SAFE USE OF HAND TOOLS

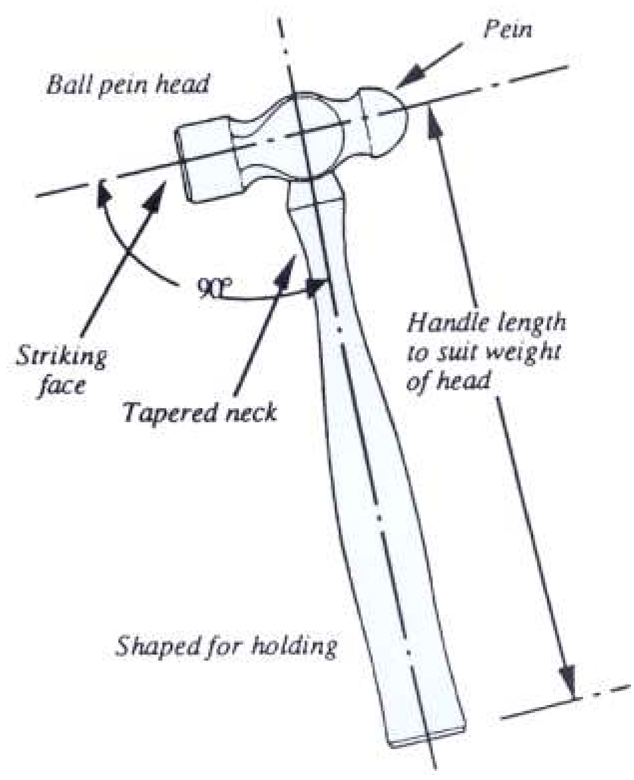
USES OF HAND TOOLS

STRIKING TOOLS

<u>Hammers</u>

The standard engineers hand hammer is the **BALL PEIN**. The flat striking face used for driving various fastenings and chisels, the rounded pein for riveting. The various elements are defined in Figure 1.

Figure 1

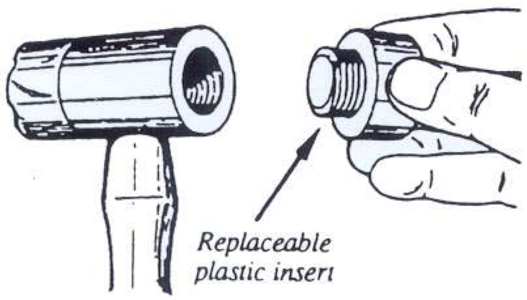


ENGINEER'S HAND HAMMER

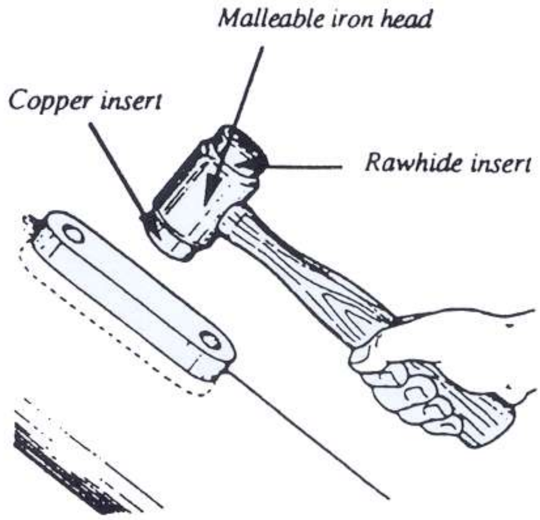
Mallets

Figure 2 shows a softheaded mallet. These are used to seat or position a workpiece for machining with no risk of damaging the part. Materials used for mallets include brass, copper, aluminium, lead, wood, plastic and rawhide. Of these, the most common are copper and rawhide.

Figure 2



SOFT FACE HAMMER



SOFT HEAD HAMMER FOR ASSEMBLING

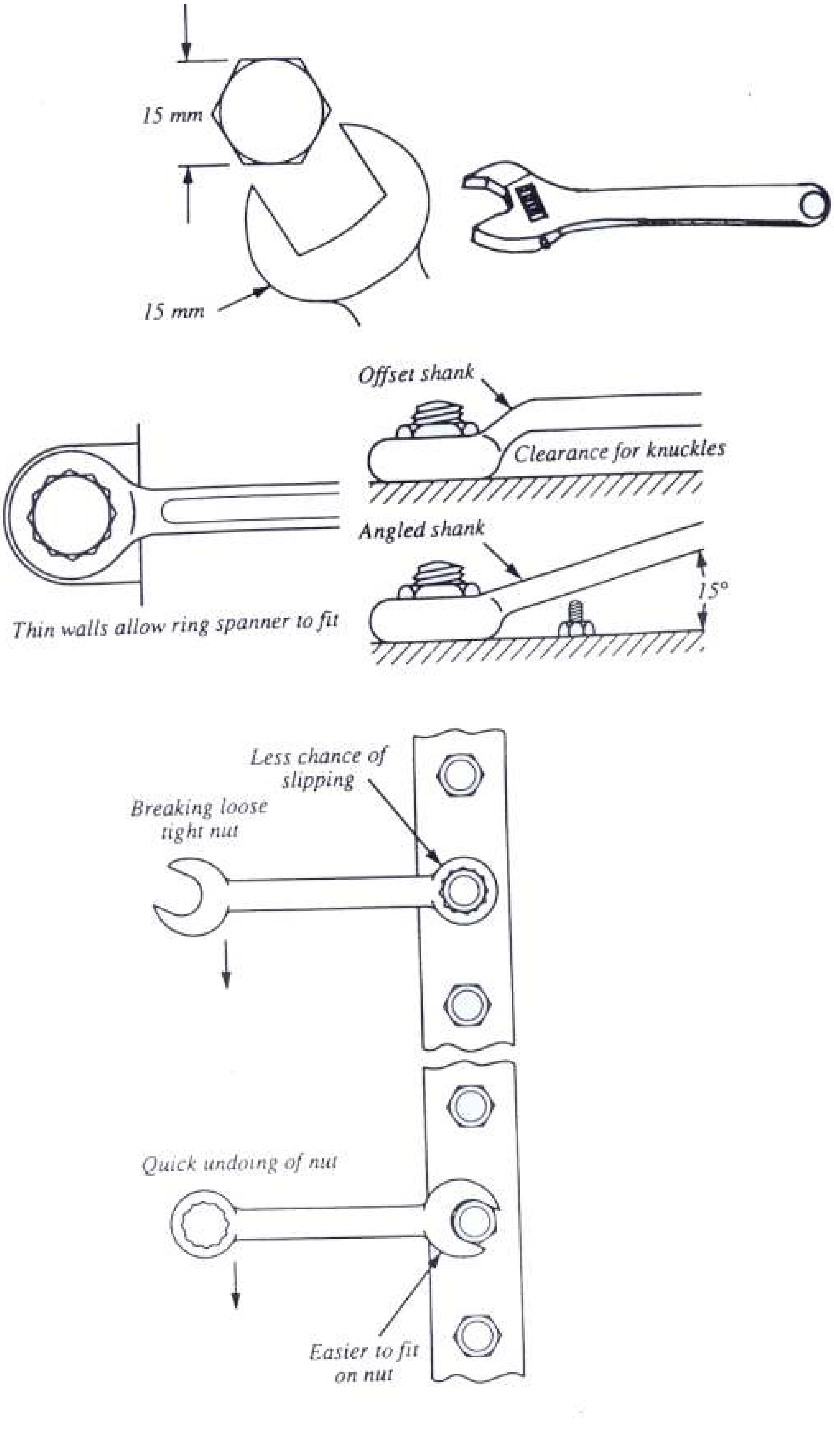
FASTENING TOOLS

Spanners & Wrenches

Figure 3 shows the most common type of spanners, the open-ended and the combination type with a ring at the opposite end. The open-ended spanner is quicker to use, but is more likely to slip if not fully engaged. There are some variations such as the spanner with an angled shank giving clearance for the knuckles in the event of the spanner slipping.

