BIRSTALL WOODTURNING CLUB Est 1997 At Mirfield

Member's Handbook

Unit 46 Holme Bank Mills, Station Road, Mirfield WF14 8NA

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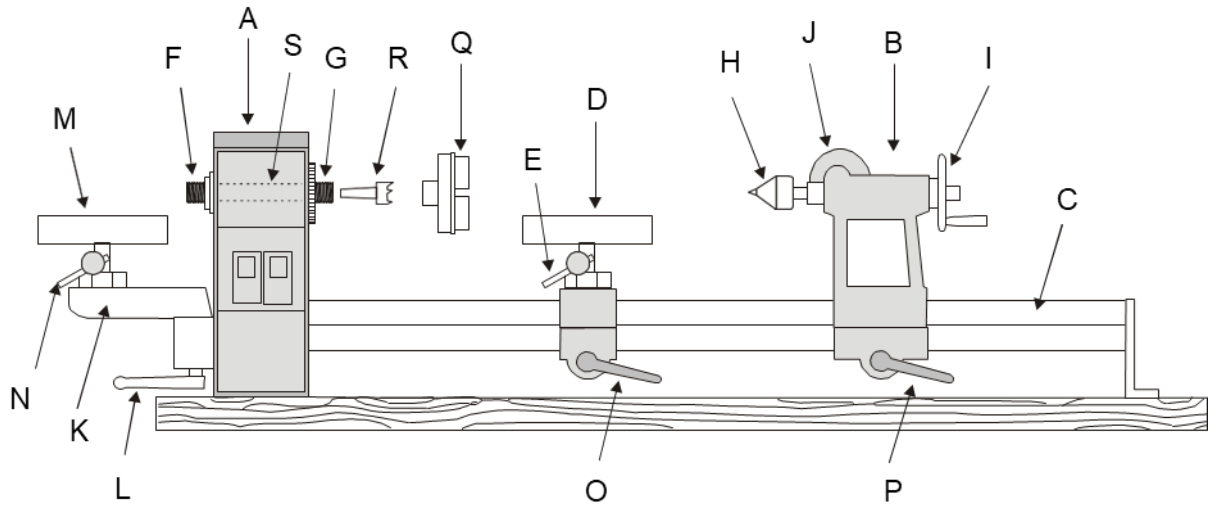
General safety rules

- For your own safety, read the manual before operating the tools and machines.
- Learn the machine's application, limitations, and specific hazards peculiar to it.
- Always use safety glasses - everyday glasses are not safety glasses.
- Wear appropriate apparel. Do not wear loose clothing, neckties, rings, bracelets or other jewellery which may get caught in moving parts. Non slip footwear is recommended. Wear hair covering to contain long hair.
- Keep work area well lit.
- Keep work area clear. Cluttered areas and benches invite accidents. Build-up of sawdust is a fire hazard. Do not turn the lathe on before clearing the nearby area of all objects that clutter the area or could be a trip hazard (tools, scraps of wood, etc.).
- Check machinery for damage and report any faults immediately. Do not use damaged or faulty equipment.
- Avoid accidental starting. Make sure switch is in the off position before plugging in power cord.
- Never leave machine switched on when unattended. Leave machine turned off and at a complete stop.
- Keep guards in place and in working order.
- Use right tool. Do not use a tool or attachment to do a job for which it was not designed.
- Use recommended accessories. The use of improper accessories may cause hazards.
- Do not force tools. It will do the job better and be safer at the rate for which it was designed.
- Maintain tools in top condition. Keep tools sharp and clean for best and safest performance. Follow instructions for lubricating and changing accessories.
- Attention to work. Concentrate on your work. If you become tired or frustrated, leave it for a while and rest.
- Do not operate machine while under the influence of drugs, alcohol, or any medication that causes drowsiness.

Safety rules for wood lathes

- Seek instruction if unsure. If you are not thoroughly familiar with the operation of wood lathes, obtain advice from your supervisor, instructor, or other qualified person. Instruction from a qualified person is strongly recommended.
- Check set-up with lathe off. Examine the set-up and rotate the work piece. By hand to check clearance and check speed is correctly selected before turning on the lathe.
- Do not operate the lathe if you suspect it is damaged or faulty. If it becomes damaged during operation, shut off the lathe and isolate it from the power supply. Replace missing, damaged, or failed parts before resuming operation.
- Do not make adjustments when the lathe or work piece is turning. Make all adjustments with the lathe stopped.
- Tighten all clamp handles on the headstock, tailstock, and tool rest before operating lathe.
- Examine workpiece and glue joints to make sure it has no defects that would cause it to break when turning.
- Always check correct speed is selected before switching on the spindle.
- Use lowest speed when turning a new or unbalanced work.
- Turn at appropriate speed, taking into account your experience and the material being used.
- Adjust tool rest close to the work piece. Before turning, revolve the stock by hand to make sure it clears the rest. At intervals stop the lathe and readjust the tool rest.
- Keep tool on tool rest. Tools should remain on the tool rest whenever the tool is in contact with the workpiece.
- Remove tool rest when sanding or polishing so fingers do not get pinched.
- Use the correct lathe tool for the operation. Do not use spindle turning chisels for faceplate mounted work, and vice versa. Spindle turning tools used for faceplate mounted work may grab the work piece and pull the chisel from your control.
- When roughing work do not take too big a cut – the tool could jam unexpectedly causing serious injury to yourself and others.
- Do not pound workpiece into headstock drive (spur) centre when turning between centres. Pound the drive centre into the work piece with a soft mallet before installing it between centres in the lathe.
- Do not use tailstock to drive work piece into the drive (spur) centre. Secure work between centres with light pressure from the tailstock quill action.
- Fasten stock securely between centres. Make sure the tailstock is locked before turning on the power.
- Never loosen tailstock spindle while work is turning.
- Correctly use faceplate. Ensure work piece is securely fastened to the faceplate and that appropriate size faceplate is used. Any screw fasteners must not interfere with the turning tool at the finished dimension of the work piece. Rough-cut the work piece as close as possible to finished shape before installing on faceplate.
- Use spindle reverse direction for sanding only.
- Visors should be worn for personal protection.
- Face masks must be worn when sanding.

Basic lathe layout



A Headstock

B Tailstock

C Bed

D Tool rest

E Tool rest lock

F Outboard left hand thread for faceplate for large diameter turning

G Inboard right hand thread for faceplate or multi-chuck

H Tailstock centre

I Tailstock adjustment

J Tailstock adjustment lock

K Outrigger

L Outrigger lock

M Outrigger tool rest

N Tool rest lock

O Moveable tool rest lock

P Moveable tailstock lock

Q Multi-chuck

R Inside shaft

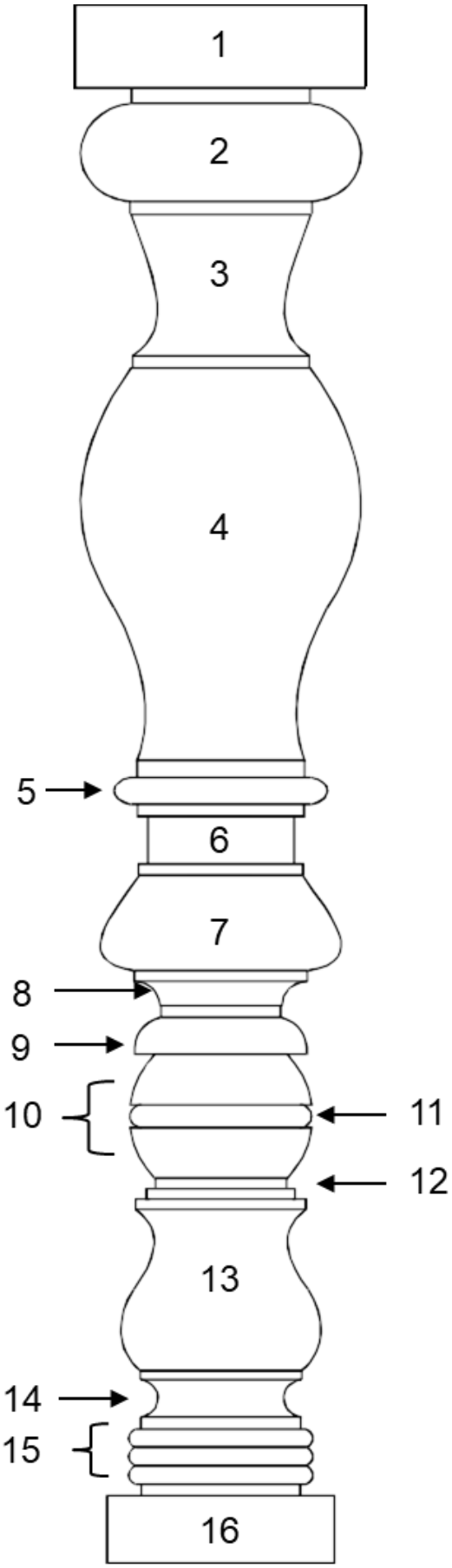
S No2 Morse taper

Names of spindle-turned shapes

Working from top to the bottom of the diagram shown on the next page:

1. “Plinth”, named because it is at the base and is straight sided.
2. “Torus” is a large, semi-circular shape.
3. Scotia, from the Greek word for “shade” so called because it is a sunk-in ovolo (see 7).
4. Perhaps the most classical of all basic forms, is the ogee. It is just an “S” shape, but it can be stretched or compressed and is usually asymmetrical in one direction or the other.
5. An astragal is a semi-circular form that extends above the surface of the piece but is much smaller than a torus.
6. A straight section occurring somewhere in an upper area can simply be called a neck.
7. A protruding segment (7) of an ellipse, an ovolo.
8. A quarter- hollow topped by a quarter-round.
9. A ball, which could be elongated into an ellipse. The abrupt transition between quarter-round and ball, itself called a quirk, is the only such transition on the spindle; all other shapes are separated by straight sections called fillets which are parallel to the axis.
10. The flat that ends the quarter round perpendicular to the axis is just that: a flat.
11. Cut into the maximum diameter of the ball (or ellipse) is a semi-circular bead. The difference between a bead and an astragal is now obvious – the bead is cut into the surface and an astragal (5) protrudes above it.
12. Topping the ball, a series of three fillets stair-stepped in reverse effects the transition to ogee.
13. Cyma reversa. Note the difference between shapes 4 and 13. With the large bulge below it is ogee, cyma-recta, and with the large bulge above it is ogee, cyma-reversa.
14. Cavetto, a semi-circular hollow. You might want to call this a cove which is a loose name for any hollow. If the hollow is semi-circular it is a cavetto; if it is elliptical it is a scotia.
15. A uniform series of three beads (it could be more than three) is called a reed. The spindle is topped (16) by another vertical, straight-sided section similar to the plinth at the bottom. However, because of its position at the top, it is called an abacus.

(Source: Jim Galbraith, American Association of Woodturners).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Typical lathe accessories

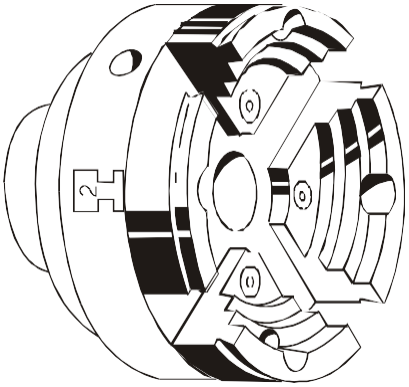
Headstock drives and faceplates

Chucks

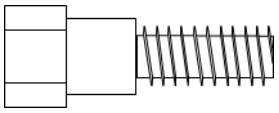
A scroll chuck or four-jaw chuck screws onto the headstock shaft and may be fitted with jaws of various sizes to grip prepared spigots or dovetails.

The chuck shown below is a ‘step jaw’ which will grip three different sized spigots or fit into one size of dovetail. Other jaws, with or without the steps, may be smaller or larger, or the distance the gripping surface protrudes from the body of the chuck may be greater.

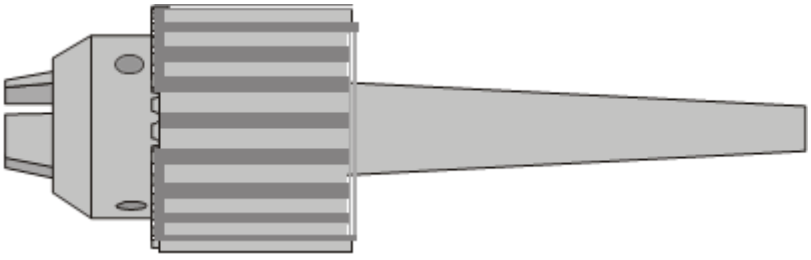
The chuck body is operated by bars or keys to turn the internal scroll and hence open or close the jaws.

