

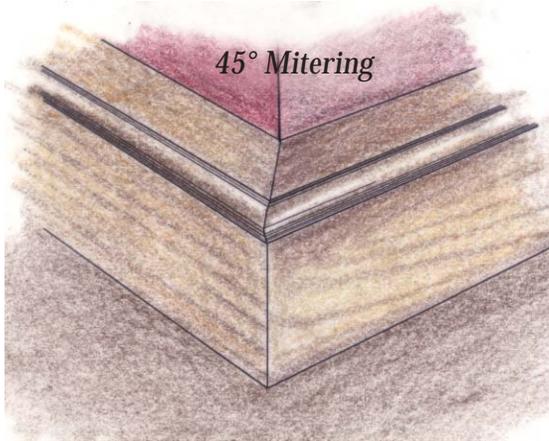


## *Shooting Boards— The Essential Aids to Hand-Cut Miters Jointing and Trimming*

*True simplicity is a rare beauty. It comes in many different forms and when you discover something simply made, you want to preserve it as best you can. Many things made for use by man, especially tools and related equipment, have a certain almost inexplicable simplicity that often goes unnoticed. Two ways I see that simplicity can be seen: One is with its apparent use; the other only becomes apparent in the actual doing of it and seldom becomes apparent until it's done. A shooting board, there are several types, is one such joiner's aid. Its simplicity must be experienced in the doing of it. Once you use it, you will be convinced of its singleness of purpose and feel joy when you reach for it in the middle of your project.*

**Base or Case Miter:**

A vertical miter used around the base of cabinets to provide a decorative transition at the base of a cabinet and to give protection from sweeping brooms or and vacuum cleaner attachments. Also, most houses have base trim around interior walls to again protect the walls and provide a transition between two flat surfaces.



**Face or Frame Miter:**

Used around door casings, window frames and to cover the face of cabinets by forming a decorative or and protective trim.

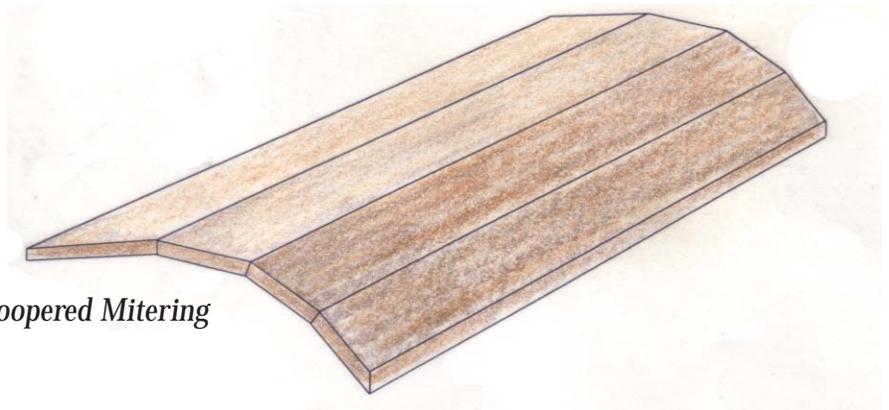


45° Mitering

**Three Principle  
Types of Miters  
Used in  
Woodworking**

**Long Grain & Coopered Miter:**

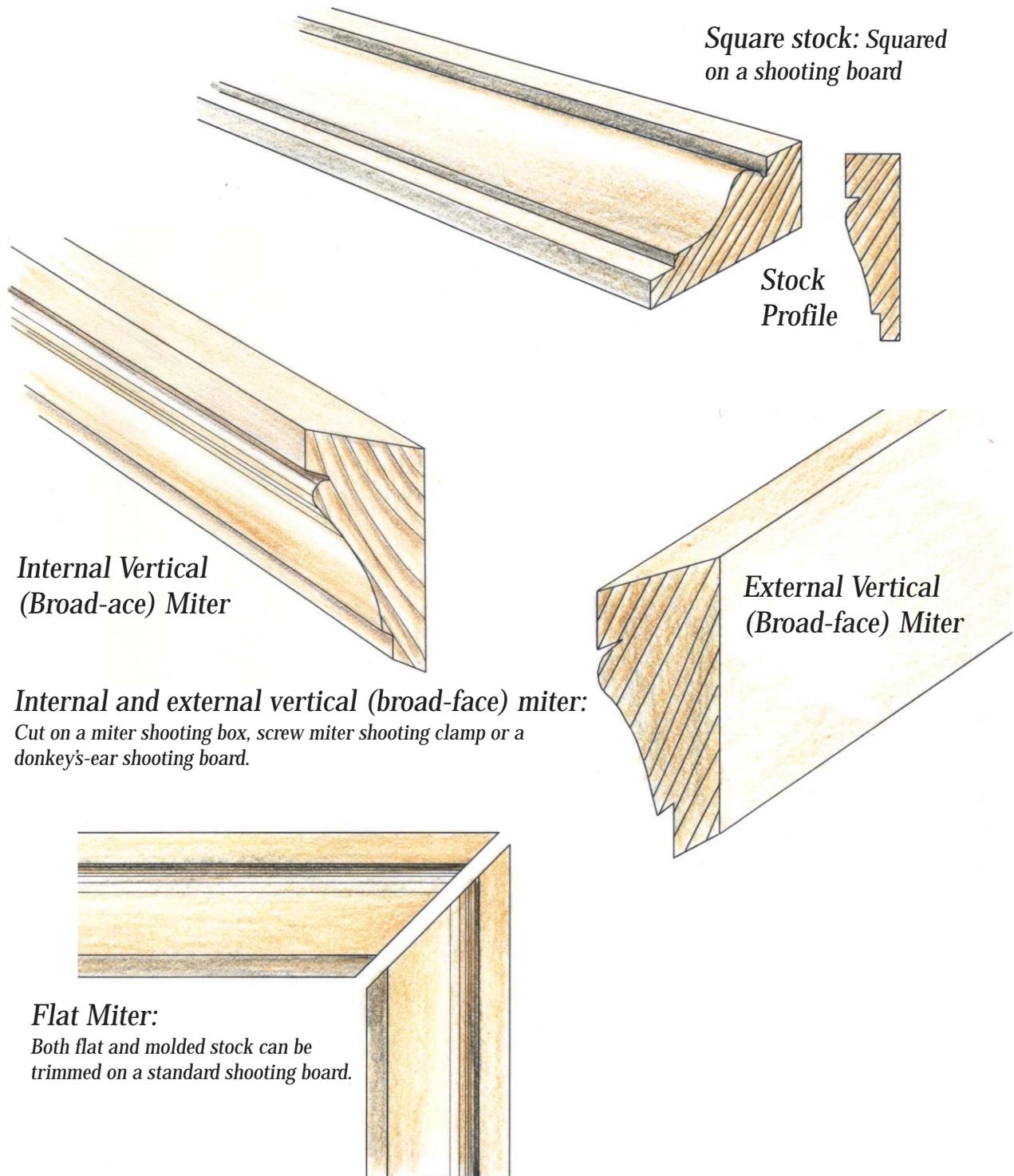
We use 45° (and other angles) long-grain miters to form corners for a variety of different situations, usually but not necessarily for protective trim. A Coopered miter (shown here) can be used to form arched tops for chests or cabinet fronts such as for corner cabinets.