At the top of the Figure you will see an adjustable spanner otherwise known as a "mover". This has one moving jaw and it is a very handy and versatile tool. However, if the gap is set even slightly too wide there is a risk of slipping and also damaging the nut by removing the corners of the hexagon.

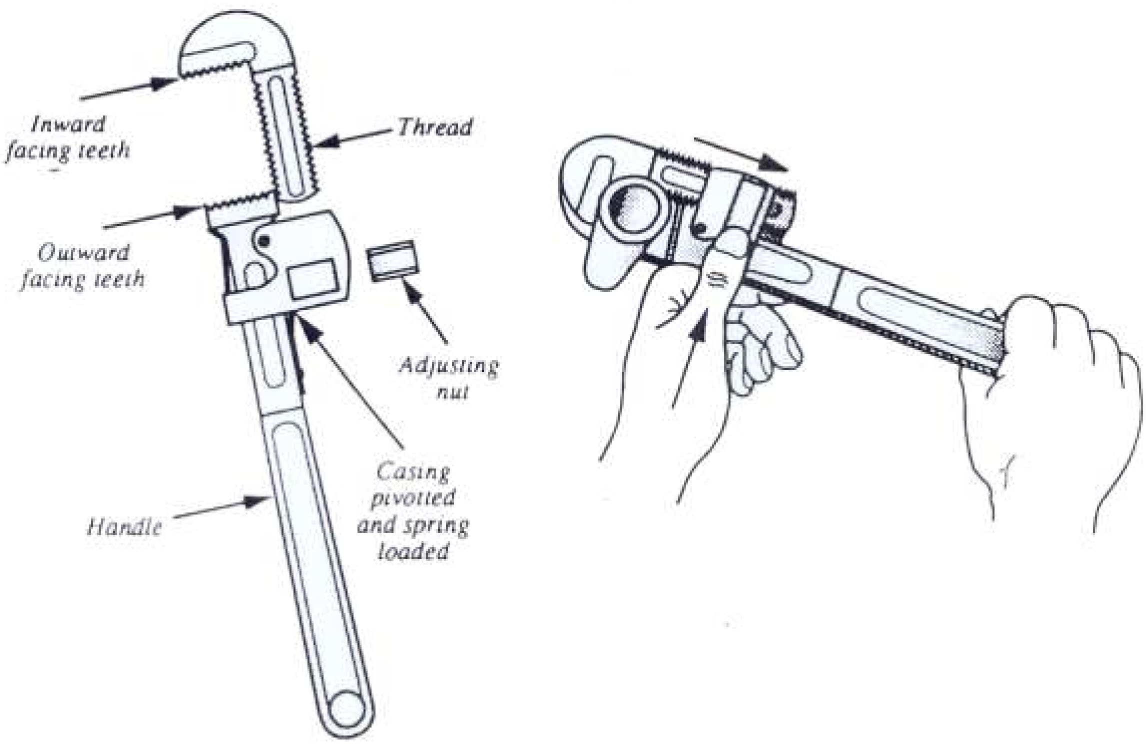
Figure 3


15 mm
15 mm
Offset shank
Clearance for knuckles
Angled shank
15°
Thin walls allow ring spanner to fit
Less chance of slipping
Breaking loose tight nut
Quick undoing of nut
Easier to fit on nut

Pipe Wrenches

Figure 4 shows the most popular type of pipe wrench, the Stillson. They have one fixed jaw and a moveable jaw that can be adjusted by turning a knurled nut. The moveable jaw is spring-loaded so that the jaws can spread slightly when they are placed on a pipe. When pressure is applied to the handle the jaws move together to grip the pipe. The teeth on the moving jaw point inward and on the fixed jaw they point outward. The wrench should be placed on the pipe in such a way that only the centre of the toothed jaws are in contact with the pipe. When using Stillsons, you must ensure that you exert force on the handle in one direction only, away from the fixed jaw. If turned in the wrong direction the wrench will not grip the pipe.

Figure 4

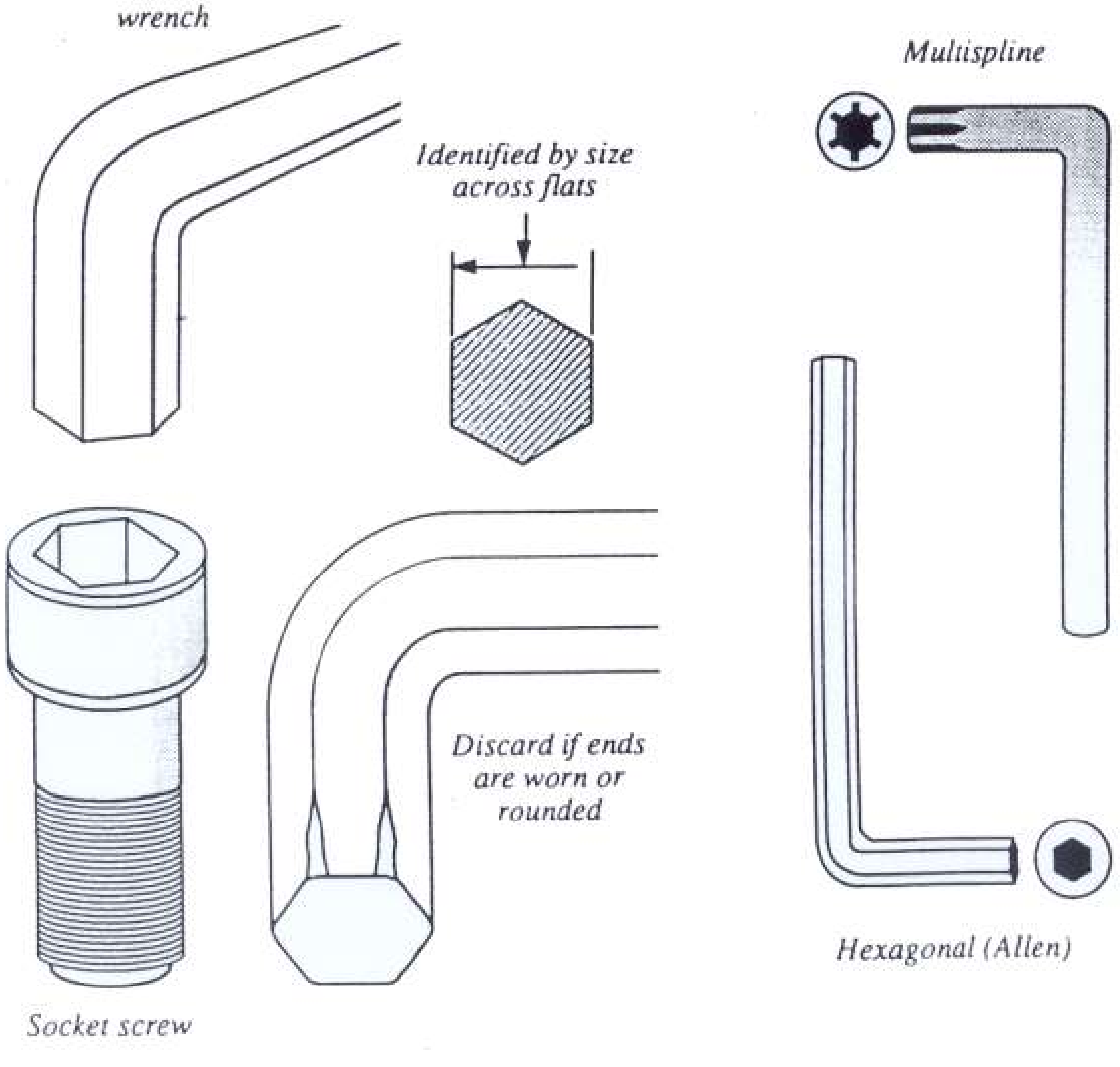


Hexagonal Keys

Figure 5 shows a typical hexagonal key, the original type being the **ALLEN KEY**. These fit into a hexagonal socket forged into the screwhead. They come in a range of sizes identified by the size across the flats.