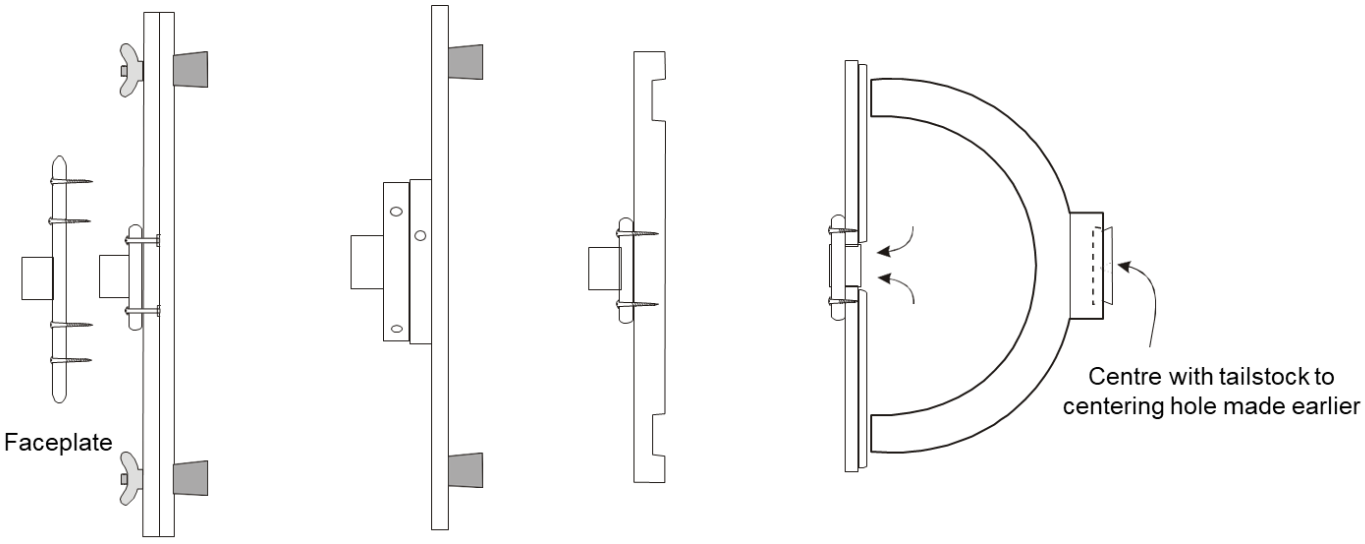


A screw chuck (left) can be held in a scroll chuck or in wood attached to a face plate. The wood to be turned is then mounted on the central screw. A spur drive (right) fits into the headstock shaft to turn wood held between it and the tailstock.



A Jacobs chuck can be fitted in the tailstock or headstock to hold drill bits or other tools.





Longworth chuck Grips inside or outside of rim

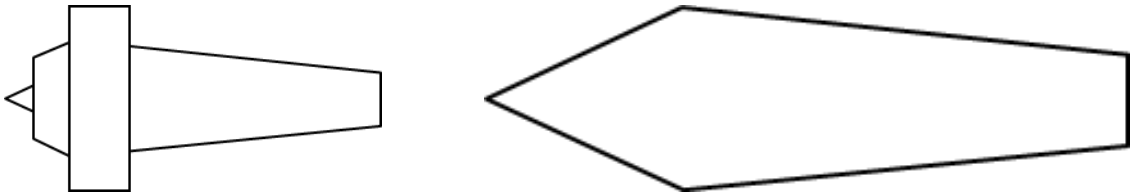
Cole jaws fit on a chuck and grip the inside or outside of rim

Jam chuck Turned to fit work. Used with tailstock

Vacuum chuck used with vacuum cleaner sucking through the centre of the faceplate

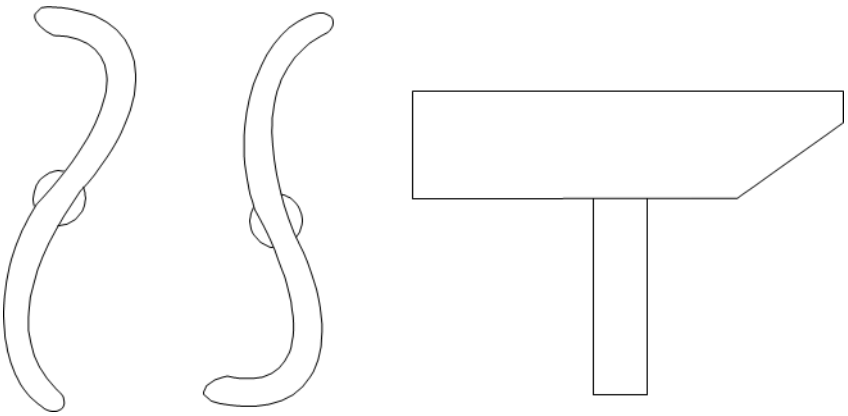
Tailstock

The tailstock may have a ‘live’, ball bearing mounted, centre (left) or ‘dead’ centre to hold the wood (right).



Rests

The ‘S’ shaped rest, or corner removed from a straight rest, can make working inside a bowl easier.

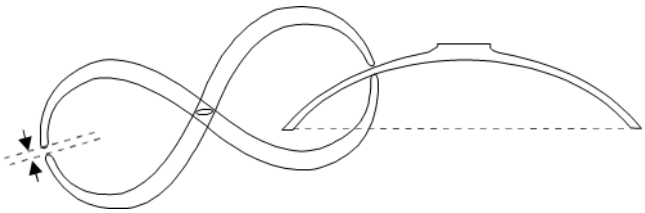


Measuring devices

For all woodturning we need to frequently measure the wood to know how far we have cut or how much more we need to cut. There is a considerable array of measuring devices available. The ones shown here can be made in most workshops.

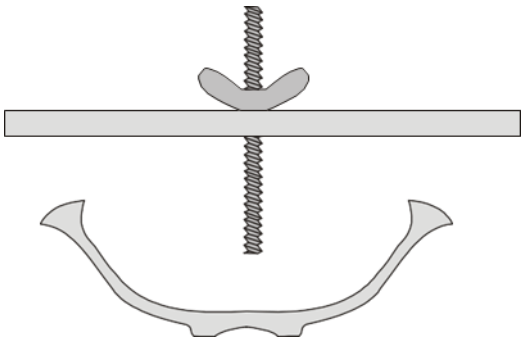
Thickness gauges

Figure-eight callipers are ideal for measuring the thickness of bowls and hollow forms. Different shapes along similar design lines can be made to measure wider or taller work.



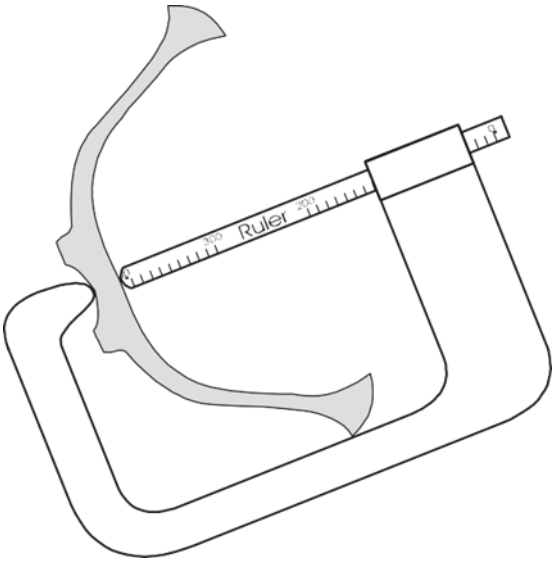
Bowl depth gauge

Set the threaded center rod to the desired depth of the bowl. Then hollow the bowl until the cross bar of the measurer just touches both sides of the bowl.



Thickness measurer

For deeper items or where an actual measurement is needed, a device like this can be useful. It is available in a variety of shapes.

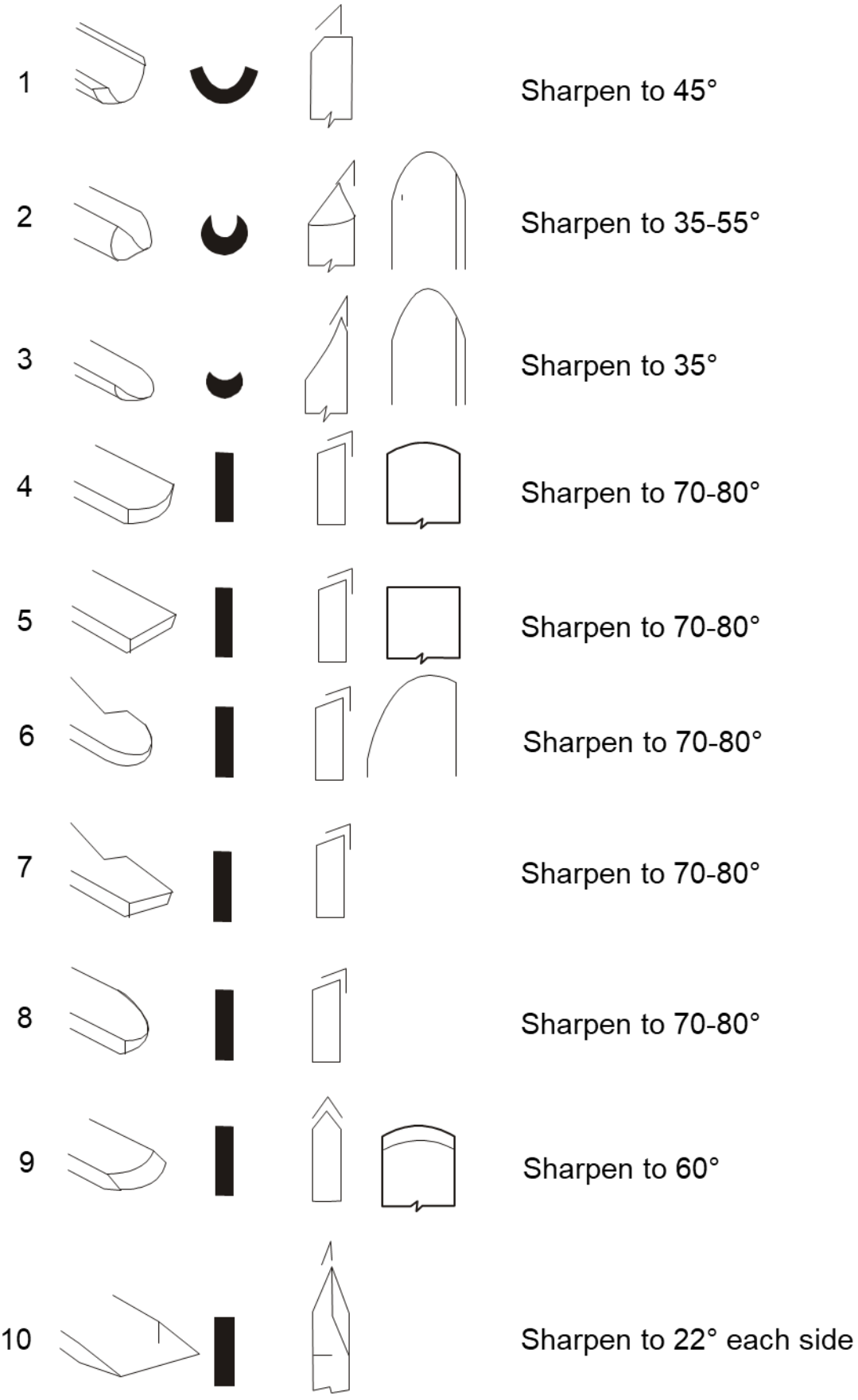


Tools

Gouges, chisels and scrapers

The descriptions below relate to the images on the next two pages.

1. Spindle Roughing gouge. An essential tool for between-centre work (spindle turning). This tool will quickly reduce square timber to the round. It is also ideal for long, shallow curves. Usually 25 mm or more in width.
2. Bowl gouge. Used on its side with the flute facing in the direction of the cut. With the bevel rubbing it is possible to obtain a smooth finish even on end grain. Usually 10 to 15 mm wide.
3. Spindle or Detail gouge. These are the main shaping tools of the spindle turner and are used for most detail work, beads, coves, ogees, etc. to which the modern round shape is particularly suited. Usually 5mm to 15mm wide.
4. Round nose scraper. Useful for finishing concave cuts and end grain hollowing. Also for larger sizes of bowls. Commonly 15mm to 25mm wide.
5. Square end scraper. For finishing outside of bowls, etc. The burr produced during grinding cuts a fine shaving. Width may vary from 10mm to 50mm.
6. Round side scraper. Excellent for boxes, goblets and undercutting.
7. Diamond side cut scraper. The nose angle of 85 degrees prevents both edges cuttingat the same time.
8. Bowl finishing inboard. Produces a fine clean finish. Also suitable for deep hollowing and shaping inside, or out if the bevel is reversed.
9. Negative rake scraper. Any of the scrapers shown above can be sharpened in this way.
10. Standard Skew or Smoothing Chisel. The skew will produce the finest possible finish when used correctly. For cleaning end grain, pummels, rolling beads, etc. when both long point and heel can be used. Width may vary from 20mm to 50mm.
11. Detail Chisel or Beading and Parting Tool. A versatile tool. When bevel rubbing will give an exceptionally good finish to beads and other spindle turning work. Width may vary from 10 mm to 15 mm.
12. Oval skew. The oval section slides smoothly along the tool rest. The lighter weight gives sensitivity for fine finishing. The cutting edge may be straight or curved and width may vary from 20mm to 25mm.
13. Hollowing Tools. Designed for end grain hollowing. Available in various forms with and without devices to control the depth of cut.
14. Beading Tool. Cuts perfect circular and semi-circular beads using a scraping action. This design can be made in many different sizes. The nose design permits multiple beads.
15. Captive Ring Cutter. Left side cutter shown, needs matching right side cutter as well. These will then cut perfect captive rings.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Sharpen to 45°
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Sharpen to 35-55°
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Sharpen to 35°
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Sharpen to 70-80°
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Sharpen to 70-80°
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Sharpen to 70-80°
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Sharpen to 70-80°
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Sharpen to 70-80°
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Sharpen to 60°
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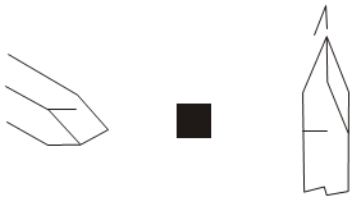
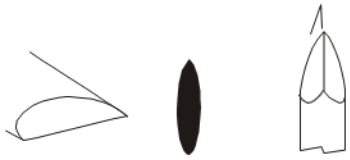
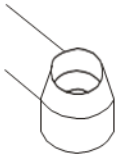
Sharpen to 22° each side