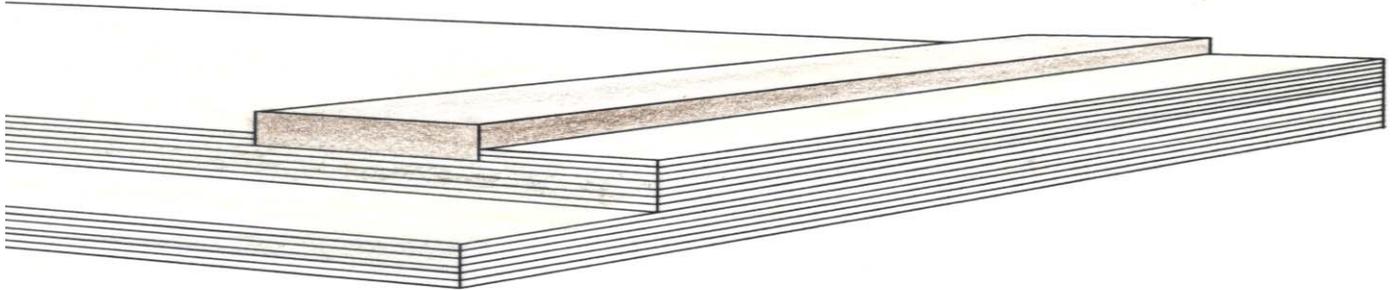
Coopered Mitering

To fully understand shooting boards and their importance to hand tool woodworking you must first understand the different applications of the miters themselves. There are internal miters, external miters and flat-face miters, each one of which satisfies different situations that occur throughout all areas of woodworking. There are three basic ways to miter stock, whether molded, angular or square, for three different applications.

The flat shooting board will readily miter both flat and molded stock along the broad width but will not miter vertical cuts. Three other types of miter trimming devices facilitate fine trimming of vertical and large stock miters—the donkey's-ear shooting board, the miter shooting box and the screw miter shooting clamp. (See drawings)

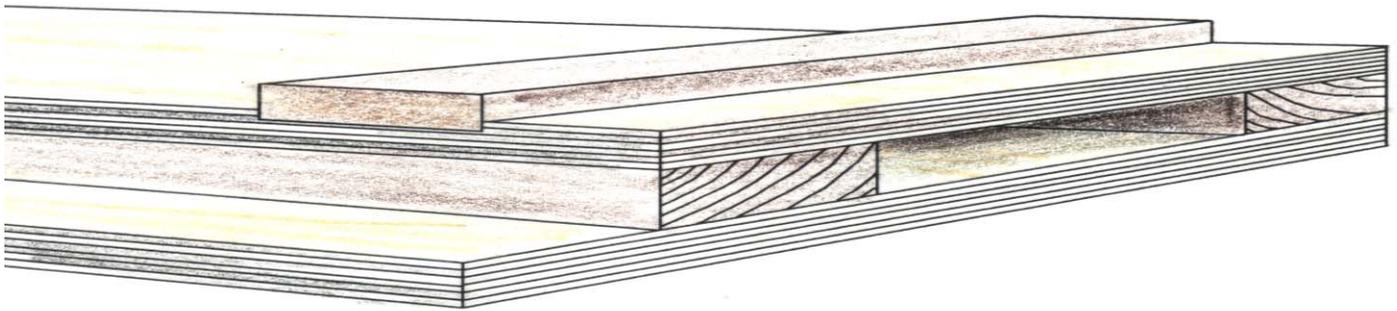


## Basic Shooting Boards



### **Basic Shooting Board:**

We use this type of shooting board for both long-grain and cross-grain (end-grain) shooting to establish straight edges. They can be made to custom length from any type of material. Plywood works well because of the extra width and length needed and also because of its stability. We generally use this type of shooting board for wider, longer boards as well as thinner stock and veneers, to establish a perfect meeting joint.

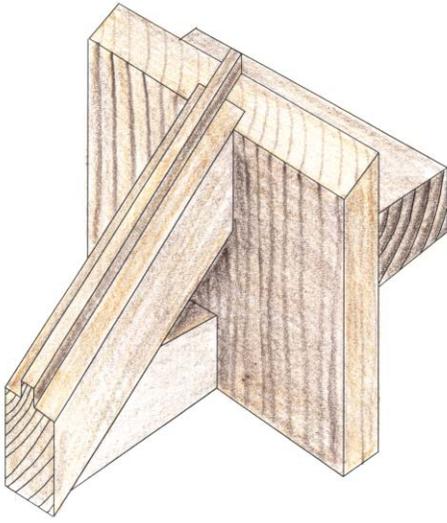


### **Inclined Shooting Board:**

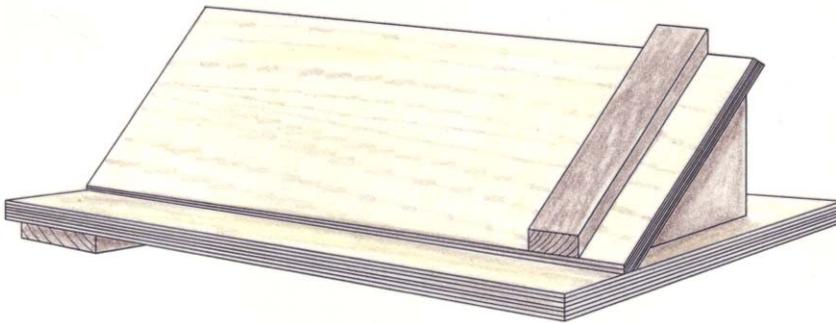
Another type of shooting board for both long-grain and cross-grain (end-grain) shooting is this inclined shooting board. The sloping recess holds and guides the plane to allow full use of the whole width of the plane's cutting iron. The sloping guide allows the plane to cut at an oblique cutting angle, which, because of the slicing action, is more efficient than square cutting. Again, we generally use this type of shooting board for wider, longer boards as well as thinner boards and veneers.

Of course you can cut and trim miters, square ends and plane long grain edges using freehand methods and be fairly accurate, but shooting boards will greatly enhance your accuracy and at the same time speed up the work in hand.

