide from the edge of the fence to the edge of the base. Whatever size you need, provide a flat base that is as long as the paper, and wide enough so that with the central fence attached a width equal to exactly one third of the paper's width (or one-half if that's what you prefer) is left on both sides. The fence need be no more than ½" to 1" wide. Plywood or hardwood would be good choices for the base because, if cut cleanly to size, the edge against which the paper is torn will remain sharp longer than the edge of a piece of softwood.

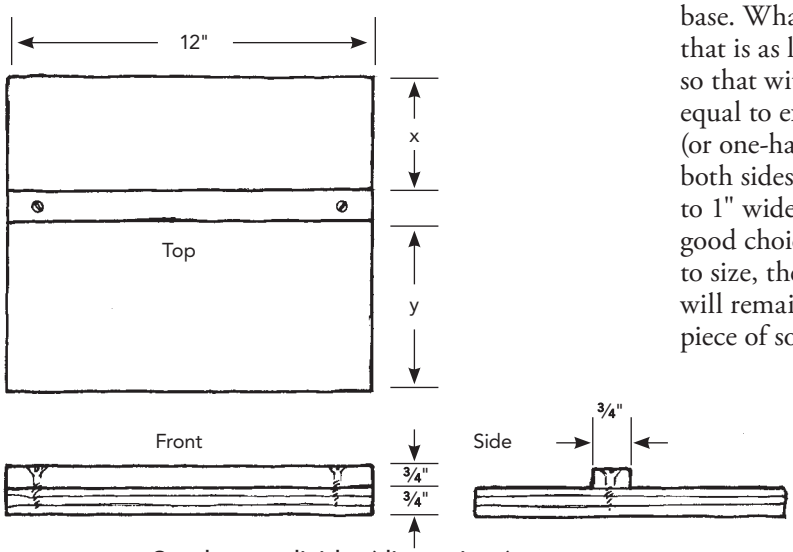


FIGURE 130B: Sandpaper divider (dimensions)

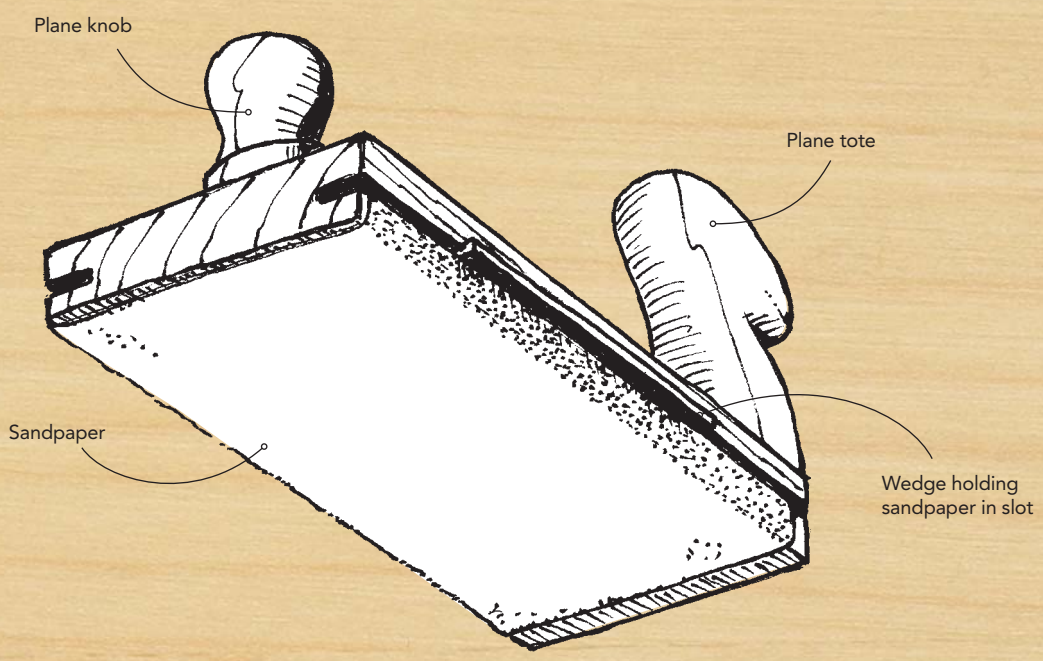


FIGURE 131A: Sanding plane

Sanding Plane

Large areas are most easily sanded with a sanding plane. The plane will help maintain flat surfaces, same as a sanding block, while sanding more efficiently due to its large size and convenient handles. (FIGURE 131A).

CONSTRUCTION • Make the base from solid wood at least 1" thick and about 6" wide by 11" long, so that a standard 9" by 11" sheet of abrasive paper may be torn in half. This leaves enough paper at the edges to wrap up and be pushed into grooves cut in the sides of the block, as shown in FIGURE 131B. Use a long thin wedge to retain the sandpaper pushed into the grooves. Recycle old plane totes and front knobs to make the jig easier to use, and if these are attached by screws from through the underside, be sure to countersink them well.

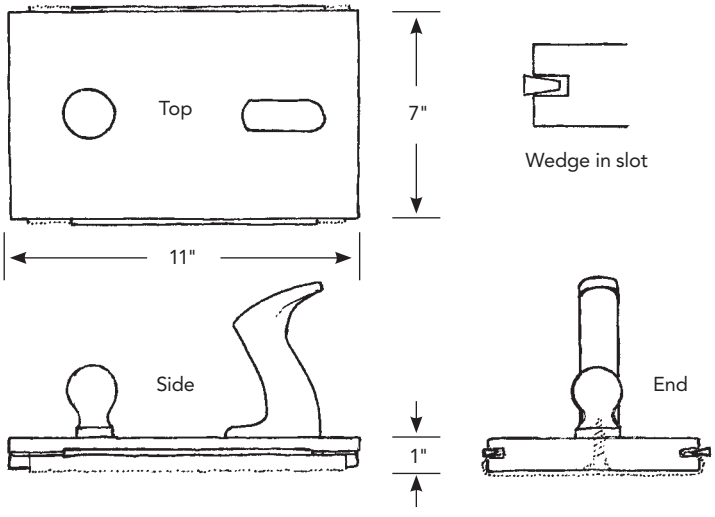


FIGURE 131B: Sanding plane

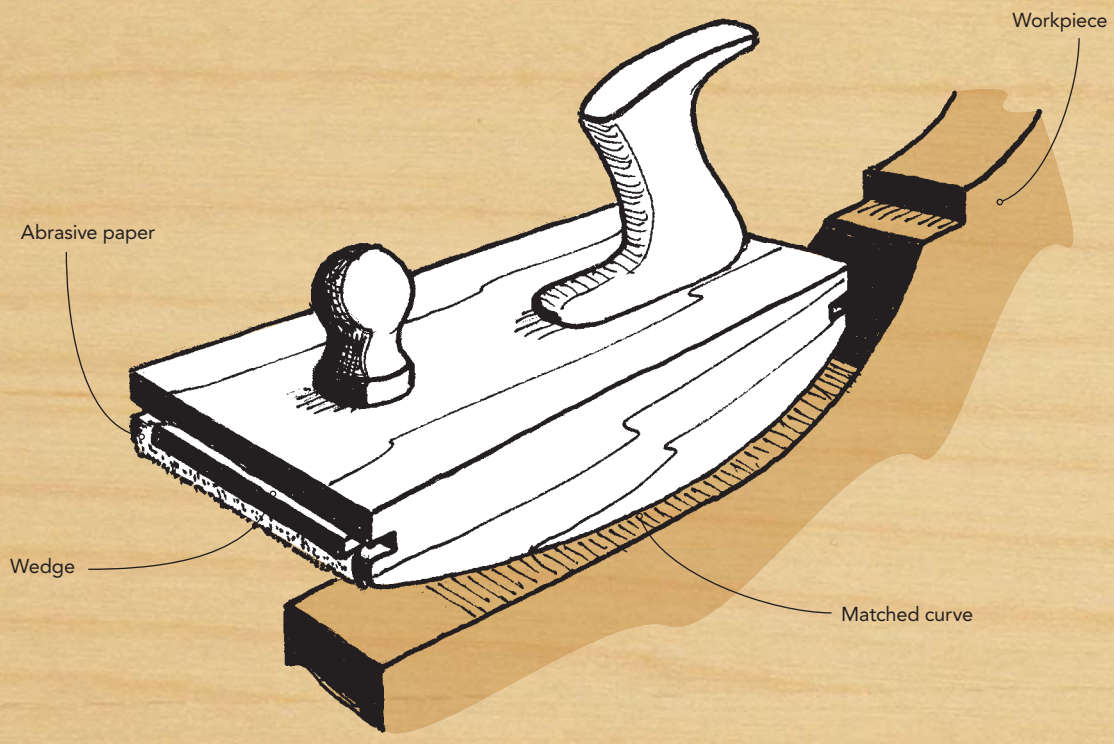


FIGURE 132A: Shaped sanding plane (concave)

Shaped Sanding Plane

Curved or otherwise shaped surfaces are best sanded with the abrasive paper wrapped around a sanding plane whose base matches the shape of the workpiece (**FIGURES 132A** and **FIGURE 132B**).

