Through Dovetails

Dovetail joints are one of the most useful corner joints in woodwork. As well as having a pleasing appearance, they have structural strength. They are traditionally used in drawers and boxes, but are also commonly used in other carcase furniture.

The ability to make close-fitting dovetail joints is often regarded as a sign of a good woodworker, and their incorporation in furniture as a sign of quality. While this is not always true, good furniture and cabinet work often includes dovetails used in appropriate situations.

There are many variations of dovetails, used depending on the situation. The simplest are through dovetails, and these will be described in detail here. Also commonly used are blind dovetails, while other variations are less common.

A number of jigs and machines have been developed to cut dovetails, but these are usually limited to cutting through dovetails, with wide pins. However, machine-cut dovetails always look unnaturally uniform and 'clunky'. Once you have cut a few dovetails by hand, you will find that it is just as quick to do this as to set up jigs.

There are many ways to hand-cut dovetails. Some advocate cutting pins first, others cut the tails first. They all have one thing in common – their advocates swear that they are the best way, and they work well for the people that use them. I will show you the way that works best for me. I always cut pins first, because it is easier to mark out the tails from very thin (London) pins than vice versa.

The steps in cutting dovetails are as follows:

General layout.

Decide which pieces will have tails and which will have pins. In drawers, the front and back have pins, while the sides have tails. On large boxes with side handles, the tails should be on the front and back, while drawer chests have the tails on top and bottom with pins on the sides.

Decide how many tails and pins you will have. For small boxes and drawers, two tails and three pins is usually adequate. For aesthetic reasons, an odd number of pins is usually used, but there is no hard and fast rule about this.

Decide how wide you want the pins to be. I prefer to use very thin pins, except on large boxes.

Decide what slope to have on the tails. The common slopes are from 1:6 (9.5°) for softwoods to 1:8 (7°) for hardwoods. You can set this angle on a bevel gauge using a piece of rectangular scrap. For a 1:8 slope, mark 1 unit from the corner along one side, and 8 units from the corner along the perpendicular side. Draw a line between the two marks. Then set the stock of the bevel gauge on the first side, and angle the blade so that it is on the line you've drawn.

Square up the timber

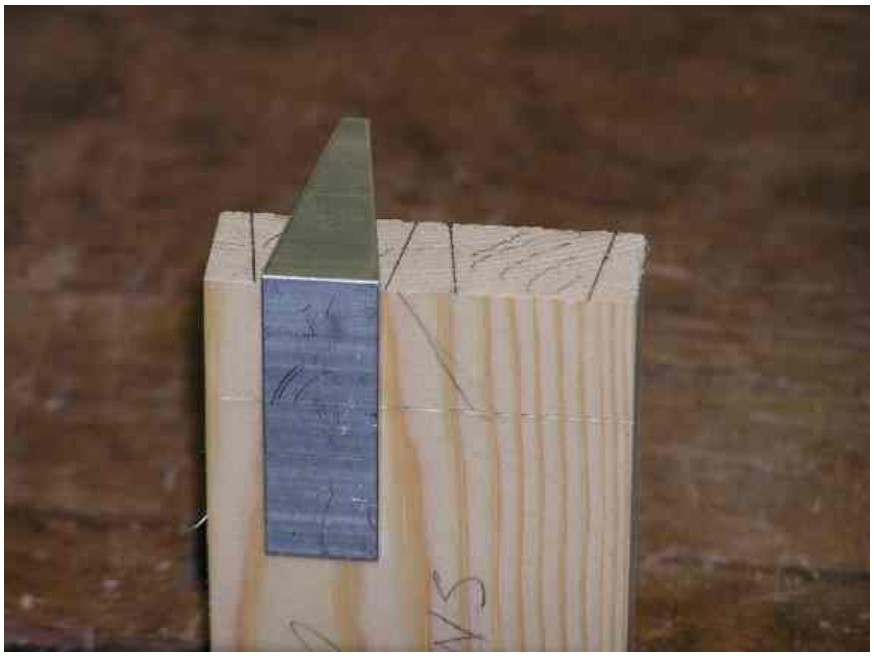
The ends, sides and edges must be cut square. (There are special techniques for cutting dovetails on angles). Mark the face sides and edges on the inside and bottom respectively of a box or drawer.