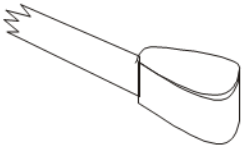
11 

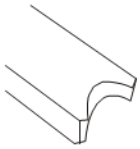
Sharpen to 22° each side

12 

Sharpen to 22° each side

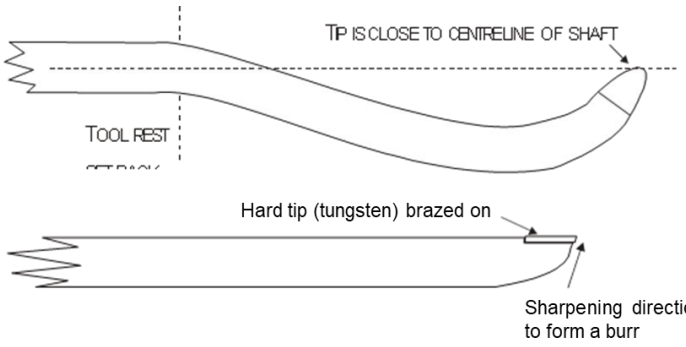
13 

14 

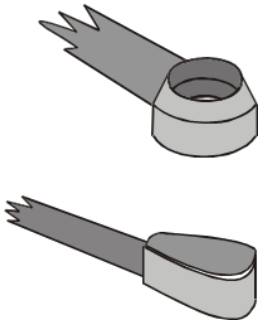
15 

Tools for hollow turning

The tool should gradually taper from the thickness of the shank to form a rounded fingernail shape approximately 4-5 mm across the tip. Too large a tip and the workload could be “heavy going”, too small a tip and the cut could become too “aggressive”.



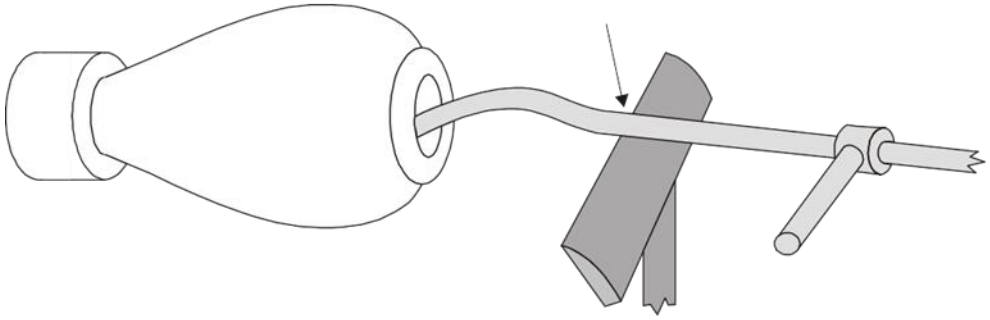
The tip may be a scraper (left) or a cutting edge as in a ring tool, or a cutting edge with a guard to control the depth of cut.



Good length handles are essential on these tools for better control, say 400-500 mm upwards dependent on shank thickness and size of the work the tool is to be used on.

There is a large range of hollowing tools available so look carefully, considering what you want to do and pick the tool that suits you and the job best.

With hook tools, the rest must be set back beyond the curve of the hook to prevent tool rotation.



A handle attached to the side prevents rotation and steadies the tool under load.

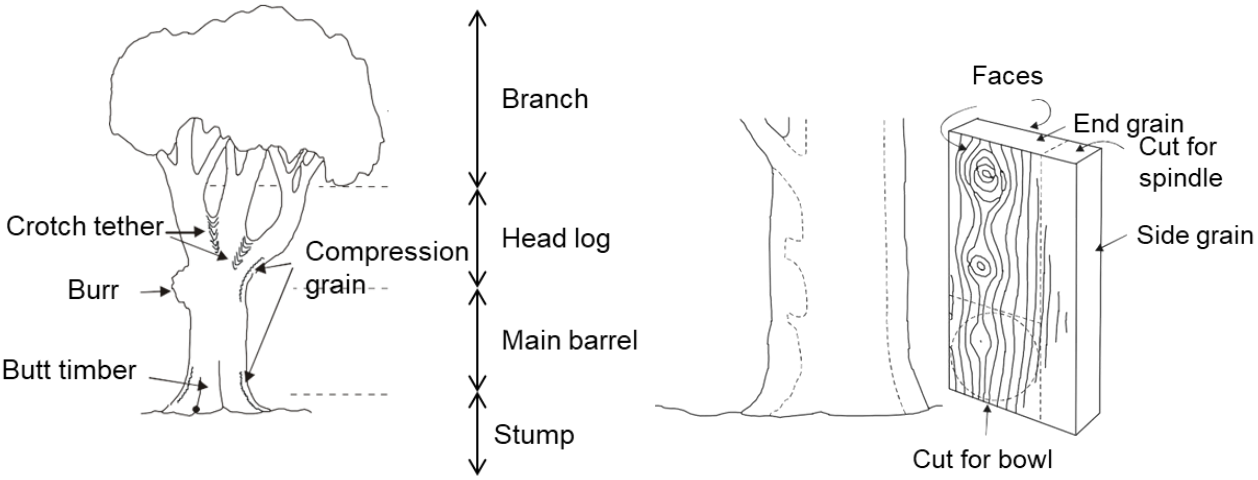
Turning principles

Grain direction

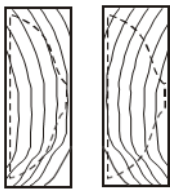
Spindle work is usually long and thin. The grain in the wood needs to run parallel to the bed of the lathe so that the finished piece will be strong.

Faceplate work such as bowls and platters will have the grain running across the bed of the lathe. The grain direction chosen will achieve different looking outcomes.

Wood for hollow forms may be mounted any way depending on the design of the work.



The faceplate turner can choose which side of the block will be the upper side of the bowl.



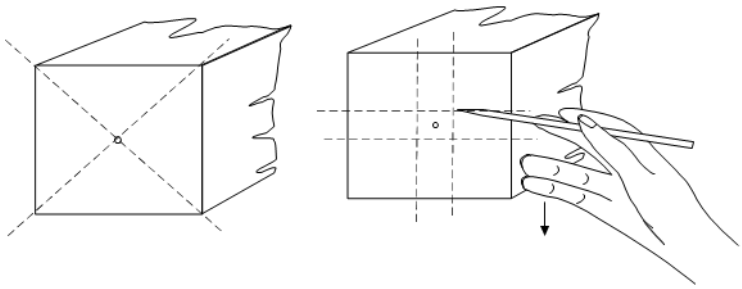
Mark the centres

Spindle turning

Where the timber is rectangular, rule lines diagonally from corner to corner to find the centre. The timber does not have to be square.

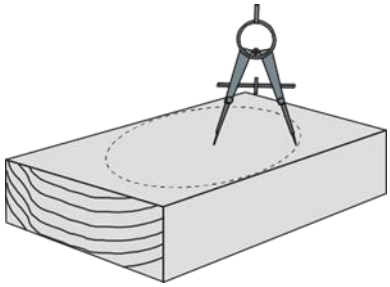
Once the centre is found, ‘punch’ the centre with a centre punch so that the spurs of both head and tail stocks can locate and lock in securely. Some hardwoods may have to be drilled to locate the centre spur or sawn to take the drive spurs.

Another method of marking the centre is to secure a pencil between your fingers and draw four lines as close to the centre as possible using your fingers as a guide along the four edges of the timber. The centre is easily located in the ‘box’ which is then ‘punched’.



Faceplate turning

For faceplate turning, keep the centre mark created when you made a circle for band sawing the blank.



Holding wood on a lathe

Drive spur and tailstock

This method enables easy balancing of the blank or obtaining the best features of the wood. The blank is positioned end grain between centres enabling access to shape both head and tail stock ends. Either end can be turned to a spigot shape and later held in a jaw chuck.

Securing timber between centres

Slide the tailstock along the lathe bed until the blank fits loosely between centres. Locate the centre of the blank onto the headstock spur. Bring up the tailstock until the tailstock centre locates the centre of the blank at the other end. Lock the tailstock to the bed with the lock down lever. Now wind in the tailstock shaft until both the headstock spur and tailstock centre fully engage in the timber. Secure the tailstock shaft lock down lever.

When mounting hardwoods, it may be necessary to drill location holes. If extra force is necessary to drive the spur into the wood, then do this with a wooden mallet while the blank is on the workbench.

NOTE before mounting a faceplate or chuck on a lathe, ensure that the spindle thread and flat face behind it is clean or debris there may push the faceplate offline.

Faceplate

The face plate is a holding device with a threaded sleeve that fits the headstock spindle. The plate lies flat against the flat surface of a blank, and normally four screws are fitted through the plate into the wood. The faceplate is a secure method to hold medium to large work pieces or where it is unsafe to use a spur drive and tailstock. A faceplate can be used for longer work such as goblets and vases but see the section “Holding Wood by One End” for more information on this.

To centre the plate quickly, turn a shaft to fit snugly inside the bore of the face plate, then drive a nail dead centre into one end. Locate the nail into the centre hole of the blank and drop the face plate down the shaft. The face plate is now centralised for drilling the screw holes.

Normal slotted woodscrews are quite adequate for attaching a faceplate providing they are large enough for the wood being turned. Woodscrews will normally require a hole to be drilled. Posi drive screws can be driven into the wood without pre-drilling. Hex-headed “tech” screws can be easier to use as they drill their own holes. Tech screws are stronger than most other screw types and will last through many re-uses.

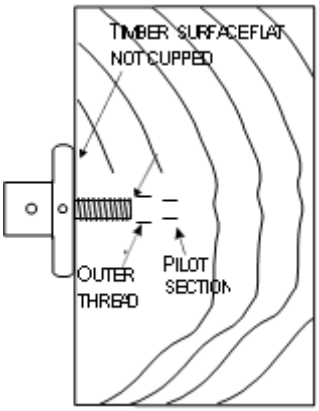
Always ensure that enough screws of sufficient length are used to ensure that the work remains securely attached to the lathe

Screw chuck

Some screw chucks are held and tightened in a four-jaw chuck while others screw directly onto the threaded headstock spindle.

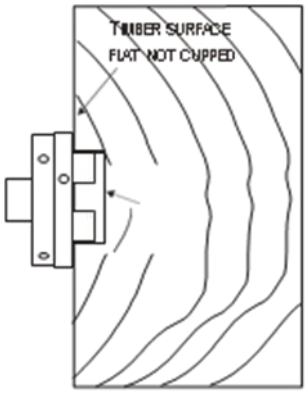
A screw chuck is suitable for small items where faceplate screw holes will show after turning. A screw chuck is not recommended for larger work.

A perpendicular hole is drilled in the centre of the blank with a drill the size of the pilot section of the screw on the screw chuck. At the chuck, the headstock is locked by engaging the index mechanism and the blank is then screwed on by hand until both flat surfaces of chuck and blank engage. Nip up, but don’t over-tighten.



Dovetail for jaw chuck

A dovetail should be created into which a jaw chuck can be expanded. Care needs to be taken to ensure that the hole size is correct for the chosen chuck and that the chuck is not over-tightened, or the wood may split off.



Jaw chucks

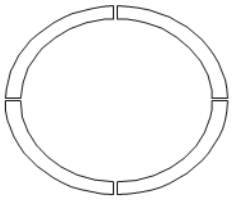
Jaw Chucks (scroll chucks) are ideal after the initial turning has been completed. In the early stages of turning of bowls and some spindle work the plan will be to hold the work by one end or side and some of these choices will be shown later in this book.

Use a chuck that suits the size of the work being done and to keep within the wood sizes and lathe speeds recommended by the chuck manufacturer. The following table is a guide, check the manufacturer's instructions for full details and other jaw sizes.

Jaw size (mm)	Bowl size (Ø x depth mm)	Spindle size (Ø x length mm)	Spigot size (min – max mm)	Maximum speed (rpm)
25	150 x 50	25 x 125	8.5 – 32	1440
50	310 x 100	100 x 150	45 – 65	1020
100	360 x 127	130 x 150	84 – 92	684
130	750 x 75	160 x 150	107 – 130	400

Chuck jaws are made as a circle and thus get the best grip on a round piece of wood, in either spigot or dovetail mode, when they are returned to being a circle, i.e. when there is about a 2 mm gap between the jaws.

When the jaws are expanded, they grip a spigot at only 8 points and hit the inside of a dovetail at just 4 points.



Jaws almost closed

Holding wood by one end

Before starting your work, you must decide how you want it to be held later to finish the outside or hollow out the inside. Some spindle work may remain between centres with each end hand finished after parting off. Spindle work such as goblets and egg cups will need to be held by one end. Faceplate work needs to be held by one face while the other side is nicely finished. You can continue to hold the work on a faceplate, or a better choice is usually a spigot or dovetail gripped by a jaw chuck as shown here. After completion of part of the work you can use a jam chuck as shown later in this book. You need to decide early in the turning process what the form or shape the work will be, how wide a foot you want and how the foot will be hidden or removed later.

