WORKING WITH WOODS

This mobile revision pdf is based on detailed work found in the MATERIALS section.

Tap on the green link button below to go to the complete website section

Tap the blue button to view all joining metal techniques, covered by this Revision PDF

WORKING WITH WOODS

1. STOCK FORMS

2. STANDARD FITTINGS AND COMPONENTS

3. WORKSHOP TOOLS AND EQUIPMENT

4. MORE MACHINES, PROCESSES AND POWER TOOLS

IMPORTANT

It is recommended that you also download the following Apps from the Mobile App Section of www.technologystudent.com

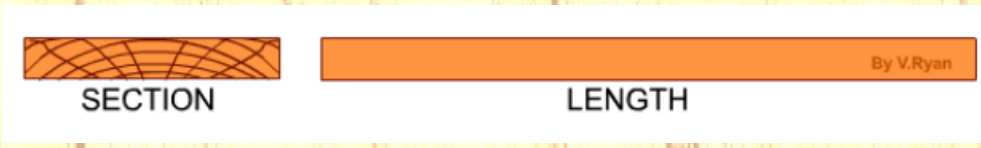
1. Common Woodworking Joints
2. Knockdown Fittings, Glues, Screws and nails
3. Wood and Metal Finishes
4. Materials – Woods, Metals, Polymers
5. Sources, Origins, Preparation of Natural Woods

STOCK FORMS

Tap the images for more information and an exercise

BOARDS

Natural wood can be supplied as boards. These are a rectangular section and vary in length.



SQUARE SECTION

These are available in a range of measurements. A typical measurements is: 50 X 50mm x 600mm

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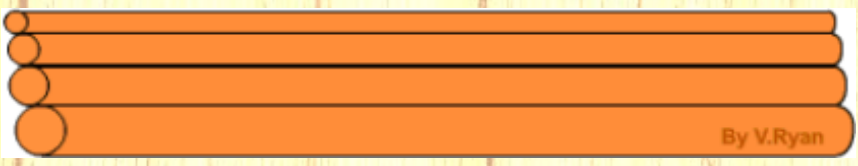
Tap the images for more information and an exercise

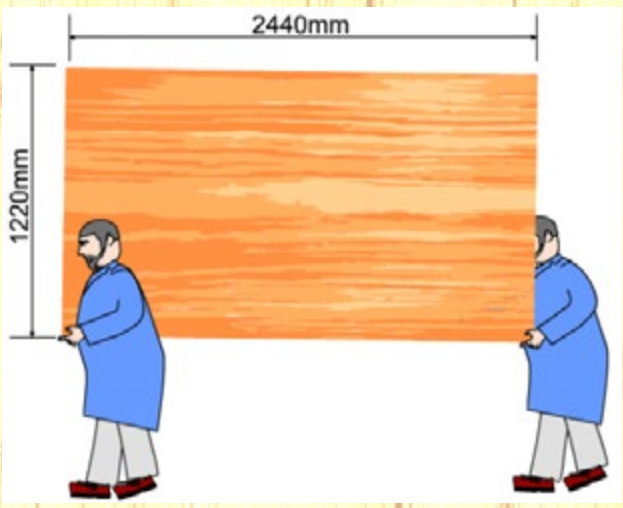
DOWEL

Dowel is supplied in different sizes. 6mm diameter to 40mm is a common range



SHEETS - FULL BOARD OR HALF BOARDS

Manmade boards are available in a range of materials such as MDF, blockboard and plywood. Full boards are usually 1220 x 2440mm. Half boards are also available.



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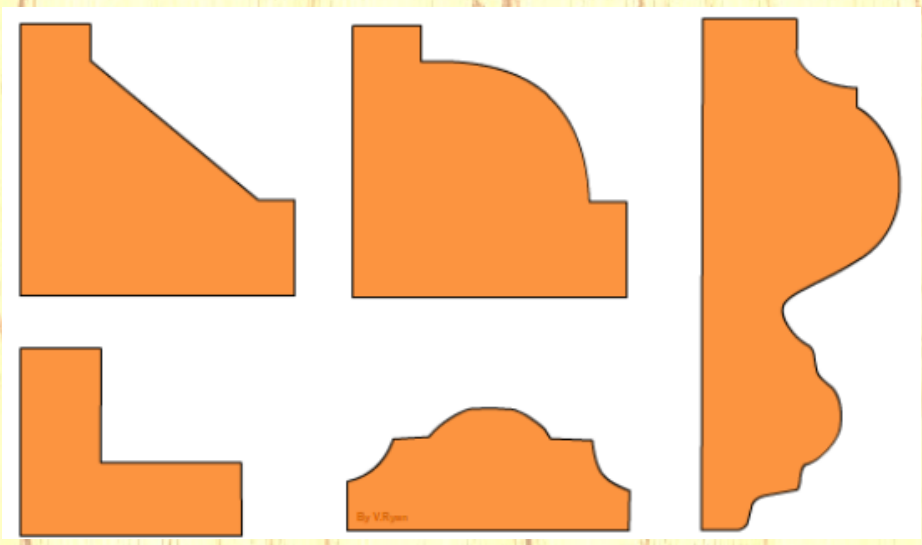
MOULDS

Wood can be supplied in the form of mouldings which have a variety of sections. Moulds are used for decorative edges and can be found on traditional furniture.

Tap the images for more information and an exercise



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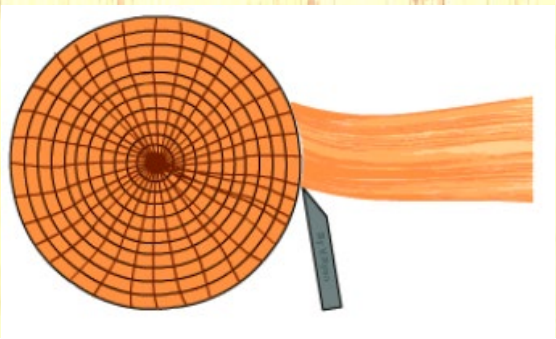
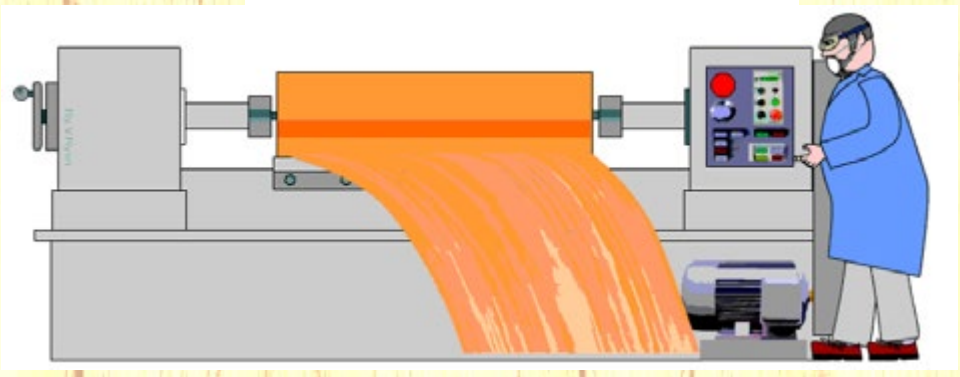
VENEER

Veneer is a thin sheet/layer of natural wood, usually a similar thickness to cardboard. It is produced from a tree trunk in a number of ways. The most popular method is to 'peel' a layer of thin wood (veneer) with a cutter, whilst the tree trunk revolves on a large lathe.

Tap the images for more information and an exercise





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NATURAL WOODS AND STANDARD FITTINGS / COMPONENTS

Standard fittings and components used with materials such as wood and metal, can generally be used with polymers.

The following slides will take through a range of standard fittings and components

Tap the blue button for the next slide / page.

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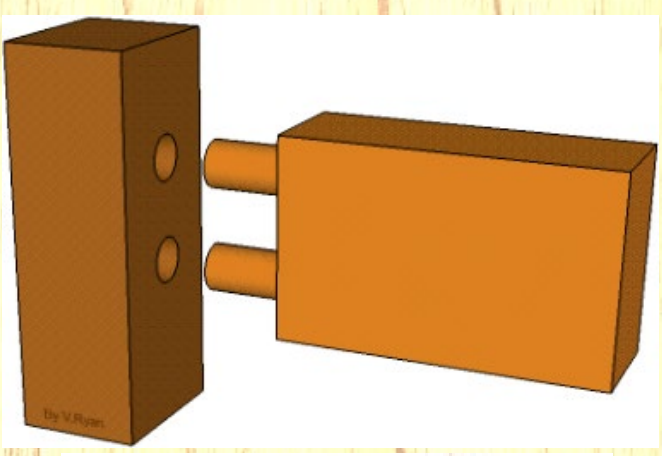
DOWEL RODS

Dowel rods are available in a range of sizes. Small precut dowels are used to join wood, with the aid of wood glue.

Tap the images for detailed information / exercises and examples of the use of dowels.



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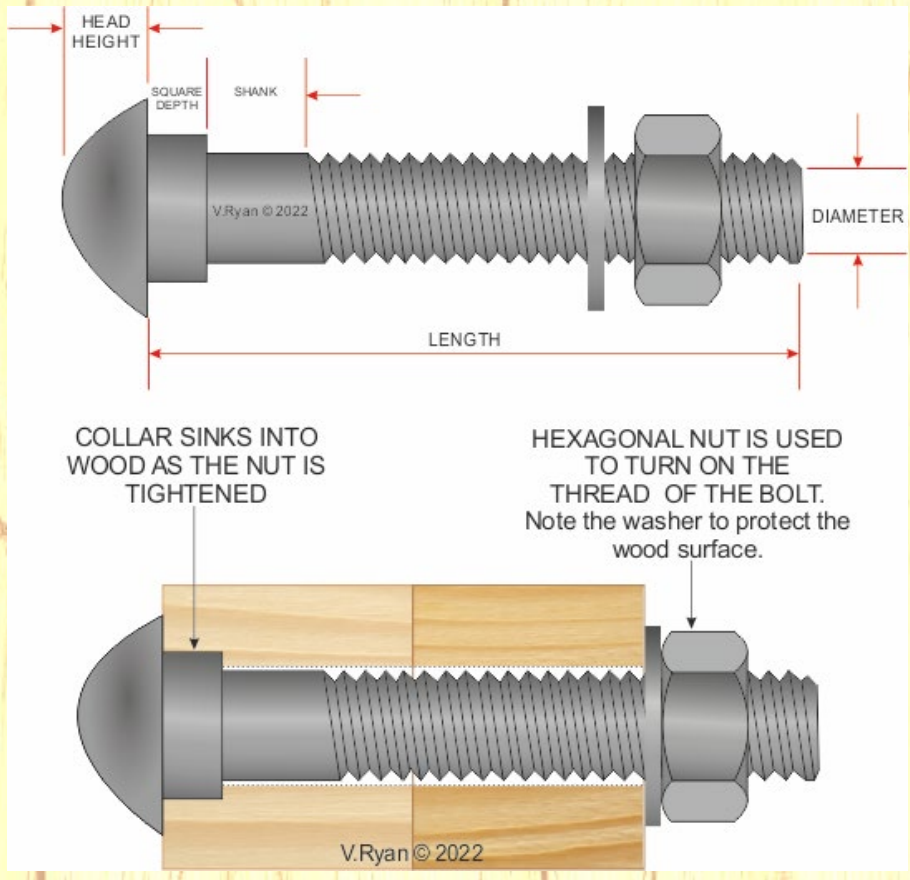
COACH BOLTS

The coach bolt has a square collar under the domed head and this locks into the wood when the nut is tightened. A washer is normally placed before the nut to stop it sinking into the surface as it is turned.

Tap the image for more information



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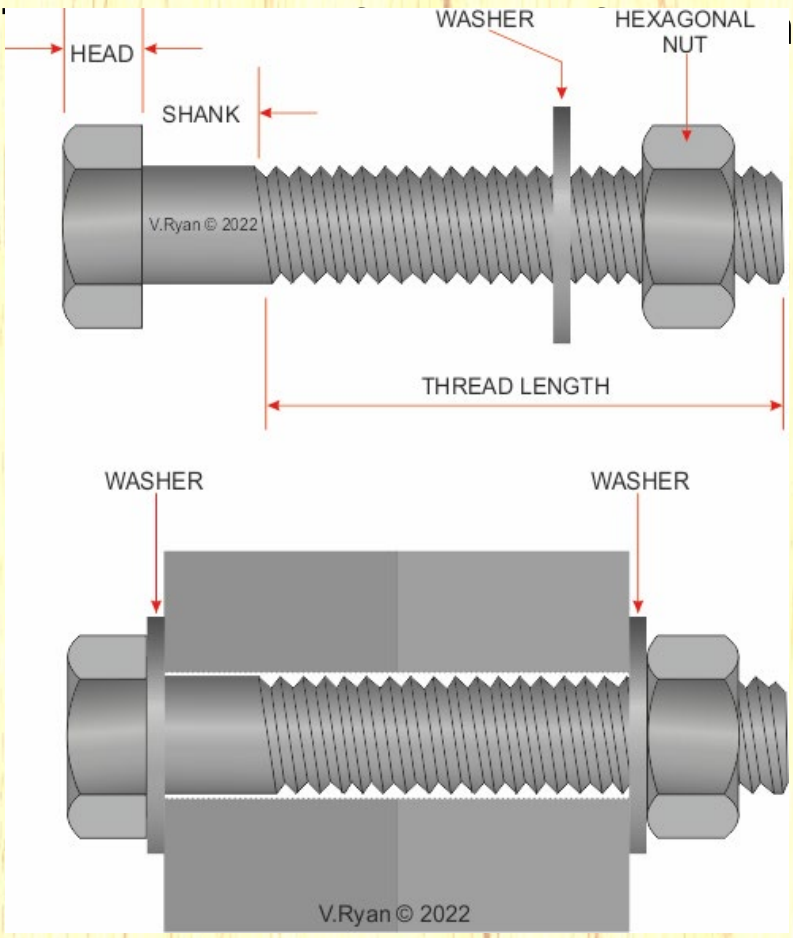
MACHINE BOLTS

Two spanners are needed to tighten this nut and bolt. The first spanner fits round the hexagonal head of the bolt and a second spanner is used to tighten the hexagonal nut.