Marking out and cutting the pins and tails

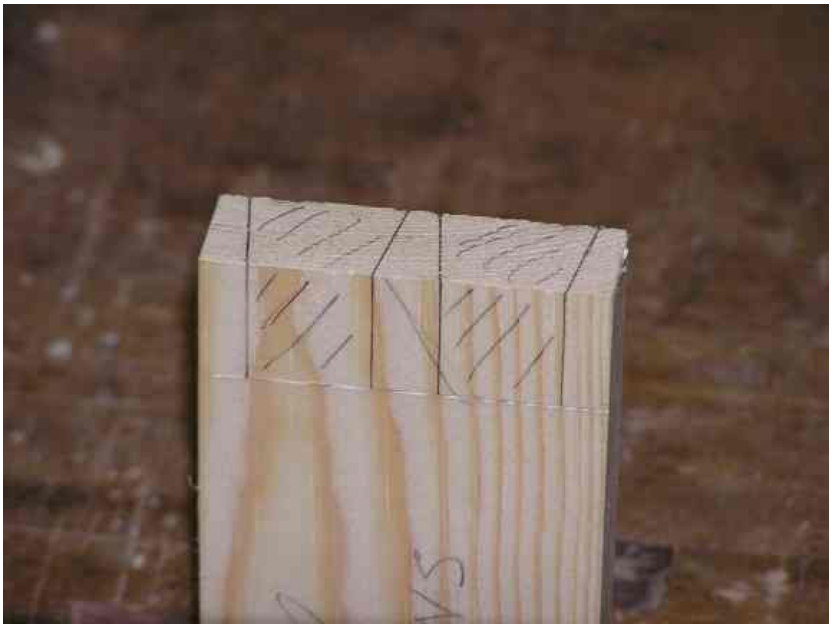
Set a cutting gauge to the thickness of the timber. If different thicknesses of timber are being used, the gauge is set on the tail piece to mark the pins and vice versa.

With the cutting gauge held against the ends of the timber, mark the depth of the tails and pins on the sides of the pin piece and all round the tail piece. There is no need to cut deeply. The score marks may be darkened with pencil to make them more visible.

Using a dovetail gauge or bevel gauge, mark out the ends of the pins with a scriber. Darken the lines with a pencil and mark the waste that is to be cut away.

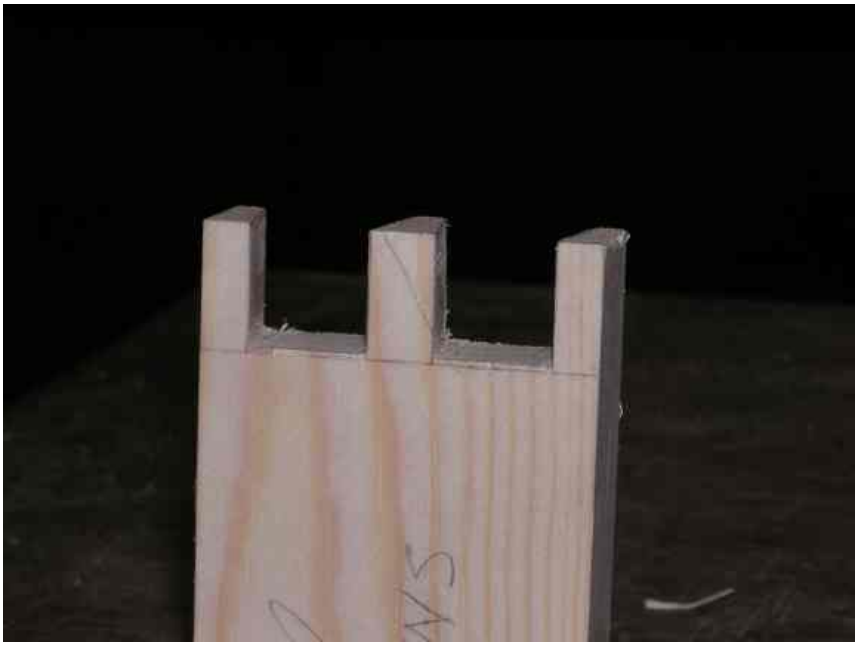


Using a try square held against the end of the wood, mark the pins on the inside and outside faces, and again, mark the waste.