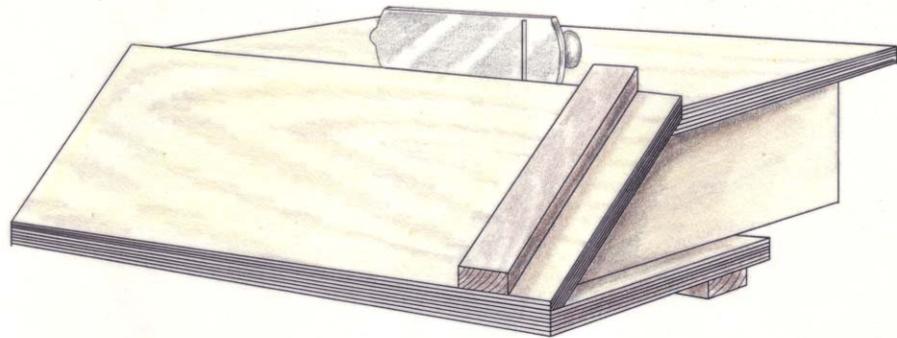
## The Donkey's-Ear Shooting Boards



**The Donkey's-Ear Shooting Board:**  
Another type of shooting board used for shooting both cross-grain and long-grain miters is the donkey's ear shooting board. Both square and molded stock can be trimmed on these types of shooting board, but craftsmen generally made them to suit their individual needs and so they come in a variety of different configurations and sizes. Here are some examples for ideas.



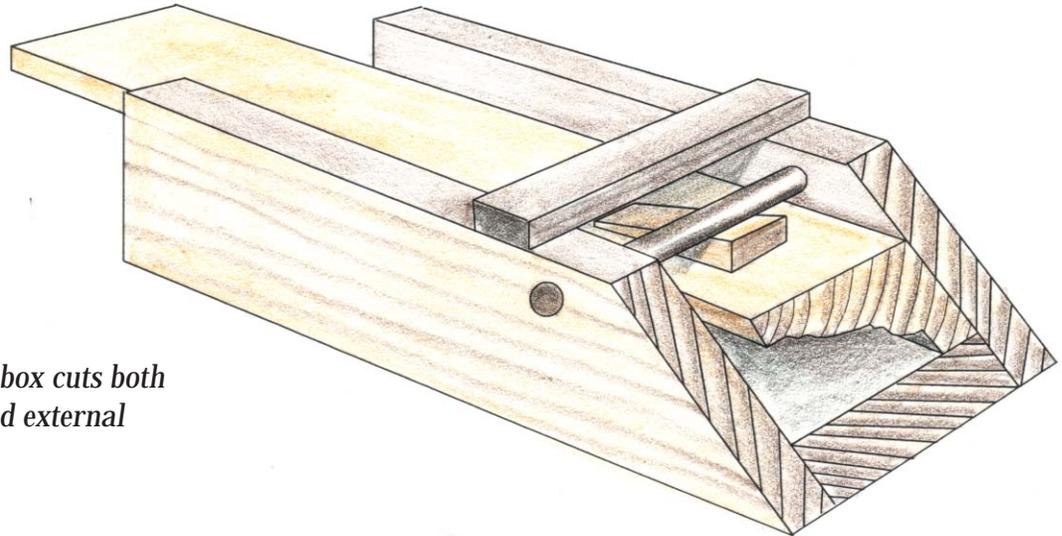
**Two Types of Donkey's-ear Shooting Board:**  
These two shooting boards are ideal for forming long-grain miters and miters in wide boards. They can also be made to any angle to suit a particular need.



# The Miter Shooting Box

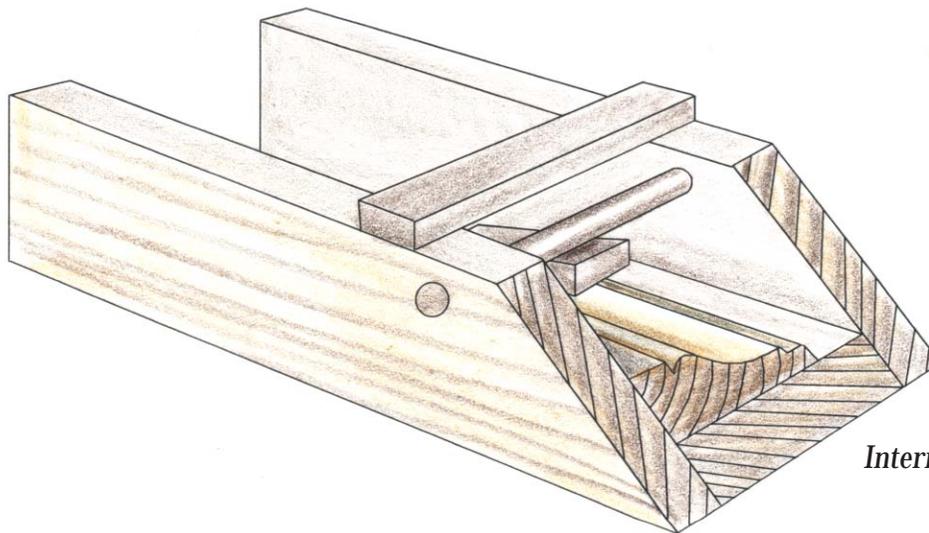
## A Miter Shooting Box:

A miter shooting box accommodates large, wide molds by holding the stock within the box and using the outside, angled walls to guide the sole of the plane. The molding can be held in place by using a dowel as a retaining bar and wedging the stock in place with a wedge. You may also need a packing to support the unsupported side of the mold, depending on the shape complexity of the mold. Often you can reverse another piece of the same mold to counterpoise the stock being worked. You can of course also use this miter shooting box to cut reverse miters (internal miters). We use the miter shooting box mainly for cutting vertical (broad face) miters.