A similar type of key is the multi-spline type, not so commonly used as the Allen Key. The latter are made from hexagonal stock and the multi-splined type from round stock. Either the short leg or the long leg can be used for turning the screw, depending on conditions. To increase the leverage a suitable piece of pipe can be used to extend the handle but care must be taken not to over stress the key. In this situation, they can be twisted or even snapped off if too much force is applied.

Figure 5



Screwdrivers

Figure 6 shows the two most commonly used screwdrivers, the flat blade and the cross-point in two versions, the Phillips and the Pozidrive. It should be noted that these are not interchangeable and the correct size and type of cross-point driver must be used for the screw involved.

A driver too small or too large will damage the recess and it may prove impossible to move the screw in either direction. Should the screw happen to be a self-taper you will be left with the tedious task of drilling it out, not an easy proposition when you realise that self-tapers are made from hardened steel. Figure 7 shows a special type of driver with a square section blade. This can be used, in conjunction with a spanner, to move a particularly stubborn screw.

One golden rule to remember is that a screwdriver should never be struck with a hammer. On occasion, woodscrews that have been in place for a long time may be hard to start and a good tip is to position the driver and strike it fairly hard with a soft-faced mallet such as rawhide. The effect is usually to shock the screw off the threads in the timber making it easier to extract. It is best not to use this procedure unless there is no other way of starting the screw, but it is preferable to making many slips and “chewing” the slot leaving drilling out as the only remaining option.

Figure 6

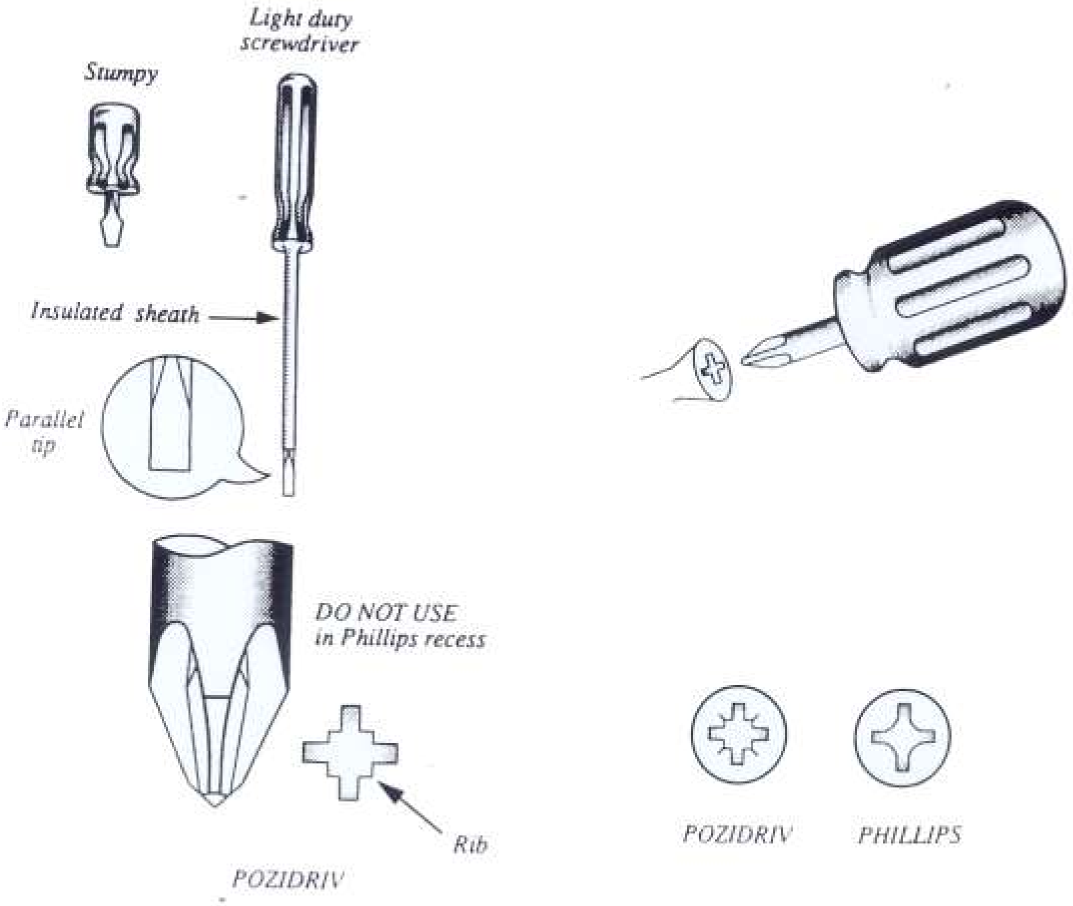
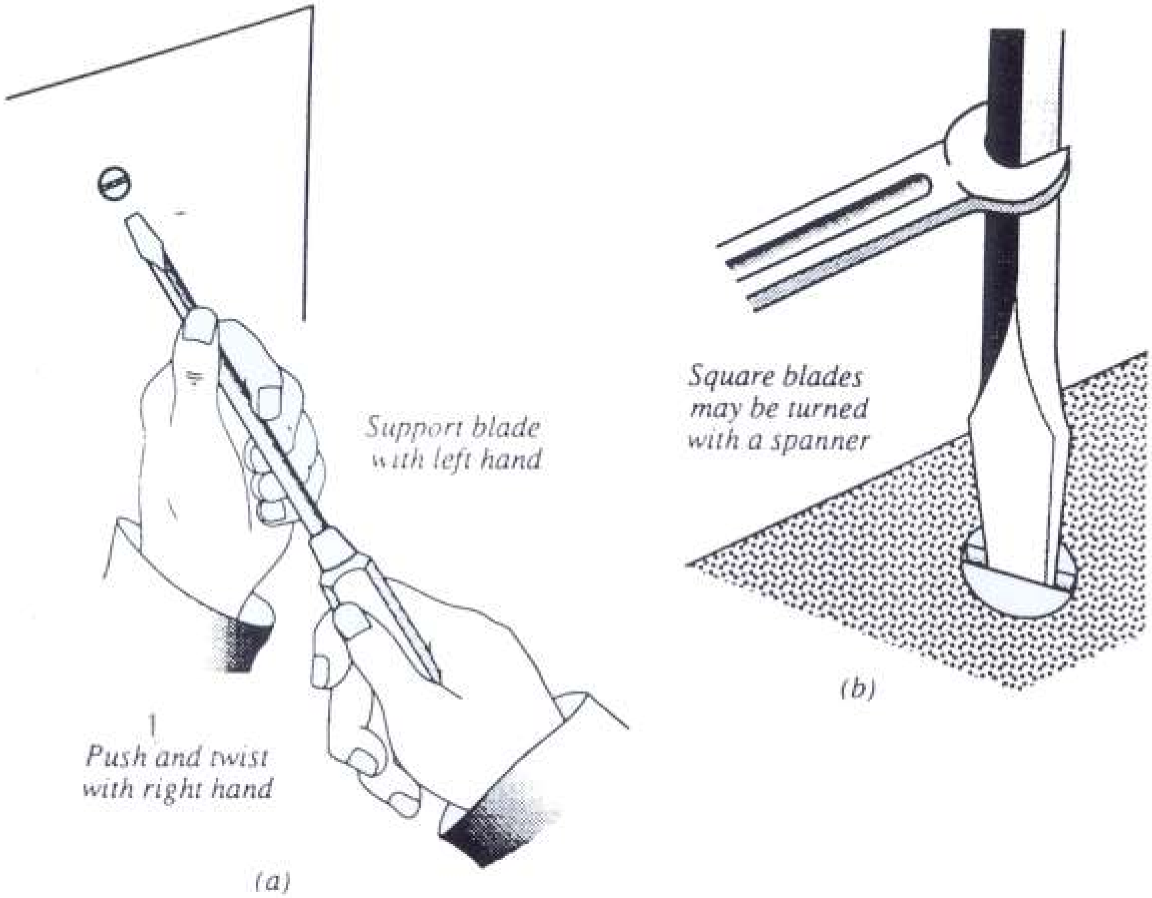