NOTE - all methods of holding wood by one end can be fragile. Whenever possible, bring up the tailstock for added security. Use the largest chuck or faceplate possible and make gentle cuts.

Faceplate

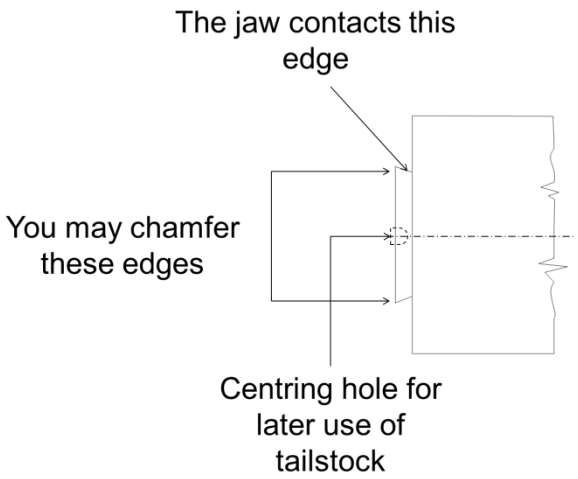
A faceplate can be used for hollow forms, vases, and the like. Usually these will require the faceplate to be screwed to end grain. Be sure to use screws that are long enough.

Spigot

The spigot on a bowl blank, or other cross-grain work, is formed with either a parting tool or skew chisel laid over on its side. Mark the required width to take the jaws of a chuck then with the parting tool on the rest, raise the handle and push it in to a depth of 5-6 mm. If using the skew chisel, lay the skew on its side on the rest then push it in gently and slightly angled towards centre a short way then, locking the skew on the rest, arc it away from the spigot out into air. Go in this way till the required depth is reached.

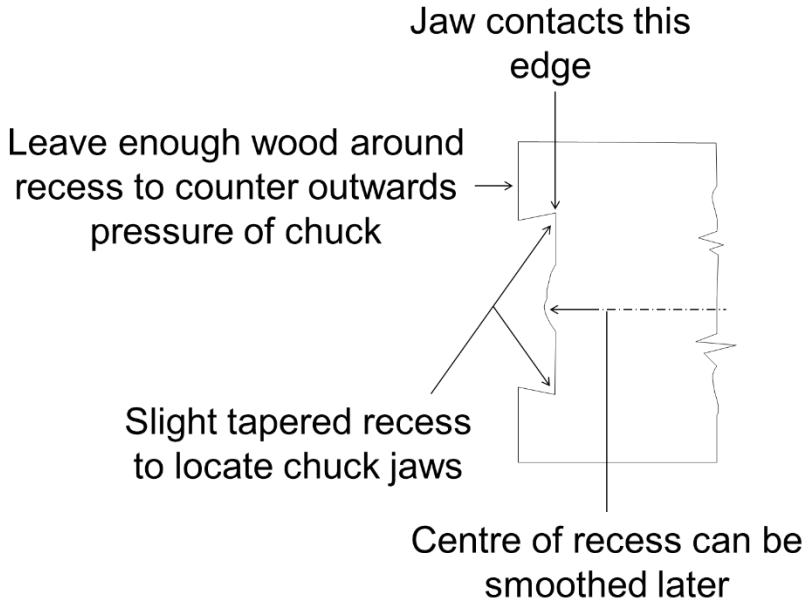
If using the gouge, start from the outside edge and cut towards the spigot, however, before reaching the foot of the spigot, rotate the gouge fully onto its side so that the tip only reaches the corner with wings clear. Form a small hole in the centre of the spigot with a gouge or the high point of the skew to centre the tailstock on later.

A spigot on long-grain spindle style work such as goblets, vases and hollow forms should be long and straight for gripping in power jaws.



Dovetail

A dovetail must be wide enough to take the expanding jaws of a chuck. The recess is formed with a parting tool or skew chisel on its side and can be finished off with a skew, small gouge or scraper. You may leave a small knob in the centre with a hole in the middle to centre the tailstock on later. This method is not recommended for long-grain spindle style work. Do not over-tighten the chuck and be aware of soft straight grain timbers that split easily.



Preparing to turn

Safety check

Before starting the lathe, carry out a quick safety check:

- Rotate the work 360° by hand to ensure there are no catches – headstock spur and tailstock centre are well engaged into the wood.
- Lock down levers to ensure the tailstock isn't going to move along the bed - tool rest locked down, levers tight.
- Apply all necessary safety gear.
- Check your stance is right.
- Check people are clear of your work area
- Check your work area is clear with no debris or tools on the floor
- Check the sharpness of your tools and set your rests.
- Switch on - check in your mind what you plan to do - you're on your way.

Setting the tool rest

With the lathe off, set the rest so that the longest corner of the revolving wood will just clear it. The height of the rest should be set slightly below the centre of the blank. Secure all lock down levers.

The work is then rotated by hand 360□ to ensure there is no contact between timber and rest. This should always be done when the blank is still in its irregular shape and is also recommended as standard practice after each reset of the tool rest.

Once the roughing out process has started the rest should be adjusted closer to the work when the gap between timber and rest widens. Always stop the lathe before adjusting the tool rest.

Lathe speed

Always check the lathe speed before roughing out a blank. Start at a low or medium speed which can be increased when the work becomes balanced. As a general rule, keep the lathe speed up to the fastest you feel comfortable with.

Before starting the lathe, carry out a quick safety check.

Rotate the work 360° by hand to ensure there are no catches – headstock spur and tailstock centre are well engaged into the wood. Lock down levers are tight to ensure the tailstock isn't going to move along the bed - tool rest locked down, levers tight - safety gear worn - your stance is right - people clear of the work area – no debris or tools on the floor – tools sharp. Switch on - check in your mind what you plan to do - you're on your way.

Body movement, feet and balance

Stance and balance are important when placing your feet in relation to the item being turned. Once your feet are planted it is just as important not to move them during the turning process.

The reason for this is while your concentration is focused on guiding the cutting edge of the tool, your body is automatically moving your torso pivoting from the hips. Your thigh, knees, arms, wrists and hands are constantly changing direction, while your fingers are pushing, pulling and guiding the cutting edge.

If you move just one foot off the floor, this disruption to your balance will have an effect on the cutting edge and the work may be ruined by a dig-in. So, position yourself to ensure that this will not be necessary.

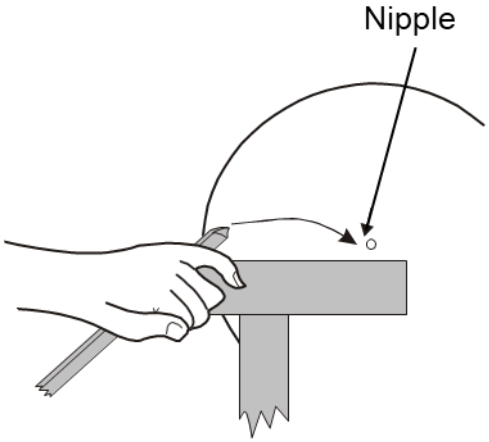
When transferring weight from one foot to the other, the heel of one foot at a time may be raised but the ball of the same foot must remain on the floor. The other foot should remain flat on the floor. Your body is an extension of the tool and with practice your body will move with the handle and cutting edge.

Holding woodturning tools

Basically, the wrist, palm, thumb and fingers of the left-hand guides, manoeuvres and directs the cutting edge to where you want it to go. The right-hand controls and helps to lift, lower, rotate and manoeuvre the handle. Keep the handle of the tool against your body for added stability.

Both hands and body position maintain the controlled direction and travel of the cutting edge. The tool is held firmly but without white knuckles. A gentle relaxed touch allows the tool its own speed of travel and enables you to be sensitive to the quality of the cut.

The “tied underhand” grip can be used for turning fine details, usually on spindle work. Hold your left-hand palm up with the index finger crooked under the tool rest. Hold the chisel shaft between thumb and second finger. This may feel awkward at first, and may need a narrower tool rest, but gives excellent control for small gouge movements.



Tool rests parallel with face

Tool chatter

Chatter occurs when the chisel vibrates and does not cut smoothly. Bumps, like corrugations in a metal road, will be cut – called “chatter marks” – which may look decorative or disastrous. The cause of the chisel vibration may be your hand, your tools flexing, your machinery moving or the piece of wood challenging you.

A number of basic moves will reduce the chances of chatter occurring: your lathe must be solid and secure so that it will not vibrate; shaft bearings must have no slop; the tool rest must be solid; secure the tool rest so that the post is not unnecessarily distant from the lathe bed; try not to work at the extremity of a long tool rest; have the tool rest as close as possible to your work; have a sharp chisel; always rub the bevel; slow the progress of the tool; relax your grip.

A possible cause is a hard patch in the wood. First, and always, sharpen your chisel again. Make a fresh cut on your work, starting on the smooth surface beyond the chatter area.

Make a fine, but firmly held, cut into the chatter area. Part way over the chatter area the chatter may begin again. Go back to the smooth area and start again. If this does not work, try another chisel for a finer cut or change from chisel to scraper.

If, however, the cause of the chatter is the wood flexing, such as on a thin-walled item, then there may be less that you can do. Again, sharpen your chisel or change to a smaller one for a finer cut. Support a thin wall with one hand while cutting with the other.

Changing the lathe speed may help but a thin-walled item may not have spare wood for another cut – consider how to use, decorate or enhance the chatter area with other techniques.

Spindle turning

Spindle turning is the process where wood is held between centres then ‘rough turned’ to a cylinder using a spindle roughing gouge. The grain of the wood is usually along the long axis of the work which is between the centres of the lathe. From then on, the cylinder is worked to the desired shape using the various spindle turning tools available, i.e. skew chisel, parting tool, beading or spindle gouge.

Selecting the timber

The timber is normally milled square but can be in the round. Check the timber for cracks, decay, splinters, knots, grain direction, aged or green wood. Note whether the timber is a soft or hardwood, and any irregularities that may hinder or enhance the turning.

Roughing out

On a rotating square section of wood, the roughing out process is a hit and miss action to take off the four corners before the square blank becomes a cylinder. The cylinder can be seen quite clearly as the blank rotates. Outside the cylinder are the four corners to be removed and these can be seen as a ‘partial’ or ‘translucent’ shadow. Look at the top of the shadow to see the line that is followed when roughing out.

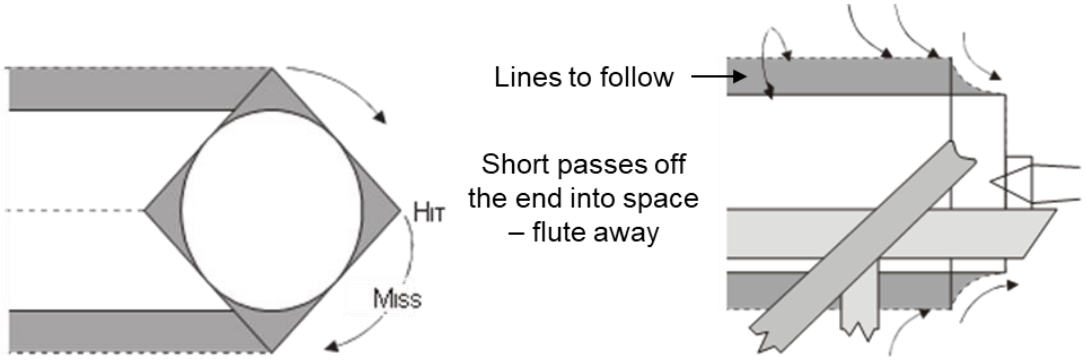
The tool rest is just below the mid-height of the wood. The idea is to cut away the corners of the blank making short passes until the diameter of the cylinder is reached over its full length.

Using the overhand grip, place the gouge on the tool rest square on to the blank and close to the right- hand end with the cutting edge just clear of the rotating work. Slowly raise the handle to engage the tip of the gouge with the wood fibres. Rotate the gouge clockwise to flute the shavings away, continuing the movement off the end of the blank into space. Continue making short passes until the diameter of the cylinder is reached over this short part at the right-hand end.

The blank can now be roughed out with similar short left to right passes working back towards the headstock. The short passes are to ensure long splinters can’t fly off.

When you approach the headstock end, stop approximately 50 mm from the end. Reverse the procedure described above, working back from the left-hand end to the rounded section. Make several passes full length until the diameter is even throughout and all flat areas removed.

Frequently check that the pressure applied by the tailstock spur has not loosened during turning, if so, stop the lathe, loosen the shaft lever and tighten the tailstock wheel and lock down again.



Tool rest

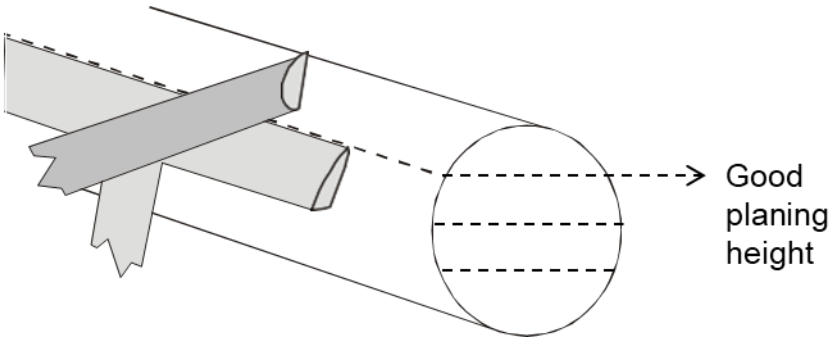
Once the cylinder has been formed, the tool rest is brought close to the wood and raised to about a quarter radius below the top of the cylinder. This provides a good planing height and better control of the planing cut at the top of the cylinder.