*This miter box cuts both  
internal and external  
miters*

*External Miter*

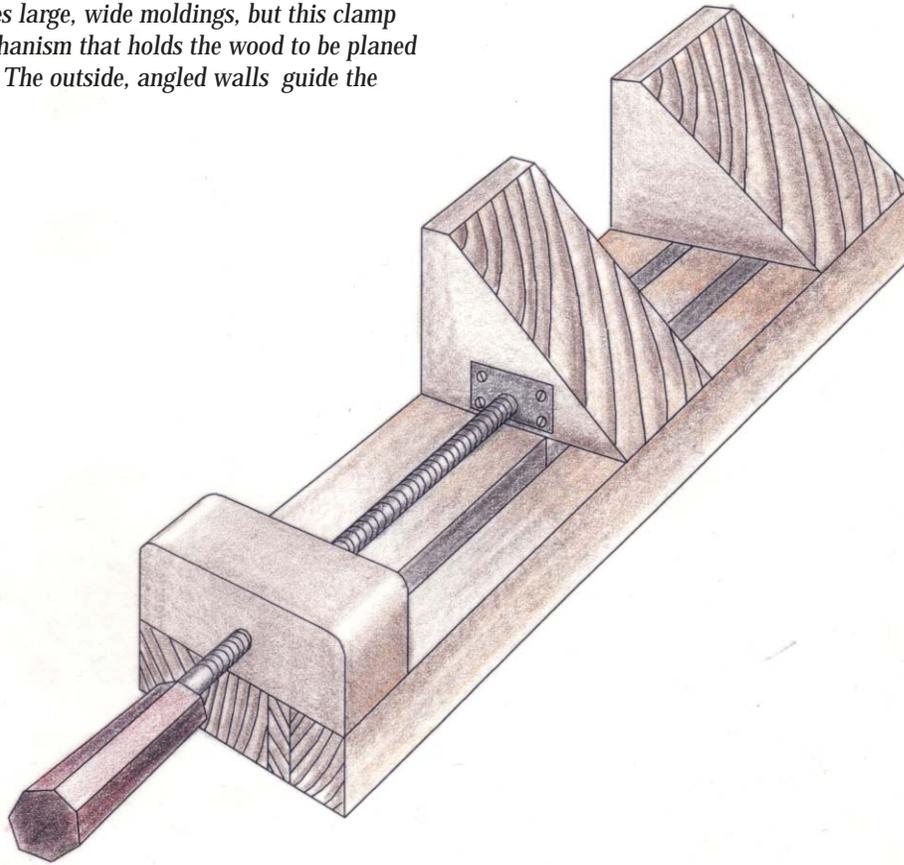


*Internal Miter*

## Screw Miter Shooting Clamp

### *Screw Miter Shooting Clamp:*

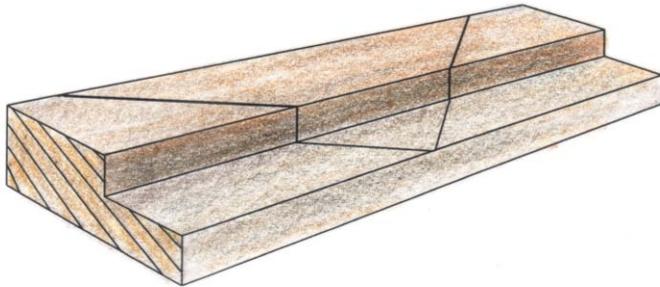
*As with the miter shooting box, the screw miter shooting clamp accommodates large, wide moldings, but this clamp has a clamping mechanism that holds the wood to be planed at the correct angle. The outside, angled walls guide the sole of the plane.*



# Miter Boxes

## Cutting Miters:

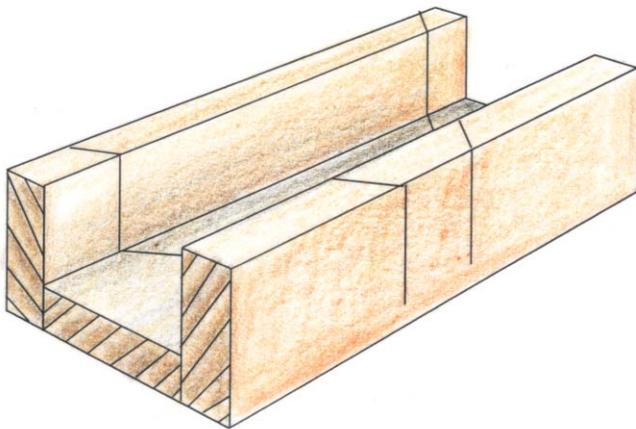
Shooting boards are not intended as a miter cutting guide but for trimming and establishing a precise finish cut to pieces previously cross cut or mitered using a saw and miter box or miter sawing block. Most of us were given to understand that the miter box provided the finished cut, so it's no wonder that we were disappointed with our endeavors at hand cutting miters and square cuts. In reality, the miter box or miter block was only the means with which we made the preliminary cut. Final trimming and fitting for fine work was always accomplished with the shooting board.



(Miter sawing blocks can be made to any size and to suit any profile from either single rabbeted stock or scraps glued and screwed together.)

## Miter Sawing Block:

Ideal for cutting small sections of wood and molding. They can be made from rabbeted stock or two separate boards glued together.



## Miter Box:

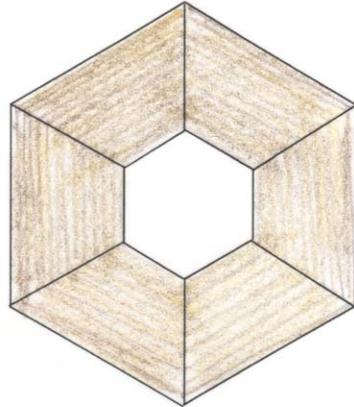
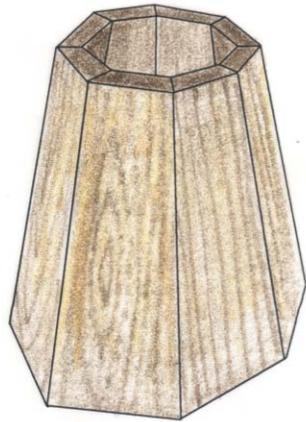
The miter box guides the saw on both sides of the material being cut and tends to be more accurate for cutting larger material. The box shown here is intended for cutting miters, but we use the same principle for square cutting too.

### Note:

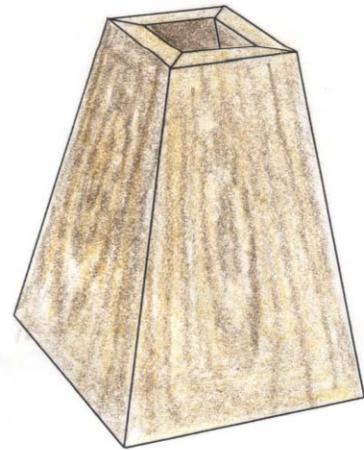
If you want truly accurate miters directly from your miter box, remove most of the set on your finest saw and use the same saw to make your miter box or block.

## *Less Conventional Types of Miters*

*Long-grain miters can be cut to any angle if you make the shooting board to accommodate the need.*



*Flat and long-grain miters can be cut with angles to suit the number of sides*



## Shooting Boards

Many devices once left out of use for a generation or two eventually become lost to the ensuing generations and so become posted in the 'what's it' column of magazines for rediscovery as some ancient relic of antiquity left behind because their true value wasn't necessary for those generations that followed. As with most antiques, we tend to think that all things from those earlier days were bettered by some evolutionary process of industrialism and therefore abandoned because they either didn't really work that well or what replaced them was an infinite improvement. It's often difficult to confine an article to the absolute essentials when the essentials change with each generation of new power equipment. But in hand tool woodworking many if not all the essentials never change. This consistency is due to the fact that many of our early craftsmen developed their tools, aids and other equipment for long-term use, and seriously considered every aspect of what they made with longevity and function in mind. Don't dismiss shooting boards as archaic. They are just as essential today as they were for craftsmen in centuries past.

For me, and I suspect for many others too, anything that works efficiently and yet doesn't need anything more than hand power to drive it is worth adding into the equation. Noise alone is not the only factor to be considered, we shouldn't dismiss the unseen factors not so readily apparent. Life without ear and eye protection or wearing a dust mask for eight hours a day, to say nothing of dust extraction and clean up from every shelf and nook in the shop or filtering the air to make it breathable will make woodworking much more enjoyable. In my experience most woodworkers don't realize that simply using hand planes and scrapers minimizes the need for power equipment and sanders and will in most cases reduce dust in the atmosphere by up to 80%. Equally if not more important is the reality that for the main part, most modern-day woodworkers spend much of their thought time anxiously considering their personal safety and what might go wrong to cause damage to their health and the material they work with, whereas using some of the earlier devices means that they could give their whole attention to the love of woodworking rather than self-preservation, safety and protection.