Using a dovetail saw, Japanese saw or fine tenon saw, cut along the waste side of the marked lines. Aim to have the saw bisect the line, but do not cut into the pin. If there is excess waste it can be removed later. Be careful to cut only as far as the depth lines on the inside and outside faces. It is better to not cut far enough than to cut too far.

Remove the bulk of the waste between the pins. This can be chiselled out, or removed using a band saw or scroll saw. Whichever method you use, do not remove the waste all the way to the depth lines. Stop about 0.5 – 1 mm short.



Use a bevel-edged chisel to pare down to the depth line. It helps to make a set of paring guides as shown below. Set the work piece in the vice with the depth lines level with the top of the paring guides. Rest the chisel on top of the guide, pointing slightly upwards, and pare away a thin sliver. Repeat this, gradually bringing the chisel towards level, but do not go through to the other side. You should be able to feel the blade of the chisel in the depth line when the cut is deep enough

Turn the work piece around, and repeat these steps, again being careful not to go through to the other side. You should aim to pare the bottom flat between the two depth lines.

If necessary, tidy up the sides of the pins so that they are flat, square and accurate.

Sit the pins on the tail piece, making sure that the edges of each piece are in line. The inside face of the pin piece must sit exactly on the depth line of the tail piece. It may be convenient to either lightly clamp the pieces or have someone hold them while you mark the tails.

Using a sharp scriber or bradawl, mark the position of the tails. Be careful not to move the pin piece while doing this. You may darken the scribed lines with a pencil for visibility.

Put the tail piece in the vice at an angle, so that you will be cutting the side of the tails vertically. It is worth the trouble of using a spirit level and bevel gauge to do this. Again, try to bisect the scribed lines on the waste side, but do not stray into the tails. You will need to reverse the angle of the piece to cut the other side of the tails.

Remove the waste from between the tails, as you did with the pins. Again, do not remove it all the way to the depth lines.

Pare back to the depth lines as before, and trim up the tails.

You should now have a neatly-fitting dovetail joint. The joint should need to be pushed firmly together, but not forced. If the joint does not go together, separate the pieces, and look for shiny patches where they are interfering. Pare these spots back lightly and try again. Don't wiggle the joint to separate it. Place the tail piece on the bench with a packing block on it near the pin piece. Lift the pin piece slightly off the bench, and thump the packing piece with a mallet. This should separate the joint cleanly.

When the joint goes together, check all round for any gaps. These can be filled with small slivers of wood, called graving pieces, when you glue up.

Once the joint fits well, do not repeatedly open and close it, as it will loosen. Also, some timber may warp, so it is best to glue the joints up as quickly as possible.

Gluing up

Usually, when gluing up dovetail joints, you are doing four corners at a time, so you will need to work quickly and use an adhesive that will give you enough time, eg PVA (Aquadhere) or epoxy.

The strength of dovetail joints should come from their shape. Only a small amount of glue should be needed. Make the corners at each end of a tail piece first, inserting the box or drawer base if necessary. The last two corners will need to be made together. When all sides are together, clamp them and check that they are square by measuring the diagonals.

After the joints have set, use a block plane set to a very fine cut, or a cabinet scraper, to clean up the outside of the joints and remove the marking lines. To avoid splintering the ends, plane from the ends toward the centre of the box. Clean any excess glue from the inside of the box using a sharp chisel.

Half Blind Dovetails

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There are many variations of dovetails, used depending on the situation. The simplest are through dovetails, which are described elsewhere. Also commonly used are half blind dovetails, while other variations are less common.

Half blind dovetails, so-called because they are only visible from one side of the joint, are used where a mechanically strong joint is required, but they would detract from the appearance of the article if they were obvious from all angles. They are of particular use in attaching drawer fronts to the sides.

A number of jigs and machines have been developed to cut dovetails, but these are usually limited to cutting through dovetails, with wide pins. However, machine-cut dovetails always look unnaturally uniform and 'clunky'. Once you have cut a few dovetails by hand, you will find that it is just as quick to do this as to set up jigs. Only the most expensive jigs and machines are able to cut half blind dovetails.

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The steps in cutting dovetails are as follows:

General layout.