Figure 7


Support blade
with left hand
Push and twist
with right hand
(a)
Square blades
may be turned
with a spanner
(b)

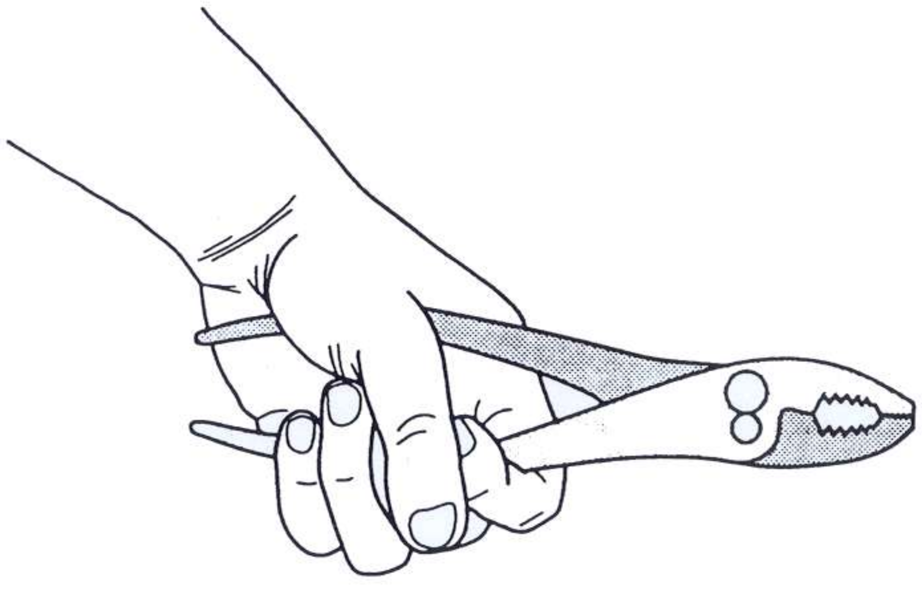
Pliers

There are many types of pliers, usually task-related. The types described here include combination pliers, cutting pliers, round nose pliers, flat nose pliers, taper-nose pliers and circlip pliers.

Figure 8 illustrates the principle involved in using pliers. Basically the pressure exerted by the hand muscles is magnified by the handles, which become levers and the teeth bite into the workpiece producing a solid grip. The type of pliers shown are only used for holding, but in Figure 9 combination pliers are shown. This type combines all three functions for which this tool is used ie, holding, cutting and bending. The versatility of combination pliers is further illustrated in Figure 10. Pliers designed for cutting wire and cable are shown in Figure 11. These form part of an electricians tool kit.

Round-nose pliers used for bending and manipulating wire are shown in Figure 12. Flat-nose pliers are used in a similar way as shown in Figure 13. Long taper pliers are for reaching into recesses and confined spaces, again a tool commonly used in electrical work. These are shown in Figure 14. Figure 15 shows two types of circlip pliers, one designed for internal circlips and other for external circlips.

Figure 8



Pliers make a job easier by increasing the user’s leverage

Figure 9

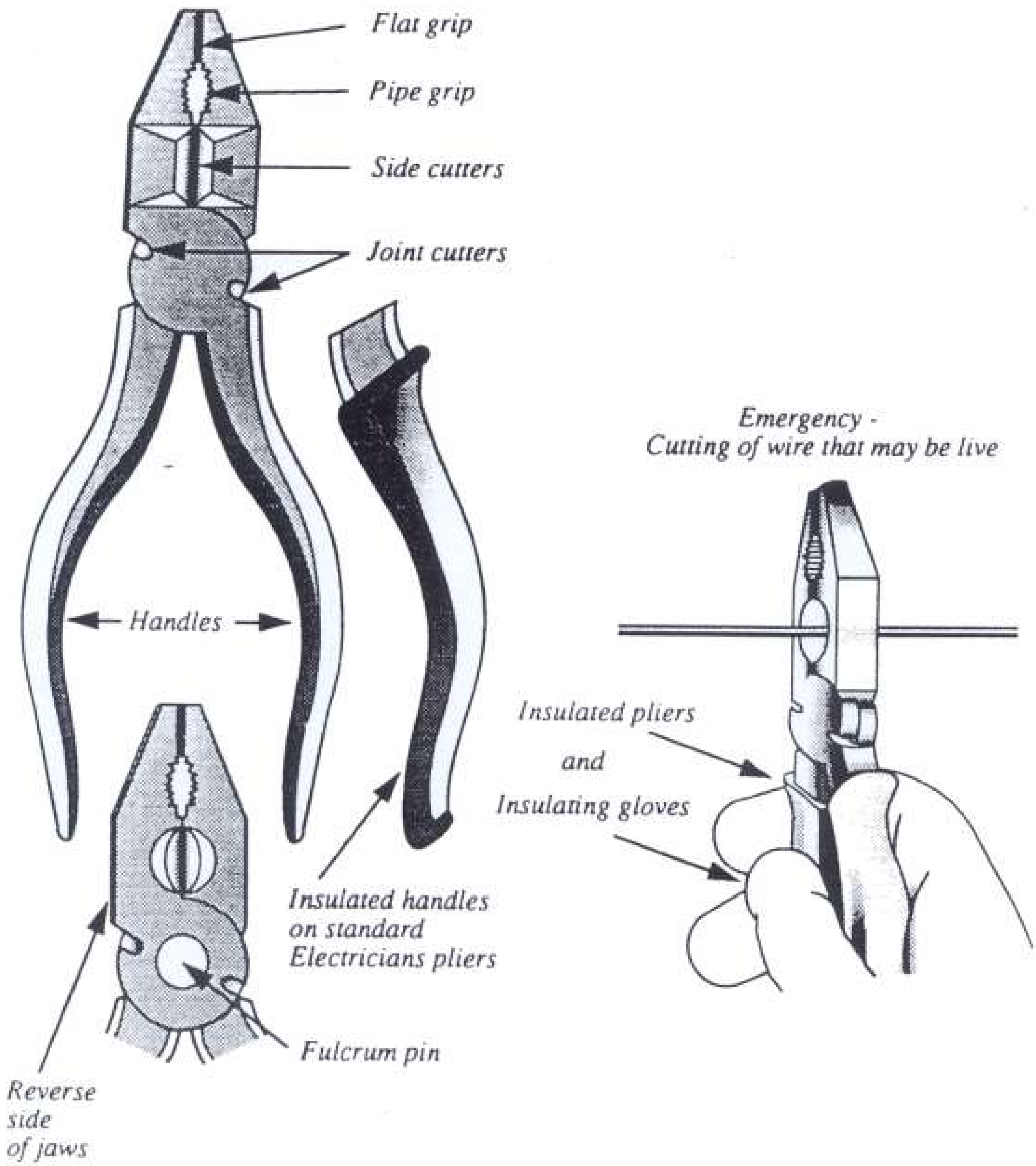

Flat grip
Pipe grip
Side cutters
Joint cutters
Handles
Insulated handles on standard Electricians pliers
Fulcrum pin
Reverse side of jaws
Emergency - Cutting of wire that may be live
Insulated pliers
and
Insulating gloves