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EXERCISE

Tap the image for more information and an exercise on coach / machine bolts

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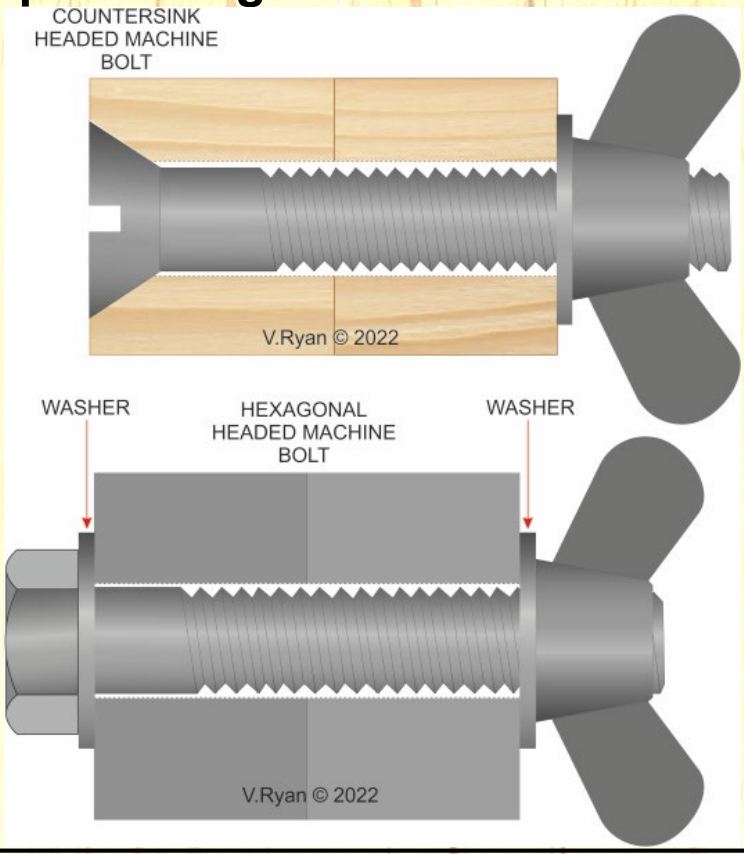
COUNTERSUNK BOLT AND WING NUT

The countersunk machine screw fits level with the surface of the wood/metal/plastic. A screwdriver is used to keep the bolt still whilst the wing nut is tightened by hand. The 'wings' of the wing nut, are designed to be comfortable when tightening the nut and bolt.

Tap the image for more information



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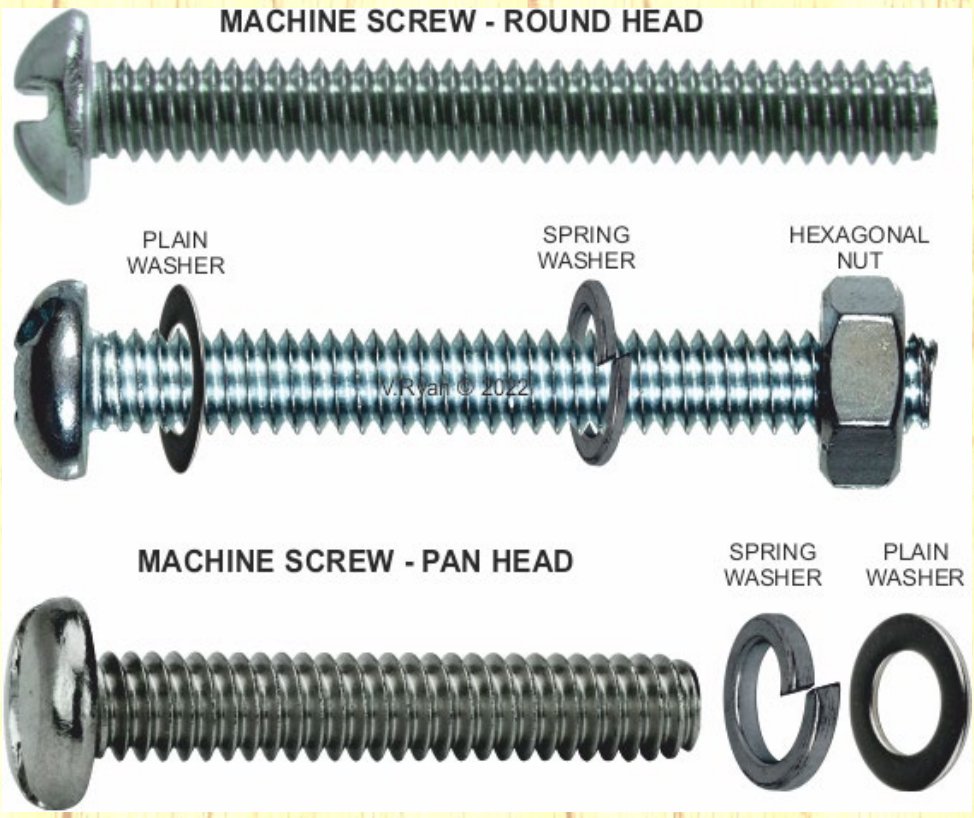
OTHER COMMON BOLTS

Tap the images for more information and an exercise

A plain washer prevents the nut sinking into the surface of the wood/plastic/metal

If there is a need to prevent a nut and bolt loosening a spring washer is used.



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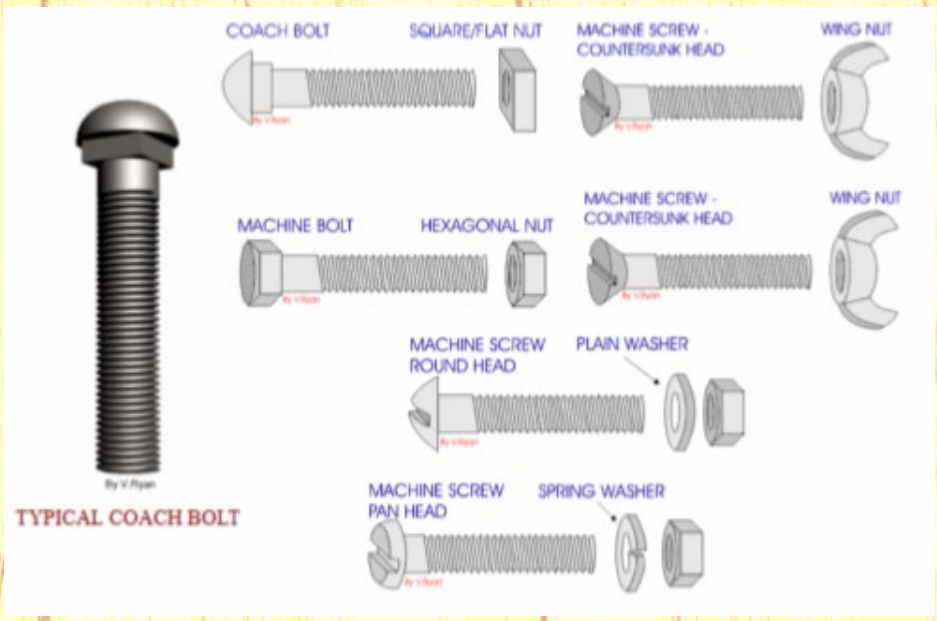
BOXED LEARNING EXERCISE

Tap the image for a revision exercise



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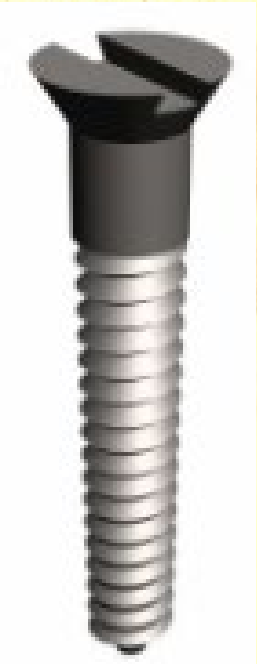
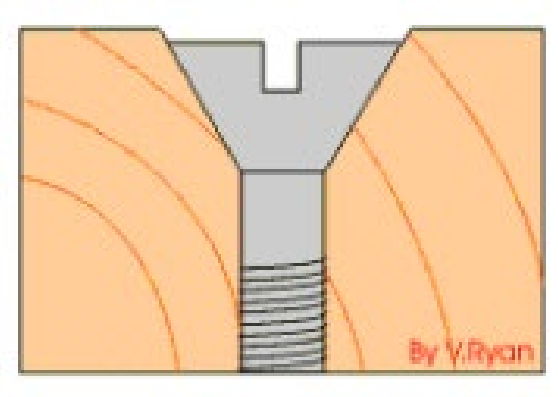
TYPES OF SCREWS

COUNTERSUNK - SLOT HEAD: This can be used for general woodworking for example fitting hinges to doors. Because the screw is countersunk it can be tightened 'flush' to the surface of the material.

Tap the images for detailed information / exercises





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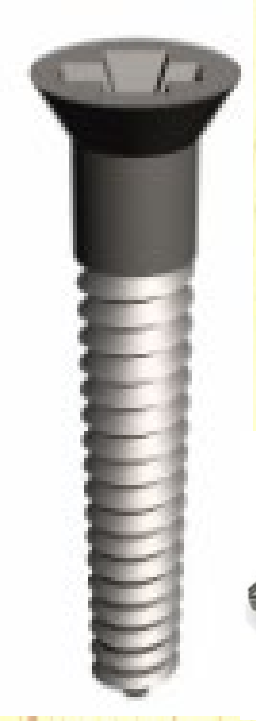
POZIDRIV HEAD: Used with special screw drivers which will not slip when pressure is applied. This is ideal when using screws in corners or confined spaces.

Tap the image for detailed information / exercises



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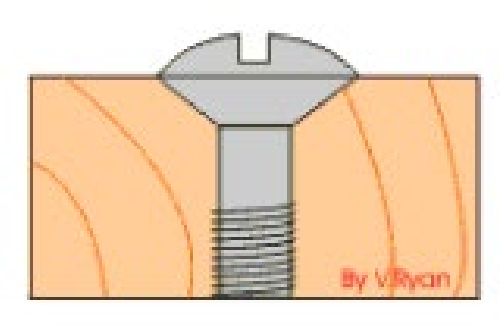
RAISED HEAD SCREW: Used to fit door handle plates and decorative features that must look good.

Tap the image for detailed information / exercises



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ROUND HEAD SCREW: These are used for fixing pieces of material together where countersunk holes are not being used. Round head screws can look quite decorative especially if they are made of brass.

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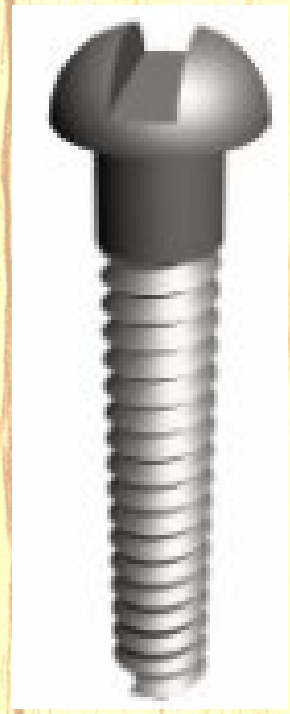

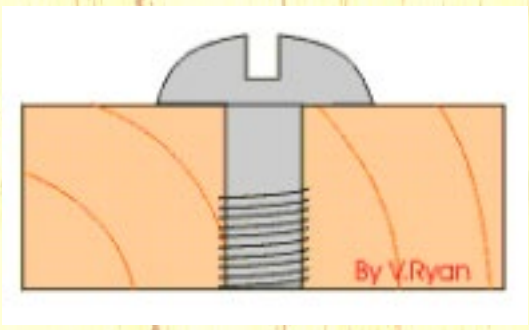

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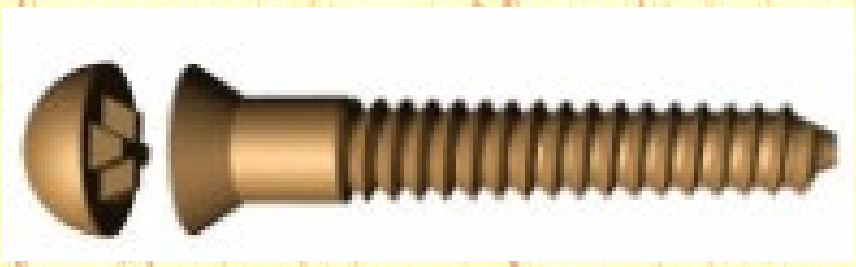
DOME HEAD SCREW: Can be used for fitting fixtures such as mirrors. The 'cap', which is the dome shape is usually chromed or made from brass and this can be a good feature. It also makes the head of the screw safe as the doom has no sharp edges to catch and cut hands/fingers.

Tap the image for detailed information / exercises



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CHIPBOARD SCREWS: The thread on this type of screw extends all the way along the length. It is best used with chipboard

Tap the image for detailed information / exercises

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HINGES

Hinges can be regarded as a standard fitting. They are used on wood, metal and plastics. Hinges are generally fitted to lids of containers, cupboard doors, bedside cabinets etc…Some common standard hinges are shown below

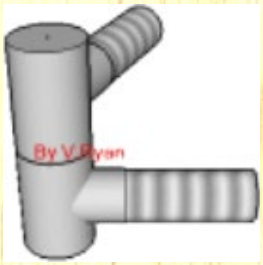
Tap the image for information / an exercise

BUTT HINGE

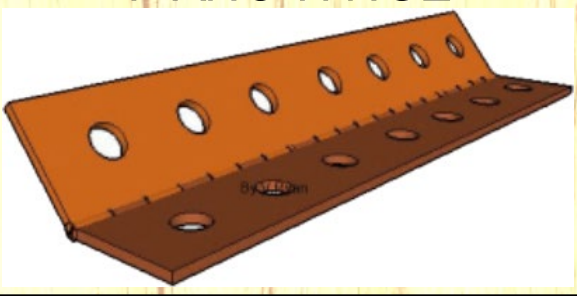
BUTTERFLY HINGE

FLUSH HINGE

BARREL HINGE



PIANO HINGE



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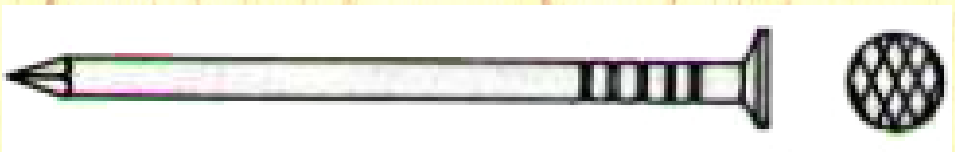
TYPES OF NAILS

Using nails is an effective way of fixing or joining pieces of softwood together. Hardwoods can be difficult to join with nails as they tend to bend under the impact of the hammer. Below is a range of nails that can be used depending on the type of wood and the nature of the work to be attempted

Tap the images for detailed information / exercises

PANEL PIN - A very popular way of joining woods although glue is usually included as part of the join.