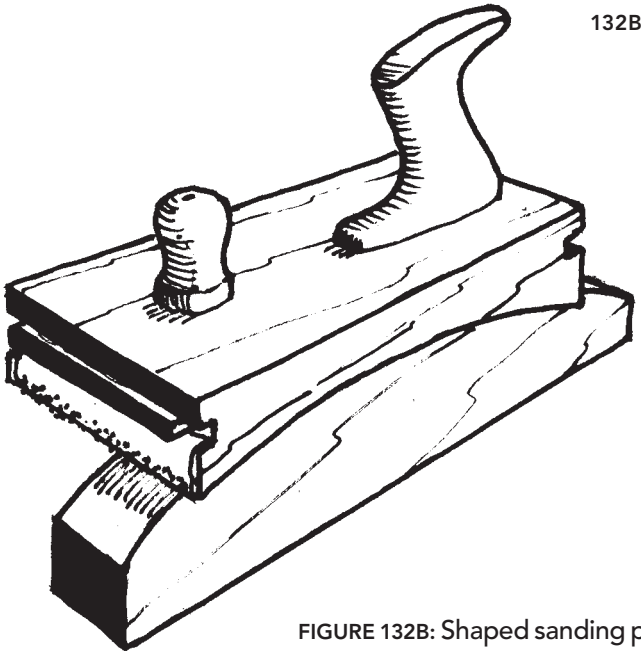


FIGURE 132B: Shaped sanding plane (convex)

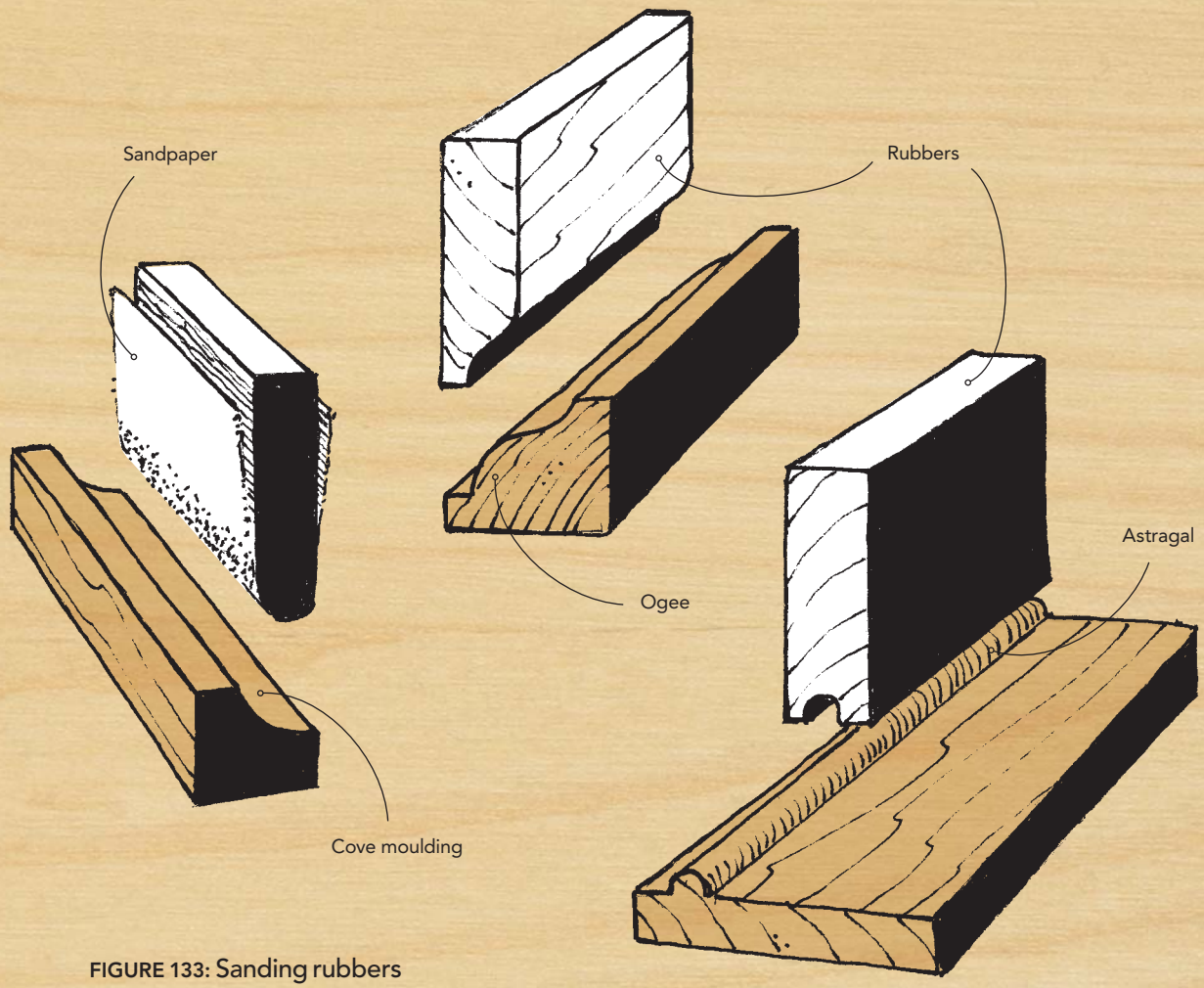


FIGURE 133: Sanding rubbers

Sanding Rubbers

The chief risk in sanding moulded profiles lies in dubbing over crisp edges. Sand them with abrasive paper wrapped around rubbers, which are small pieces of hardwood carefully shaped to mirror a particular profile. Just as complicated mouldings can be built up from several simpler shapes, mouldings can be sanded with a succession of simple shapes such as coves, rounds, and quirks (**FIGURE 133**).

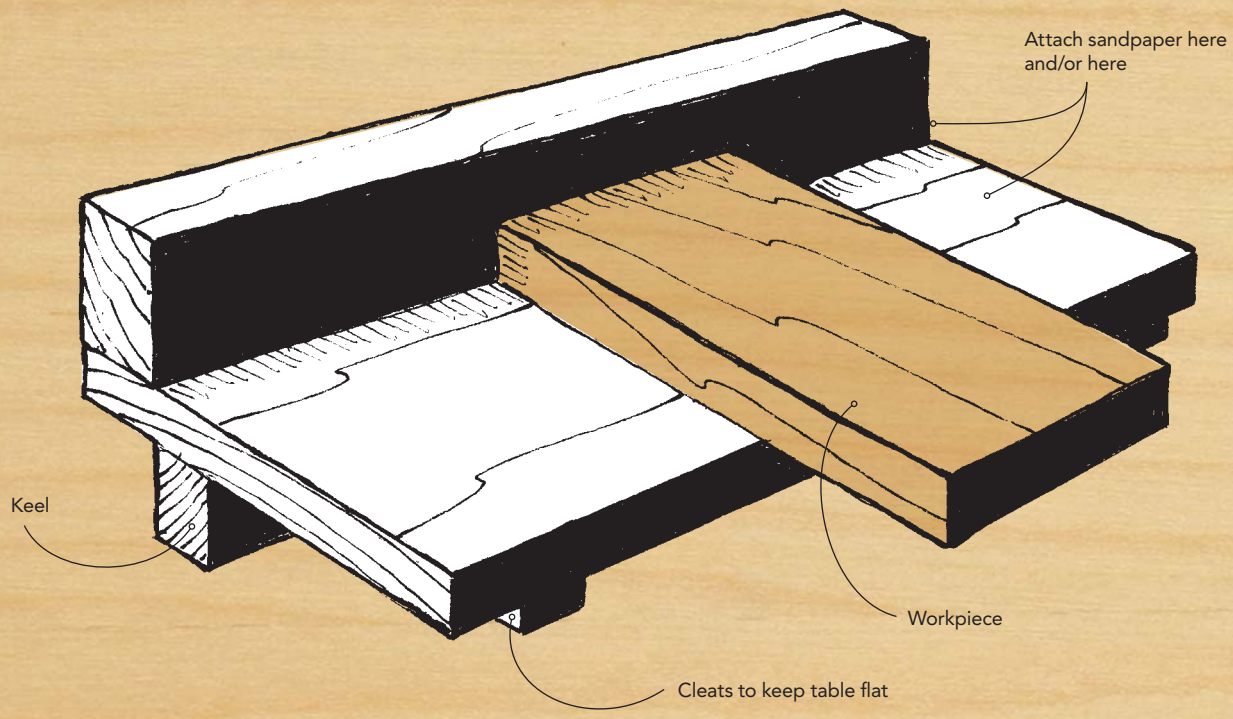


FIGURE 134A: Sanding shooting board

Sanding Shooting Board

Where the power-tool woodworker uses a disk sander with an adjustable table to sand adjacent surfaces at precise angles, the traditional woodworker uses a far simpler fixture known as the sanding shooting board.

CONSTRUCTION • Similar to a bench hook in construction, the sanding shooting-board has sandpaper glued with rubber cement either to the surface of the board or to the inside of the hooks. This allows the workpiece to be shot smooth while maintaining perfect flatness or a perfectly square edge. As with to shooting boards used for planing, a sanding board may also be made with either its hook or its bed at an angle other than 90°. Alternatively, when edges at angles other than at 90° need to be sanded, the jig can be made with an angled or wedged bed (**FIGURE 134B**).