Many aids to woodworking were actually fairly ingenious, very efficient and simple to use because they acted as positive guides to hand tools. The shooting board in all its various forms is one such device. Making a basic shooting board is a fairly simple process requiring minimal skill and time. Once you've made one you will have it for a lifetime and the accuracy is positively stunning provided you use a keenly sharpened well-adjusted plane. I know that it's hard to imagine in our modern-day world of working wood, with all the sophisticated machines, laser guides, digital readouts and sensor controls giving minute-by-minute data, that craftsmen of times past accomplished extremely advanced levels of woodworking long before the advent of machines. Not only that, many of the methods they used were even faster than setting up the jigs and machines we now depend so heavily on to guide our routers and skillsaws to accomplish even the simplest of tasks. Even with the best intentions, in many cases most of the gadgets and aids manufactured for woodworkers to work with serve only to substitute for developing true and substantive skills. I can think of a dozen or two right now. But occasionally you will come across photographs or drawings of old workshops depicting craftsman of old working with hand tools. The aids they used, often seen hanging from the walls and ceilings, give some indication as to what was important and necessary for them to accomplish those high standards: Bow saws, froes, clamping devices, axes and so on. For me, looking back on my past in English woodshops I went to and worked in during my youth, it's the shooting board. I recall them as unsophisticated, functional, efficient and with pretension. These aids were the answer to precise trimming that ensured perfect intersections between flat boards and molded trim that was as a matter of course so common to the pre-compound-chop saw era of woodworking.

There are three basic types of shooting board designed to accommodate trimming solid wood, veneers and so on. The most common types were developed to facilitate the trimming of end-grain fibers of small sections of wood for



various reasons and applications. Most woodworkers will tell you that squaring end grain and mitered ends with a hand plane takes much practice to maintain consistent accuracy, and this is indeed true. The main difficulty lies in the fact that two dimensions must be accurately trimmed at the same time and it takes skill to adjust and balance the plane square in both directions, even for competent craftsmen. Add to this the wiry and fibrous nature of inconsistent wood grain with infinitely varying densities and wild grain structures and you can begin to understand the complexity of problems we face. Though as I said, many gadgets and aids substitute for developing real skill, I recommend shooting boards because they absolutely guarantee the necessary accuracy



needed for precise trimming after sawing, even after sawing with chop saws and radial arm saws in many cases. Look at any old or antique project requiring accurately cooped facets, miters or square end cuts and you will see that in the pre-machine era, craftsmen worked with perfect simplicity and accuracy, a simple accuracy that truly matches our modern-day methods and in many cases exceeds them. How is that possible? Many woodworkers truly believe that in the evolutionary process of woodworking each mechanized method replaces those existing with something better. In reality the old methods were never abandoned because they didn't work and work well, they were abandoned simply because they didn't keep pace with an ever-industrializing world. So just how did they accomplish such exactingly high standards in crosscutting, trimming and general fitting?

### **Shooting Boards**

Though a regular bench plane will work well with your shooting board, using a low-angle plane of any type will really refine the cut surface of the wood exponentially, producing both a perfectly planed surface and an accurate cut. I use two low-angle planes by Veritas, both of which work extremely well but the weight and heft of the low-angle jackplane, combined with its 3/16" thick iron and the accurate machining throughout the plane itself make this tool my first choice for shooting wood of all types. I should reiterate at this point that a dull plane is extremely counterproductive to accuracy. Even though you may make a perfect shooting board, with all the angles and stops accurately cut, you will not be able to produce the crisp, clean, precise cuts you desire without a well-sharpened plane iron. When a cutting iron dulls through use it actually develops a micro-round on the very cutting edge. Instead of slicing cleanly through the wood in a continuous single plane, the cutting iron itself causes the plane to incrementally rise as it continues through the cut and so produces a round or hollow instead of a truly flat plane.

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### **Variations on the Theme**

You are not of course restricted to 90° and 45° trimming. You can make or adapt a shooting board to suit any specific angle for a particular project. A shooting board will ensure that you create accurate angles for all kinds of

segmented work. Window frames or picture frames or circular clock face doors, pediments to name a few. A donkey's ear shooting board can be used for creating columns, which can be used as they are with flat facets or turned round on the lathe. You can make a tapered column by using tapered boards and planing the angles on a long-grain shooting board. To determine the angles, simply divide 360 by the number of facets you want and then halve the number. Example:  $360^\circ$  divided by 4 =  $90^\circ$  divided by 2 =  $45^\circ$ .



### Removable Stops

Stops are by necessity disposable. Inevitably the stops wear, shrink, bruise and in other ways distort through continued use. They take a lot of beating and so removeable stops became the answer. Not only that, making tapered stops ensured that the stops could be kept tight against the angled shoulders even if shrinkage took place in different seasons when atmospheric changes in humidity levels would shrink or expand the stops. As I said, shooting boards are relatively simple to make and use. I recommend you make them simply because they will simplify many aspects of your woodworking life, produce accurate work and also save you time. The most commonly used shooting board is the miter shooting board, primarily because we use miters in exposed locations as distinctive features to trim out or accent certain aspects of a project such as the architrave (door trim) around door and window frames for instance. Both square and miter trimming can be accommodated in the same shooting board. The second shooting board used in days past is one developed for trimming wider sections of wood such as the vertical miter on base boards. Another shooting board, the donkey's-ear shooting board, is probably the least used but very practical. Those outlined here are simple to make and work well. There is another shooting device made to surface plane mitered sections is the screw miter shooting clamp, which uses a screw-threaded tightening mechanism to hold the wood.

To make a basic shooting board you will need either a suitable hardwood, or you can combine hardwood with some type of hardwood plywood such as Finnish birch; using the plywood for the main baseboard. I used mahogany to make mine. Other woods such as cherry, walnut or oak would also work well, but whichever wood you use you must make sure that the wood is well seasoned to minimize the possibility of any distortion that might affect the stability or accuracy of the board. To make a shooting board of any type you must work accurately. Any discrepancy will be transferred to your project so take your time and follow the patterns for well-made shooting boards that will last you through a lifetime of use.

To make this shooting board you will need a few simple hand tools that must be sharp, well adjusted and accurate. This shooting board will accommodate both  $90^\circ$  and  $45^\circ$ . You will need the following materials:

Main base board	1" x 8 3/4" x 23" long
Fence platform	1/2" x 4" x 23" long
Stop	1" x 1 1/2" x 12"
Under stop	1" x 1 1/2" x 12"

### Three Types of Miter Joint

A miter joint is not technically a joint. It's usually the simple butting up of one piece of wood against another, both of which are then usually nailed in place. For a true joint, one piece of wood is reduced and formed in some way to fit into or through a second piece of wood which in some way is also reduced to receive the other. Three common applications that require mitered joints are shown below. In most cases mitered pieces of wood and boards serve to provide a transition between two planes while at the same time providing protection to vulnerable points. This can be in the larger context of a building or in smaller projects such as cabinets and furniture pieces.