ROUND WIRE NAIL - This is used for general work. It is not attractive in shape and it can split wood when hammered in position



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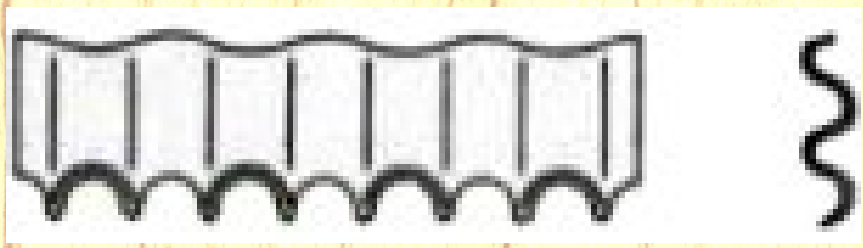
TYPES OF NAILS

Tap the images for detailed information / exercises

OVAL WIRE NAIL - This is a long nail and care must be taken when it is hammered into the wood. It is unlikely to split the wood.

CORRUGATED FASTENER - This will hold the corners of wood frames firmly together



Tap the link buttons information and exercises on a variety of nails

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IMPORTANT

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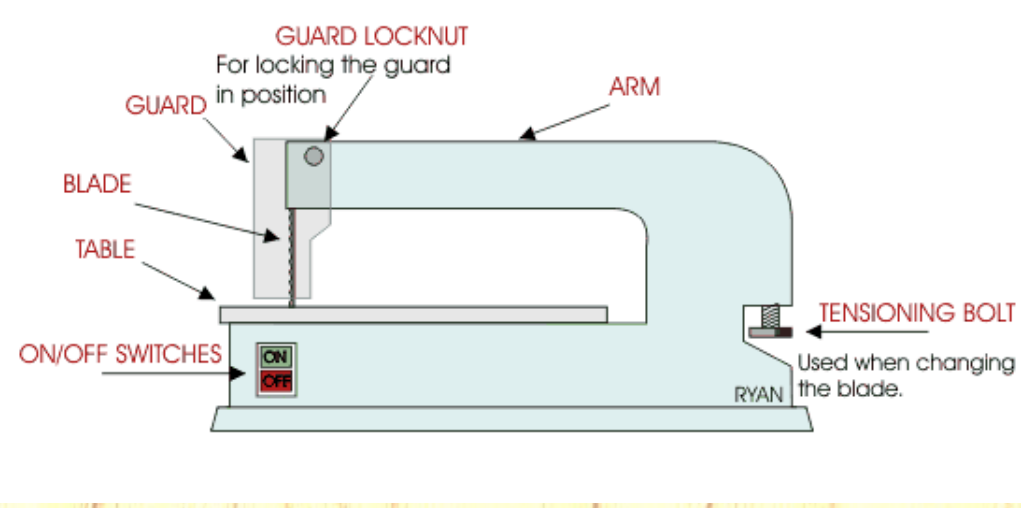
THE FRETSAW / SCROLL SAW

The fretsaw is a general workshop machine. It is used to cut and shape light materials such as perspex, MDF and plywood. These can be used to cut very detailed shapes and they are supplied with different types of blade according to the material that is to be cut. Plastics such as acrylic, should have a layer of masking tape on the surface, before cutting, just in case the material shatters.

Tap the image for information / an exercise



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PRECISION HAND MITRE SAW

The ‘precision hand mitre saw’ is extremely useful, especially when cutting angles. It is a lightweight adaptable saw, with a range of uses. It is ideal for cutting joints, such as the mitre corner joint. It can even be used to help cut halving joints. The most common type has a 550mm blade, with 14 TPI (teeth per inch).

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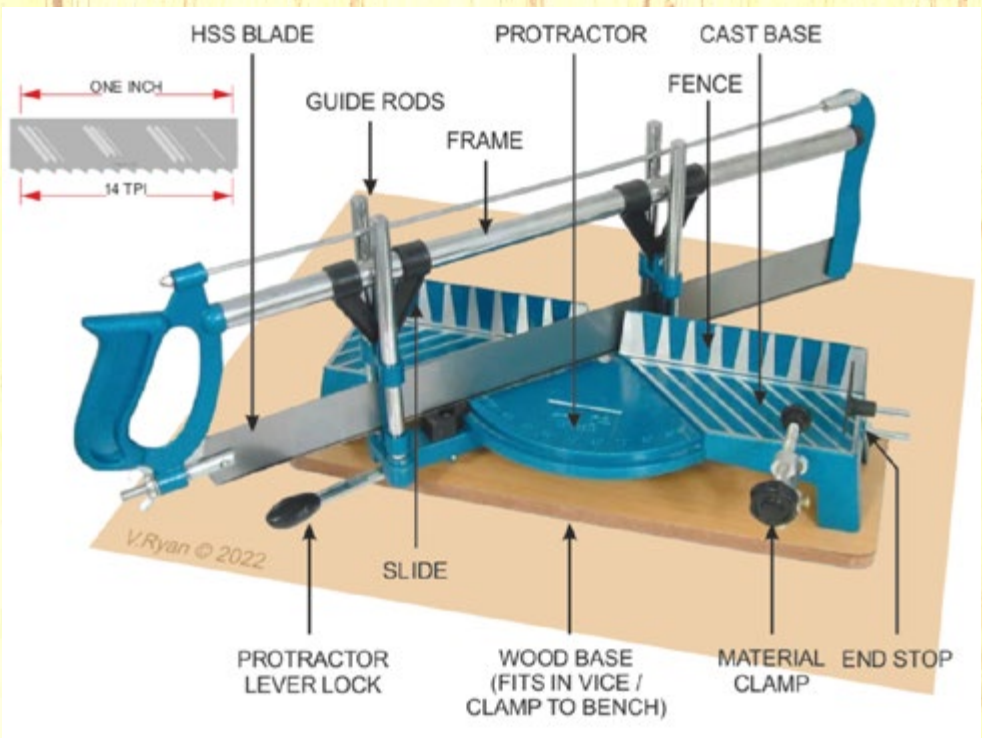

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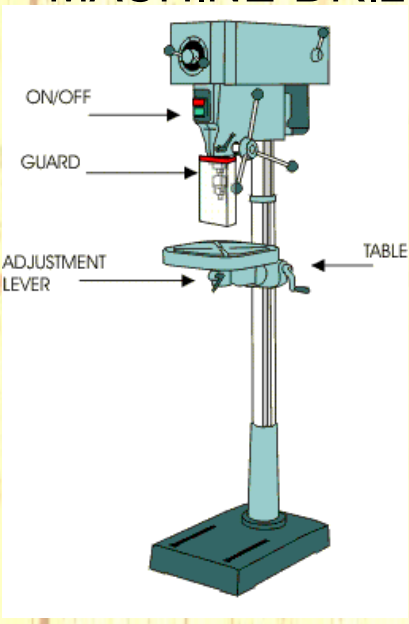
THE DRILLING MACHINE

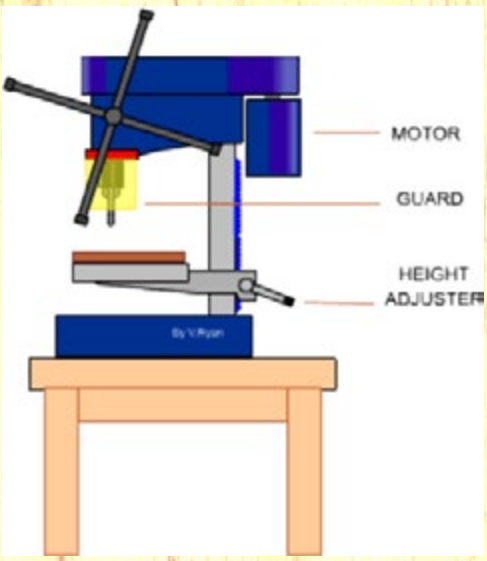
There are two types of machine drill, the bench drill and the pillar drill. Both are used for drilling holes through materials including a range of woods, plastics and metals. The material should be clamped, placed in a machine vice or bolted down, for safety. Plastics such as acrylic, should have a layer of masking tape on the surface, before drilling, just in case the material shatters.

Tap the images for information / an exercise

MACHINE DRILL



BENCH DRILL



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SUITABLE DRILL BITS

Tap the images for information / an exercise

Twist Drill

Used for drilling holes. A normal drill set will include sizes from 1mm to 14mm.

Hole Saw

For large diameters a 'hole saw' can be used. Interchangeable sizes

Countersunk Bit

Creates a hole that allows countersunk screws to be level with the surface

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SUITABLE DRILL BITS

Tap the image for detailed information / exercises

Forstner Bit

Used for larger diameter holes. When using this bit the hole is drilled very slowly so that the bit does not 'jam' in the wood.

FLAT DRILL BIT

Makes drilling easy and can be used with a brace and bit OR machine drill

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HAND DRILLS

In the workshop you probably use a 'hand drill' and a 'ratchet brace' as part of practical work. These are used for drilling a range of sizes of hole and they are very useful especially if machine drills are not available.

Tap the image for detailed information / exercises

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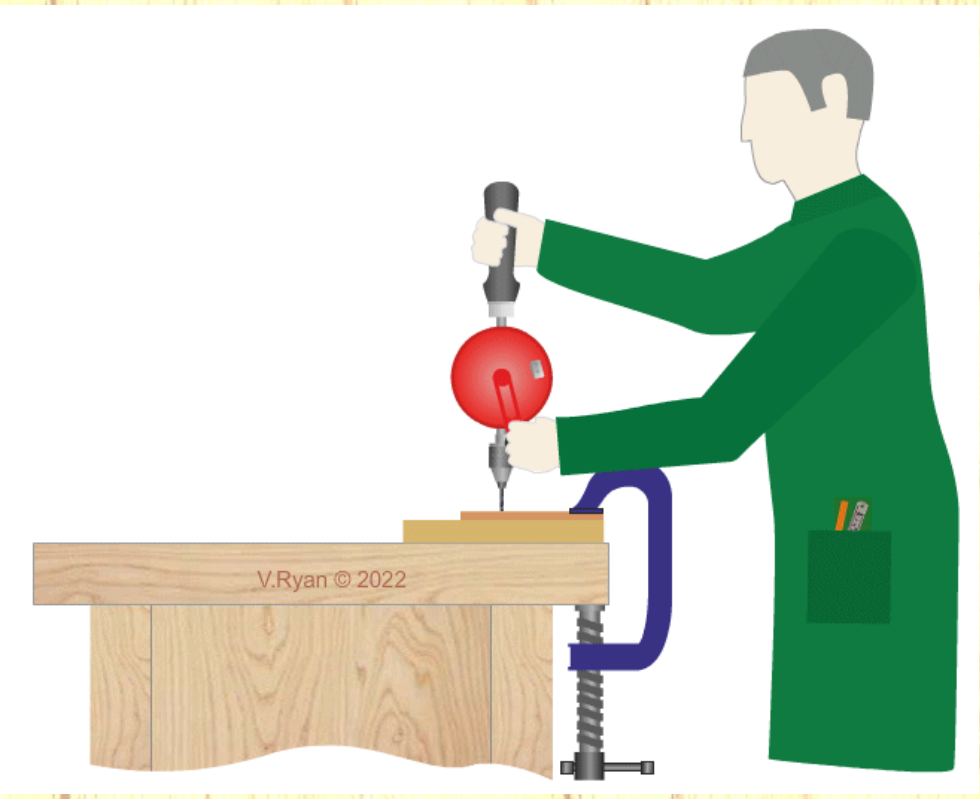
HOW TO USE A HAND DRILL

The hand drill is held vertically. One hand holds the handle at the top whilst the second hand rotates the other handle in a clockwise direction. This turns the chuck and drill bit. Only light pressure should be used to push down on the hand drill

Tap the image for detailed information / exercises



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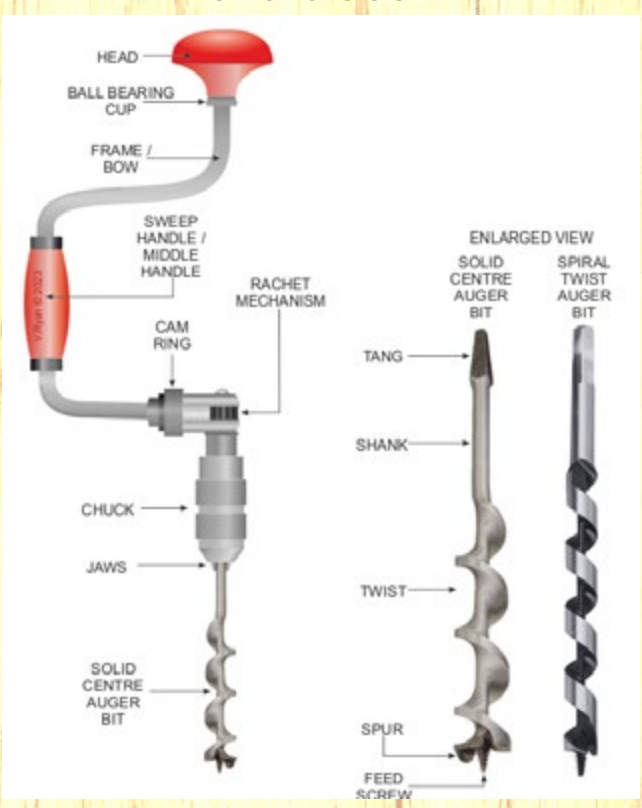
MORE ON THE RATCHET BRACE

The ratchet brace is ideal for drilling holes, including larger diameters. One hand applies downward pressure to the 'head' (top handle), at the same time as the second hand rotates the 'sweep handle'. The distance moved by the sweep handle, is simply called the 'sweep'.