Decide which pieces will have tails and which will have pins. In drawers, the front and back have pins, while the sides have tails. On large boxes with side handles, the tails should be on the front and back, while drawer chests have the tails on top and bottom with pins on the sides.

Decide how many tails and pins you will have. For small boxes and drawers, two tails and three pins is usually adequate. For aesthetic reasons, an odd number of pins is usually used, but there is no hard and fast rule about this.

Decide how wide you want the pins to be. I prefer to use very thin pins, except on large boxes.

Decide what slope to have on the tails. The common slopes are from 1:6 (9.5°) for softwoods to 1:8 (7°) for hardwoods. You can set this angle on a bevel gauge using a piece of rectangular scrap. For a 1:8 slope, mark 1 unit from the corner along one side, and 8 units from the corner along the perpendicular side. Draw a line between

the two marks. Then set the stock of the bevel gauge on the first side, and angle the blade so that it is on the line you've drawn.

Square up the timber

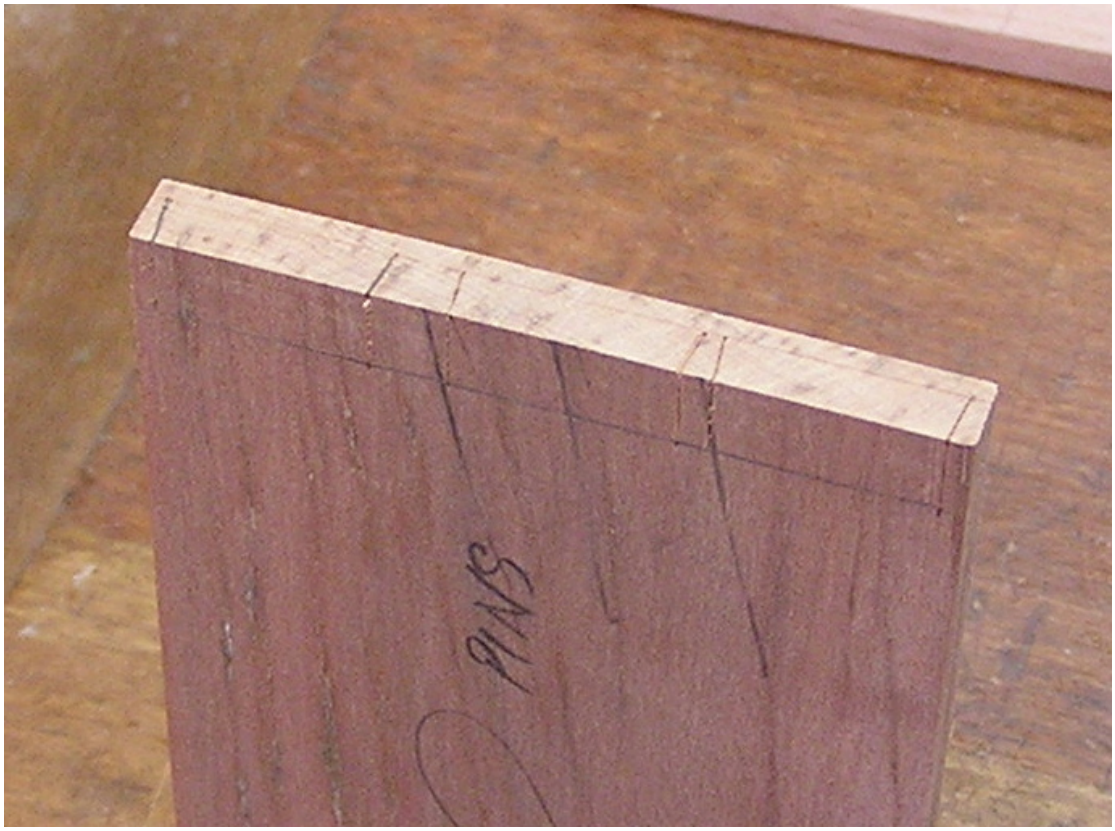
The ends, sides and edges must be cut square. (There are special techniques for cutting dovetails on angles). Mark the face sides and edges on the inside and bottom respectively of a box or drawer.

Lay the sides end to end in the order they will be assembled, and mark each pair of ends so that they can be assembled in the correct order.