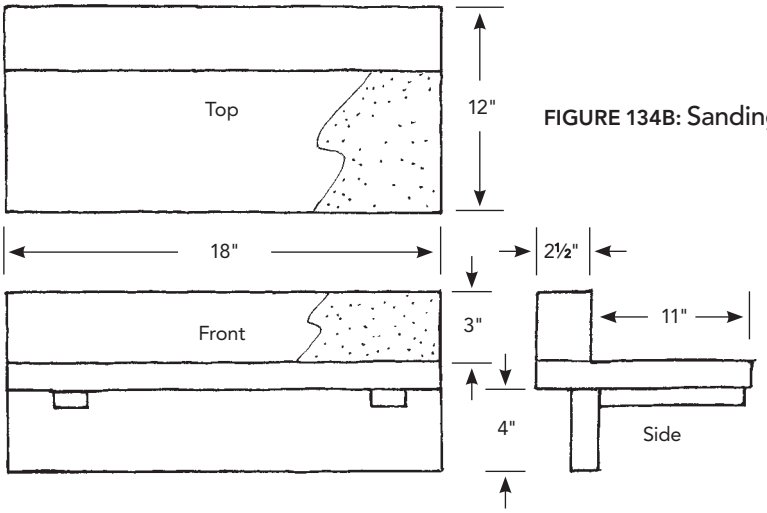


FIGURE 134B: Sanding shooting board

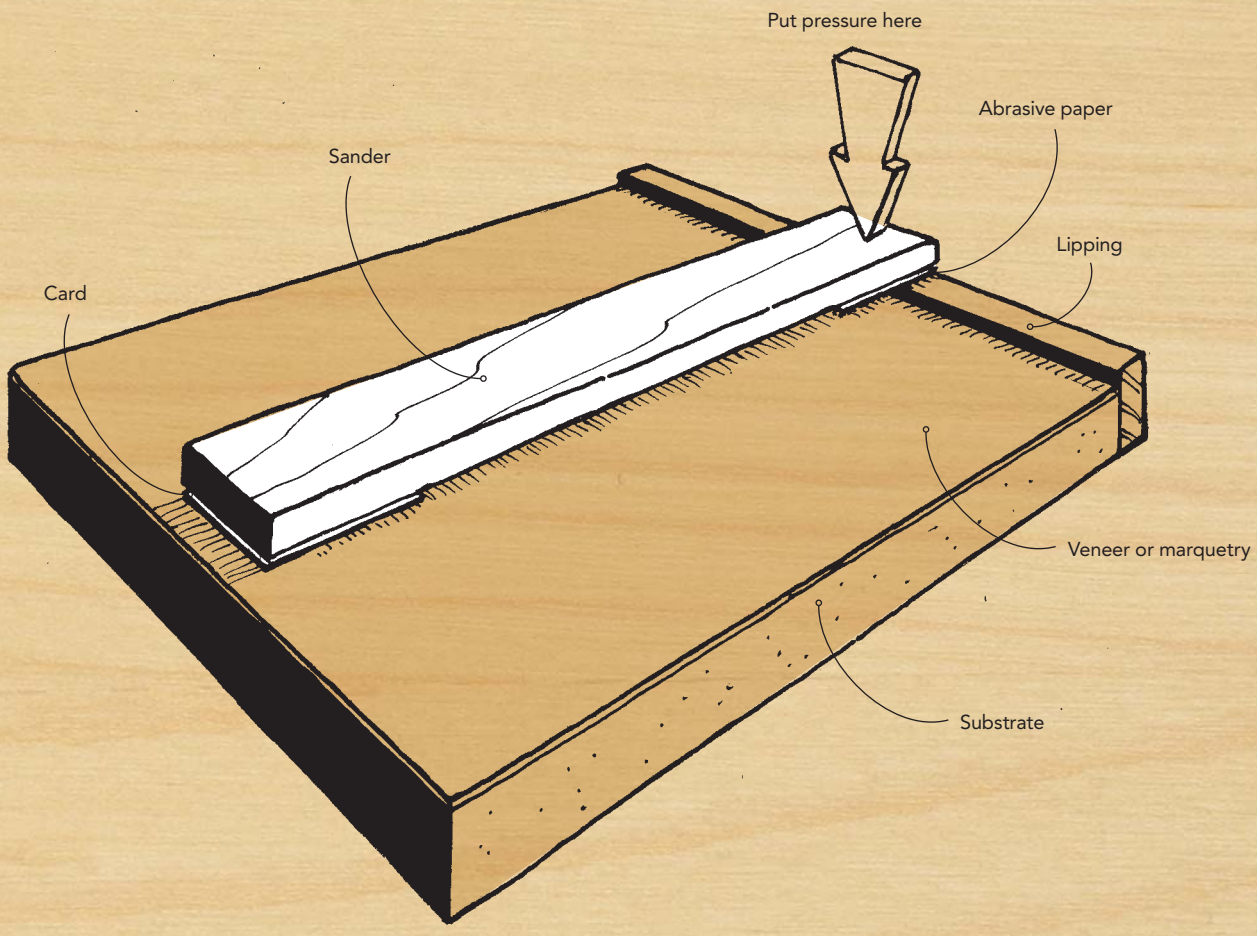


FIGURE 135A: Lipping sander (in use)

Lipping Sander

Sanding any kind of veneer, inlay, or marquetry work is always fraught with the danger of sanding through the thin material. This is especially true when you are attempting to level surrounding solid wood such as lippings, edgings, or mouldings with the veneered surface. The lipping sander can largely overcome the danger. It permits flush leveling without damaging the veneer. Pressure on the abrasive end is relieved at the other end by the protective masking tape (FIGURE 135A).

CONSTRUCTION • Make the lipping sander from an 8"-long strip of relatively narrow material, perhaps 1½" wide and thin enough to be slightly deformed under moderate pressure. Face the strip at one end with adhesive abrasive paper of the desired grit, or stick the abrasive onto the stick with double-sided tape. At the other end of this strip, and on the same face, apply a couple of layers of masking tape or a piece of thin card. This will prevent the strip from marring the surface while keeping the area being sanded essentially level with the overall surface of the workpiece.

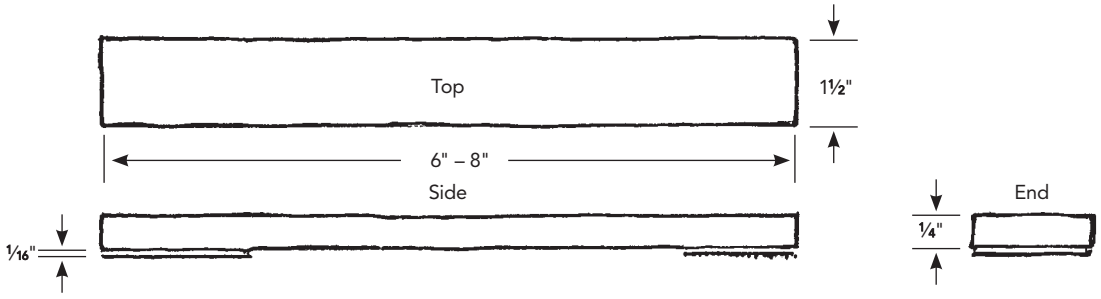


FIGURE 135B: Lipping sander (dimensions)

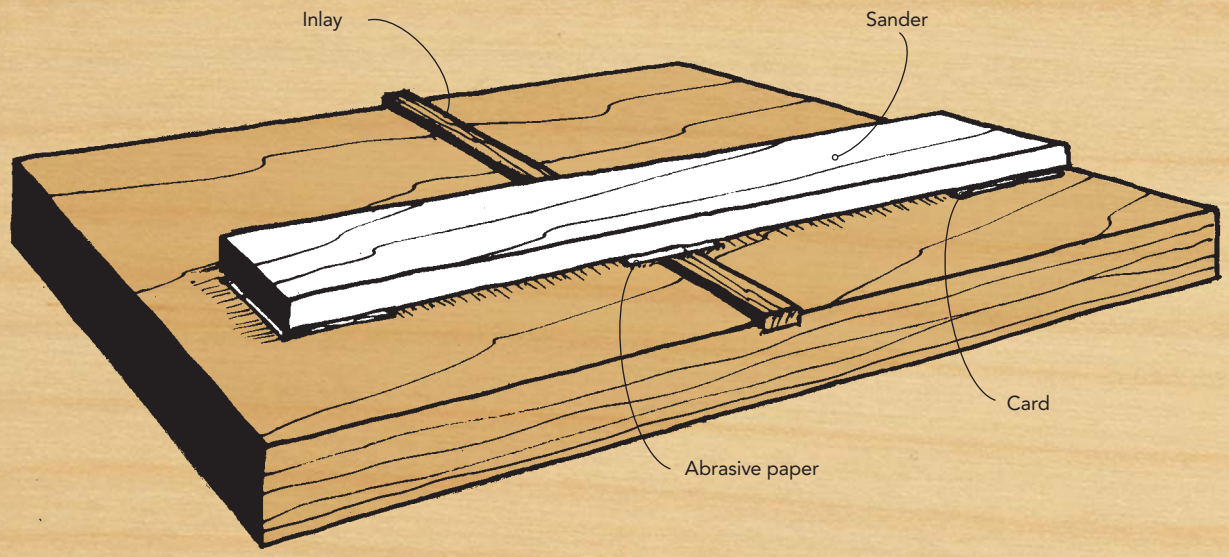


FIGURE 136A: Straddle sander (in use on center inlay, showing pressure point)

Straddle Sander

The straddle sander is similar in concept to the lipping sander. As its name implies, it enables leveled sanding of a given interior area of inlay without impacting the surrounding area. The straddle sander has abrasive paper attached to a narrow and relatively inflexible section in its center, while both ends are furnished with layers of masking tape or a piece of thin card to protect the surrounding workpiece.