Tap the image for detailed information / exercises



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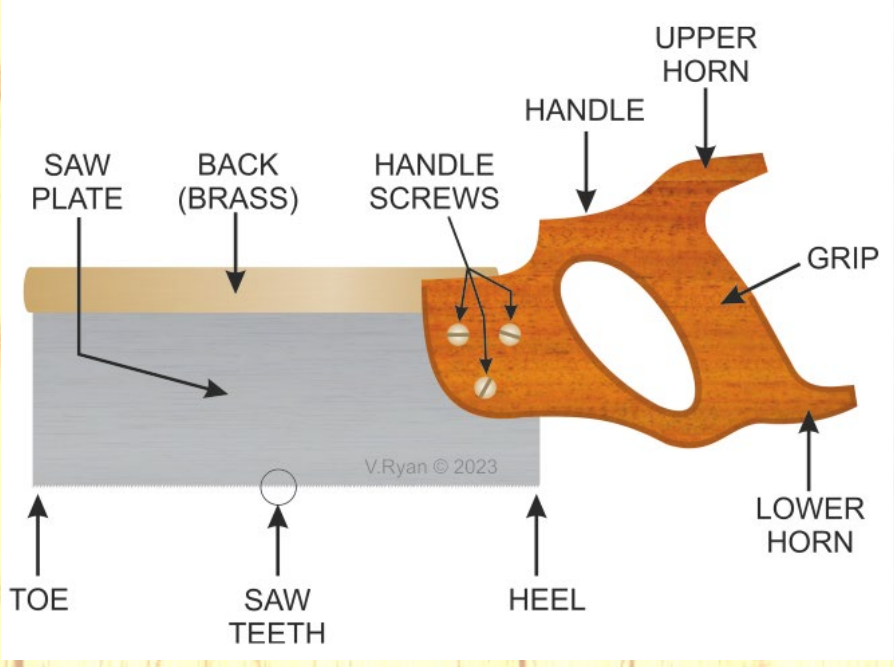
BACK SAWS - TENON SAWS AND DOVETAIL SAWS

Back Saws get their name from the steel or brass back (labelled on the diagram). The heavy back gives the saw its weight which is useful when sawing wood. The two main types are the tenon saw and the dovetail saw.

TENON SAW : for general sawing and cutting mortise and tenon joints.

DOVETAIL SAW : for cutting joints such as dovetails

Tap the image for detailed information / exercises



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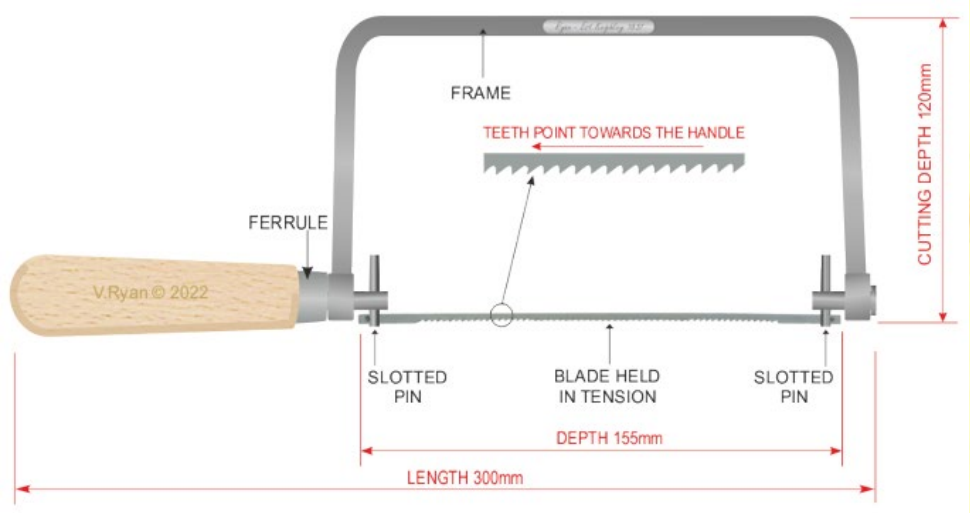
THE COPING SAW

Coping saws are used for cutting a range of woods and are very useful for cutting unusual shapes or curves. In a modern workshop these shapes are normally cut using machine fretsaws. However, there are times when these machines are not available. Also, using a coping saw is a test of skill as it can be difficult to control and requires practice.

Tap the image for detailed information / exercises



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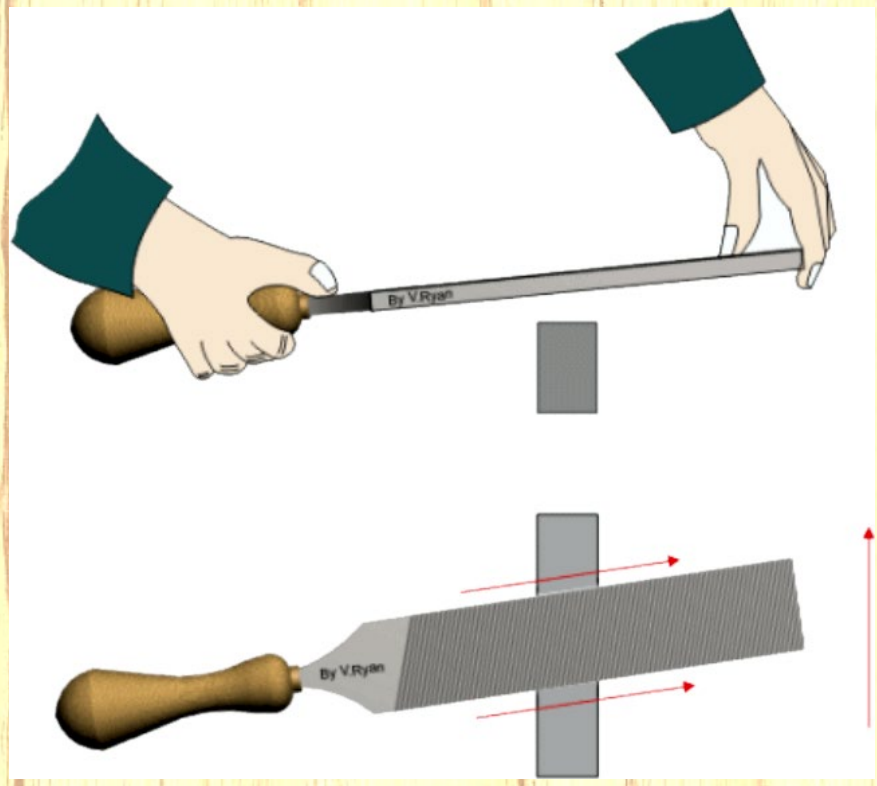
HAND FILES

Hand files are used in the workshop to smooth rough edges. They can be used to smooth a range of materials including metals such as brass and steel to plastic based materials and also woods. They are made from high carbon steel and they are heat treated so that they are tough and durable.

Tap the image for information / an exercise



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THE SURFORM

The surform is a woodworking tool, used for roughing out a shape. It is much more abrasive than a file (consequently, it is sometimes called a surform plane) and much more material can be removed. The closest description, is that it is cross between a 'rasp' and a 'plane'. However, as a roughing tool, it does not produce a good finish.

Tap the image for information / an exercise

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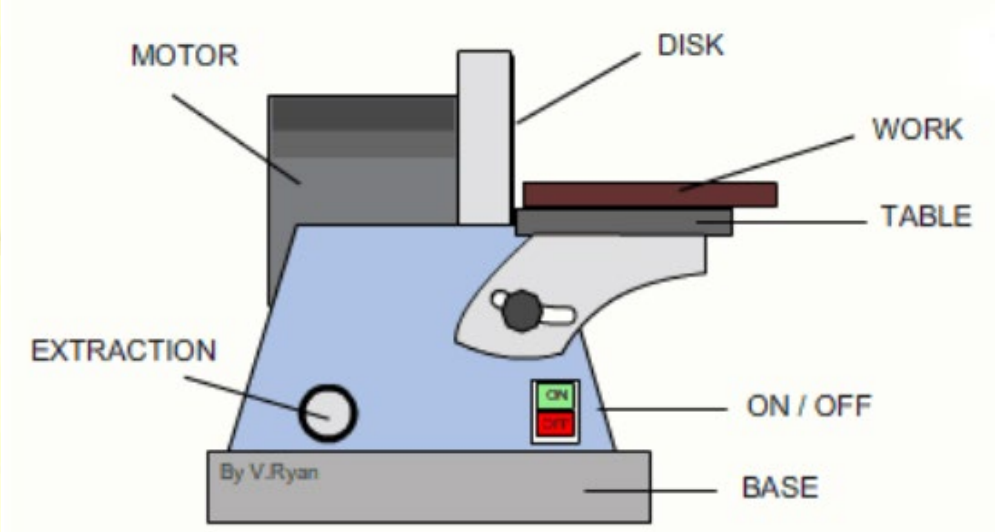
THE DISK SANDER

The Disk Sander is used to smooth materials such as woods and **plastics**. It is also used to remove small amounts of waste material. It is a dangerous machine if safety is ignored. Goggles must be worn at all times. Hands and fingers must be kept as far away from the rotating disk as possible. A guard, making it impossible to use the wrong portion of the rotating disk must be in permanent position.

Tap the image for information / an exercise



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TYPES OF PLANE

A large range of planes are available and they are used for different purposes. The earliest known examples of planes are from the Roman era but even today they are used for the same purposes - to smooth rough surfaces or the plane down the thickness of a piece of wood to the required size.

WOOD BLOCK PLANE: Although this is a very old design they are still used today to remove a large amount of wood. This is due to the fact that they are lighter than steel planes and therefore they can be used comfortably for longer periods.

Tap the image for detailed information / exercises

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Tap the image for detailed information / exercises

JACK PLANE: It is used to plane longer pieces of wood.

SMOOTHING PLANE: A shorter version of the steel jack plane. Used for general work such as smoothing short pieces of wood

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HOW TO USE A JACK PLANE AND SMOOTHING PLANE

The plane is placed at the end of a piece of wood. It is pushed along the surface and removes a ‘chipping’. The plane is placed back at the end of the wood and the same process is repeated, until enough material has been removed.

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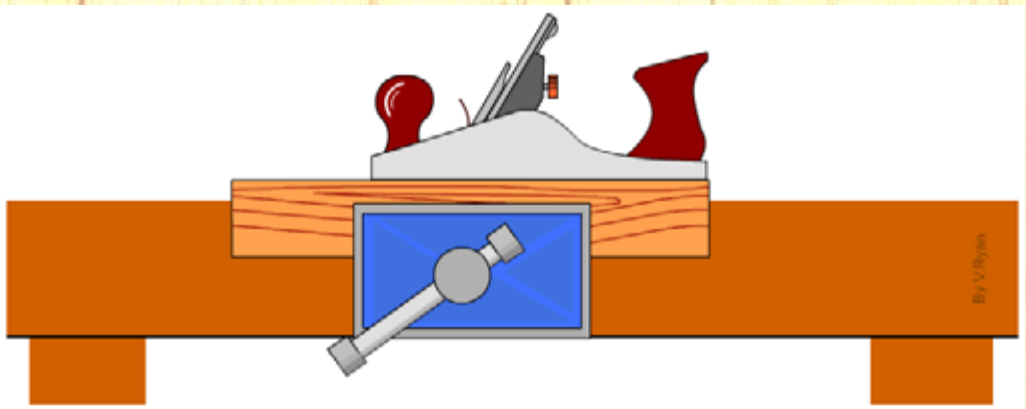

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THE SPOKESHAVE

The spokeshave is classified as a plane. There are two main types, one having a flat sole and the other having a curved sole. They are normally used to smooth curved surfaces and to produce chamfers. Older versions have wood bodies, but the most common in school workshops have metal bodies.

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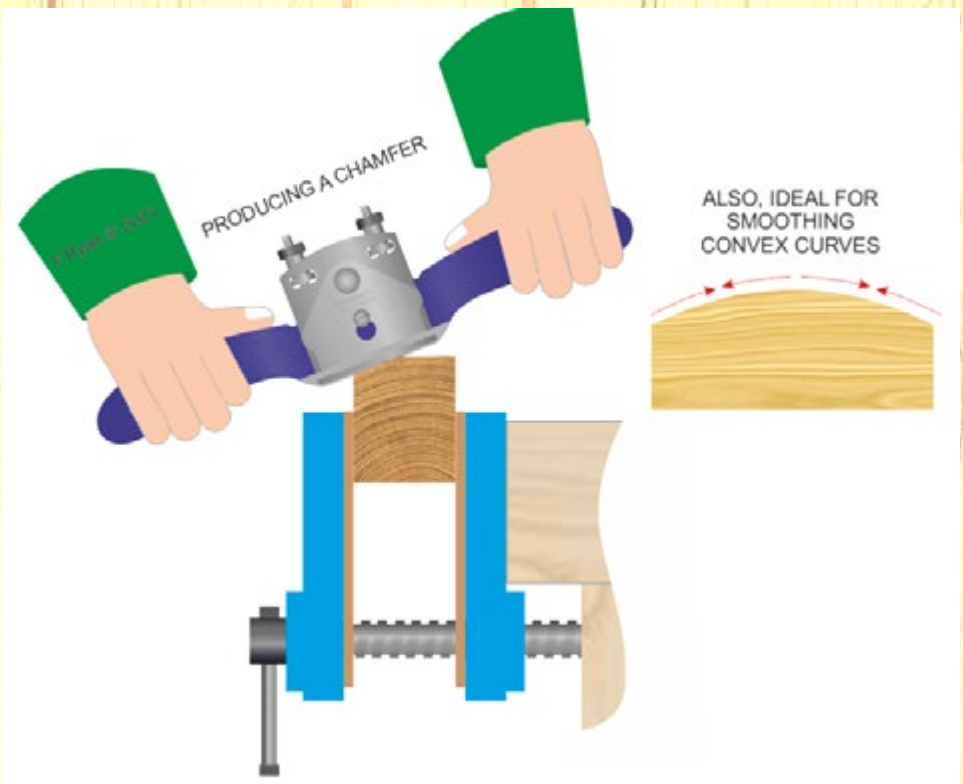

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TYPES OF CHISELS

BEVEL edged chisels are undercut making them easy to push into corners - used for finishing dovetail joints.