Marking out the pins

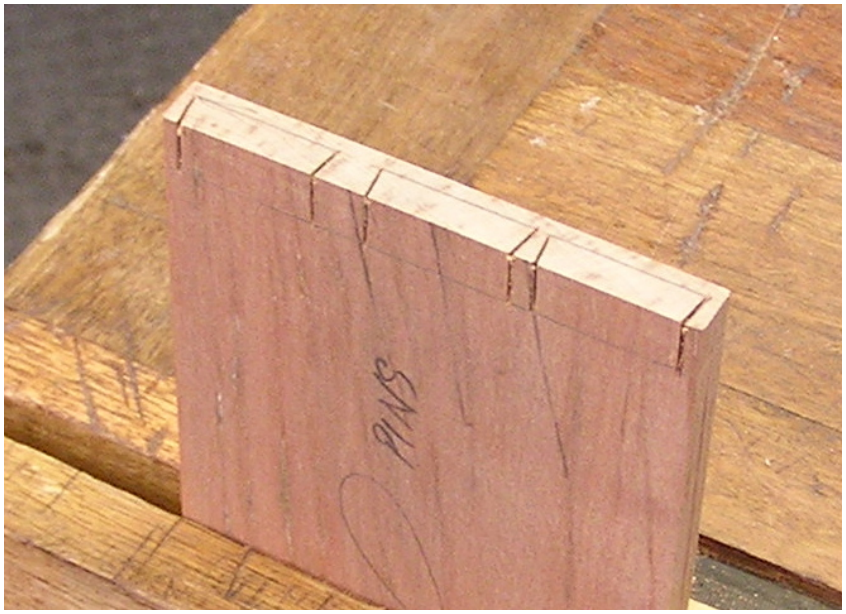
Set the cutting gauge to the depth that the pins will be. This is usually $^{2}/_{3}$ to ¾ of the thickness of the side. Mark this distance across the end of the pin piece, and on the inside face of the tail pieces. Then set the cutting gauge loosely to the thickness of the tail piece, and mark this distance on the inside face of the pin pieces.

Using a scratch awl, mark the location of the pins on the scribed line. If the lid of a box is to be separated later, remember to allow a wide pin for the saw kerf. Then use a bevel gauge set to the desired angle, or a dovetail gauge, to et the pins out on the end of the piece. Use a try square to set out the pins on the inside face. Mark the



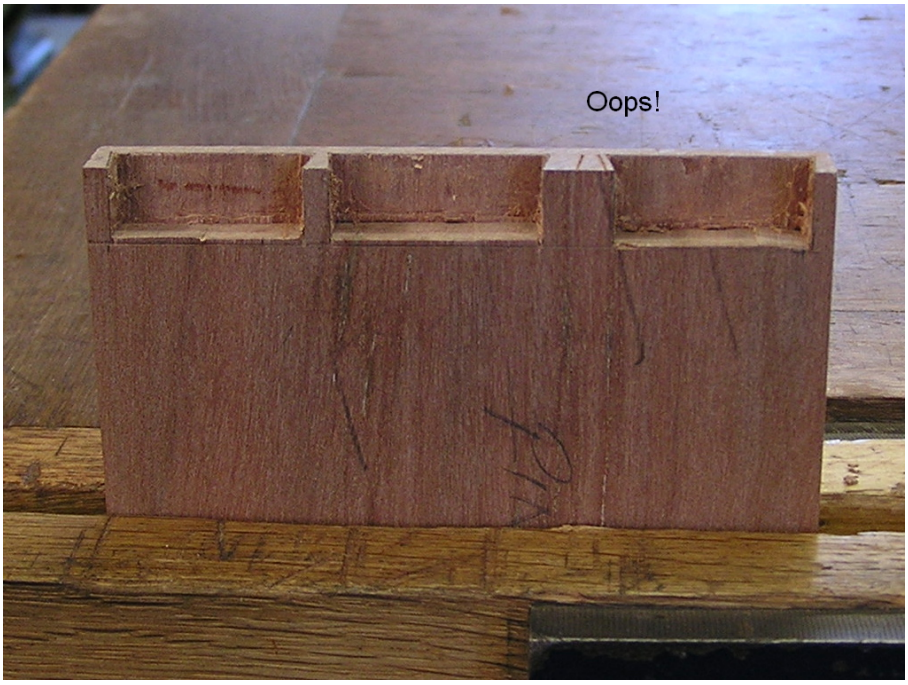
Cutting the pins

Set the pin piece vertically in the vice, and use the dovetail saw to cut at along the scribed lines. Make the cuts carefully, letting the weight of the saw do the work. Hold the saw at an angle with the handle down, and be sure not to cut past the lines.