Reset the rest close to the work as the diameter is reduced, to maintain good tool control.

Holding the skew chisel

Once the blank is turned to a cylinder, the skew chisel, which is a finishing tool, comes into action. It is used to plane the desired profile you want. It provides a clean smooth surface that needs little sanding if at all. The straight or curved cutting edge allows a 45° presentation to the wood surface with the handle almost at right angles to the work.

To plane the wood surface of the cylinder the overhand grip is used by placing your left palm over the blade which is lying flat on the tool rest. An added support is to rest the heel of your hand against or on top of the rest, to steady the planing action.



Keep your elbows tucked close to your sides and you will find that your whole body will move with the cutting edge. Position the top edge (high point) of the blade at the junction where your palm and fingers meet, then curl the end of your fingers around with the thumb also on top of the chisel. The right hand should grip the handle firmly but without white knuckles. The position of your right hand will vary between the middle and outer end of the handle and with practice you will find the position that suits you best.

However, better control of the cutting edge is achieved by gripping the handle fairly high and almost directly behind the left hand with the remainder of the handle tucked under your forearm. By keeping the tool rest close to the work at all times, this grip maintains a steady and controlled planing and cutting action.

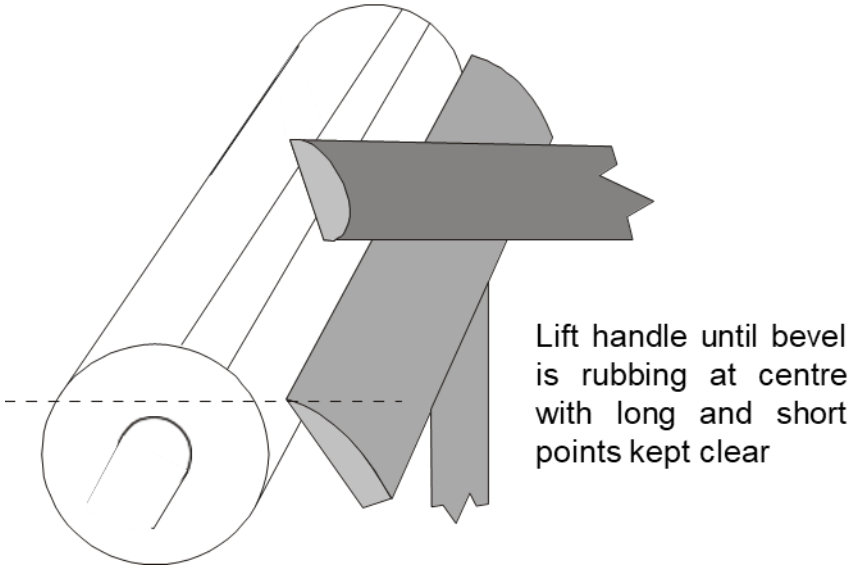
Making contact with the wood

Present the cutting edge to the cylinder at 45° with the blade lying flat on the tool rest. Initial contact is made with the rotating cylinder by gently raising the handle until the bevel only is rubbing on the wood at its centre and the cutting edge is kept clear.

Contact is made with the centre of the cutting edge by again gently raising the handle at the same time slightly rotating the blade counter clock- wise (as shown below) until a shaving is obtained (or clockwise if working from left to right).

Hold the shaving stationary for just a moment, then move the skew towards the direction of travel keeping the shaving on the edge and the bevel rubbing - keep both corners of the blade clear of the wood. Be careful of ‘dig ins’ at the high point. Allow the cutting edge to regulate its own travelling speed and always keep the handle behind the cutting edge in the direction of travel. To go beyond this point may result in a ‘kick back’ and will damage your good work.

Start planing from halfway towards one end. Then reverse cut starting at halfway again but working towards the other end.



Turning a bead

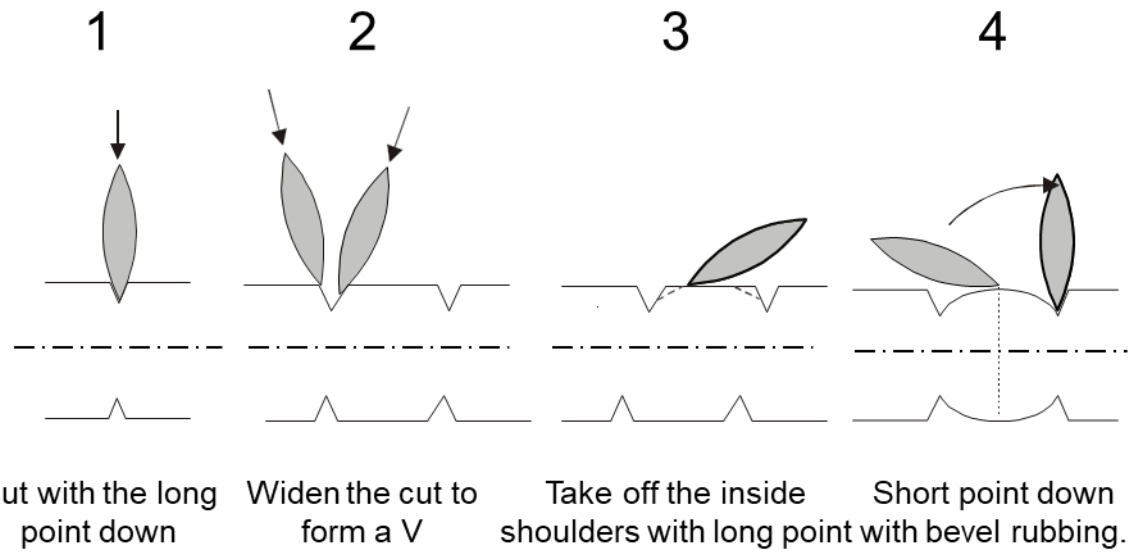
Using a pencil, mark three evenly spaced lines along the cylinder approximately 15 mm apart. Do this with the cylinder rotating. The two outer lines will be the lines to cut while the centre line remains as a centre guide line to work from. The tool rest should be set just above centre with the blade on its edge on the rest, long point down, curl your fingers below and around the blade with your thumb along the top edge. Hold the handle about halfway with your other hand.

Starting at one of the outer lines, hold the long point square on to the cylinder and clear of the rotating wood. Now raise the handle fairly quickly to make a slicing cut into the wood fibres then, just as quickly withdraw the chisel point. Do not push the long point straight into the fibres as you are forcing the fibres apart and heat created at the end of the chisel will burn the fibres.

The next stage is to widen and deepen the initial cut to form a ‘vee’. With the long point downwards, make two cuts approximately 1-2 mm on both sides of the initial cut, but this time with the blade turned slightly inwards to the centre to form the ‘vee’. Form the same size ‘vee’ on the other outer line.

To initially form the bead, gently take off the two inside shoulders of both ‘vees’ using the long point and the blade tilted about 45 degrees. Removing the shoulders provides a better formed contour to follow when completing the full bead. The cut should be a rolling action.

To complete the bead, lay the blade flat on the tool rest. This time, use the short point of the chisel, long point upwards. Starting at the centre line apply the same technique as for planing by raising the handle until the bevel is rubbing, then gently raise the handle further at the same time rotating the blade, till the lower cutting edge holds the shaving on the line. Pause for a split second, then follow the contour by keeping the shaving on the cutting edge and rolling the cut all the way to the bottom of the ‘vee’ until the blade is vertical. Complete the other half of the bead and the full bead is formed.



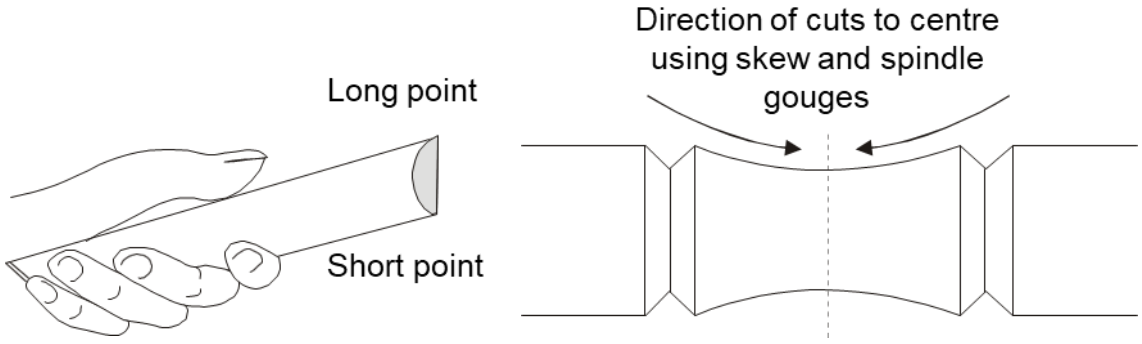
The grip

If using the underhand grip, it is easier to control the cutting edge with your thumb and fingers and if you are able to ‘hook’ onto the tool rest with your first or second finger a more stable and controlled cut can be made. Always ensure the handle never crosses that imaginary line at right angles to the work in the direction of travel otherwise a ‘kickback’ may result, spoiling your work.

Turning a cove or hollow

Using the skew tool

With the short point down, form three ‘vees’ approximately 40 mm apart with the centre ‘vee’ roughly 10 mm deep. At the centre ‘vee’, remove the shoulder on one side. Each successive cut starts further outwards with the skew blade laid over on its side using a scooping action. The centre edge of the skew is used with the bevel rubbing. Now do the other side. Then alternate from one side to the other always working from the outer ‘vees’ into the centre until the required depth is reached. The hardest part is marrying the centre portion without leaving a ridge, but by slowing down the cut and a gentle touch this is soon overcome with plenty of practice. Do not form the complete cove from one direction only as on the rising side you will be cutting into the end grain on one side and are likely to have a poor finish or a ‘kickback’.



Using the spindle gouge tool

The spindle gouge is fingernail shaped and is designed to form coves. The cutting edges on both sides do most of the shaping and a good finish is achieved with the bevel rubbing. The first step is to mark out the width of the cove then at the centre make a deep cut using a parting tool, or, with the gouge placed high up on the rest, on its side. Lift the handle and arc the cutting edge into the wood fibres on one side of the centre line and at a slight angle, doing the same on the other side of the line. This will give you an initial vee cut to work from. Widen and deepen the cut more.

You can now make some sweeping cuts working from the outside to the centre on both sides of the depth cut. The gouge is now laid on its side with the inside hollow facing the depth cut. Lift the handle and pierce the wood near the nose of the cutting edge and roll the cut towards the centre. The cutting edge now shifts from the nose to the side cutting edge and at the centre of the cove the shallow flute should now be facing upwards. The rolling cuts achieve the rounded and hollow shape you want. Always cut from a large diameter to a smaller diameter. The outer width marks of a wide cove are better cut with the skew chisel. Narrow coves should be cut with a spindle gouge.

The process of turning a bowl

Practice with green wood – this helps to keep tools sharp. Eyeball the prepared round blank for best features, cracks, knots and if sound, centre and screw on a face plate, attach it to the headstock spindle and tighten securely. This is important, for if loose, the sudden start of the lathe will freeze the face plate to the spindle, and it will be hard to remove.

Turning the edge of the disc

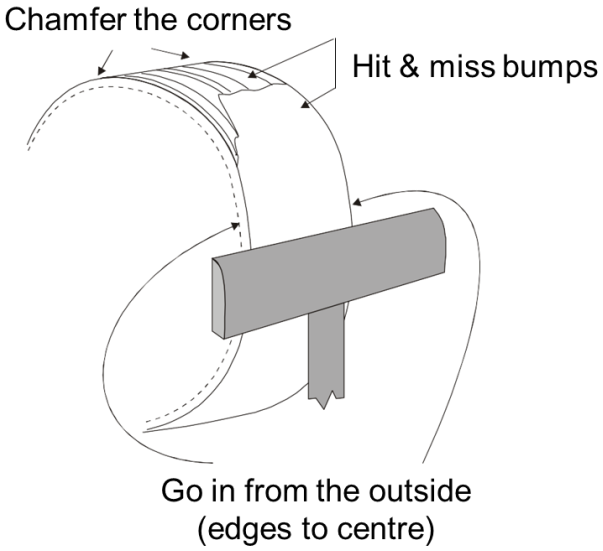
This is not necessary if the blank has been milled to a near perfect circle; however, if there is a need, set the tool rest across the edge just below centre so that the edge of the gouge will contact about centre and the handle of the gouge is comfortably just below hip level.

Rotate the disc 360° by hand to ensure there are no catches between the wood and tool rest then lock down. There will be some vibration when you start the lathe so ensure the lathe speed is set low – 750-1000 rpm.

Using the overhand grip with the handle low down, make several passes without cutting to get the 'feel' of things then slowly raise the handle until fine shavings appear at the edge. The gouge should be well over on its side with the flute facing and angled in the direction of travel. The tip of the gouge will initially break the wood and once engaged the cut is between the tip and a portion of the lower edge. As you guide the gouge across the face, a certain amount of bumping will occur because of the irregular and unbalanced wood.