FIRMER chisels have a blade with a rectangular cross-section - used for tougher/heavier work.

A **PARING** chisel is a longer, thinner chisel which can be pushed into long joints such as housing joints.

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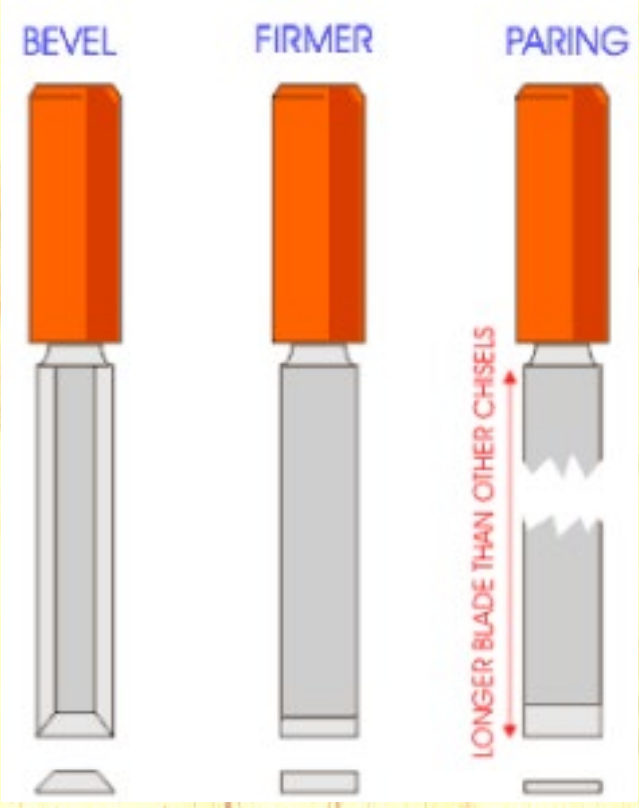

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SANDING / GLASS PAPERING NATURAL WOOD

To finally prepare natural wood and most boards for a suitable finish, different grades of glass paper are used, to produce a blemish free and smooth finish. Although most people refer to sand paper as an abrasive, it no longer exists. Glass paper is often referred to as sand paper, but there are other similar abrasive sheets including aluminium oxide, silicon carbide and garnet. Abrasives have a paper or cloth backing, that holds the particles of abrasive in place.

Tap the image for detailed information / exercises

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Glass paper / abrasive sheets are supplied in a number of grades, sometimes referred to by grit size or the density of grit, as seen in the table below. It is worth noting, that manufacturers vary slightly in their description of grit size and density, but the table below is a general outline of the grades, available at retailers and suppliers.

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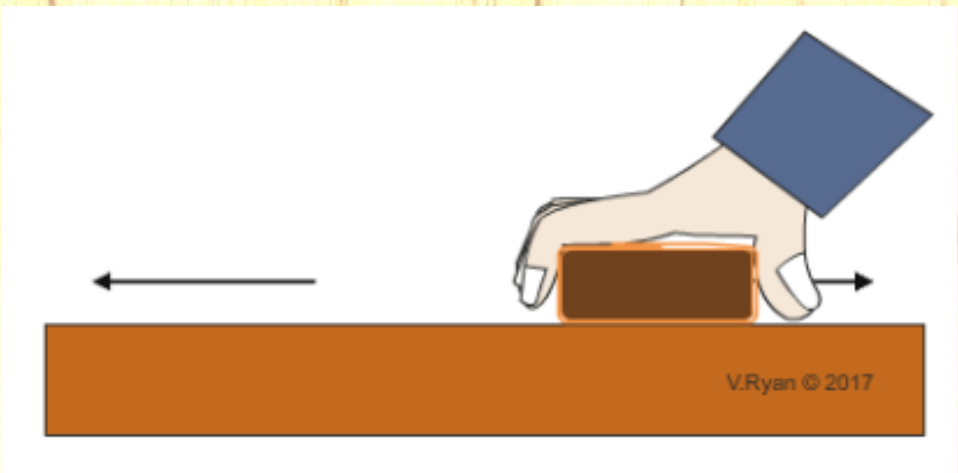

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THE WOODWORKING LATHE

Wood turning is one of the most interesting ways. Numerous traditional examples of wood turning can be found in most homes and work places. These include, table lamps, table legs, and bowls

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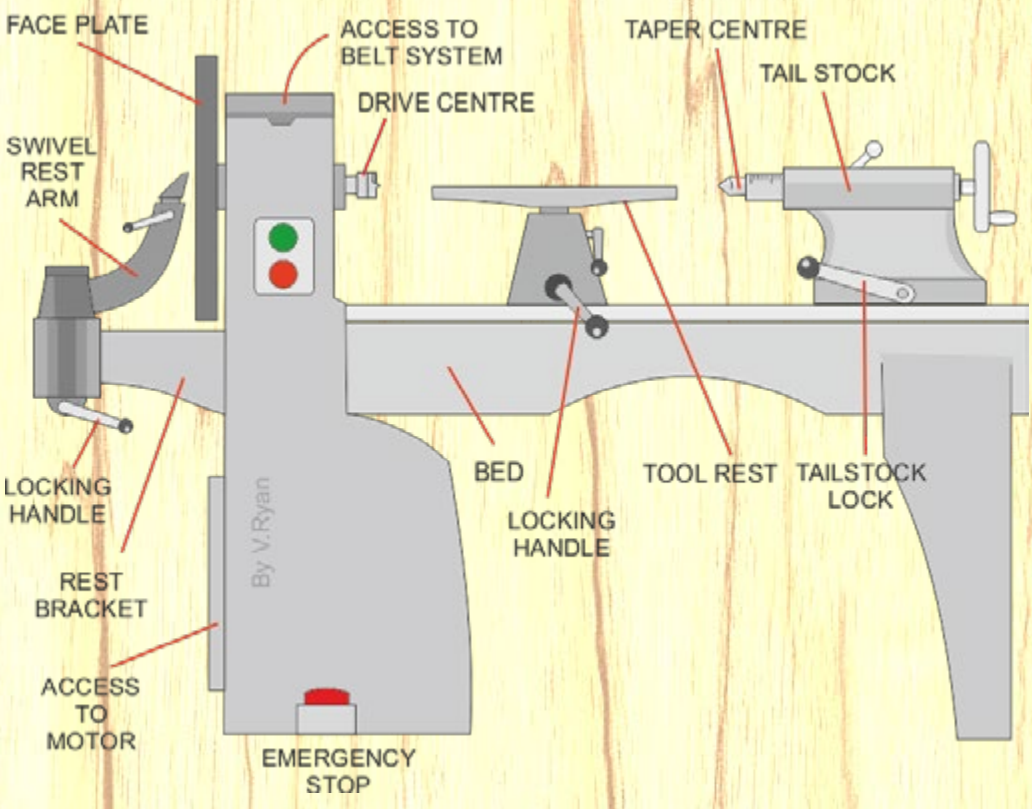

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INTRODUCTION TO WOOD TURNING

Typical turning between the tailstock and drive centres can be seen below. The wood to be turned, is held securely between the centres. A drive centre is used at the headstock side of the lathe (left). This rotates, powered by the motor. A dead centre or a live centre (preferred), is used at the tailstock side (right).

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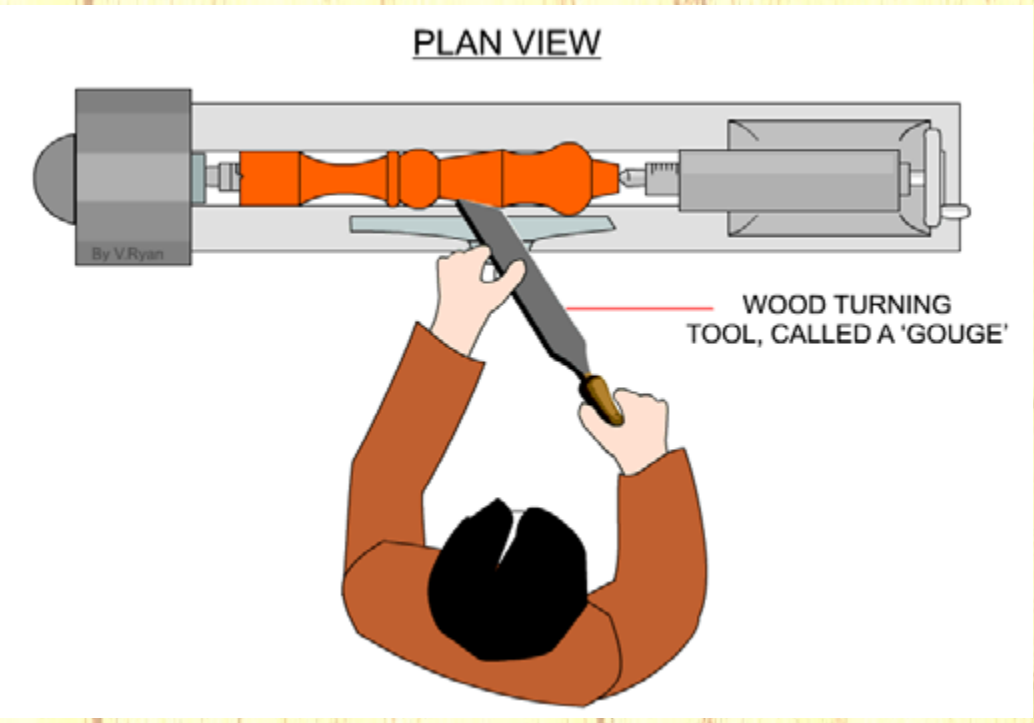

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Tap the image for detailed information / exercises

TRADITIONAL PRODUCTS

TABLE LEG

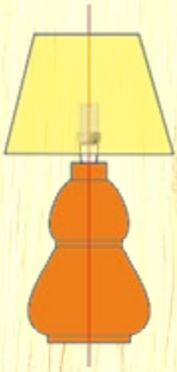
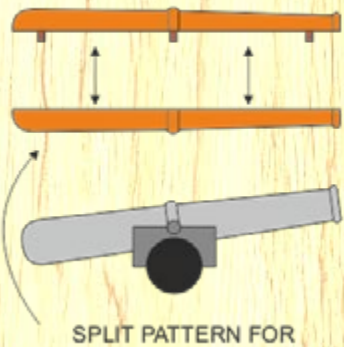


TABLE LAMP

BOWL



SPLIT PATTERN FOR CASTING IN ALUMINIUM / BRASS E.G. ORNAMENTAL CANON

MODERN WOOD-TURNED PRODUCTS

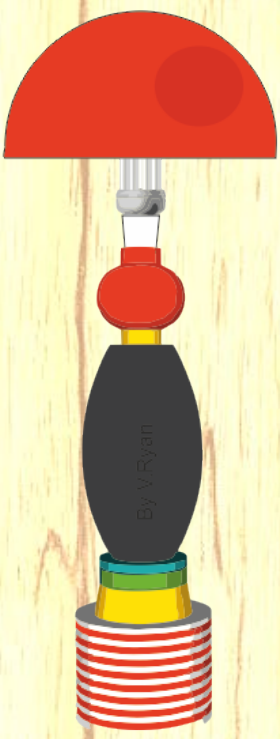


TABLE LAMP, BASED ON TOTEM POLE DESIGNED BY ETTORE SOTTSASS

HAND PAINTED CANDLE HOLDER

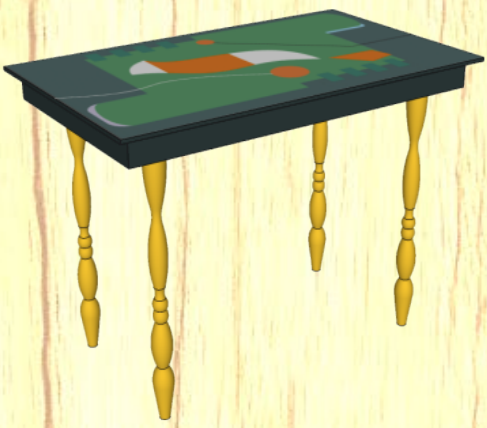


TABLE WITH TURNED LEGS, BASED ON THE ATROPO OCCASIONAL TABLE ALESSANDRO MENDINI (1984)

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FOR DETAIL ON WOOD TURNING – TAP THE LINK BUTTON BELOW

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THE MORTISING MACHINE

The mortising machine is a specialised piece of equipment, used to cut mortise joints and rectangular slots in wood. Mortise joints are often cut by hand. However, if a number of mortise and tenon joints are required, the mortising machine is quick, accurate and easy to use.

The mortising machine is often used to cut square or rectangular recesses, in the surface of wood (e.g. for hinges).