Ask anyone how to cut a miter of any kind and they will most likely answer by saying use a chop saw or a radial arm saw. In most cases woodworkers today would give their opinion that the chop saw gives a superior more accurate cut than the miter box, which is of course true. But most woodworkers nowadays don't realize that the miter box was only the preparatory first step to remove the bulk of the waste. It was the first stage in a two-step process, the second of which could actually produce a more superior cut to those produced by most modern-day machine methods. Obviously a chop saw gives thousands of minute cuts to attain the results it does. How then could a back saw possibly produce what a chop saw can when it relies on just a handful of strokes powered by frail human hands. But I know, and so do so many who have studied antiques of the earlier centuries, that some of the finest levels of woodworking ever done was accomplished before the advent of industrial machines. Looking back may be much more advantageous than you may think. In fact I strongly advise that you do. Read any old books on woodworking and you will inevitably find that the those earlier woodworkers had a whole

different perspective on hand tools, methods of work and so on than we do today. Whenever I look through those early publications I am always amazed at the wealth of information there is on any subject to do with woodworking, including the devices they used to accomplish those aforementioned high standards. To give you a comparison, I looked up some information on shooting boards, first in an old 1905 publication, and then in a 1999 one. In Paul Hasluck's book 'Woodworking', he describes a shooting board as follows:

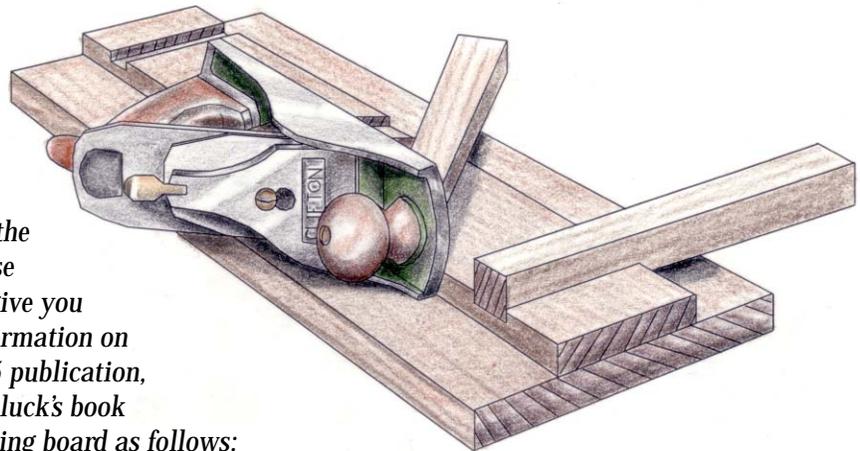
"Notwithstanding the large number of patented mitering machines in the market, skilled joiners, when any particular good piece of work is in hand, still prefer to use the ordinary home made wooden shoot. The machines, whilst new and in good condition, are undoubtedly the more expeditious in use, but if carelessly handled they are apt to get out of order, and then their work is far from satisfactory; whilst the wood shoot will stand a deal of rough usage, and is also easily repaired." On the other hand the more modern publication sadly declares that "A shooting board is a good aid for getting a feel for jointing or for jointing really thin pieces; otherwise, I find that it's more trouble setting everything up than it's worth." The author then went on to show two exceptionally poor examples of what could be accomplished using shooting boards, neither of which could possibly work effectively. Sadly, anyone reading the comments would likely believe the author, and therefor never discover the reality that simple well-made shooting boards will exponentially improve all types of squaring, jointing, mitering, trimming and fitting, to say nothing of never discovering the true value of working with a well-made shooting board. Don't rely on only the modern authors for their opinions. Find some of the old books and read what they have to say as well. I've gone through much of my life without questioning many of the traditions of my craft passed down from my forefathers. I feel they knew well the essentials and passed them on to me. Many today discount those early values that held good for generations and yet who knew better than the economy of time and effort than those early craftsmen. Efficiency was no stranger to them and waste an unknown product.

The shooting board is an extremely valuable aid even to and I would say especially for modern-day woodworkers striving for those standards that serve as the signature of craftsmanship.

### Using a Shooting Board

First of all, the purpose of the shooting board is twofold. The first and primary function is to simply support the wood while holding it at the correct angle and, secondly, to line up and guide the plane as it passes along the fence and carriage to trim off minute thicknesses of wood at exactly the right angles.

Shooting boards must be precisely made. Though there is no adjustment in the shooting board itself to correct any inaccuracies, you can readily micro-adjust the adjustment features in the plane itself by using the depth adjustment to adjust the amount of stock you remove, and also by adjusting the lateral adjustment lever to set



your iron at 90° to the platform so that the angles are perfectly perpendicular to the stock being trimmed. Using a low-angle plane with an adjustable mouth enables you to open and close the throat of the plane to suit your needs.

It's a mistake to think that if the shooting board is accurately made, then the miter or square end being trimmed will also be accurate. You must consider the tool used to expedite the cut to be of equal importance and also the actual adjustments in the plane itself. Your cutting edge must be extremely sharp, I hone and polish to a mirror-finish. Otherwise the plane iron will 'ride' the cut, which serves only to create a scalloped miter rather than a true plane. A sharp plane also ensures that you can trim even molded stock without damaging any unsupported fibers that occur when trimming molds. Another important consideration is that the sole of the plane must be truly flat and milled 90° to the walls.

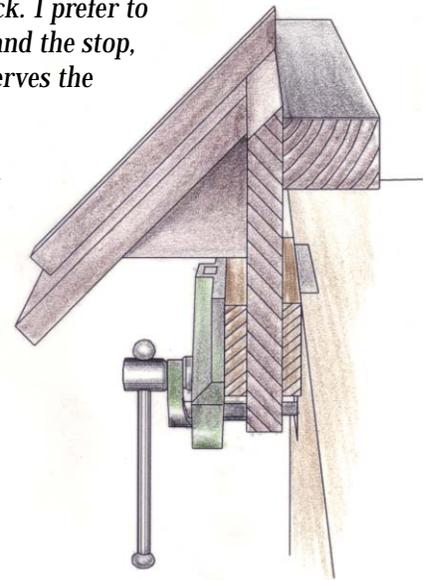
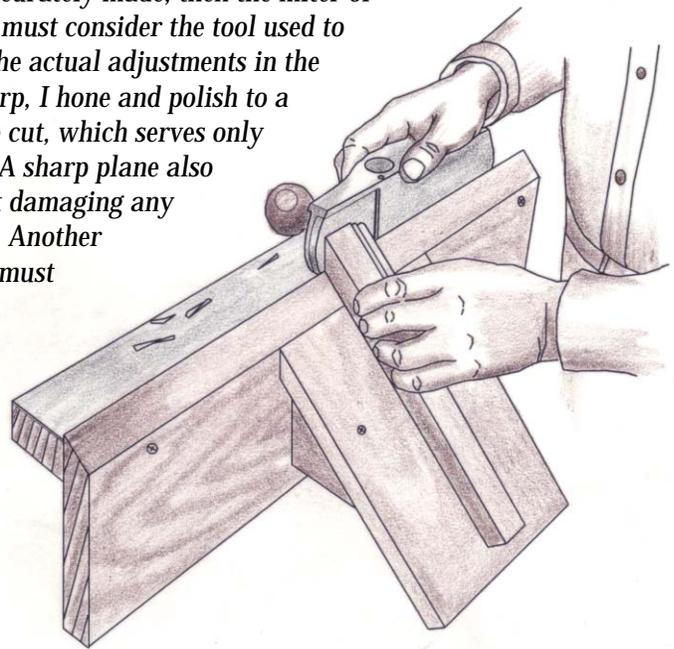
Adjusting the depth of cut is not very scientific with a combination of tweaking the stock, clamping it with hand pressure only and adjusting the plane setting, you remove as minute an amount from the stock as possible, repeatedly passing the plane back and forth through the cuts until you accomplish a complete shaving with one continuous pass. It may take a few passes with the plane before you achieve a full shaving. Once you do, take a few more shavings to establish crisp clean lines to all the angles or shapes of the pieces being worked.