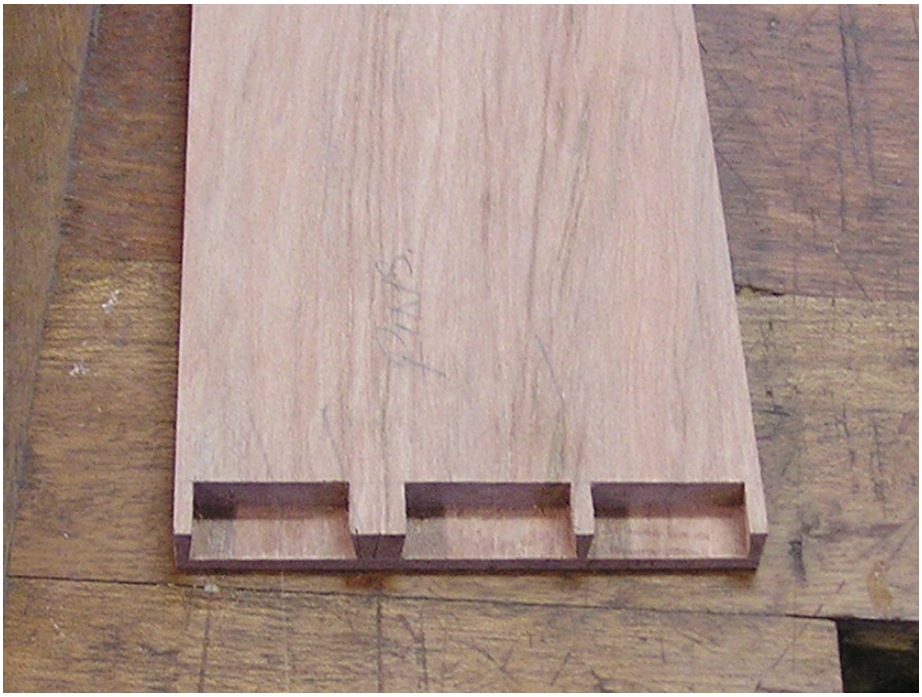
The easiest way to remove the bulk of the waste from between the pins is by using a router. Set a small cutter to the depth of the pins and carefully remove the waste. Do not route right up to the lines, and be sure the router cuts no deeper than the marked line.

Using small chisels, carefully remove the remainder of the waste in the corners.



With the side flat on the bench, pare down to the gauged line.

Clean out the sockets and, if necessary, straighten the pins.