Figure 10

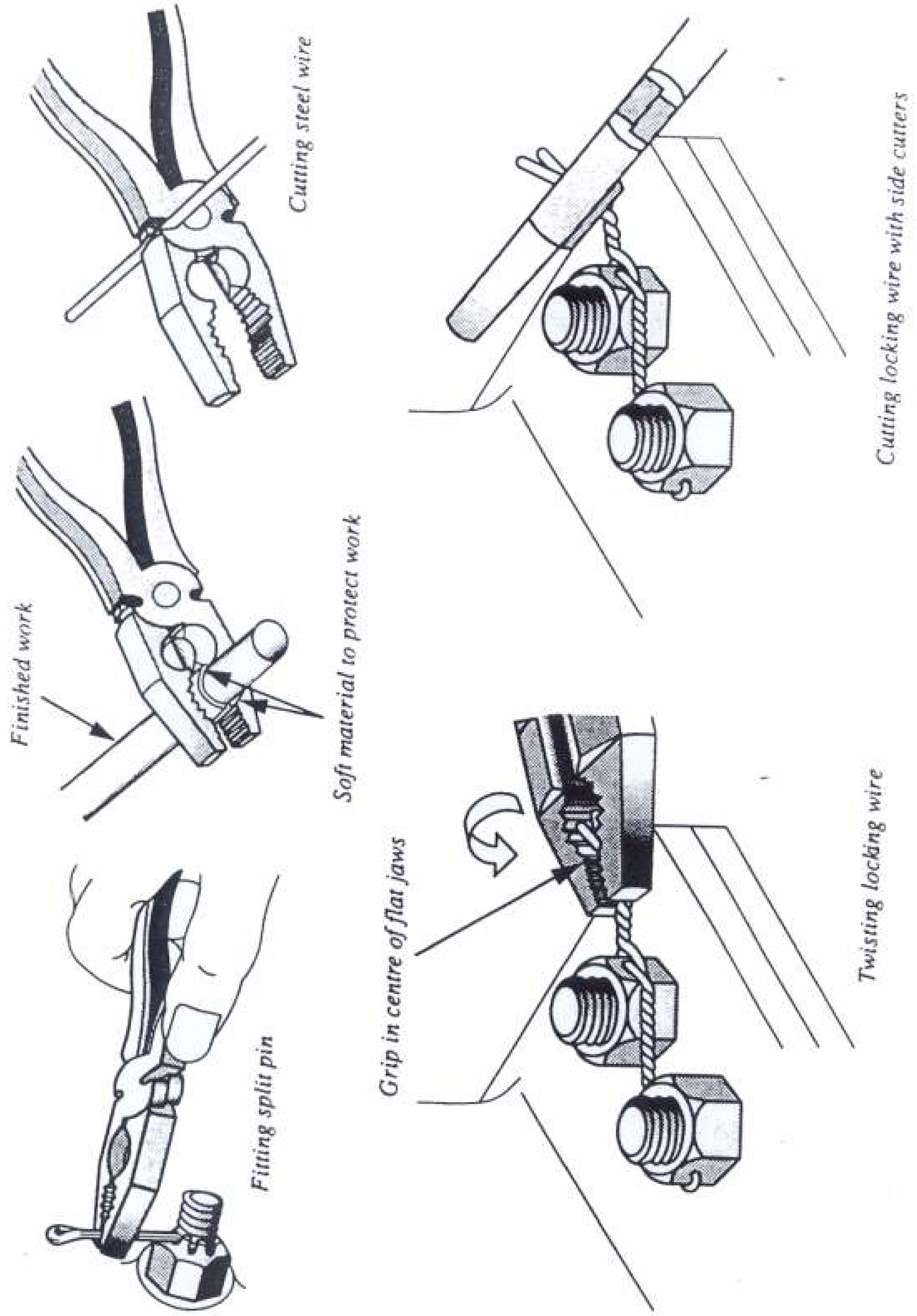

Cutting steel wire
Finished work
Soft material to protect work
Fitting split pin
Cutting locking wire with side cutters
Grip in centre of flat jaws
Twisting locking wire

Figure 11

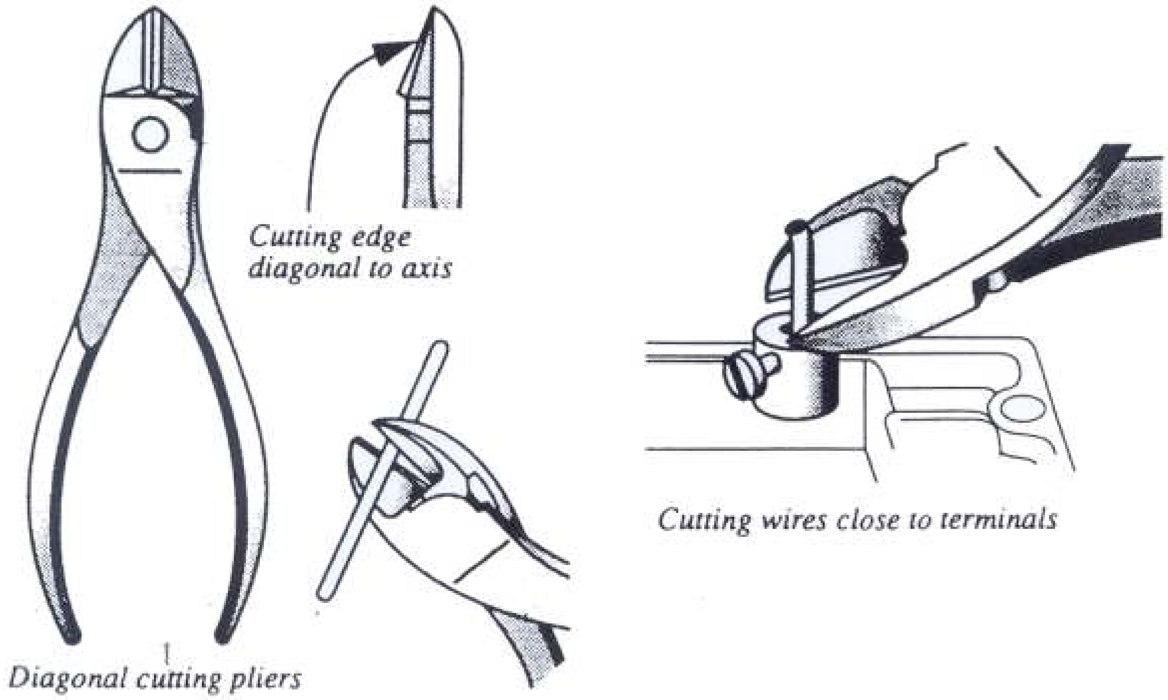
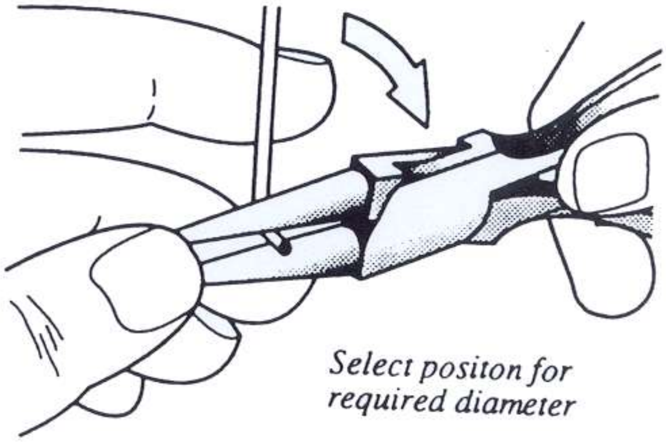
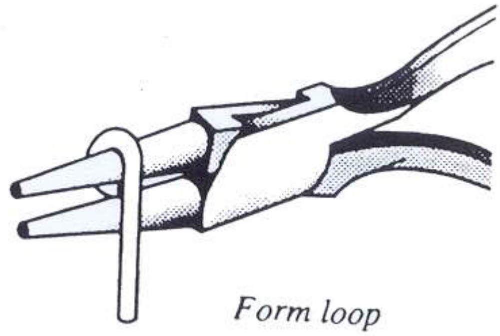

Cutting edge
diagonal to axis
Cutting wires close to terminals
Diagonal cutting pliers

Figure 12

Round Nose Pliers

These are made with tapered, rounded (conical) shaped jaws and are used to shape loops in wires and to form curves in light metal strips and also hold small parts.