If the stock 'creeps' as you plane, consider using a light spray adhesive to glue medium-grit sandpaper to the surface of the stop or fence platform, keeping the grit away from the cutting edge of your plane. The grit will help grip and hold the stock as you plane.

The stops in the shooting board may splinter as you repeatedly trim stock. I prefer to interpose a sacrificial piece of wood between the material I'm working and the stop, before the stop itself breaks down. Customizing the sacrificial stop preserves the permanent stop and provides the exact support where I need it.

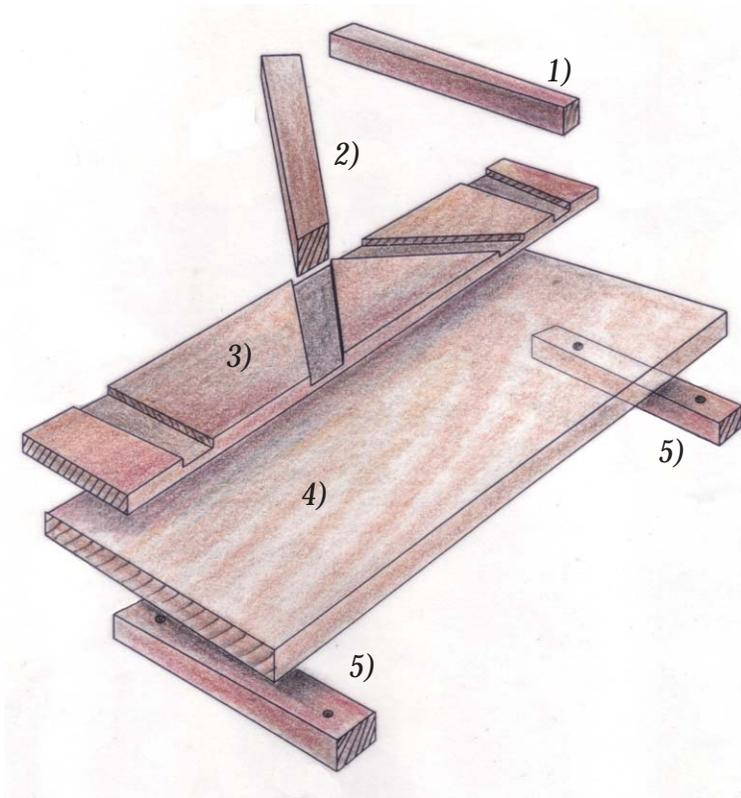
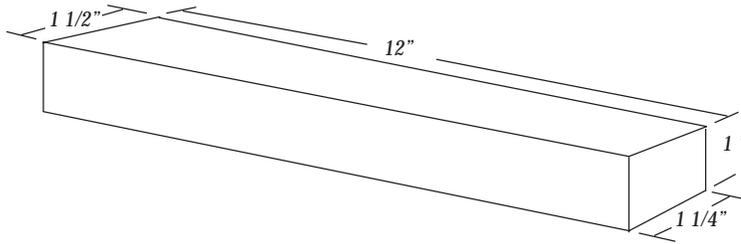
As I said, stops are by necessity disposable. But they must be accurately made so that they feel firm in their tapered housing and firmly support the material being shaved. It's best to make additional and replacement stops slightly oversized so that you can trim them down with the smoothing plane to fit the housings.

End view of Donkey's-ear shooting boards in vise



# Making a Classic Shooting Board

Cut two or three fence stops according to the drawing. You will need one for 90° cuts and another for 45° cuts. Cut them accurately and exactly the same.



*The Components for Making a Shooting Board*

- 1) Square Stop
- 2) Angled Stop
- 3) Fence Platform
- 4) Main Base Board
- 5) Underside Stops

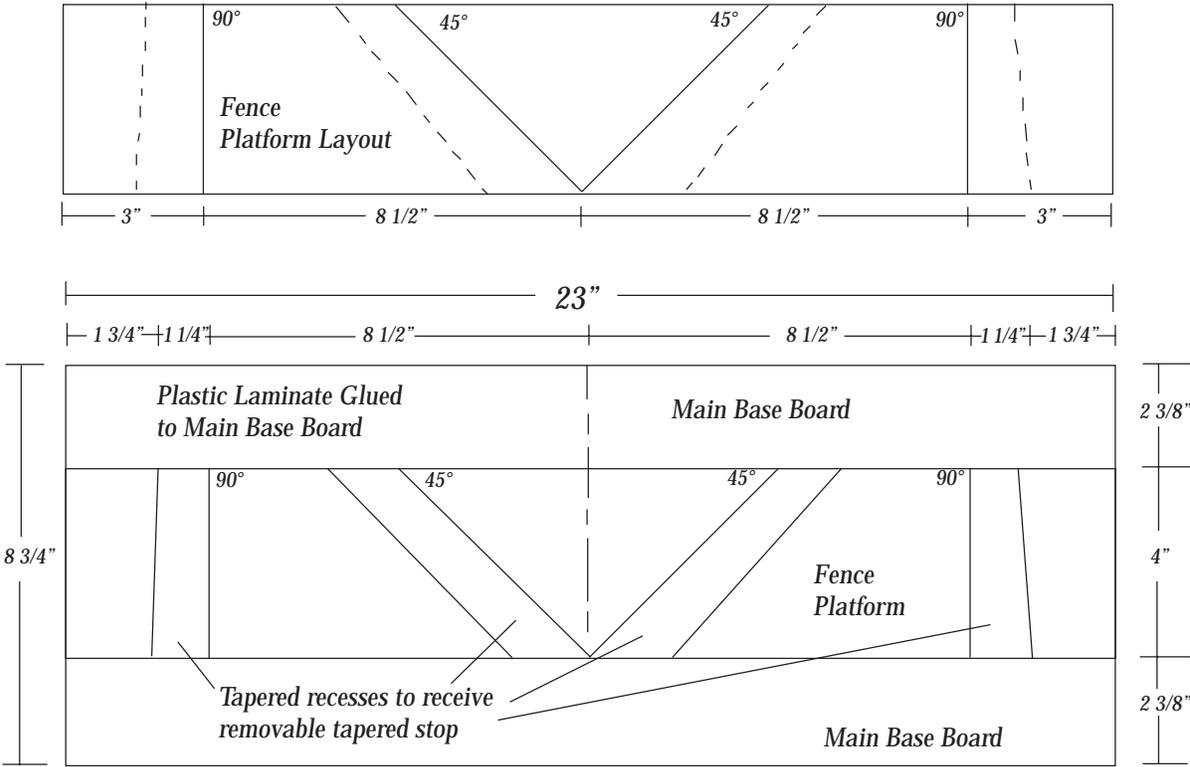
*The Finished Shooting Board*



Lay out the 90° and 45° lines only onto the flat face of the 4" wide board using the combination square and pencil according to the drawing.