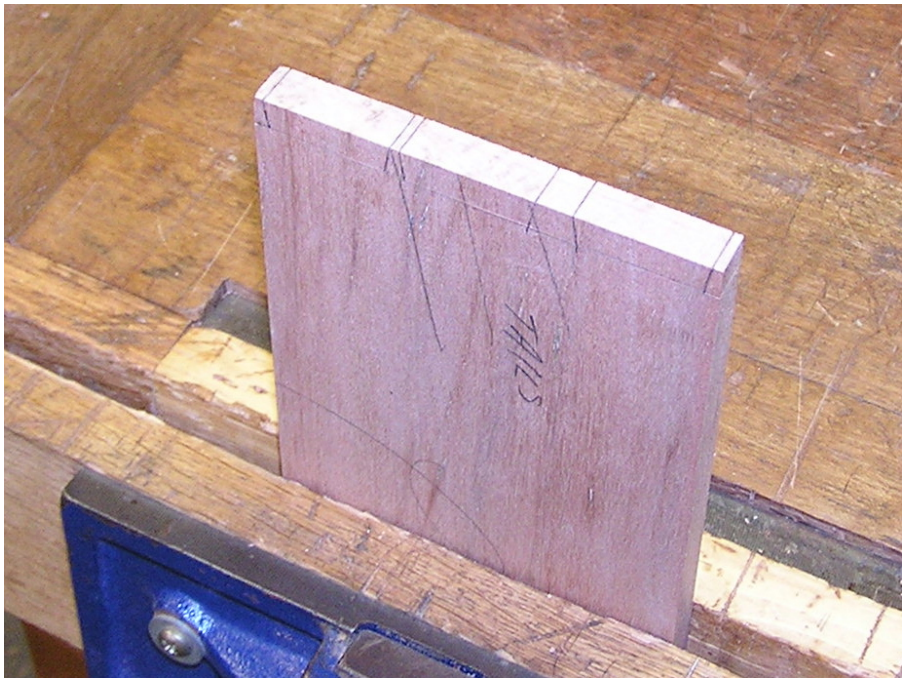


Marking out the tails

Using a try square and marking knife, extend the scribed line to both edges. Then, extend it to the outside face, but mark this line using a sharp pencil, not a knife.

Hold the pin piece in position against the tail piece, and carefully mark the location of the tails using a scratch awl.

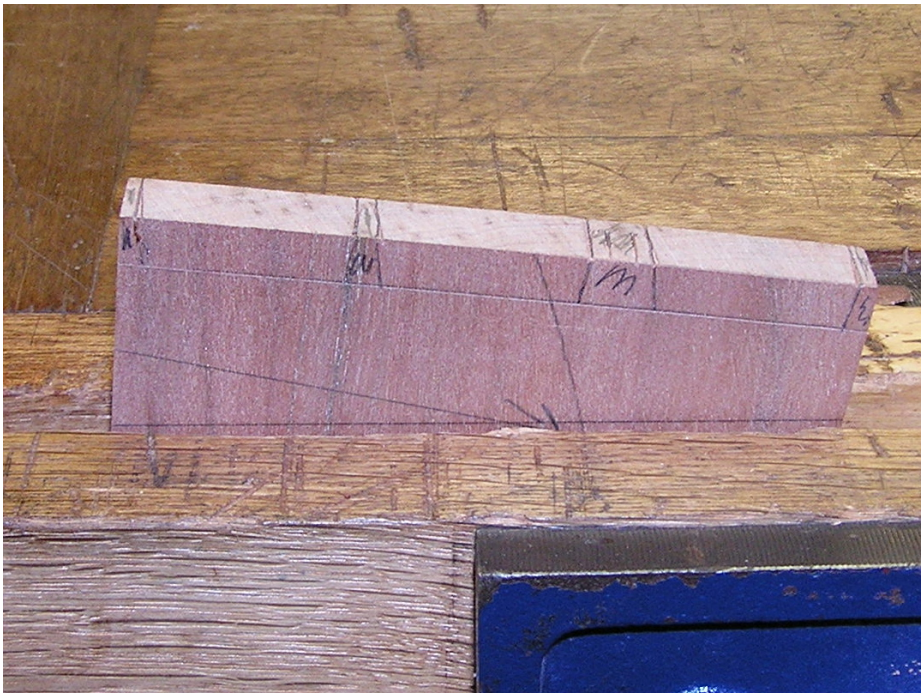
Using a try square and awl, mark the position of the tails on the ends, and extend them down to the pencil line on the outside.



Mark all the waste so you don’t remove the wrong material

With the bevel gauge, mark lines at the angle of the dovetails, across the inside face, in both directions.

The purpose of these lines is to help you put the piece in the vice at the correct angle.



Cut along the marked lines. Aim to bisect the scribed line with the saw on the waste side of the line. Cut carefully to the marked lines on the inside and outside faces, but do not go past them. Cut out the bulk of the waste using a scroll saw, fret saw or chisel, but leave a little waste to be squared up accurately.

Clean up the tails carefully, and test fit them. Do not force the joints together. They should go together with no gaps, and be a firm but not force fit. To separate the joints after testing, place the tail piece on the bench with the pin piece vertical. Hold the pin piece firmly with the tails slightly above the bench, and strike the tail piece firmly with your hand or a soft-faced mallet. Do not try to wiggle the joints apart.

At this stage, if the box is to have floating panels or till supports, the slots should now be cut by router. This box is to have till supports.

If the box is to have floating panels take care when cutting the slots, not to cut through the ends of the tails, or into the pins.