Stop the lathe and look where the hit and miss spots are to give you an indication how much is to come off before the 'true' cylinder is reached. To remove splitting grain at the extreme edges, cut in from both edges towards centre (opposite to the action for spindle turning). This cut starts outside the edge by locking the gouge with your palm on the tool rest and slowly raising the handle to arc the tip into the wood then continuing the travel with bevel rubbing. The handle should be tucked into your side low down and your body should move with the cut.

The next stage is to chamfer both edges to avoid cuts to the hand. This is done starting outside the edge again then arcing the cutting edge across the corner and rolling the gouge off into space.

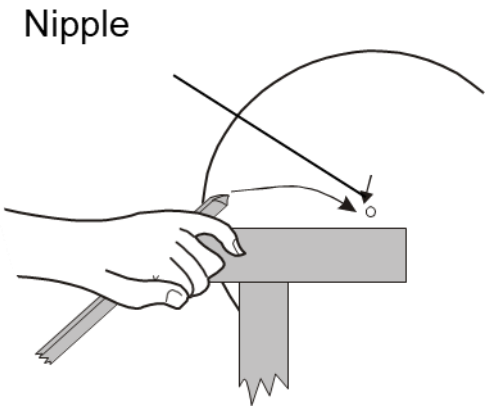


Truing the face

Bring the tool rest square on, close to and just below centre so that the gouge's cutting edge will slice across and into the centre and the handle of the gouge is comfortably just below hip level. Rotate the wood 360° by hand to ensure no catches between the face and tool rest. When the lathe is turned on, the centre is easily seen.

Start with gentle cuts from the edge towards the centre until there is enough flat surface to rub the bevel. Continue with shallow cuts until the surface is flat. Stop the lathe for frequent checks. Adjust the tool rest close to the work while the lathe is stopped.

Tool rests parallel with face. Forearm locked, palm resting on tool while fingers push, pull and maneuvre the cutting edge.

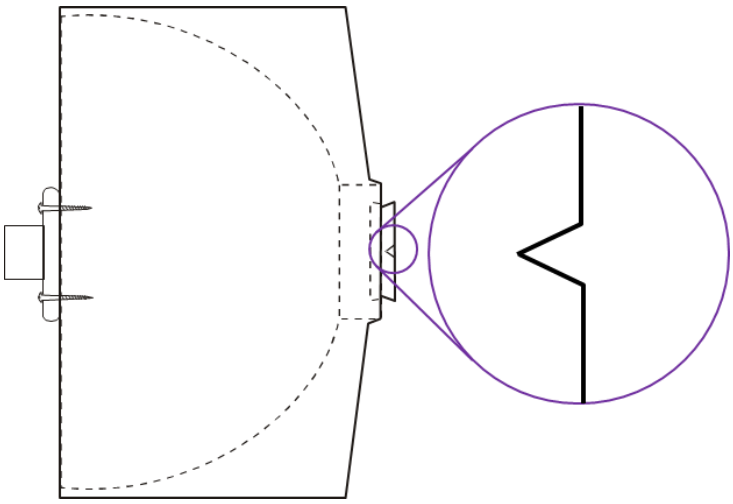


Plan the bowl

With the edge and face now clean and smooth it is easier to plan the bowl shape and choose the size of the foot.

Cut the approximate foot line and a spigot (or dovetail) for later re-mounting on a chuck.

Make a small dimple in the centre of the foot to assist with final re-mounting to clean off the foot of the bowl.



Turning the bottom

Cut in a downhill direction using an angled slicing cut with, and across grain.

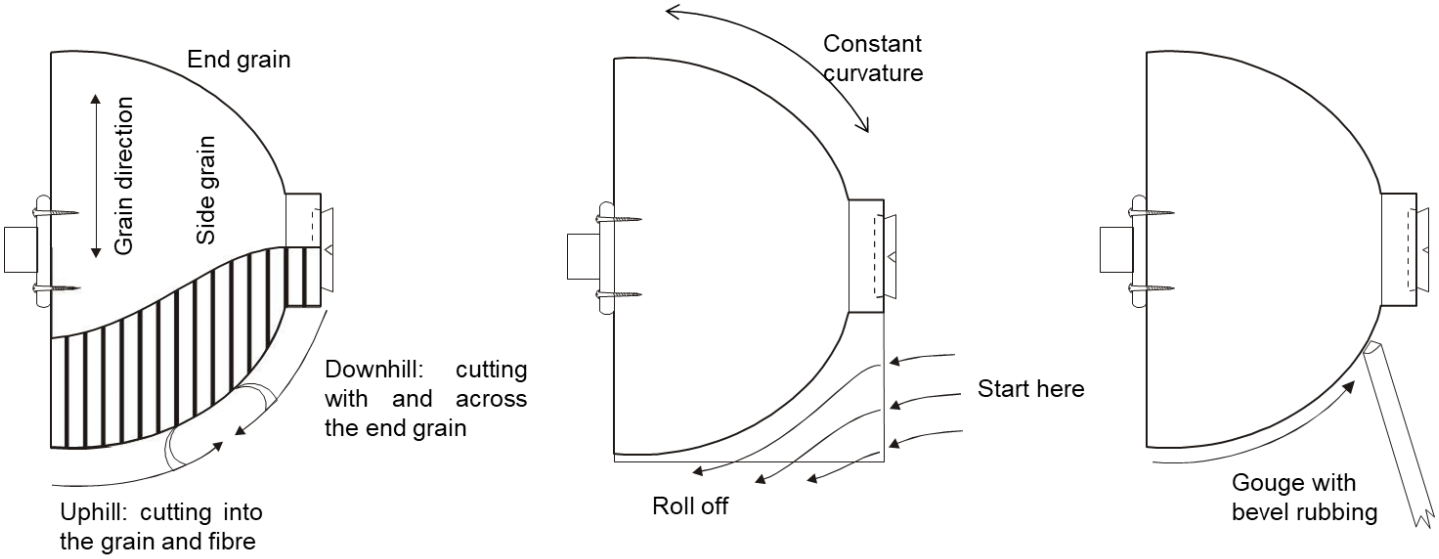
Although you can cut in an uphill direction, the cut is into the wood fibres and the result of the cut will always be rougher than a downhill cut.

Using the overhand grip, the handle of the gouge is held low and tucked into your side. Lay the gouge over on its side with the flute facing the direction of travel and commence with the light cuts across the corner of the outside edge. Near the end of each cut roll the cutting edge off into space. Rub the bevel with each progressing cut to shape the desired form. Keep moving the tool rest around and close to the wood surface as you go.

The edge of the foot can be started with the skew to form a small lip to start the gouge against. The gouge is laid on its side then the tip arced into the wood, bevel rubbing. The gouge is locked at the rest and then arced away from the foot with a slicing cut. Follow this line till the required depth is reached then marry the foot with the curvature of the base.

Finishing cuts are made by honing up the gouge, stepping up the speed a bit then taking the cuts slowly, concentrating on keeping the shaving continuous and bevel rubbing.

An uphill cut using a push action, working from outside edge to centre, can be more comfortable for the turner but is against the grain and will leave a very rough finish. The cut from the outside edge should be an arc to the centre with the bevel rubbing all the way.



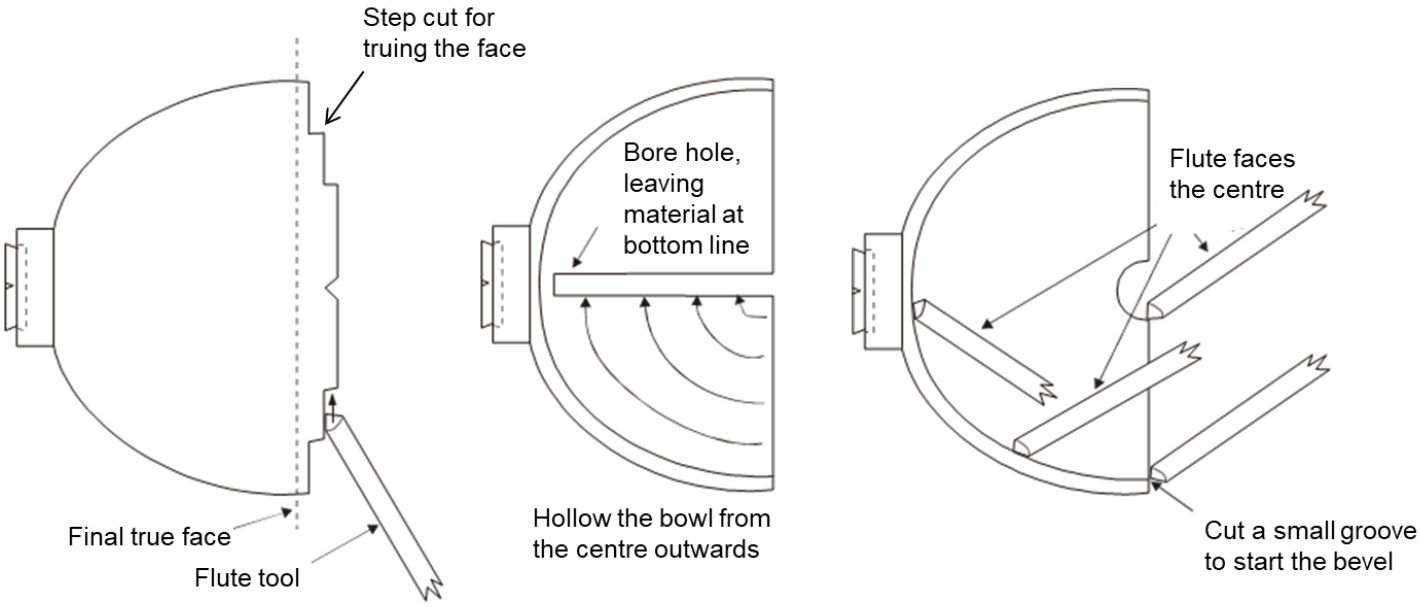
Hollowing the middle

Reverse the bowl and re-mount it as you decided earlier. Set the tool rest just below centre and rotate the work 360° by hand to ensure there are no catches.

Switch on. If the work is not rotating true switch off, bring up the tail stock to the centre mark made earlier and apply a little pressure. Now loosen the chuck jaws to ‘pop’ the face of the chuck against the face of the wood surface. Re-tighten the chuck again and slide back the tailstock.

Use shallow step cuts to true the face by laying the flute inwards on the side towards the wood making short step cuts starting at the edge to centre. Once the bumps are removed, dress the face.

You may make a hole in the centre to a pre-determined depth which will be the inside depth of the bowl. Mark this depth with tape on the drill or spindle gouge which will act as an auger to bore the hole. Start to the left of centre then push the gouge into the centre. Take a second bite and then firmly push the gouge straight into the wood. Clean the flute after each push till you reach the depth mark.

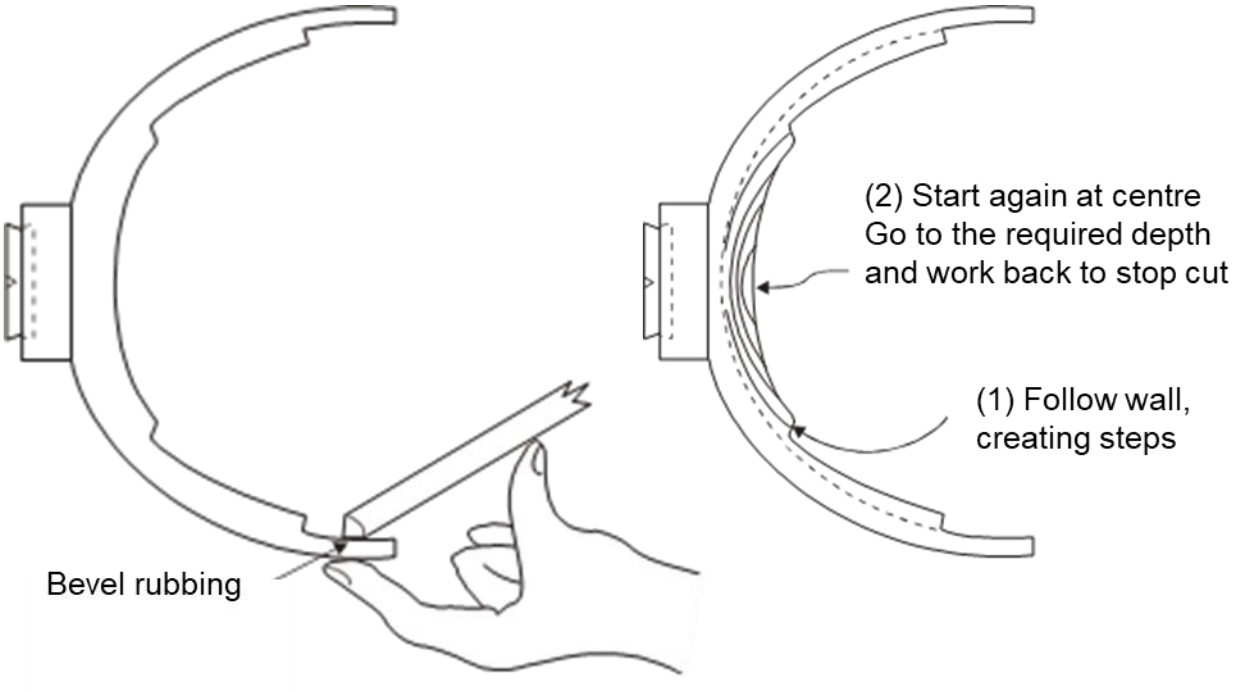


Another method, particularly for thin-walled bowls, is to use your thumb to guide the gouge and your index finger to steady the outside of the rim with handle canted over to the right, flute on its side and bevel parallel to wall. The rim itself and the first 50mm should be completed while the rest of the wall is still thick.