**Layout for Building a Conventional Shooting Board for 45° and 90° Cuts**



Place the tapered stop against the 90° and the 45° pencil lines and mark the position of the tapered lines according to the drawing.



Square the lines onto both of the edges.

Use a marking gauge set to 1/4" deep to score the depth lines on both sides of the board

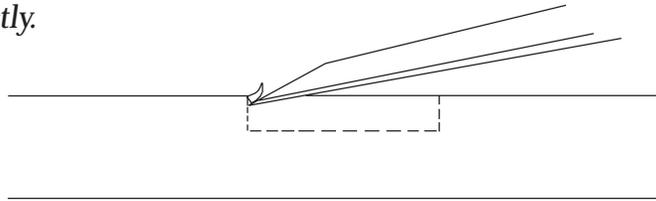




With the pencil lines in place and the depth marks scored, use the knife and combination square to cut the 90° and the 45° lines only. (Not the tapered lines at this stage. The other tapered lines will be marked directly from the tapered stop to ensure that the taper of the wedge-shaped recess corresponds to the tapered stop.)



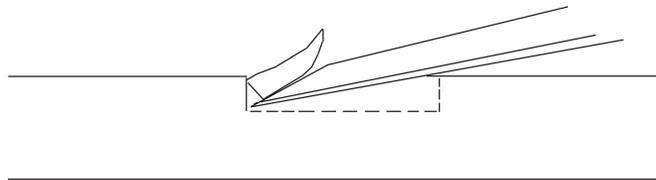
On the 90° and 45° knife cut, chisel a slight angled recess in preparation for guiding the saw cuts. This knife cut will ensure that the saw follows to the knife wall exactly.



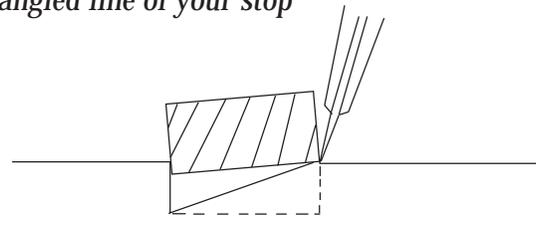
Use a small back saw to cut down the walls of your recess to the gauge line.



Make deeper cuts in towards the wall of your recess, down to just slightly above the depth line



Place your stop in against the wall of your recess and use a knife to score the angled line of your stop



*With a 1" chisel, define the second, opposite knife walls.*



*Use the saw to cut down to just above the depth line.*



*Remove the waste wood with a chisel but stay slightly above the final depth.*



*Use a hand router to surface-trim the bottom of the recesses level.*



*Use a marking gauge set to to 2 3/8" to mark a parallel line along the length of the main base board*





*Apply glue to the underside of the fence platform and position it against the gauge line on the main base board with the recesses uppermost.*



*Clamp the fence platform to the main base board using protective cauls to prevent damage to the shooting board.*

*Fit the wedged-shaped stop into the tapered recess and tighten by lightly tapping with a small hammer.*



*If the stop overhangs, remove the excess with a small saw. If it falls short of the outside edge, shave off some of the width of the stop with a plane.*



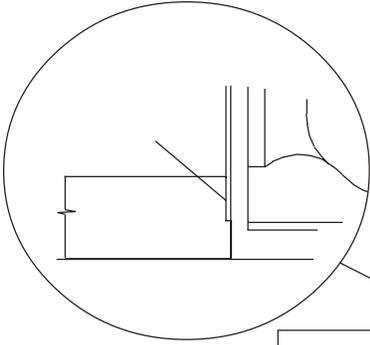
*Grip the board in the vise and plane the fence stop flush with the outside edge of the fence platform.*



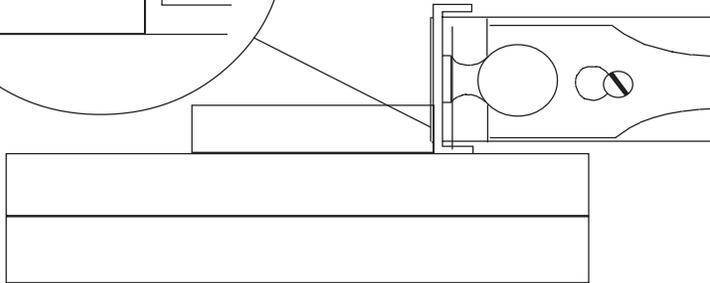
*For added wear resistance and to reduce friction, glue a piece of plastic laminate to the main base board rebate.*



To use the shooting board, lay a plane on its side in the rebate as shown and slice off a few shavings at both 45° and 90°.



When you use the shooting board for the first time, the protruding plane iron will form a small rabbet on the fence and so automatically line up the rabbet with the stop. The edge corner of the plane sole will then be guided by the fence platform.



If you find your miter or square cuts are less than perfect, trim them by adjusting the wall of the recess with a sharp knife against the square.



Compare the surface of a hand planed miter with a machined miter; machined on the left, hand planed on the right.

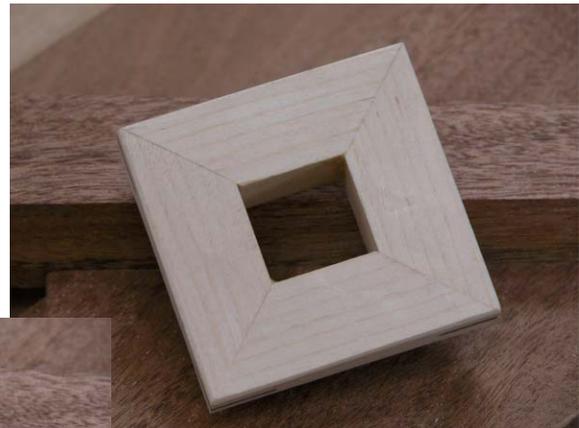
I used two low-angle planes for trying out the shooting boards. The low-angle of the cutting iron in relation to the plane body proved ideal for all types of trimming and shooting. I used the heavier low-angle jack plane for larger stock and shooting long edges, and the shorter low-angle smoothing plane for smaller stock, even though the either plane will do the work of the other without fault.



*Even quarter-sawn ponderosa pine produced crisp, see-through shavings with a well-sharpened plane.*



*I made a miniature mitered frame from 1/2" x 3/4" stock to test the accuracy of my shooting board. The frame measures 2 1/4" square.*



*Front and back views*