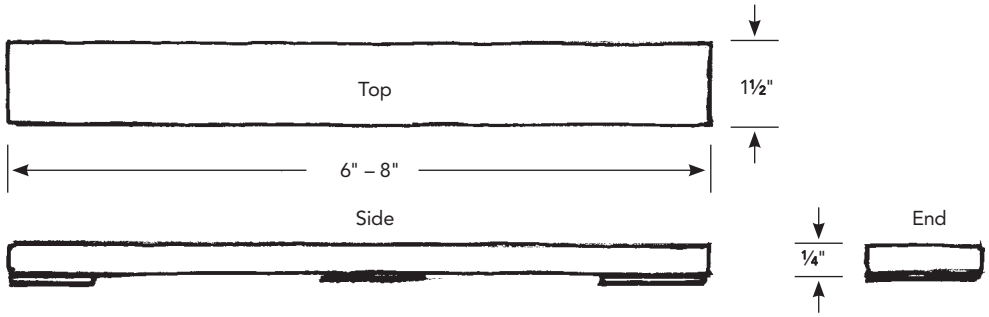


FIGURE 136B: Straddle sander (dimensions and adhesion areas)

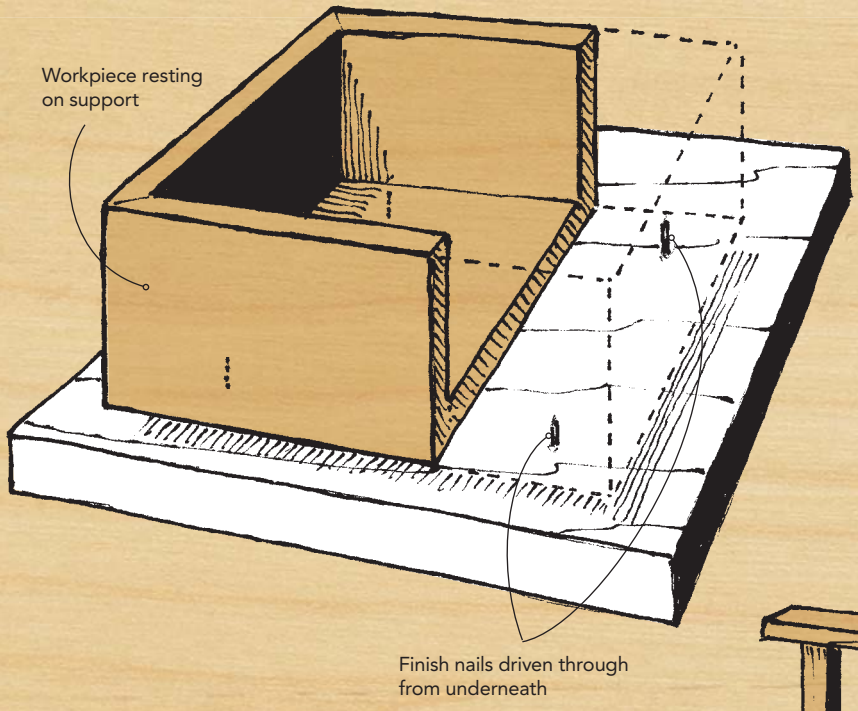


FIGURE 137: Finishing support board

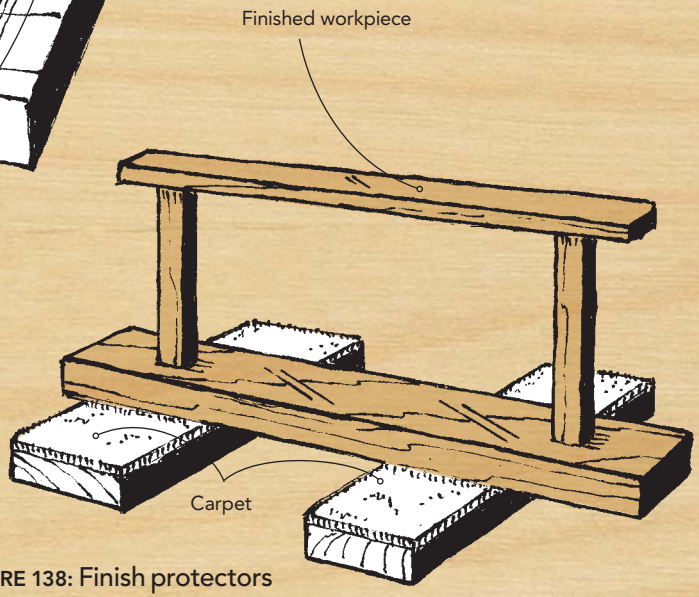


FIGURE 138: Finish protectors

FINISH PROTECTION

Finishing Support Board

In order to avoid dry-lines and uneven coverage it is often advisable to apply finish to the entire piece at the same time. This is sometimes difficult to do, however, since part of the piece must be in contact with some supporting surface, such as the floor or a wall. A finishing support board provided with appropriately spaced pins or small pyramids of wood can be an invaluable fixture in the finishing shop. It's far easier to touch-up the tiny areas that may have rested on the pins or pyramids than it would be to refinish an entire surface (**FIGURE 137**).

Finish Protectors

It is often necessary to continue work on a piece after finish has been applied. You can avoid a lot of retouch time with one or two scrap blocks covered with carpet, clean excess toweling, or some other soft fabric on which the workpiece can be supported without danger of being scratched or dented (**FIGURE 138**). Some woodworkers cover the top surfaces of a pair of sawhorses for this purpose.

8

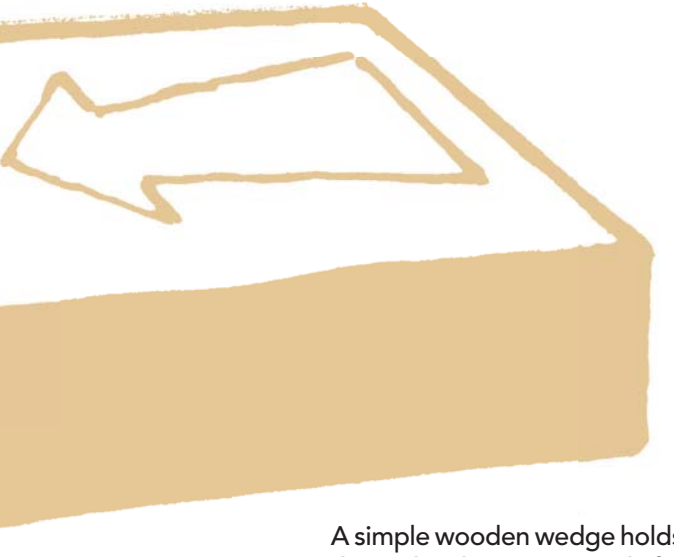
JIGS & FIXTURES FOR SHARPENING

CHAPTER 8

JIGS & FIXTURES FOR SHARPENING

Sharpening lies at the very heart of traditional woodworking. While power tools may be able to work by force, being so much more powerful than the human hand or arm, most hand tools – apart from various striking and holding tools – require sharpening. And, as every traditional woodworker discovers, the better they are sharpened the easier they are to use and the better they work.

There are, of course, many ways to sharpen, many theories, and much equipment, but some things remain the same: metal and edges. One only has to look at masterpieces from the past to realize that, strange as it may seem, fine work was somehow accomplished without the high-tech toys we enjoy today. Fundamental to the process are sharpening stones and the edges they produce. Here are a few traditional approaches that are guaranteed to work.



A simple wooden wedge holds the tool at the correct angle for sharpening to a perfect edge.

JIGS & FIXTURES FOR SHARPENING

What Is Sharpening?

Sharpening is the process of reducing the cutting edge of a metal blade from whatever thickness it may be down to the thinnest possible dimension before it no longer exists. The thinner the edge the sharper the blade. But there is a trade-off: the thinner the edge the sharper it is but the quicker it will wear down and become blunt again. Three things affect the rate at which this ultimate sharpest edge breaks down: the quality of the blade metal, the length of the bevel that forms the edge, and, of course, the material the edge will be asked to cut. When the material is wood several factors contribute to the edge-blunting process including the wood species' inherent hardness, its particular grain structure, and its mineral content.

To manage the variables that may change as you go from project to project, traditional woodworkers have established certain useful compromises. First of these is the actual bevel, since the longer the bevel the sharper the edge, but the sharper the edge the quicker it breaks down. Strictly speaking we are never cutting the material so much as separating the wood's cellular structure, but averaging most situations out, bevels formed between 25° and 35° tend to last, and remain efficient, the longest. You can gauge the angle from the length of the bevel: when it is twice the thickness of the blade, the angle is 30°.