If you encounter difficulty at the centre of the bowl, follow the wall then stop about a third of the way down. Start at the centre again with short light cuts just as you did when you first started hollowing the bowl. Then finish with a sweeping cut to centre.

Work from small to large diameter when working on the outside of a bowl.

Work from large to small diameter when working on the inside of a bowl.

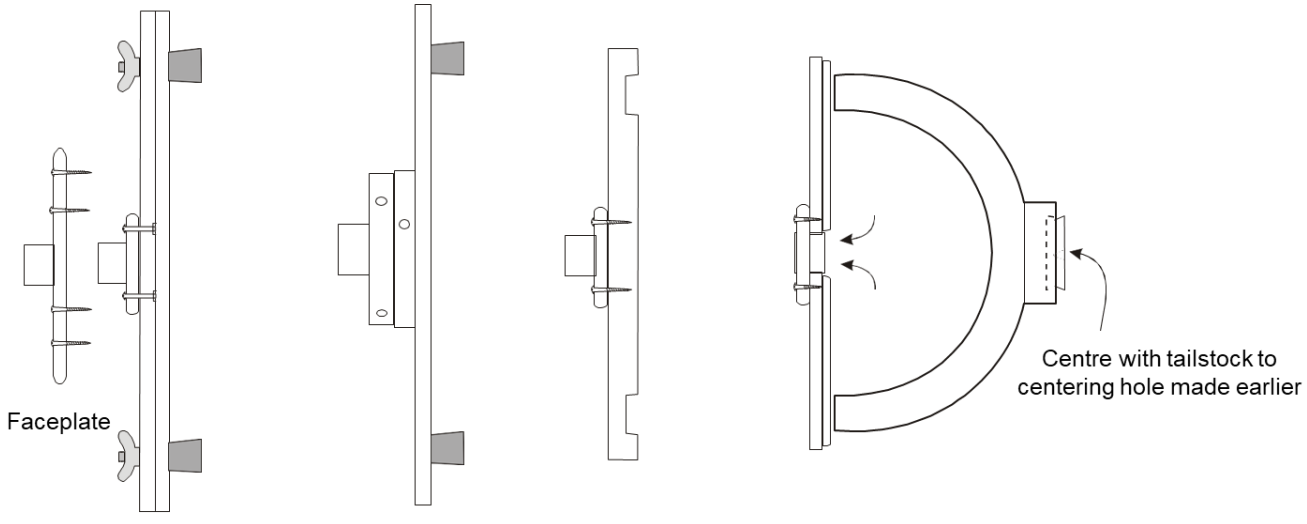


Cleaning the bottom

To enable finishing of the underside of the bowl, turn it over and re-mount it on a Longworth chuck, Cole jaw, jam chuck, or vacuum chuck.

Use the dimple you made earlier to help centre the bowl on these chucks. Then bring up the tailstock for added security.

Gently cut the foot of the bowl to a nice shape. Use a straight edge to ensure that the base is slightly concave and the finished bowl will not wobble on the table.



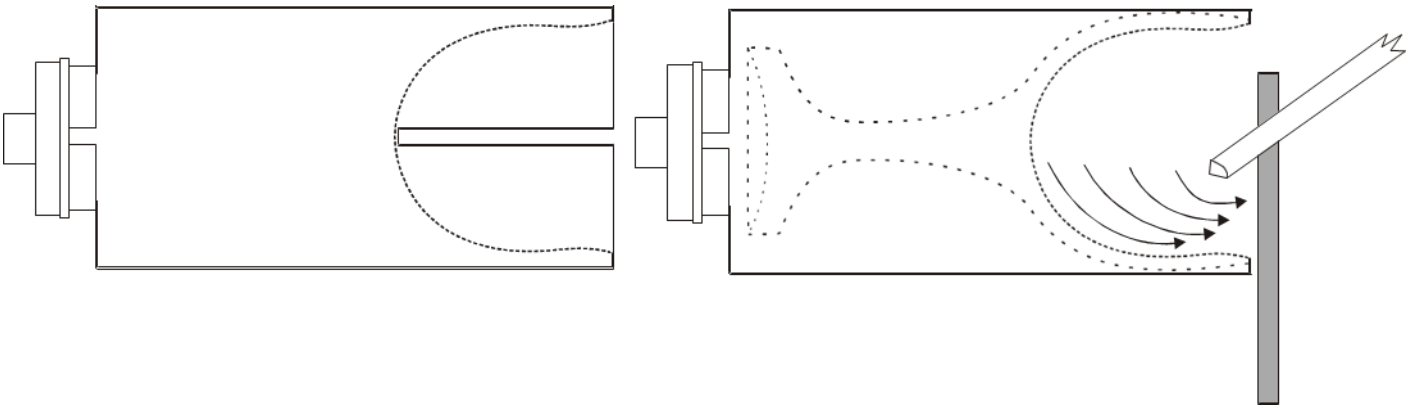
End-grain hollowing

For goblets, egg cups, lidded boxes, and similar items, it is necessary to cut a wide- mouthed hollow in end grain. Techniques and tools are different from those used for cross-grain bowl turning and a little different from those used for enclosed hollow forms.

Mount the work held by one end. If the work is large use deep spigot jaws. Keep the tailstock up to the wood until it is round and balanced.

True up the tailstock end surface. You may drill a hole down to the depth of the planned hollow.

Position the tool rest parallel to the end of the work. Remove the wood from the centre outwards so that each cut is “downhill” in relation to the grain direction. If a gouge is being used position the tool rest below centre and cut at about centre height. If a scraper is used set the tool rest at or above centre height and cut above the centre line.



The scraper

Most wood removal is done using gouges, scrapers being reserved for cases where a good surface cannot be achieved with the gouge. This might be when the timber is very hard, the grain is contorted, or tool access is awkward.

Scrapers can be curved, square, or shaped to achieve specific profiles. The following description is for a round-nosed scraper used in an end-grain hollow or the inside of a bowl. Use the largest scraper available for this work. Position the tool rest so that the scraper will contact the surface of the wood just above centre. If the scraper catches in the wood at this position it has room to swing down and away from the wood surface. Only the sharp edge of the scraper contacts the wood surface – scrapers are an exception to the “rub the bevel” rule.

Hold the scraper flat (not tipped to either side) on the tool rest, and gently bring the edge to the wood. Cut “downhill”. This means cutting from the centre outwards in end-grain hollowing and in towards the centre when scraping inside a bowl. Initially it is safer to swing the scraper by pivoting it on the tool rest rather than trying to slide the whole tool.

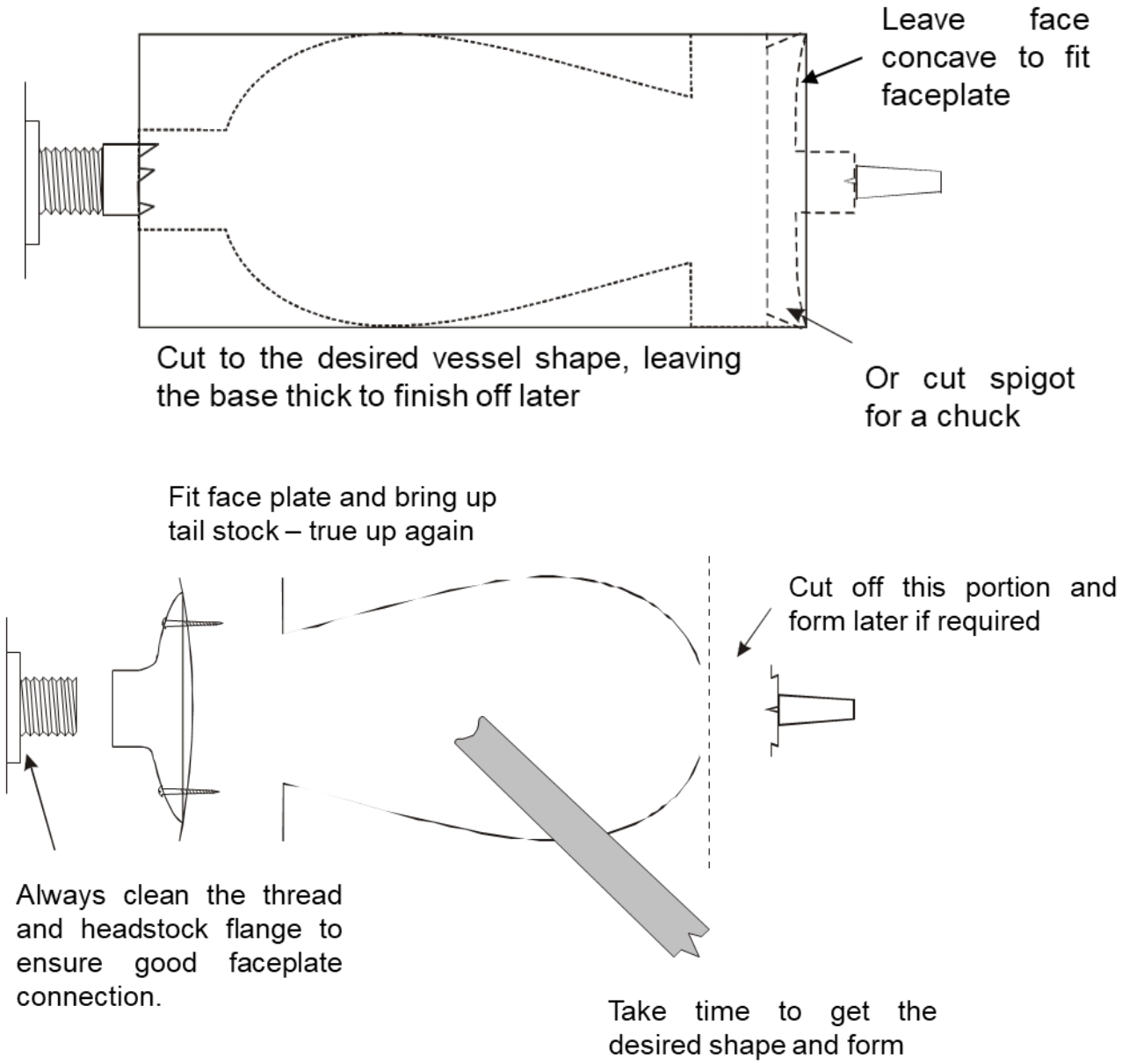
A scraper can also be used on the outside of a bowl. Hold the scraper flat on the tool rest, presenting it below the centre line, and pull it gently across the surface.

For a better finish a scraper can be presented at an angle to the work surface (i.e., tilted on the tool rest) to slice, rather than scrape, the wood surface. This is called “shear scraping”.

Hollow turning

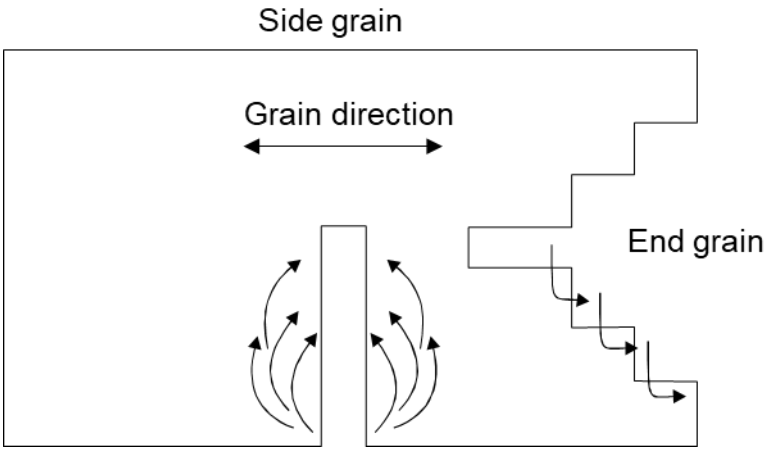
Shaping the outside

Hold the blank between centres. This gives you better options to expose patterns and features in the wood through shifting the centres slightly. The usual grain direction in this work is between the centres.



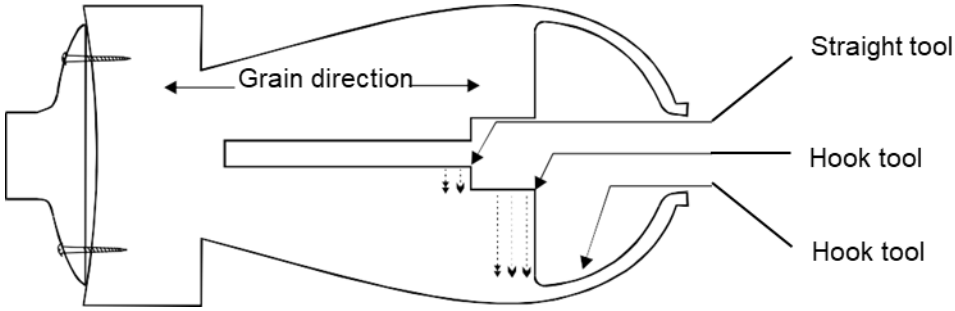
Hollowing out the inside

It is easier to always cut across or with the grain than down or against the grain.