It is a good idea to apply a coat of shellac to the interior of the box, lightly sand it and apply a second coat before assembly, as this can make it easier to remove any glue squeeze-out. When doing this, be careful not to put shellac on the parts to be glued. The floating top and bottom panels, if any, should also be shellacked at this point.

Mark the tails and pins that are to go together, in a place where the marks cannot be seen.

Glue the till supports into their slots.

Select a glue that will give you sufficient time to glue up, while providing adequate strength. Epoxy will give lots of time, but is expensive and can be messy. PVA is a good option, as it allows reasonable time, can be accurately placed and is reasonably priced and strong. Aliphatic (yellow) glue has the same advantages, is stronger but sets more quickly. If you use it for dovetails, be prepared to work quickly. All these glues set more quickly on hot days.

Glue will need to be put into small spaces, so it is a good idea to cut a flat edge on some kebab skewers or chopsticks to use as spreaders.

Place a small amount of glue on a pair of tails and pins and spread it. Be sure not to miss any of the mating surfaces. Tap the pins into the tails. Repeat the process with the adjacent corner on the tail piece.

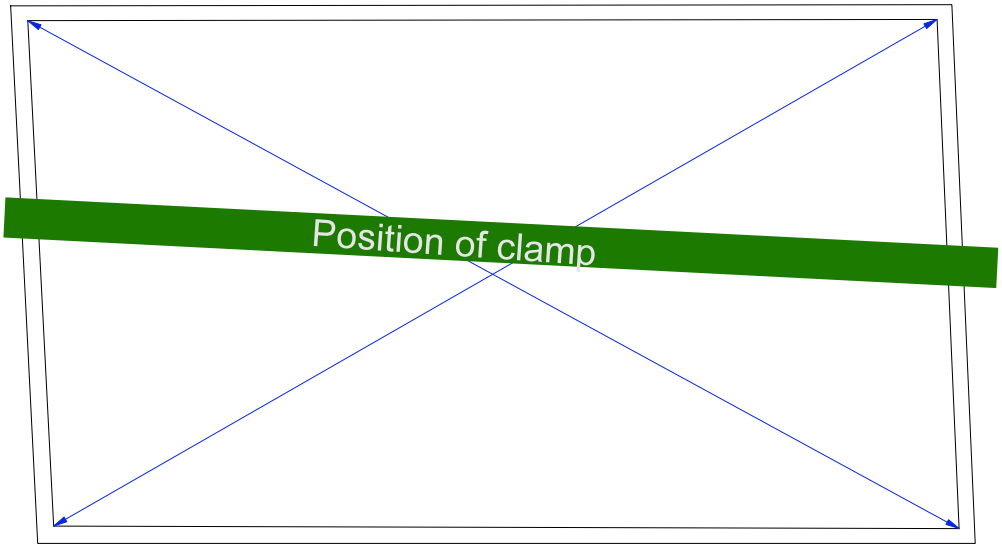
If the box has floating top and bottom panels insert them in their slots now. Be sure to put the right panels in the right slots, the right way up.

Then place glue on the remaining two corners and tap the last tail side home.

The box can be clamped using F clamps, but a pair of band clamps is better if they are available. Do not clamp too tightly or too much glue may be squeezed out and a dry, weak joint will result. Clamp just tightly enough to close the joint completely.

After the box is clamped up, check that it is square. Because the sides will temporarily deform slightly under clamping, you cannot check for squareness using a try square. You need to measure the diagonals using either a rule or diagonal gauges as shown below.

If the box is not square, place a clamp lengthwise along the box, at a slight angle. The clamp should be angled slightly in the direction of the long diagonal. This clamp does not need to be very tight. Check the diagonals frequently as the clamp is tightened.



Leave the box clamped up long enough for the glue to set – several hours for PVA, up to 12 hours for epoxy. Remove the clamps, and carefully remove any squeeze-out using a sharp chisel. If you used epoxy glue, beware of sharp chips as the excess breaks away. These can cut skin or damage your eyes.

Place the assembly in a vice. If it has no top or bottom it may be supported as shown below. Planing from the outside towards the centre, carefully work the ends of the pins down until they are flush with the tailpiece. If you have a block plane this is ideal for this purpose. Otherwise, a sharp smoothing plane may be used.

The box may now be completed and finished.