The Sharpening Process

The first stone you use should be fairly coarse, perhaps 1000-grit, because a finer stone will simply take longer to remove the coarse scratches left by the grinding wheel. When all the coarse scratches have been replaced by scratches from the first stone, resist the temptation to feel for a wire edge on the back of the blade, since this may result in breaking the wire edge off, leaving you with a blunt edge. Instead, carefully place the back of the tool on the stone, and wear the wire edge off rather than breaking it. You will know this has been done when the back, just like the front, no longer shows its original coarse scratches.

The remainder of the sharpening process is simply a matter of progressing through a series of increasingly fine stones. Stones may be found with extremely fine grits, but there is little point in sharpening with a stone whose grit is finer than the cellular structure of the particular wood species you are planning to cut. In general this means that edges sharpened with 8,000-grit to 10,000-grit stones are more than sufficient.

One last aspect of the sharpening process bears mentioning, and involves perhaps the simplest jig or fixture of all – the heel of your hand. To wear off the most minuscule remaining wire edge , strop the finished tool against the heel of your hand by alternately dragging both sides of the tool off your hand.

Stropping is a useful technique for a stop-gap resharpening if you find yourself in the middle of a planing or cutting operation and do not want to stop work to go through the entire sharpening process. Note however, that using an old-fashioned barber's strop of the kind once used for sharpening straight razors is not a good idea, because it will round over the cutting edge. Such a rounded edge may be fine for carving tools, but is less than ideal for paring chisels and plane irons.

Hand-Grinder Blade Support

To establish and maintain a bevel angle, we can make a blade support for the hand grinder. The lowly hand grinder as used by the traditional woodworker possesses one significant advantage over motorized grinders: it is very difficult to draw the temper of the blade. The hand grinder simply does not turn fast enough to generate temper-destroying heat. It is, however, difficult to use since one hand is always turning the grinder and the other hand is all you have to hold the blade at that critical angle. Some hand grinders may be furnished with a small metal bracket on which to rest the tool, but results are never as satisfactory as with the blade-support jig.

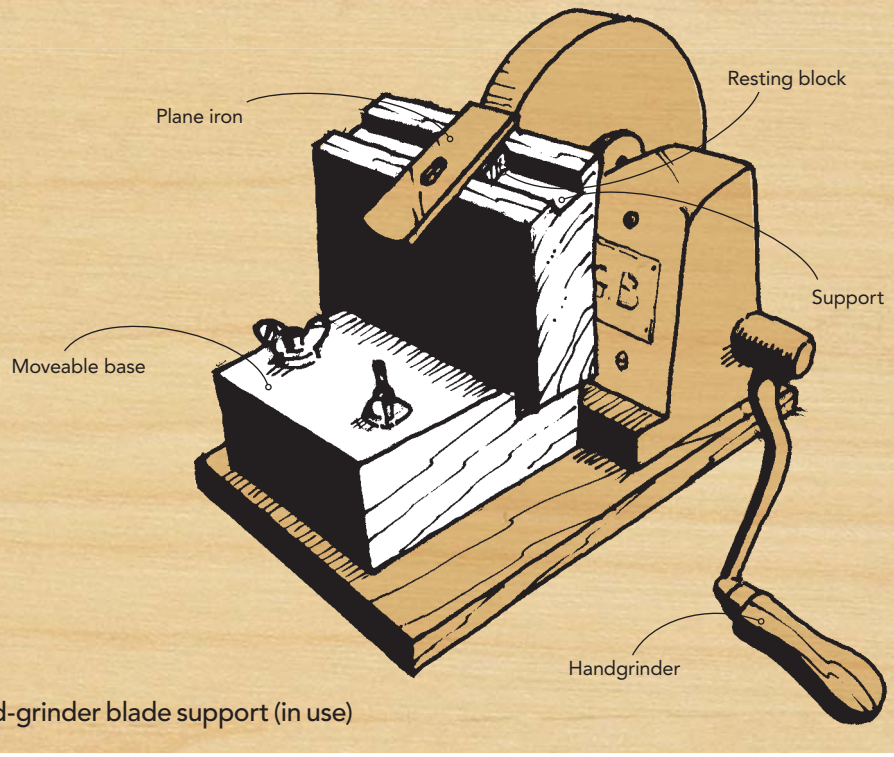


FIGURE 139A: Hand-grinder blade support (in use)

There are two important parts to this jig. The first is the moveable base, which allows the support to be adjusted right up to the wheel, and the second is the actual resting block (often one of several, designed to produce different bevel angles), which slides from side to side in a groove cut in the top of the support. The blade to be sharpened can be held with one hand on the resting block and moved across its entire width against the wheel without fear of being skewed. In this way the bevel, and the transverse angle at which it is formed on the end of the blade, remain constant.

CONSTRUCTION • Most contemporary hand grinders have a clamp that secures them to a horizontal board, bracket, or shelf. You can use this clamp to mount the grinder on a separate, free-standing 6" to 8"-wide base. The base also carries a sliding L-shaped part with a slotted base secured with adjustable screws (or bolts and wing nuts). The base in turn can be mounted somewhere convenient in the shop, possibly to its own purpose-built grinding stand.

The upright portion of the L-shaped part is beveled about 30°. When positioned as close to the grinding wheel as possible, the bevel abuts the wheel some little way below the wheel's center. This upright part should be thick enough – 2" or so – to cut a side-to-side groove that is 1" wide and no more than ½" deep. Make a separate block, about 2" wide or wide enough to support chisels and most plane irons, to fit snugly but moveably in the slot. The top of this sliding block may be further bevelled to produced any required angle on the cutting edge, as shown. It is usually most convenient to have two or three such blocks, so you can grind cutting-iron bevels of 25°, 30°, and maybe even steeper.

Wax the sides and bottom of the block and groove so it will be easy with one hand to hold the blade securely against the block, and at the same time slide it without compromising the angle by rocking or tilting.

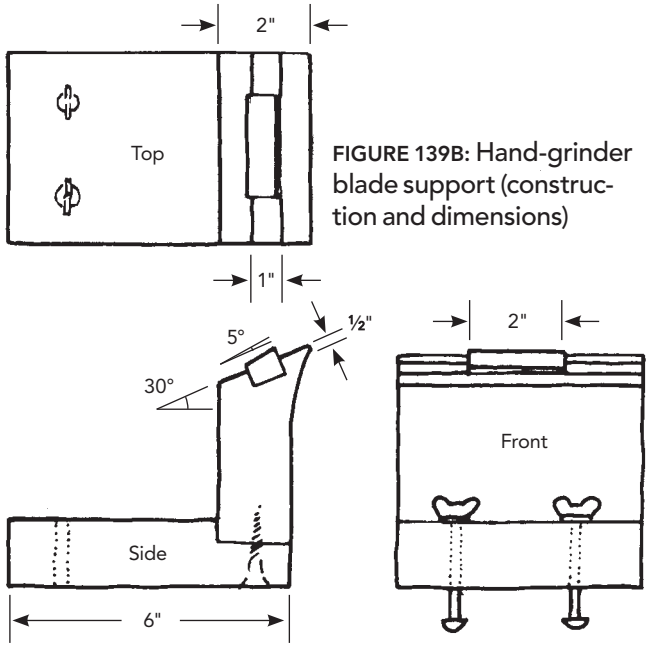


FIGURE 139B: Hand-grinder blade support (construction and dimensions)

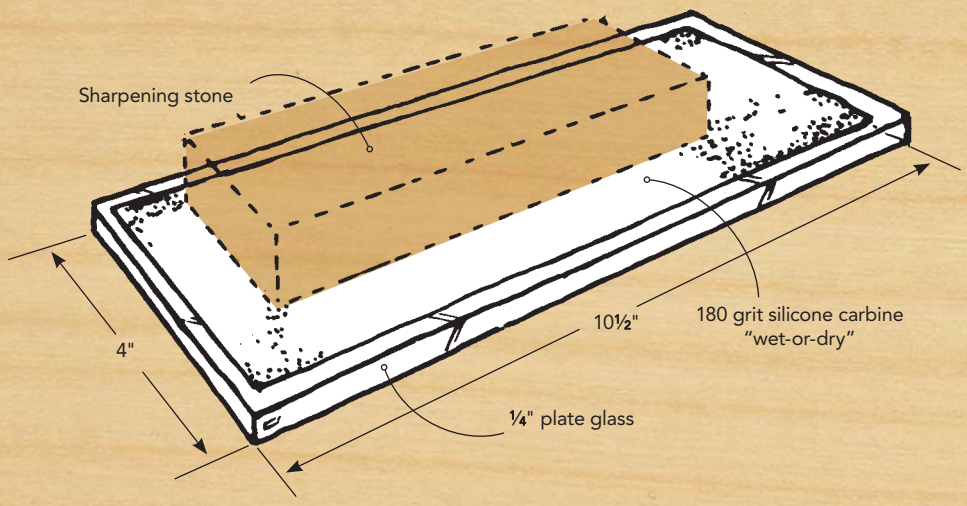


FIGURE 140: Sharpening stone flattener

Sharpening Stone Flattener

The first stage in sharpening is using the hand grinder to establish the basic straightness and bevel angle by rapid but coarse removal of metal. Once the tool's cutting edge has been correctly formed, all that remains is to eliminate, as far as possible, the scratches left by the coarse composition of the grinding wheel. This is done with a series of graduated sharpening stones, each progressively finer than the previous one. To do this without altering the ground bevel, and, in addition to form and maintain a perfectly flat back on the cutting tool, two things are necessary. The first is a perfectly flat stone, since you cannot sharpen anything flatter than the flatness of the stone on which it is being sharpened. The second is some way of consistently holding the tool at the required angle without rocking, so the ground bevel remains flat.