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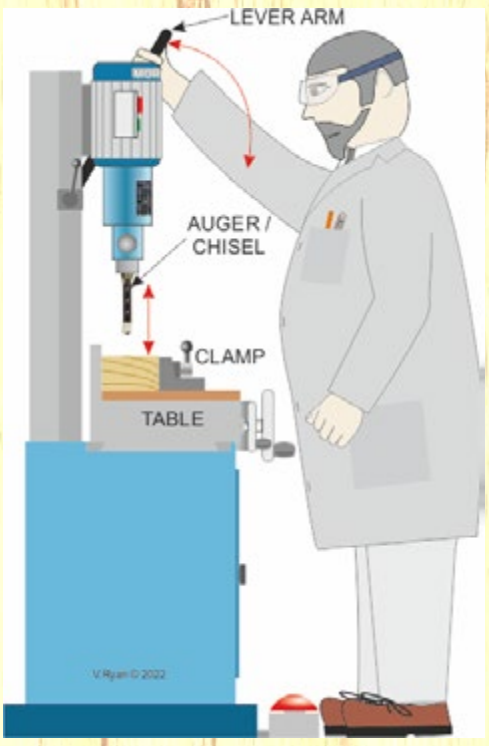

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THE MORTISING MACHINE

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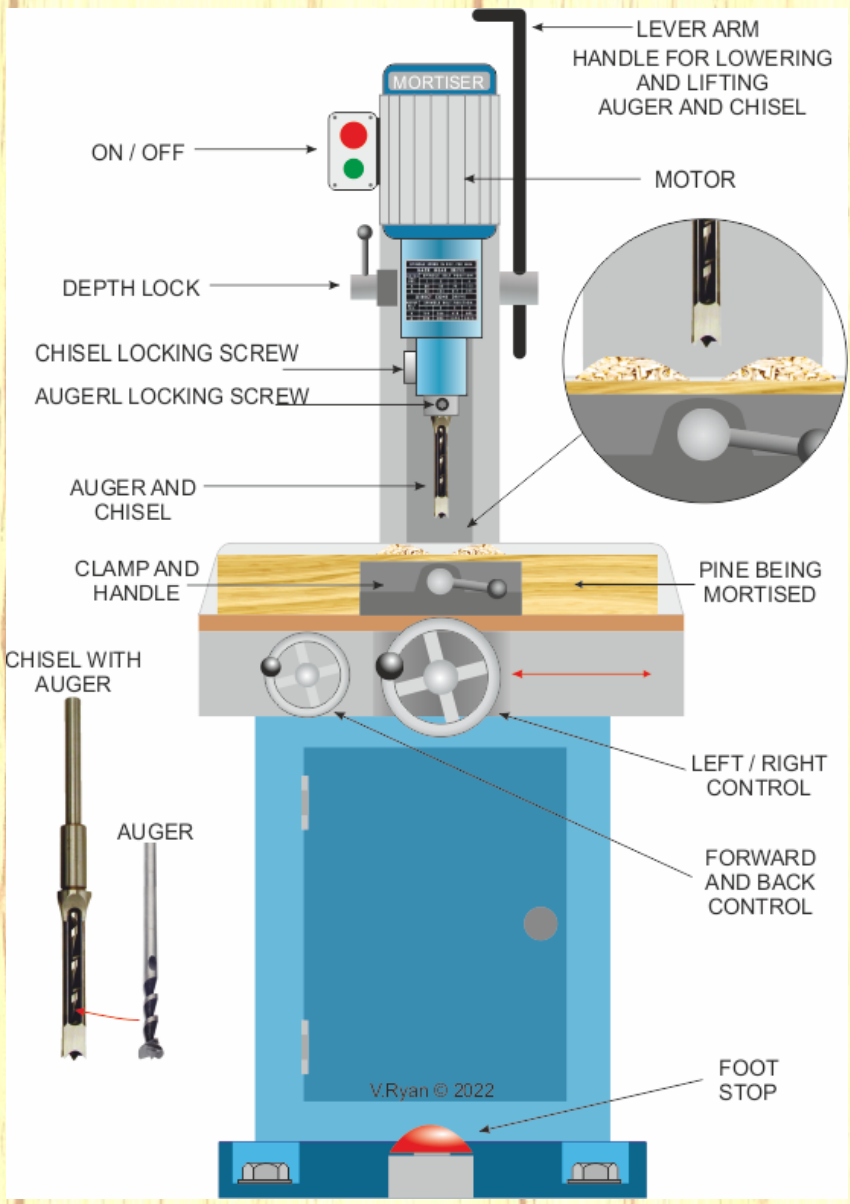

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COMBINATION DISC / BELT SANDER

The combination disc and belt sander, is a versatile machine for smoothing and shaping wood and plastics. This machine is two machines in one. It has a disc sander and a belt sander. Due to their dual functions, this type of machine is NOT recommended for schools. Widely used in industry.

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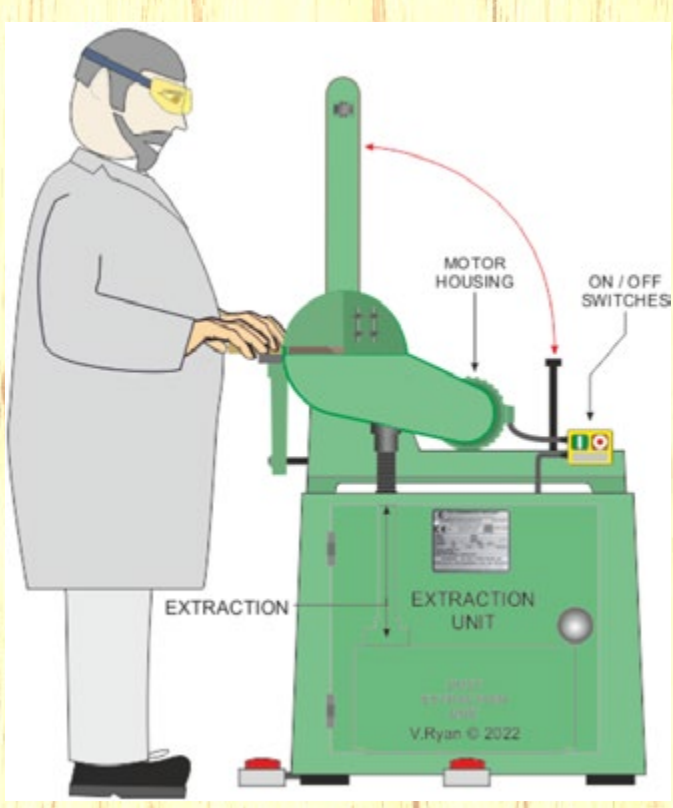

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LAMINATED VENEER

When thin layers of veneer are glued together, forming one part, they are called laminates. Complex shapes can be achieved with one piece of laminated material. A former is normally used to hold the layers of veneers to the correct shape.

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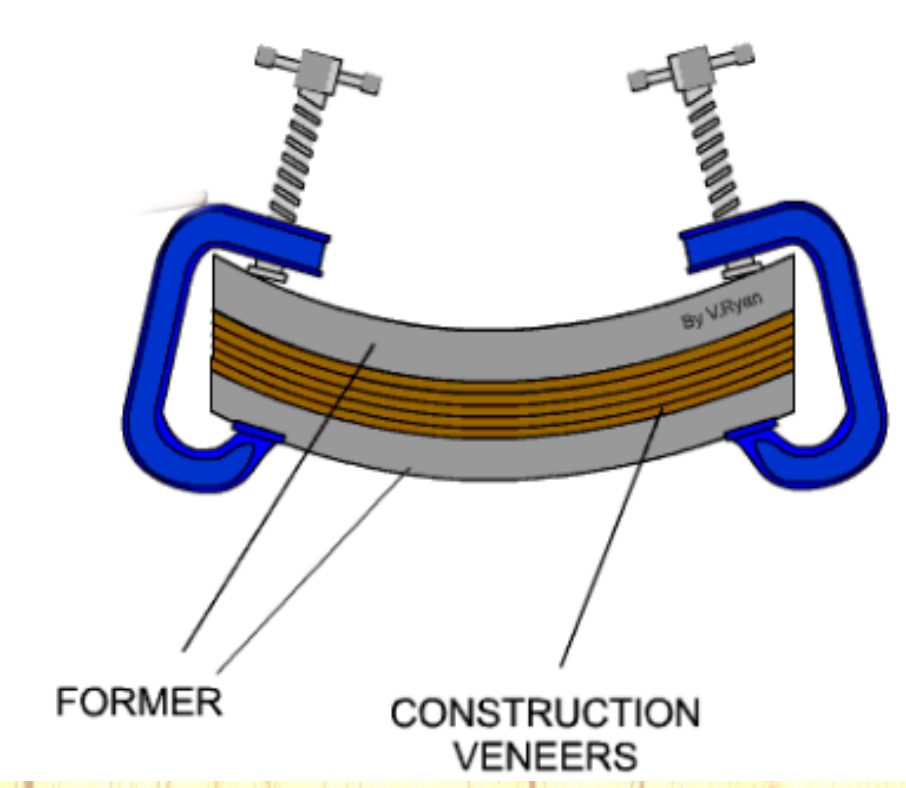

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VENEERS AND STEAM BENDING

Thicker layers of veneer are steam treated first, before bending. They are placed in steam chamber. Steam is introduced at one end and excess steam / pressure escapes at the opposite end. Condensed steam (water) drains away. As the steam flows from one end of the tube to the other end, moisture is absorbed by the veneer. After a period of time, the veneers are removed. They are now pliable and it is possible to bend them to the required shape, using a former.

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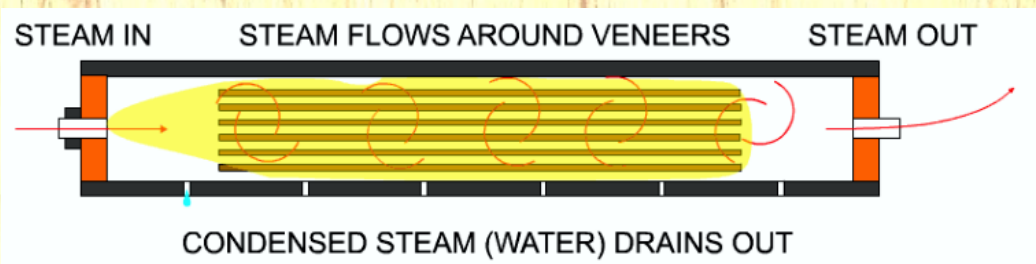

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STEAM BENDING CHESTS

Cut a piece of plastic tube (e.g. drain pipe). Clad the outside with wood battens, held in position with wire. Alternatively, use insulating foam or a hot water tank jacket, to wrap round the steam tube.

The end stops should be made from exterior grade plywood.

Steam wood inside the tube, for one hour, per 25mm of thickness.

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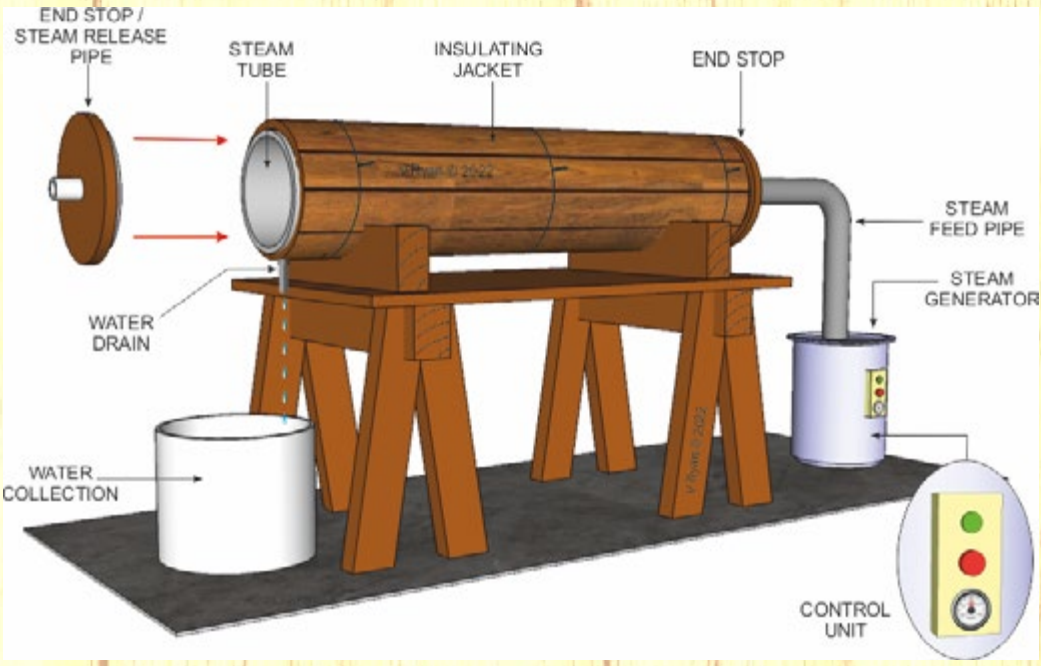

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USING A STRAP AND FORMER - STEAM BENDING OF WOOD

A mild steel strap, used to 'force' the wood round a former, is one of the most efficient ways of 'bending' steamed wood. The steel strap is manufactured from 1.5 mm, flexible, mild steel or plated mild steel. It must be the same width (or greater), than the wood being formed.

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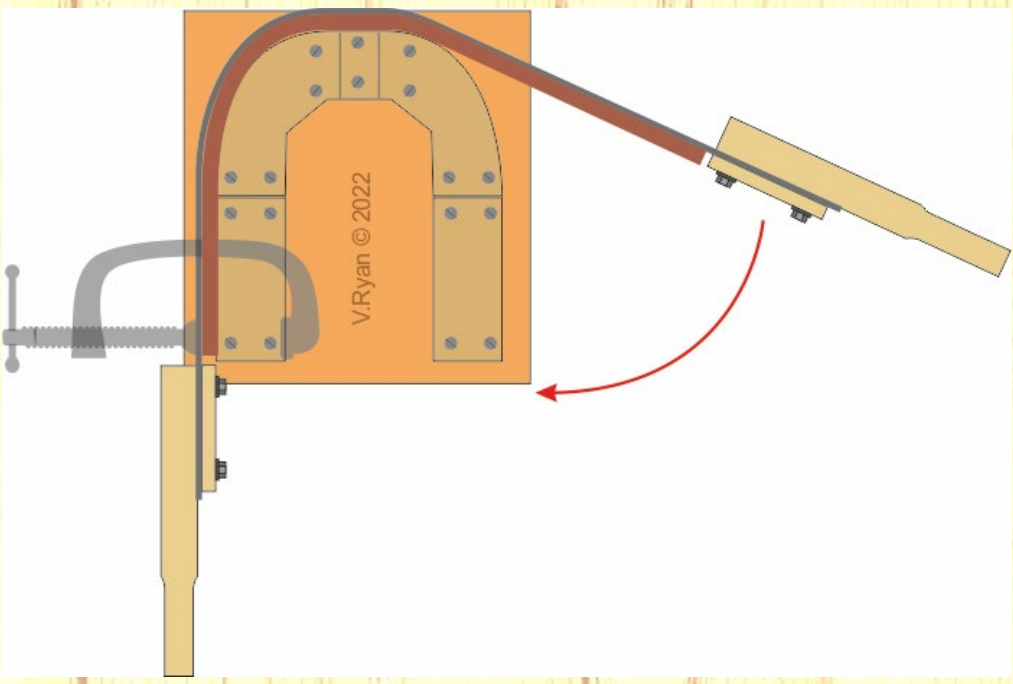

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EXAMPLE OF A STEAM BENDING - A PLYWOOD PRODUCT

LOUNGE CHAIR BY CHARLES AND RAY EAMES - 1956

The classic chair seen below, was designed by Charles and Ray Eames in the 1950s. It was first manufactured for sale in 1956 by the Herman Miller Furniture Company of Michigan, USA.