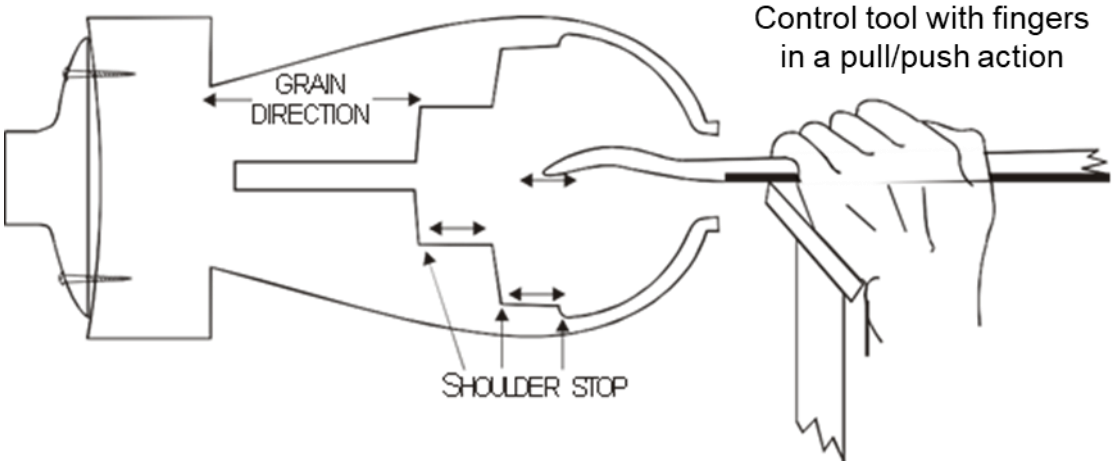


End grain hollowing

Drill a hole almost to the final hollowing depth and mark this on the outside. Draw the final shape of the base on the outside so you know where you wish to cut inside. Now cut from the drilled hole and work outwards across the end grain. Use straight and hook hollowing tools.

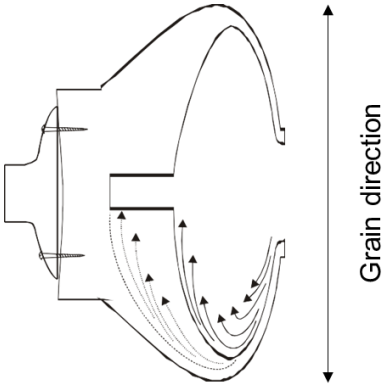


Always leave a shoulder to start the next cut on - visualise and feel where the tool is and what it is doing. Straighten the side wall with gentle strokes along the wall with the cutting edge tilted downwards for finer cut – 'feel' for the shoulder to make the next cut. Check the wall for thickness using callipers.



Side grain hollowing

To complete a smooth curve inside a vessel with side grain both the hooked and straight hollowing tools are required.

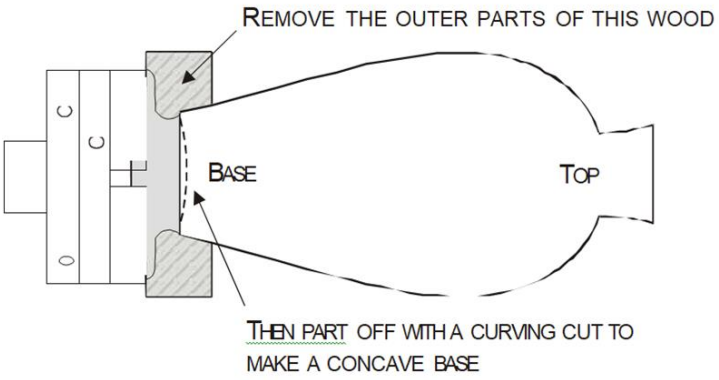


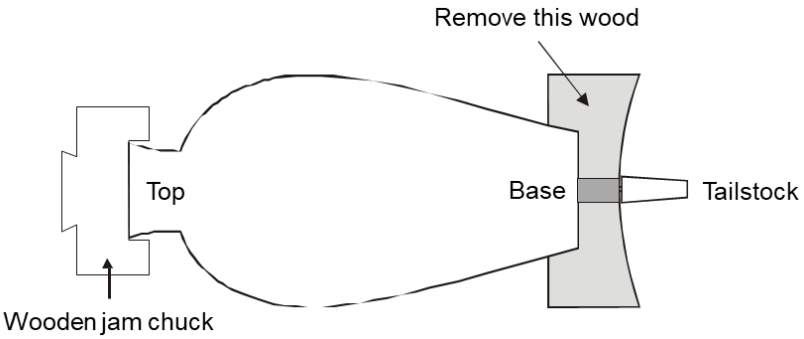
Cutting off the base

To finish off the base, visualise, measure and mark the finish points at the base. Remove the waste carefully.

If the work was turned on a faceplate, true the foot as close as possible to the tailstock centre then remove the work from the lathe. Remove the remaining centre portion with a chisel and sand smooth.

If the work is chuck-mounted, then remove the surplus wood around the base and part off with a curving cut to give the base a concave finish.





Finishing

Safety

- Wear a suitable sanding mask. Dust is harmful to the lungs. Beware of toxic timbers when sanding.
- Check work for rough jagged edges before sanding. Slow the lathe speed down when sanding.
- Use a dust extractor.
- For all sanding remove the tool rest.

Principles

No matter what finish is to be applied to any wood; the most important thing to consider is "what lies below the surface". If the wood surface has been damaged by the use of tools that are not sharp enough or have been used incorrectly, then an acceptable finished surface will never be achieved. This is especially important on end grain, which in some cases can tear out several millimetres below the surface.

If end grain does tear out the fibres can be fractured and twisted, leaving a surface that is almost impossible to finish with abrasive material. Better finishing cuts save hours of sanding time and provide a much improved finished product. Before sanding applying a coat of sanding sealer can be helpful. Remove excess sanding sealer and allow to dry.

Sand at no more than 500rpm and start using coarse sandpaper such as 80 or 120 grit to remove all tool marks. Then work through the grades with each grade being no more than 50% finer than the previous one. Stop the lathe after each grit is used to check progress. Work in an area with good lighting.

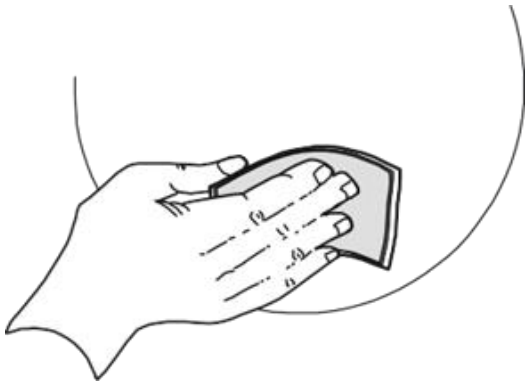
Do not miss out any of the grits otherwise scratch marks will still be seen and may prove hard to remove without returning to the grit which is one step finer than that which made the scratch. When sanding, do not apply heavy pressure; let the abrasive do the cutting. For spindle work finish the sanding process with the lathe stopped and the sandpaper worked along the grain. It can be helpful to use a soft brush to remove dust before moving on to the next grade of sanding paper.

Small cracks can be effectively camouflaged by running a little superglue into the cracks and then quickly rubbing fine sanding dust into the crack. Adding other fillers to a larger crack does not usually look good so either throw the piece away or make a feature of the crack by carving or shaping it.

Sanding methods

Hand sanding

Use a soft sanding pad, piece of leather or leather gloves to cradle the sandpaper. This spreads the sanding action and counters heat to the hands. Apply gentle pressure with the pads of the fingers, not the tips. Move the sandpaper continuously over the surface to prevent excess heat to the wood which may cause ‘heat cracks’ that you will have to remove with a gouge and re-sand. When hand sanding your fingernails can add scratch marks to your work. Work through the grits.

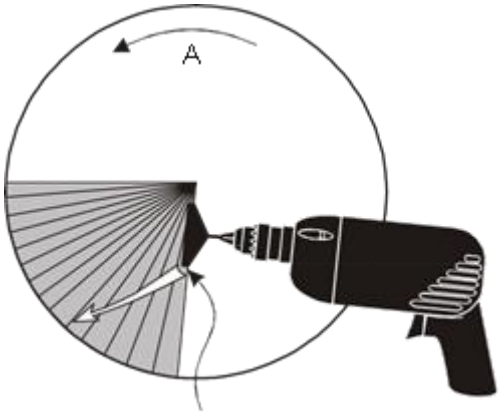


Power sanding

This is done with a flexible pad (home-made or purchased) that fits into an electric drill on which sanding discs can be interchanged using the velcro system. Another method is to cut round discs of sandpaper, then using two-sided sticking tape, attach the round to the tape and then to the sanding pad on the drill.

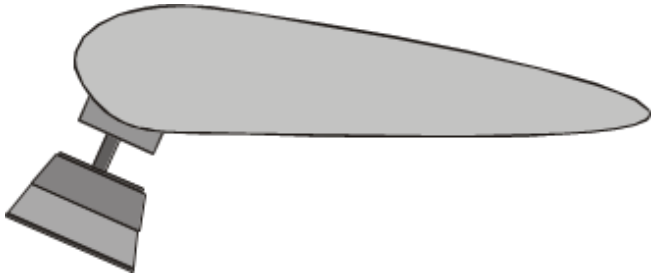
To sand the inside of a bowl, start from the centre and work out to the rim using only the bottom half of the sanding disc. Work through the grits.

Where fibre has been pulled out at the end grain, lock the bowl using the index system at the headstock (if you have one) and sand the area with the wood stationary. Once the marks are gone, release the index, switch the lathe on and continue power sanding, changing the discs from coarse to fine as you go.



Freewheelers

This is a sanding disc attached to a hand-held handle. Holding it to an item turning on the lathe causes the sanding disk to rotate and sand the wood. This sanding action is gentle and cool on the wood. It is still necessary to work through the grits.



Stains, bleaches and grain filling

Full information on this extensive subject is well beyond the scope of this manual but it is worthwhile considering some basic aspects. Staining, bleaching and grain filling can be applied to all or part of a turned item or just used within decorations made by carving or rotary tool work.

Stains are available in a variety of forms. The colouring agent may be a pigment which does not soak into the wood (these may also be used for grain filling) or it may be a dye which does soak in. Dyes may come in a water (grain raising) or spirit (non-grain raising) base. They may be specifically made for woodwork or you can use things like fabric dyes, shoe polish or marker pens. Each one will be different when applied to different woods, and possibly on the differing grains of one piece of wood. Some are easy to apply and some need practice – the golden rule is “Experiment before applying it to your fine turned work”.

Bleaching can be done with household bleach (rinsed off with vinegar and water) but this may leave a grey appearance. Other chemical mixes, each with their own neutralising agent, can produce better results.

Grain filling is where open-grained woods, such as oak, are wiped over with a filler which may achieve a blonding or colouring effect. Proprietary fillers are available, and waxes designed for decorative work can also be used.

Texturing

This involves changing the texture of the surface of the wood so that it will look or feel different. The texture may be carved, burned, drilled, blasted or cut into the wood using chisels, rotary tools, power carver, sand blaster or special woodturning texturing tools.

Before starting most texturing, it is important to have a good finish on the work – either to provide a good finish for the texture to work on or because some of the surface will remain visible between the textures.

Coatings

There is a huge array of coatings and finishes available to the wood turner. The final choice may depend on the end use of the item, personal wish of the buyer or whim of the turner. There is no single finish that is “best” for all woods or satisfying for all users. The finish should maintain the wood in good condition and be easily maintained by the end- user, ideally, maintaining the colour and tones of the wood or enhancing them, if that is desired.

Sanding sealers are designed to aid a sanded finish, not to “build” a coat, but they can be used as a complete finish. There are oils which will soak into the wood and will change the look of the article but, generally, will not change the surface texture. Mixtures of oils and waxes or oils and polyurethane will soak into the wood and also coat the surface. Some, if used repeatedly, will “build” the surface coating. There are waxes designed to be applied onto the surface of either the bare wood or over a previously applied coating and then buffed to a desired finish. Varnishes, including polyurethanes, can be applied as an exterior coating to clean dry wood and wood that has been treated with sanding sealer but not oil-treated wood.

Items which are to be used for food storage or serving must not have coatings which are toxic or likely to flake off into the food. Generally, they also need to be washable although this will usually be a wet cloth wipe rather than hot water and detergents.

All cloths used to apply finishing products should be soft, lint-free and clean. Many coating products are flammable. Ensure that you have good ventilation and no naked flames. Leave all rags, paper towels and any other material contaminated by finishing oils and thinners in an uncompressed state i.e., laid out flat or hung on a line, until they are perfectly dry to avoid the possibility of spontaneous combustion. Alternatively, if a rag is to be repeatedly used for application of one finishing product then the oil-wet rag can be stored in the smallest practicable sealed can or jar to keep it wet for later re-use. There must be minimal air space in the container and the container itself should not be affected by the finishing product. Rags or steel wool used to apply waxes can be stored inside the wax container. Brushes should also be clean but if used for only one finishing product then you can store them inside the container holding the finish by either shortening the brush handle or attaching the handle to the lid in a way that preserves the lid seal.

Toxic timbers

There are various forms of toxicity caused by exposure to woods through dusts or by direct contact. As a general rule: every wood is toxic if you inhale enough of it.

You can develop allergies following contact by touch or through the inhalation of dust. In other words, both large and small particles can sensitise you to the allergen. The reaction can be a skin or lung reaction. Skin reactions are generally itchy rashes. Lung reactions are generally chronic coughs or wheezing.

Other types of problems come from chronic exposure to dusts that are small enough to reach the small airways and alveoli.