Your sharpening stone should be kept as flat as possible, even though absolute flatness is lost the moment you pass any cutting tool across it. This is true regardless of the kind of stone, a topic open to much discussion and susceptible to a variety of opinions. It helps enormously to dress the stone frequently during use, by rubbing it on a known flat surface. Depending on its hardness and grit composition, it is not unreasonable to spend as much time flattening the stone as actually using it to sharpen.

All you need for a sharpening-stone flattener is a piece of ¼"-thick plate glass a little larger than the stone itself, and a piece of 180-grit wet-or-dry silicone carbide sandpaper. Cut the sandpaper to match the glass and attach it with a smear of silicone adhesive, which is waterproof. Both items are commonly available and more than adequate for the job, as shown in **FIGURE X13**, even though more expensive stone-dressing blocks and diamond-encrusted flattening plates can also be bought.

The Tool's Flat Back

Before starting to remove the scratches left by the grinding wheel on the newly formed bevel, you should make sure that the back of the cutting tool is perfectly flat. To see how flat the back is, rub the tool back-side down on the sharpening stone flattener. If it is perfectly flat, then scratches left by the wet-or-dry sandpaper will show up across the entire rubbed surface. Note that you do not need to flatten the entire back, but only from the tip to an inch or so up the back. However, if scratches show only in the middle of this area then you have a little more work to do before addressing the bevel, because a curved back meeting a flat bevel will produce a thickening edge rather than a uniformly thin edge.

Once you are sure that bevel and back are both flat and meet at an arris that is nicely perpendicular along its length to the sides of the tool being sharpened, you are ready to start the process of making these two surfaces as smooth as possible.

One other thing to bear in mind is that not all tools with a cutting edge have parallel sides, so measuring perpendicularity may not be possible with a try square. Rather, you should aim to have this edge perpendicular to a longitudinal center length imagined down the length of the blade.

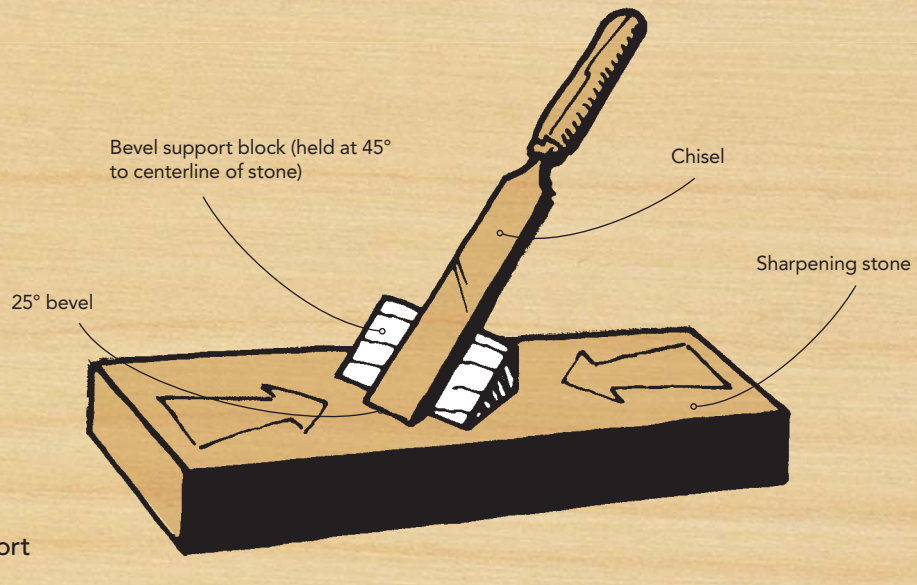


FIGURE 141: Bevel support

Supporting the Bevel

There are three ways to ensure that the bevel remains flat while being rubbed on the stone: by finger pressure alone, by using a commercial honing guide, or by making and using a bevel support block.

Simple finger pressure is perhaps the best way to keep the bevel flat. If the bevel and the stone are indeed flat, then it should be possible to place a finger (or two) on the back of the blade behind the bevel and press so that the two surfaces make perfect contact. When you are sure you can feel this, you can start to move the bevel against the stone, but remain vigilant about being able to feel that the contact is complete between the two surfaces. With a little practice this becomes second nature, but if you move too fast in the beginning you will surely lose awareness of how perfect the contact is, and the bevel will become rounded over.

A commercial honing guide may ensure that the bevel remains constant, but it has several disadvantages. The first disadvantage is that most manufactured honing guides require the blade to be moved backwards and forwards, with the result that scratches left by the stone run right off the end of the cutting edge. Look at such an edge under a magnifying glass and you will see that this translates into a minutely serrated edge, resulting in bluntness when the tips of the serrations break off. To avoid this the edge should be moved not backwards and forwards but from side to side – impossible with a honing guide.

Of course, a sideways motion producing scratches parallel to the cutting edge is also not ideal since a single such parallel scratch is vulnerable to being broken off completely, leaving a wide blunt edge. The compromise is to sharpen at a 45° angle to the length of the stone, which is easy to do by hand. The second disadvantage of a honing guide is the risk of the edge digging into the stone, with consequent damage both to the tools's edge and to the stone's flatness. The third disadvantage, which can intensify the second disadvantage, is the tendency to put too much downwards pressure on the cutting edge. Excess pressure in no way increases the cutting action of the stone and may simply render the stone less efficient. The pressure exerted by one or two fingers is perfect.

Bevel Support Block

To ensure that the bevel remains flat on the sharpening stone while producing a desirable scratch pattern, make a bevel support block, Make it preferably from a block of close-grained hardwood such as boxwood, although coarser-grained species will also serve. The cutting tool can then be held against this block and the two items moved as one over the entire surface of the sharpening stone while additionally being held at 45° to the longitudinal axis of the stone.

Make the bevel support wide enough and big enough to support the item being sharpened, and be sure it maintains the appropriate angle. For most purposes 25° will be ideal. If you find that the edge breaks down too quickly at this angle, then make another block with a steeper angle – perhaps 30°. On the other hand, if the cutting edge seems to last a long time, it might be made of a better quality metal that you might now sharpen at a lower angle. Remember, the longer the bevel the more easily the edge will separate the cellular structure of the wood.

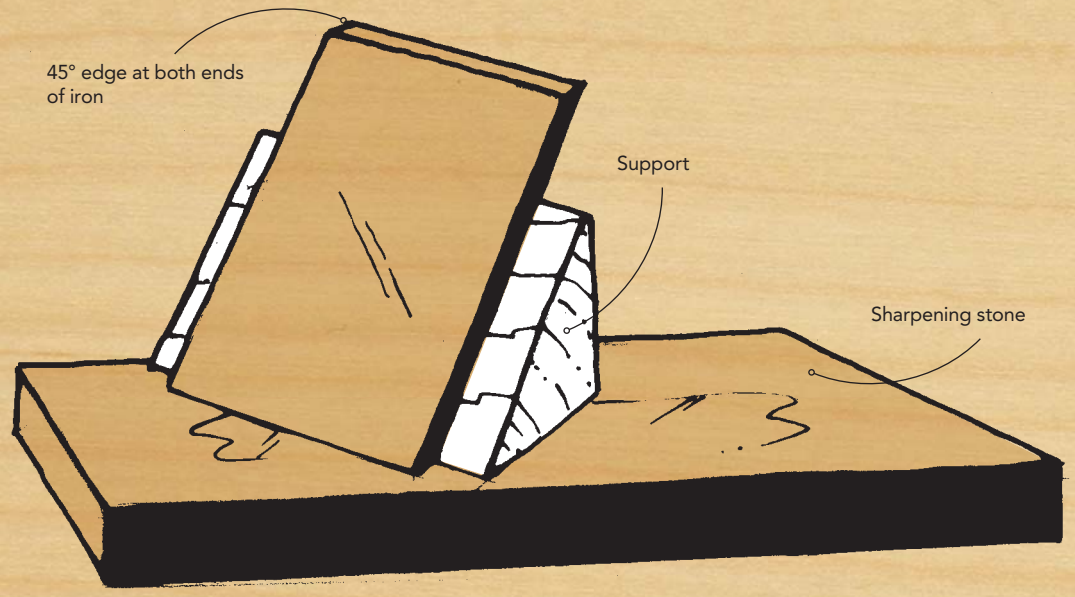


FIGURE 142: Scraper-plane blade support

Scraper-Plane Blade Support

The blades used in scraper planes are an important exception to the typical angles of bevels formed on single-edge cutting tools. The scraper plane blade is not a plane iron, but rather a scraper held in a plane-like body. It does not work exactly like a plane, but instead uses a short 45° bevel, the edge of which is sometimes turned, to scrape rather than cut. Such a blade can nonetheless have its bevel formed similarly to that of other cutting edges, but it must be sharpened at such a steep angle (45°) that a blade support is essential.