Tap the image for detailed information / exercises

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MACHINE PLANERS

When the width or thickness of a piece of wood needs reducing by a small amount, a plane is normally used. However, if a large amount of wood needs removing or the piece is very long, using a smoothing plane or jack plane is time consuming and can be inaccurate. The best option is to use a machine plane. These are relatively cheap and save time and effort. PLEASE NOTE - machine planers are not normally used in schools, due to Health and Safety Laws.

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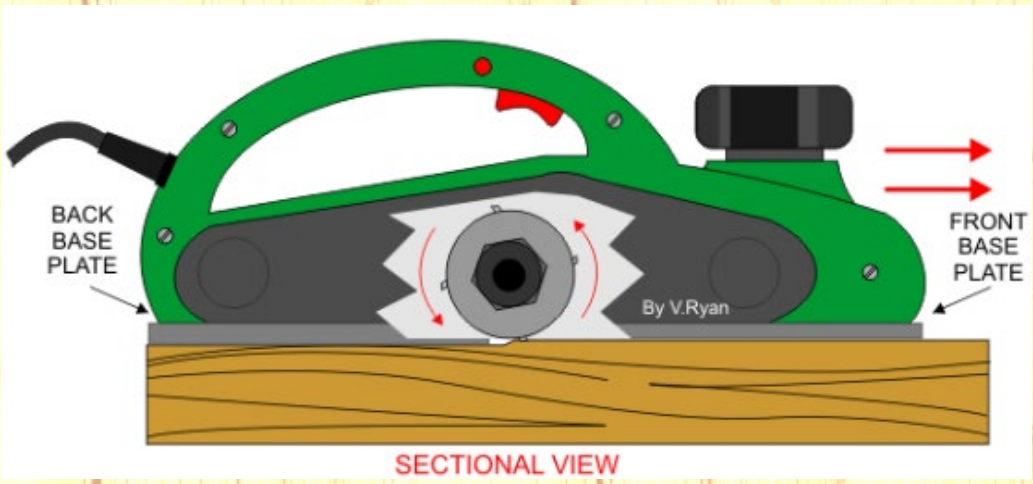

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SHEET SANDERS

Sheet sanders are used to sand / smooth wood surfaces. When sanding wood, glasspaper is 'clipped' into the sheet sander. If the surface requires a lot of sanding then start with 'coarse' glasspaper rather than fine - as this will reduce the amount of time required. When in use the rectangular base vibrates at 1200 rpm (revolutions per minute). This 'sands' the surface of any material beneath it.

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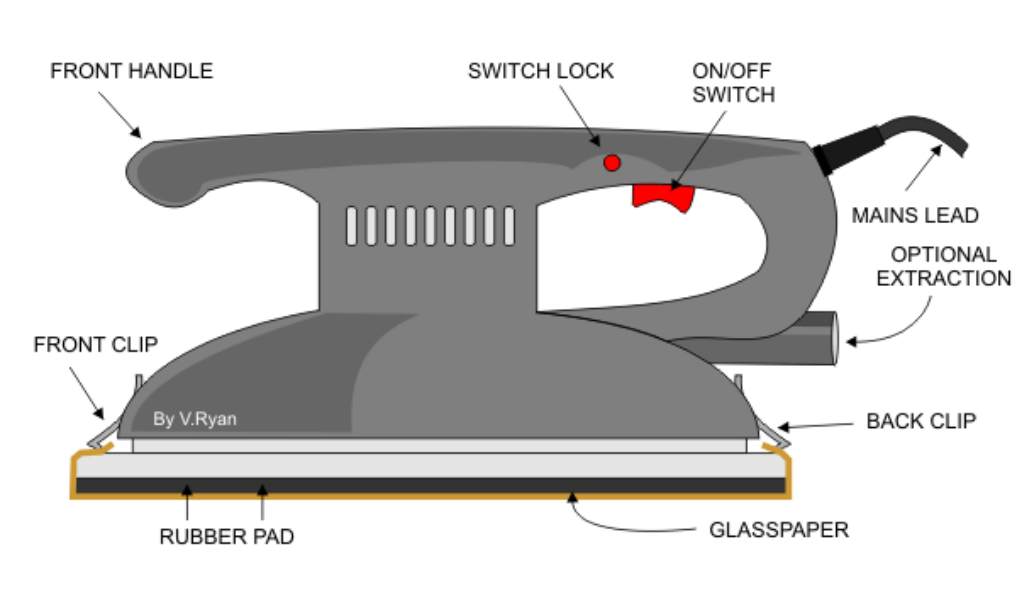

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PALM SANDERS

Palm sanders are extremely useful tools and they fit into the palm of one hand comfortably. They are relatively light, easy to control and cheap. The glasspaper sheet is normally fixed to the pad with velcro and this means that it can be replaced easily. Because they are quite small and have a 'triangular' shape to the pad, they can be used to sand into corners.

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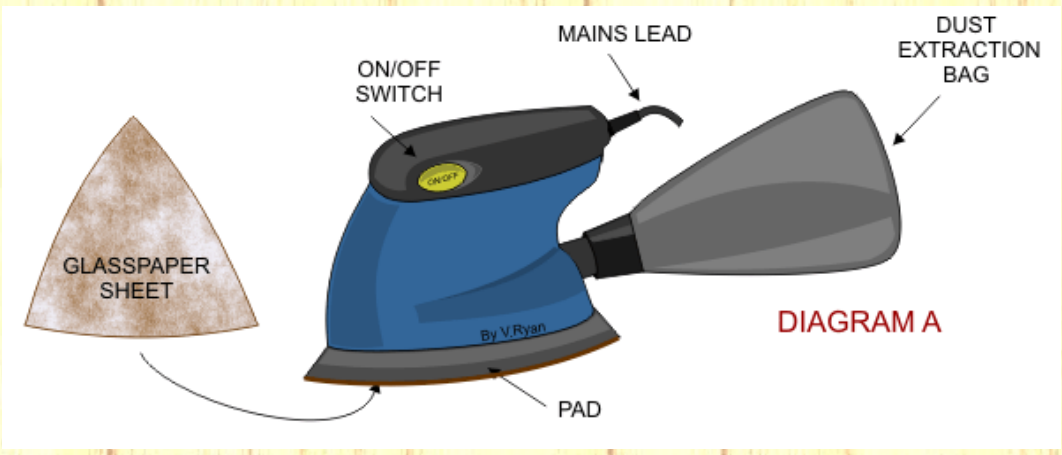

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MACHINE ROUTERS

Machine routers are generally used to cut grooves and profiles in natural wood and manmade boards. They have a cutter that rotates at high speed - as the operator pushes the router forwards the cutter removes the wood in its path.

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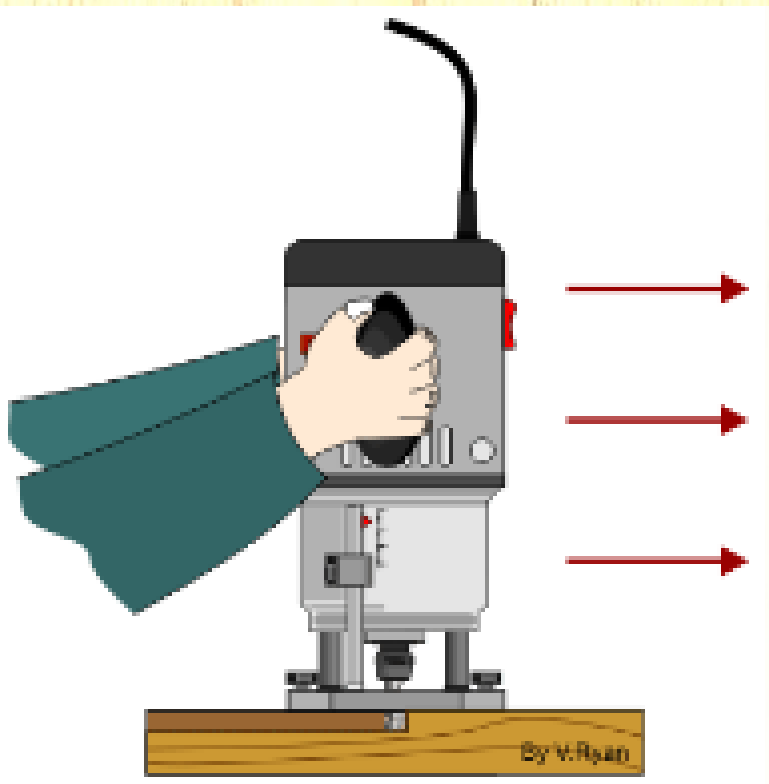

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ROUTER BITS and PROFILES

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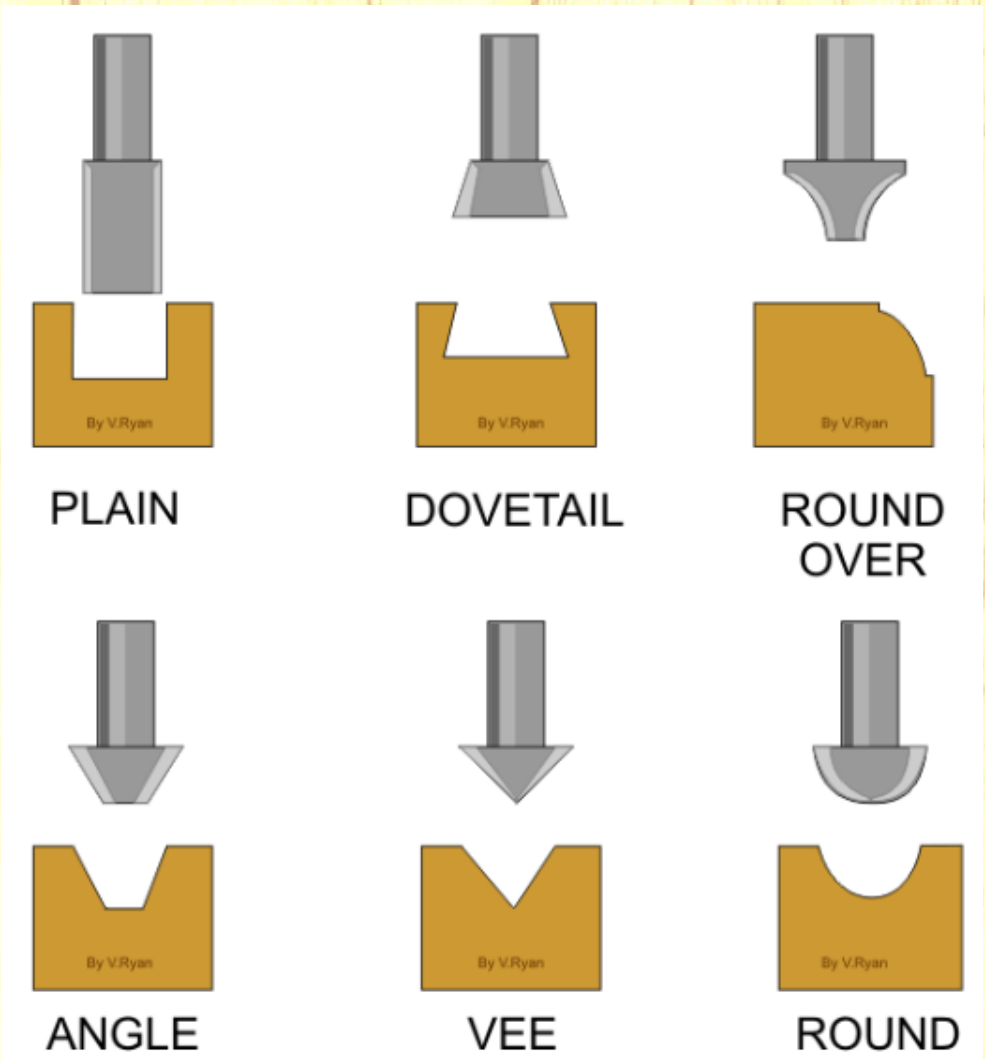

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THE INVERTED ROUTER TABLE

Machine routers can be bolted securely to a router table, which in turn, should be bolted to a substantial work bench / cabinet, specifically designed for this machine. This type of accessory, allows the user to concentrate on pushing the wood through / across the router's cutter.

Always wear the correct safety 'gear', including goggles / visor, a work coat / apron. Ensure that the fences and 'clamps / cramps are securely in place.

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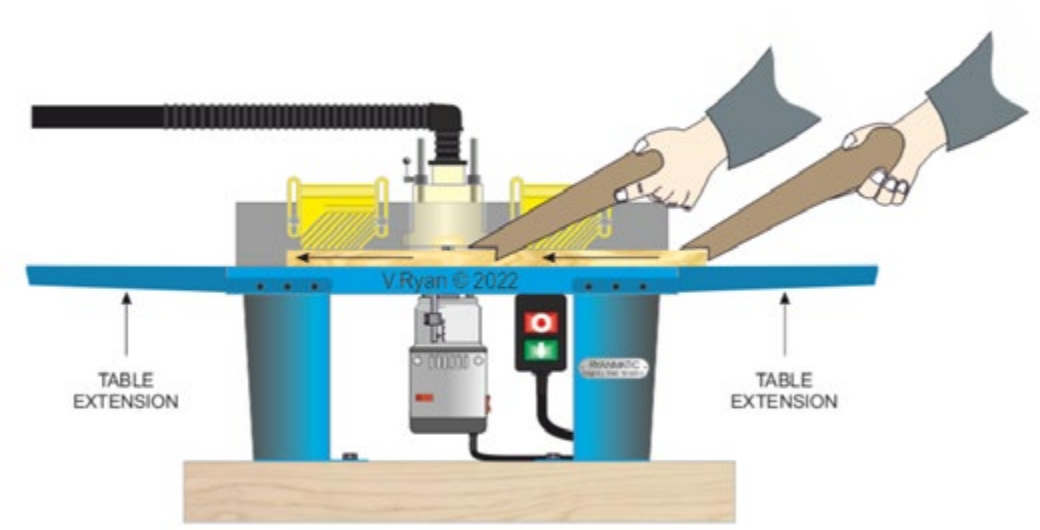

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JIGSAWS

Jigsaws are general cutting and shaping tools. They are provided with a selection of blades suitable for cutting and shaping a range of materials. They are ideal for cutting thin manmade boards such as plywood and MDF and they are capable of cutting detailed curves. Thin material (4mm to 6mm) can be cut quite quickly, but great care must be taken when cutting thicker material.