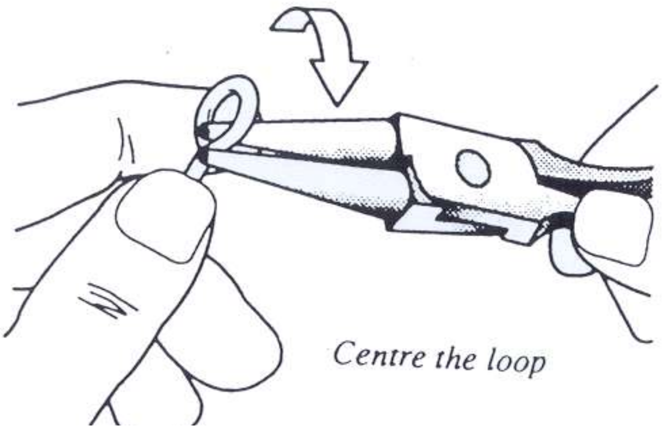
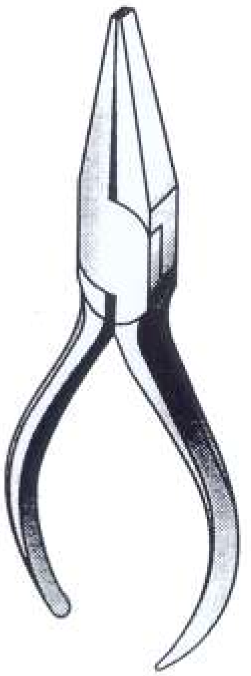


Figure 13

Flat Nose Pliers

These are made with tapered wedge shaped jaws with flat gripping surfaces that may be either smooth or serrated. They are used for bending and folding narrow strips of thin sheet metal and to shape wiring in electrical equipment.



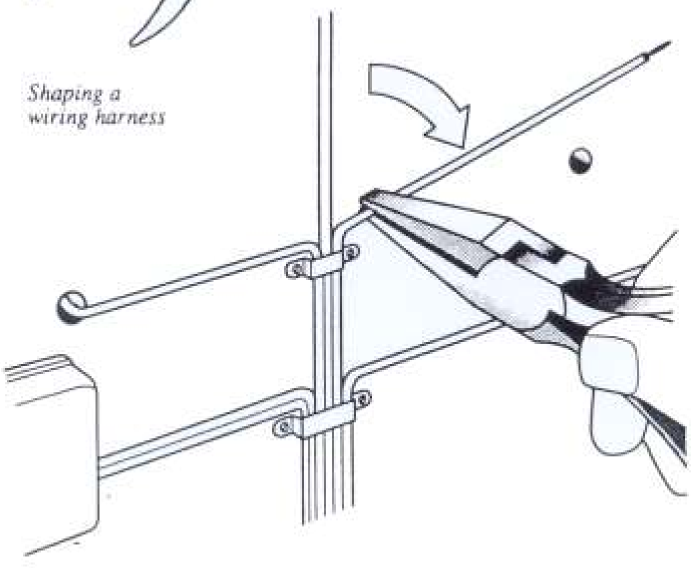


Figure 14

Long taper nose pliers are for reaching into confined spaces

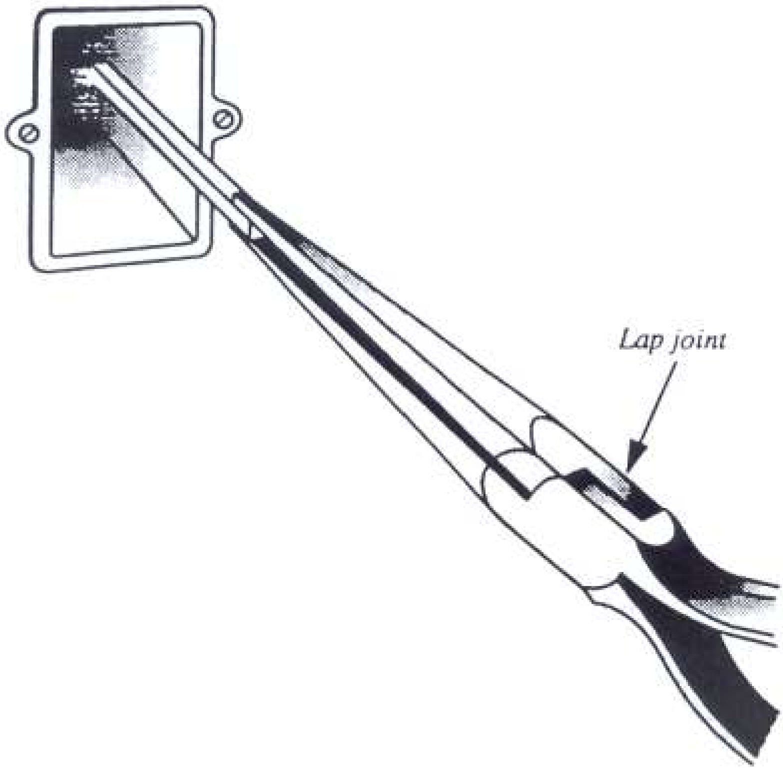
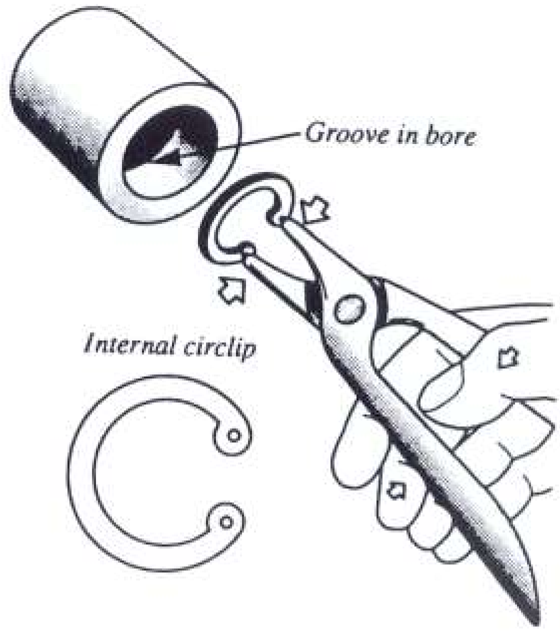
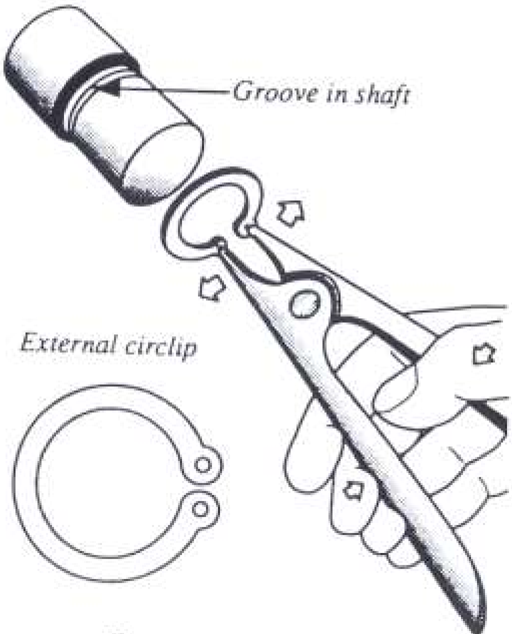