The scraper-plane blade support is similar in all respects to the regular bevel support except for size and dimensions.

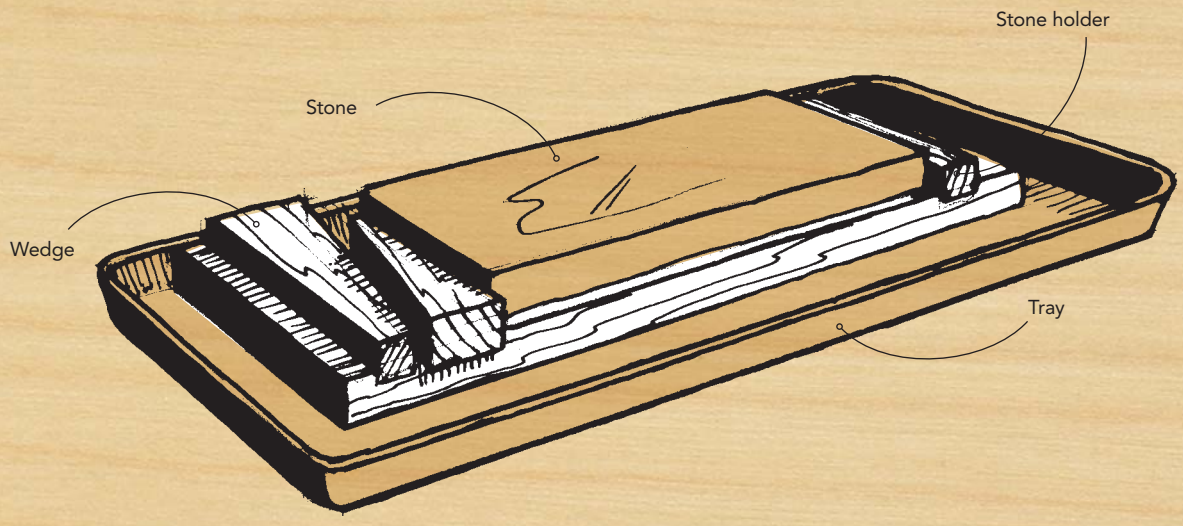


FIGURE 143: Wedged stone holder (on shooting board, and in tray)

Wedged Stone Holder

The true traditional woodworker will eschew powered sharpening machines, and will primarily use bench sharpening stones. But many people make the mistake of believing, probably because they have observed previous generations of woodworkers using them, that an oilstone is more traditional than the recently introduced waterstones. The truth is that for a long time before the introduction of oilstones, all sharpening stones used water as a lubricant and a medium for washing away broken-down stone particles and removed metal.

It was primarily with the advent of large-scale whaling operations in the nineteenth century that whale oil began to be used as a lubricant, thanks to enterprising advertising. It is true that whale oil worked well, since it is considerably finer than much commercially produced mineral oil. But it has been a long time since whale oil has been generally available, and probably longer since anyone used it for lubricating stones used for sharpening woodworking tools. As a result, the typical oilstone unearthed from your grandfather's workshop is invariably a messy affair, its surface clogged with heavy proprietary oils such as 3-in-One™, and its flatness long since a thing of the past. And yet very often these are still useful stones.

To recondition an old stone, the first step is to bake out the old oil by leaving it in the oven at 350° for a couple of hours, preferably in a metal tray to catch the extruded oil. Then the old stone can be flattened using the sharpening-stone flattener described above.

Once clean and flat, these old stones may be used with water, just as did Thomas Chippendale's workers in that most famous of British cabinetmakers' shops 250 years ago. Something that will make the process easier, regardless of the type or size of sharpening stones you use, however, is not the hollowed-out and lidded box in which oilstones were often kept, but a wedged stone holder set in a shallow waterproof tray.

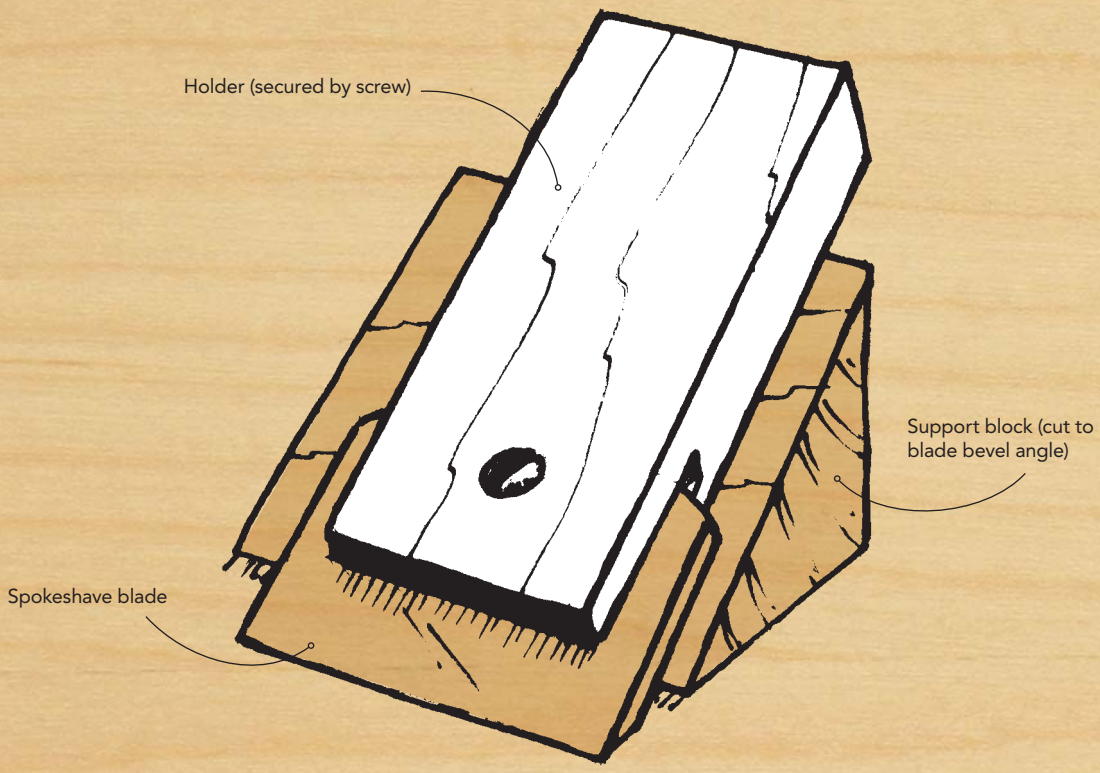


FIGURE 144: Spokeshave sharpening holder (in use, with support block)

Spokeshave Sharpening Holder

Spokeshave blades also need to sharpened with a bevel, but because they are so small it is more convenient to place them into a holder rather than to attempt holding them against an angle block. If such a block is made large enough, it can easily be held by hand and also against a bevel support.

CONSTRUCTION • The holder is slotted so as to hold securely the spokeshave blade. It may also be fitted with a screw to tighten both sides of the slot down against the blade. To be used with the bevel support, the holder block should be carefully made with its back perfectly parallel to the back of the blade itself.

Jigs & Fixtures for the Hand Tool Woodworker

 Published by Popular Woodworking Books, an imprint of F+W Media, Inc., 10151 Carver Rd., Suite 200, Blue Ash, Ohio, 45236. (800) 289-0963. First edition.

Distributed in Canada by Fraser Direct

100 Armstrong Avenue

Georgetown, Ontario L7G 5S4

Canada

Distributed in the U.K. and Europe by

F&W Media International, LTD

Brunel House, Ford Close

Newton Abbot

TQ12 4PU, UK

Tel: (+44) 1626 323200

Fax: (+44) 1626 323319

E-mail: enquiries@fwmedia.com

Distributed in Australia by Capricorn Link

P.O.Box 704

Windsor, NSW 2756

Australia

Tel: (02) 4560 1600; Fax: (02) 4577 5288

Visit our website at popularwoodworking.com or our consumer website at shopwoodworking.com for more woodworking information projects.

Other fine Popular Woodworking Books are available from your local bookstore or direct from the publisher.

ISBN-13: 978-1-4403-3340-8

18 17 16 15 14 5 4 3 2 1

Publisher: Kevin Ireland

Acquistions editor: David Thiel

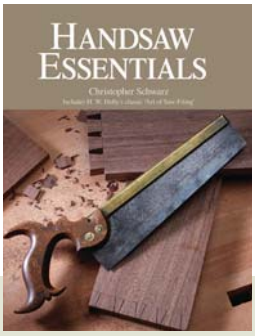
Content editor: John Kelsey

Designer: Daniel T. Pessell

Production Coordinator: Debbie Thomas

IDEAS • INSTRUCTION • INSPIRATION

These are other great Popular Woodworking products are available at your local bookstore, woodworking store or online supplier.

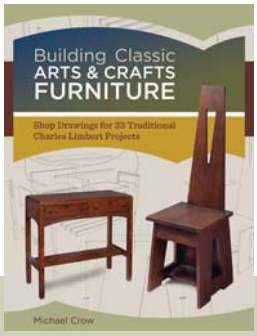


HANDSAW ESSENTIALS

By Christopher Schwarz, plus the editors and contributors to Popular Woodworking

Many woodworkers – from beginners to professionals – are intimidated handsaws, yet once you master their use, there is no other tool in the hand-tool woodworker's kit that is as powerful. In this book you'll learn how to choose the right saw for your budget and project, use it successfully and keep it cutting like new.