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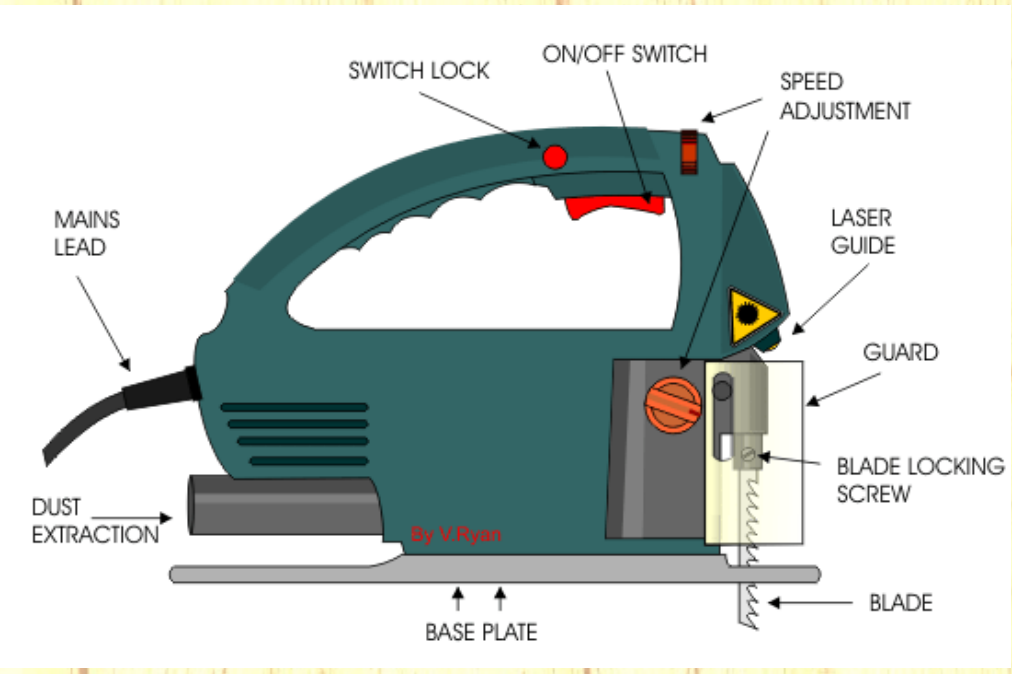

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USING A JIGSAW

If the wood to be cut and a wood guide is G Cramped to a work bench it will be possible to cut in a straight and accurate line. The jigsaw is pressed against the guide whilst been pushed in the direction of the cut. Wood guides are very useful and they are safe if used properly.

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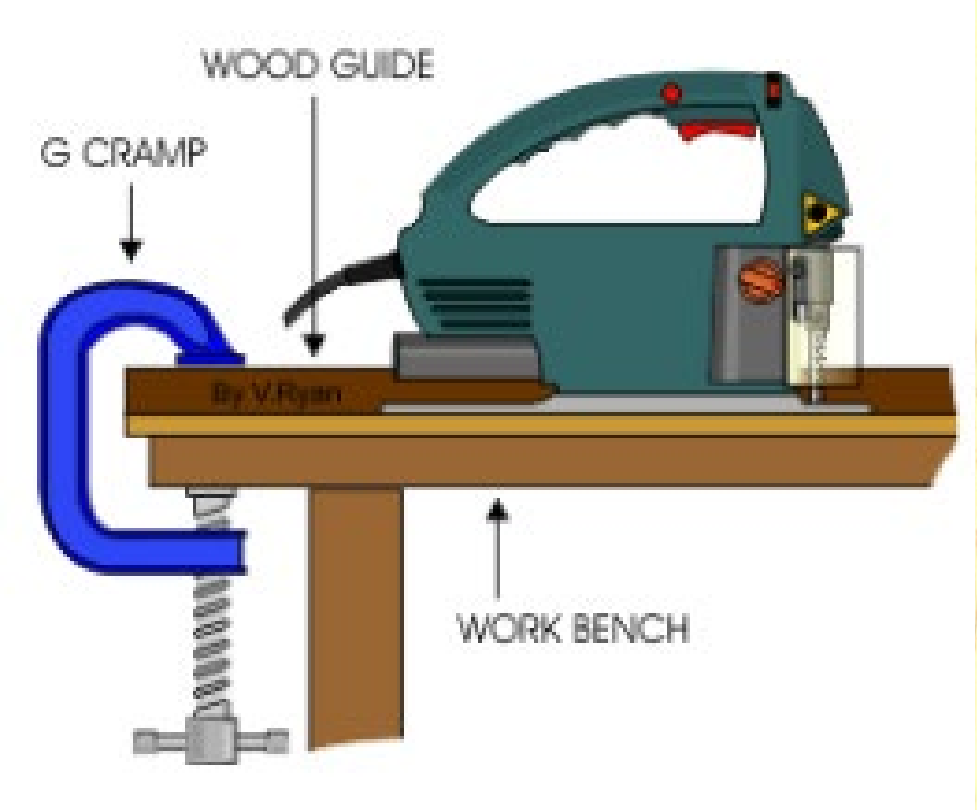

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TABLE - CIRCULAR SAWS

Table circular saws are used for cutting woods to size . They are extremely powerful and dangerous if used incorrectly. They are ideal for cutting manmade boards such as plywood and MDF and natural woods up to a size of approximately 50mm thickness. They can be used to cut materials for joinery, furniture and windows.

Tap the image for detailed information / exercises

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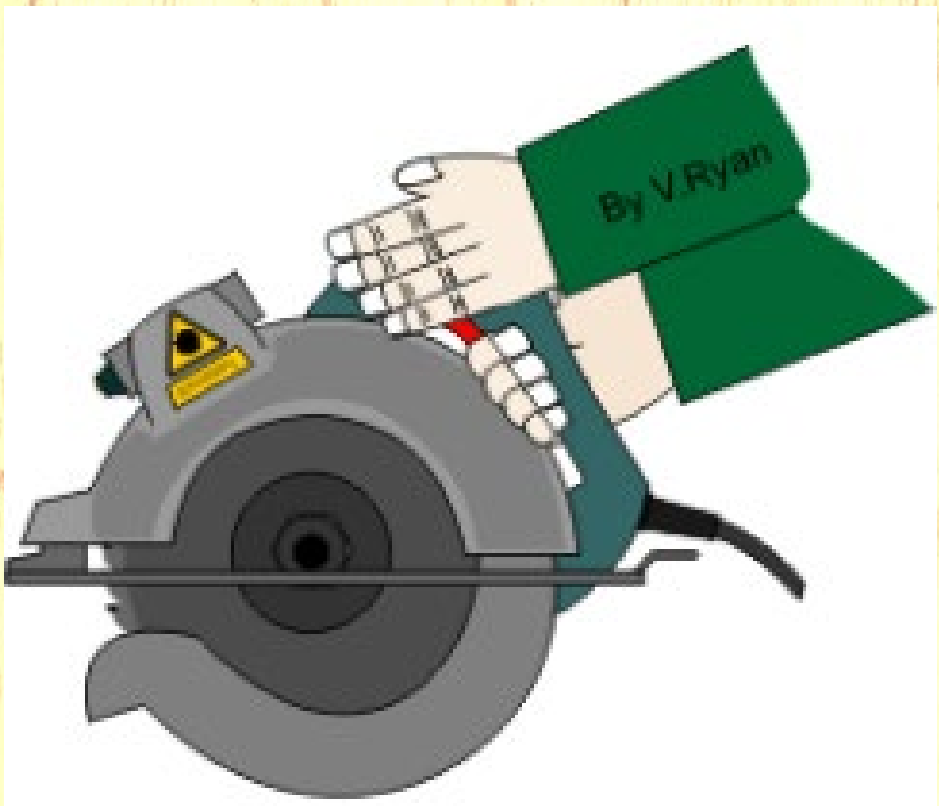
HAND HELD CIRCULAR SAWS

These are powerful electric saws, capable of cutting through wood very quickly, even thicker sections. They are not normally used in school. Ideal when 'lots' of cutting is required

Tap the image for detailed information / exercises



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THE BAND SAW

The band saw is used for preparing materials, cutting and shaping. The blade is in the form of a continuous loop that runs around two (sometimes three) wheels. Special training is required for the use of band saws, as they are potentially very dangerous, if misused.

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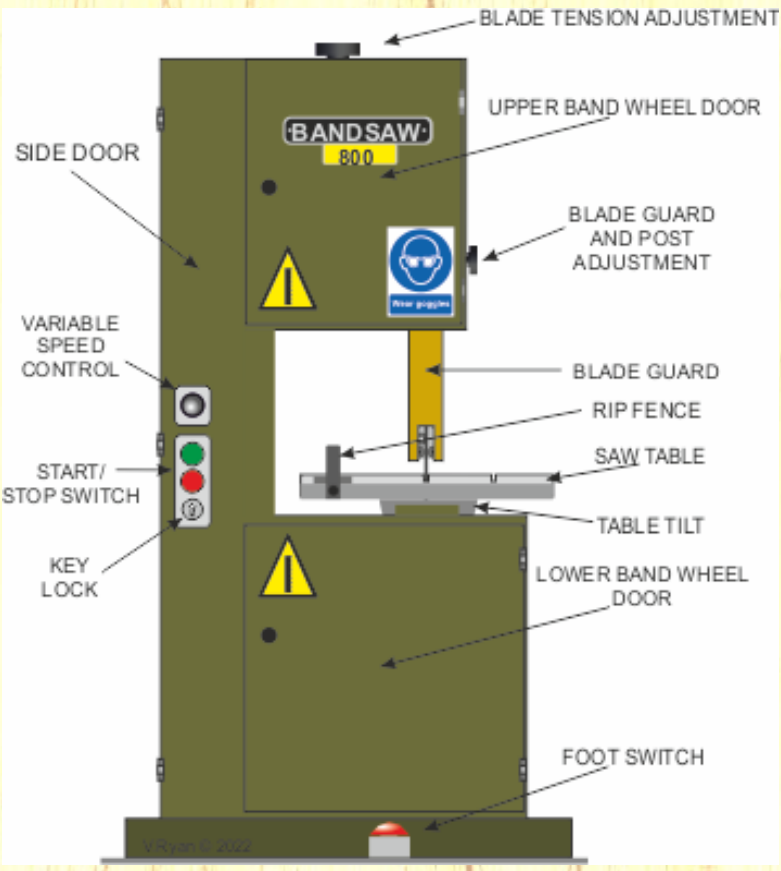

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THE BAND SAW

This image shows the band saw being used, without the need for a fence (free-hand cutting). Each hand is positioned to each side of the blade. This is for basic safety - if a hand slips, it will not go straight on to the sharp blade.

Tap the image for detailed information.

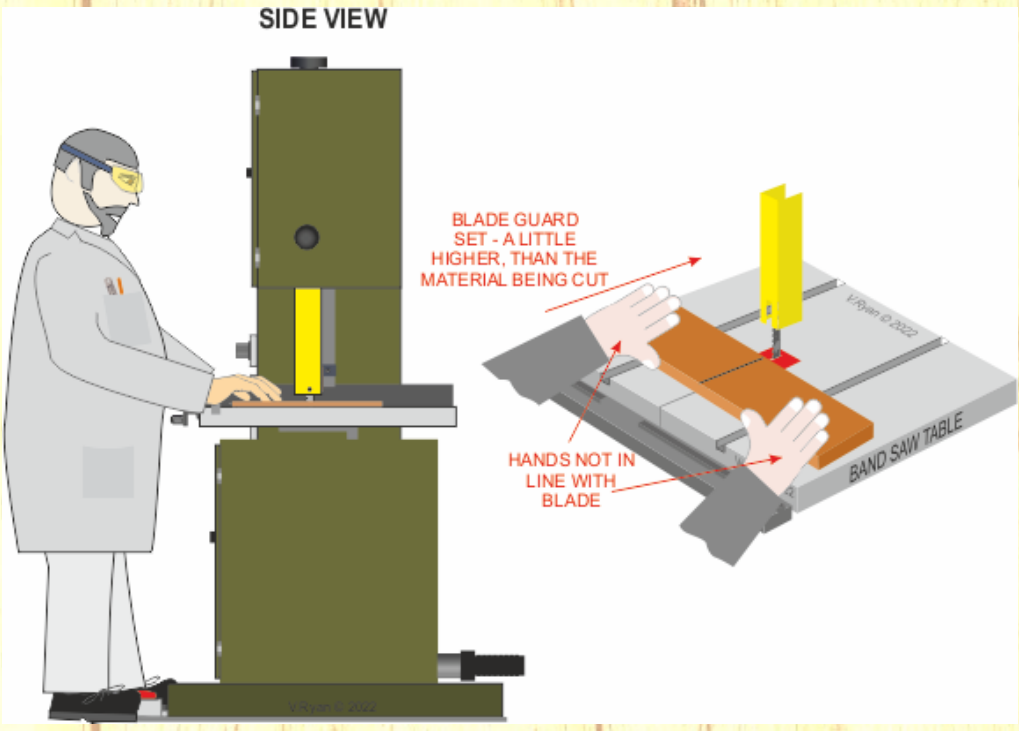

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TABLE - CIRCULAR SAWS

The band saw can be used for a range of work.

Tap the circles for detailed information / exercises

1 2 3

4 5 6

Tap the red button to return to the Contents page