Figure 15



Compressing internal circlip



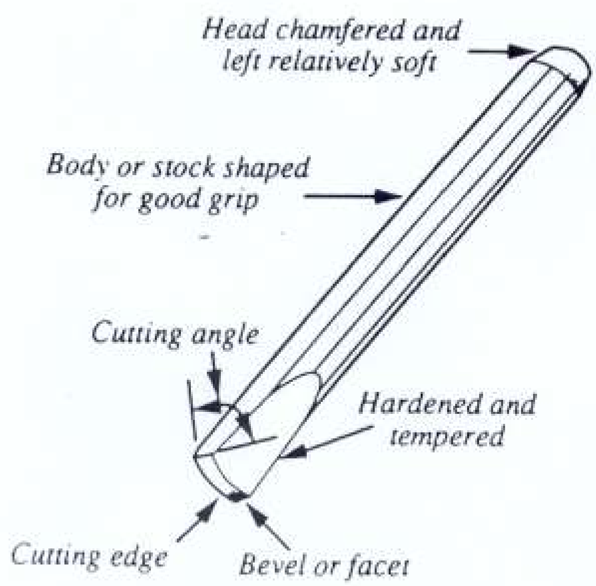
Expanding external circlip

Chisels

Figure 16 defines the various elements of a cold chisel and also the point cutting angles for different types of material. The tip tends to become more "stubby" as the material becomes harder. This is to extend the life between sharpenings. Only about 15mm of the tip is fully hardened, after this the material is much softer to cope with the hammer blows, at the head, without shattering.

Figure 17 shows the correct range of angles at which to hold a chisel when cutting. As a general rule, the tougher the material, the smaller the angle and the more shallow is the cut. Figure 18 displays the safe and correct way to re-sharpen a chisel.

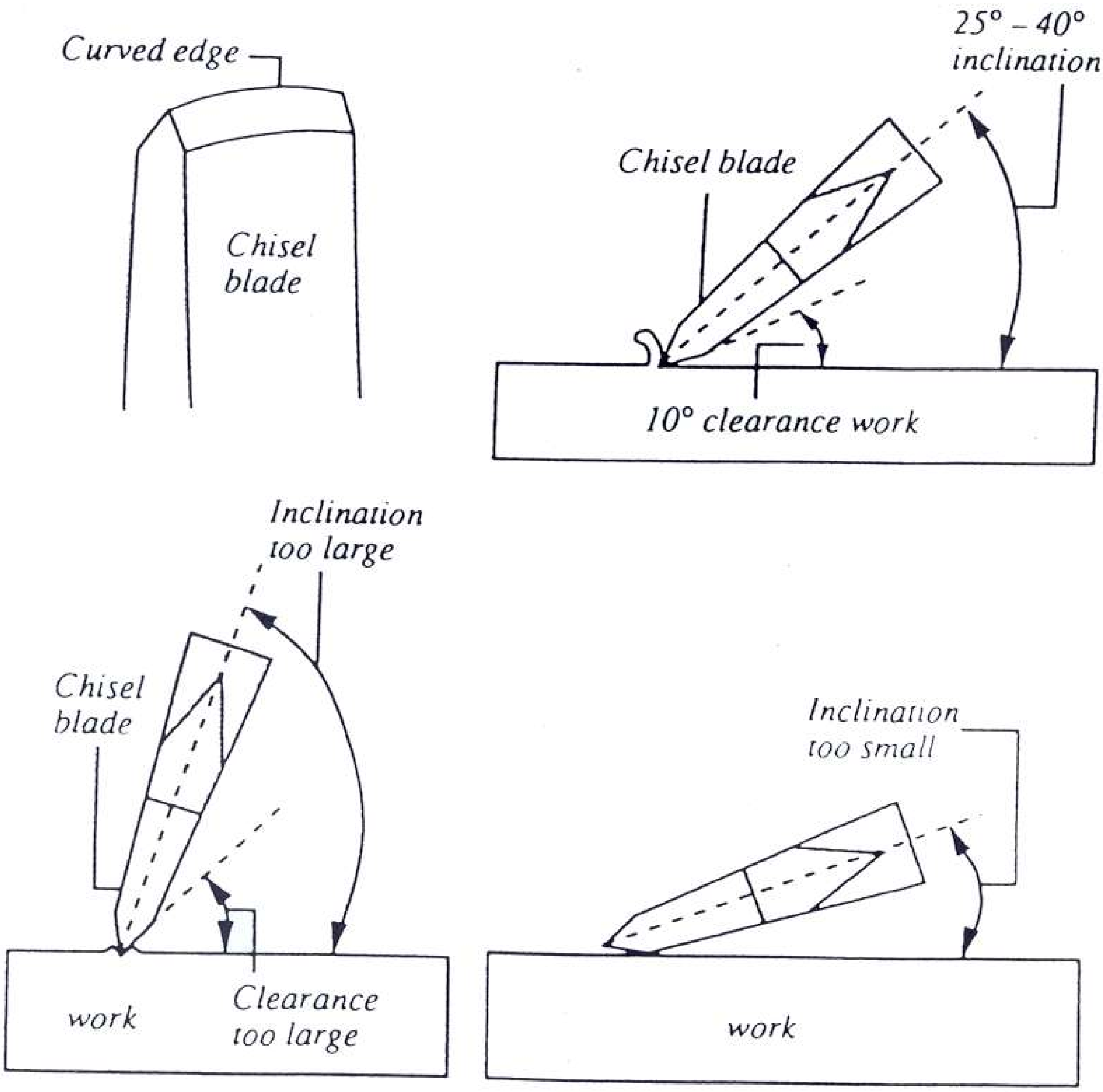
Figure 16



CHISEL POINT CUTTING ANGLES

Metal Being Cut	Angle of Chisel Point
Cast Steel	65°
Cast Iron	60°
Mild Steel	55°
Brass	50°
Copper	45°
Aluminium	30°