Hardcover • 312 pages

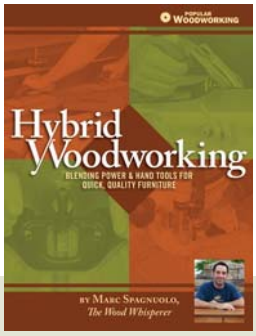


BUILDING CLASSIC ARTS & CRAFTS FURNITURE

By Michael Crow

Charles Limbert was one of the leading figures in the Arts & Crafts furniture movement, and also one of the most unique. Now, for the first time, author Michael Crow has carefully detailed 33 of Charles Limbert's finest designs in measured shop drawings so you can build this beautiful furniture yourself.

Paperback • 176 pages



HYBRID WOODWORKING

By Marc Spagnuolo

Known online as The Wood Whisperer, Marc Spaguolo presents a fresh approach to woodworking and furniture making by showing the most efficient ways to utilize both power tools and hand tools in the furniture building process. Not only will you learn which tools are best for which tasks, but you will also find tips for how to use, maintain, and fine tune them.

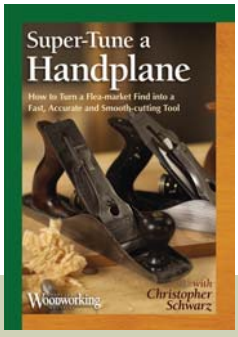
Paperback • 192 pages

ULTIMATE WORKSHOP SOLUTIONS

By Popular Woodworking Editors

From better clamp storage, to the perfect miter saw stand to benches and beyond, you'll find 35 projects specifically designed to improve and organize your favorite space. These projects have been created by the editors of Popular Woodworking Magazine for your shop, and now we're pleased to share them with you.

Paperback • 192 pages

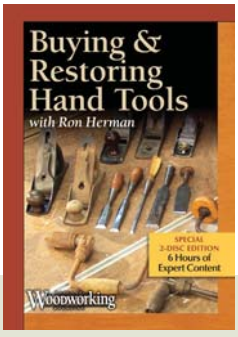


SUPER-TUNE A HAND PLANE

By Christopher Schwarz

Many woodworkers are looking for a handplane that can be brought back to working life with just a little time and effort — and at a great bargain. This DVD from Christopher Schwarz shows you how to rehab a flea-market find (or soup up a new tool) into a perfectly tuned plane that can handle any task.

Available at Shopwoodworking.com
DVD & instant download

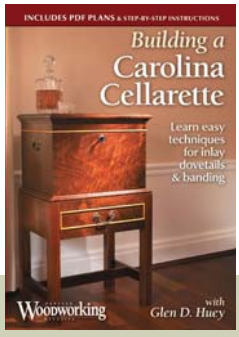


BUYING & RESTORING HAND TOOLS

By Ron Herman

Learn how to bring a fine old woodworking tool back to life. Traditional hand-tool expert Ron Herman will help you assess individual tools and shop for the best deal to ensure you're making a smart purchase. Once you have what you know is a quality tool, Ihe'll show you how to restore it to working condition and tune it for maximum performance.

Available at Shopwoodworking.com
DVD & instant download

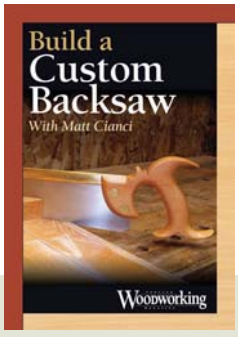


BUILDING A CAROLINA CELLARETTE

By Glen D. Huey

Watch as Glen Huey walks you through the steps to build this elegant, walnut, maple and pine cabinet using a router, a table saw and a few choice hand tools. You;ll learn tips and techniques you can use to speed your work on this and every new project

Available at Shopwoodworking.com
DVD & instant download



BUILD A CUSTOM BACKSAW

By Matt Cianci

Backsaws should be very personal tools, so building your own custom backsaw will ensure that it fits you and your woodworking needs. By starting with a simple kit including the blade, back and hardware, Matt Cianci walks you through the steps to customize your own saw.

Available at Shopwoodworking.com
DVD & instant download

Visit **popularwoodworking.com** to see more woodworking information by the experts, learn about our digital subscription and sign up to receive our free newsletter or blog posts.

IMPROVE YOUR HAND TOOL WOODWORKING WITH TRADITIONAL JIGS!

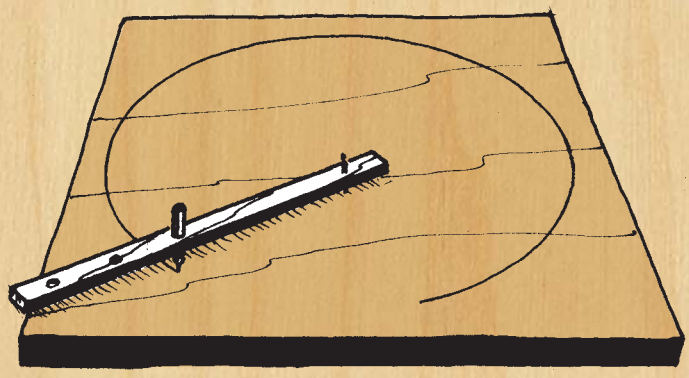
When traditional woodworkers wanted to improve the speed, accuracy and repeatability of their work, they developed clever jigs and fixtures such as shooting boards, a flexible straight edge and a grasshopper gauge. But the vast majority of those aids were user-made and disappeared from sight when power tool woodworking took over in the 20th century.

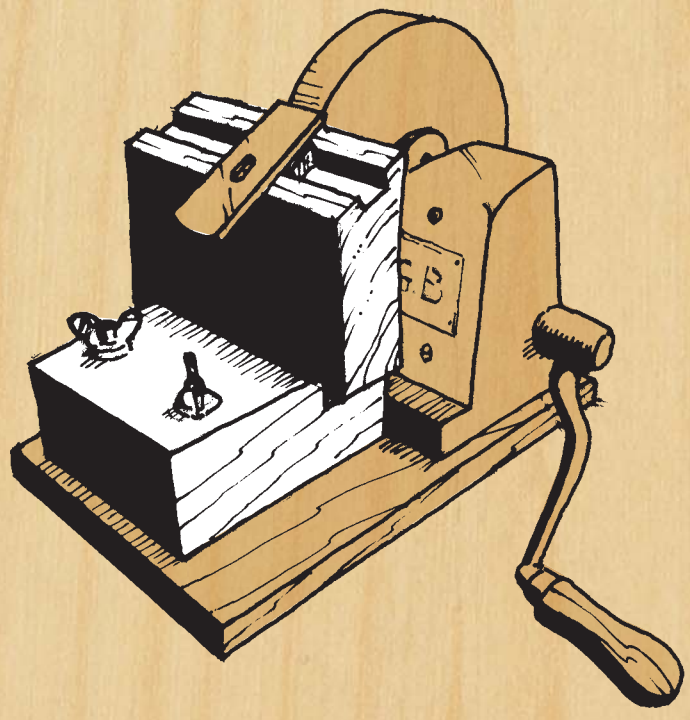
The result? Beginning hand-tool woodworkers today often experience unnecessary frustration because they don't know that simple shop-made aids can vastly improve their work.

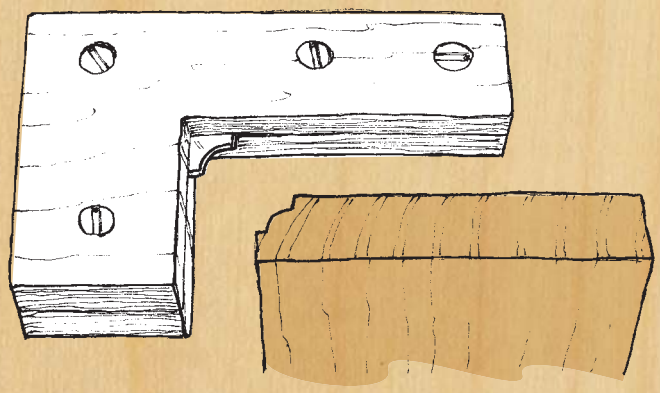
Jigs & Fixtures for the Hand Tool Woodworker changes all that. It reintroduces traditional user-made devices, unveils others author Graham Blackburn grew up with, and expands upon those with more recent adaptations and even some manufactured items.

Most of the user-made jigs are simple to construct and use. And once you've tried them in your shop you'll quickly see they'll will make all the difference between frustration and success in your woodworking.

Graham Blackburn is a noted woodworking author, videographer and lecturer, who has written more than a dozen books on woodworking, starred in a 16-DVD woodworking series and contributed to or edited several woodworking magazines. He's also a champion tango dancer and earlier in his career studied music at Julliard and played saxophone with Van Morrison and others.







US $27.99
U7879 (CAN $31.00)
ISBN-13: 978-1-4403-3340-8
ISBN-10: 1-4403-3340-8
52799
EAN
9 781440 333408
UPC
0 35313 65920 1