Figure 17



Grinding Wheels

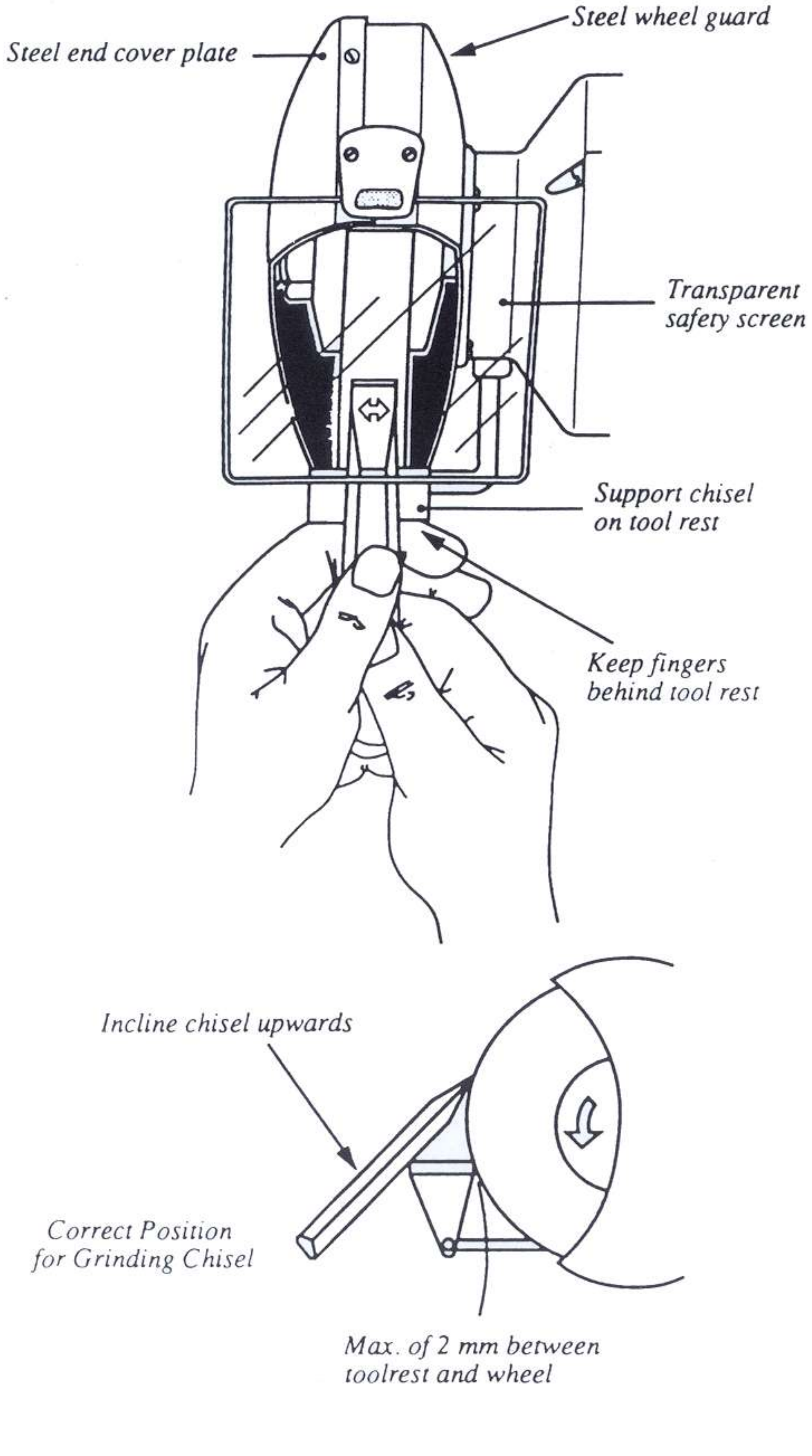
Before using a grinding wheel, carry out the following visual checks:

1. Work area is clear of any debris
2. No grooves or other damage in wheel
3. Correct toolrest gap

When using a grinding wheel:

1. Wear goggles
2. No loose clothing or hair
3. No gloves

Figure 18

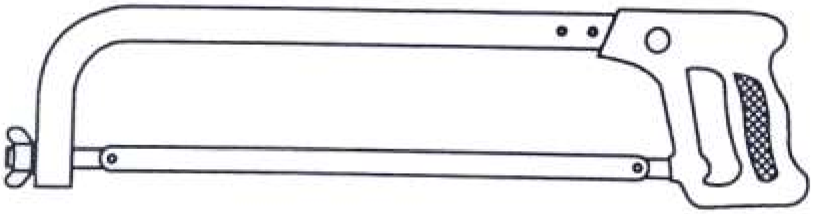

Steel end cover plate
Steel wheel guard
Transparent safety screen
Support chisel on tool rest
Keep fingers behind tool rest
Incline chisel upwards
Correct Position for Grinding Chisel
Max. of 2 mm between toolrest and wheel

Hacksaws

Figure 19 defines the various elements of a standard 12" hacksaw. Most hand hacksaws have frames, which are adjustable to take several different lengths of blade. A setscrew enables the bow to be adjusted as required. The tension and blade holding spigots have square shanks so they can be set in any one of four positions. From the flats of these spigots hardened steel pins project at a slight angle to hold the blade. A wing nut is used to tension the blade. Hacksaw frames should be quite rigid when tensioned. A blade not fully tensioned will become blunt quite early in its life because the teeth will lose their "set".

Figure 20 illustrates a **JUNIOR HACKSAW** used for fairly light work in confined spaces. In all cases when fitting a blade to any hacksaw the teeth must point forward.

Figure 19



Hacksaw frame and blade

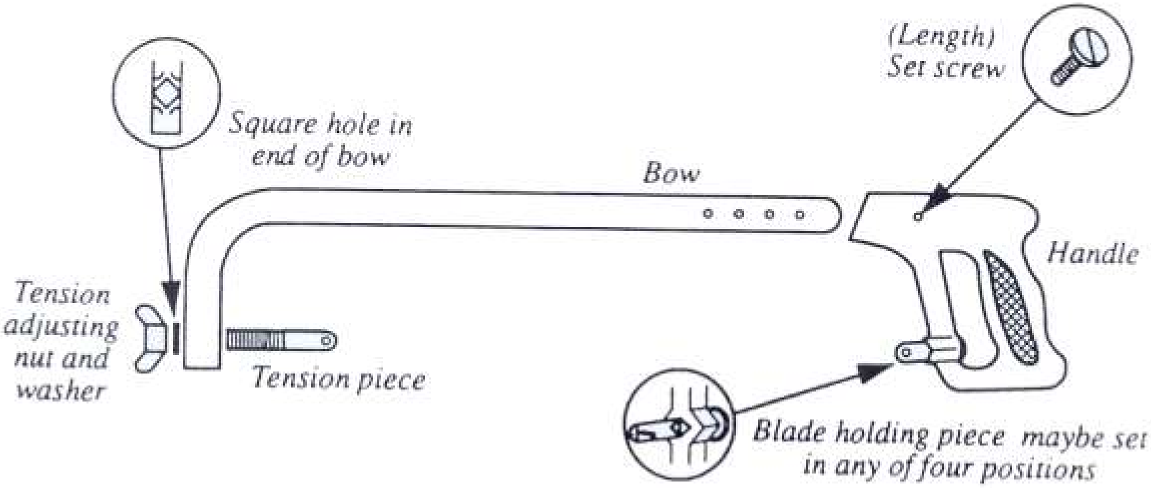
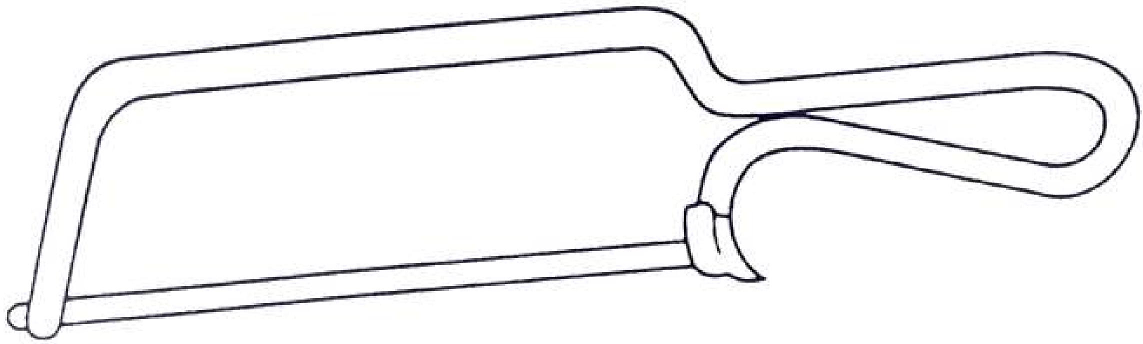


Figure 20



Junior saw

HAZARDS INVOLVED IN USING HAND TOOLS

There are some common sense rules, which should be observed when using hand tools to minimise the risk of injury to yourself and those in the immediate vicinity. These are:

1. Always select the right tool for the job
2. Make sure it is in a safe condition
3. Only put sufficient effort into the job to accomplish the result
4. Work at a safe pace
5. Adopt the right stance

Right Tool

A hammer, which is too heavy, may damage the work and could result in injury. On the other hand, a hammer which is too light, could suffer a fractured handle turning the head into a missile. Using the wrong sized screwdriver increases the risk of slipping, possibly resulting in barked knuckles or worse. Similar hazards result from using the wrong sized spanner.

Safe Condition

Hammers should be checked for the condition of the handle. There should be no splits or cracks present and the handle should be locked in place with a secure wedge. Screwdrivers with wooden handles should also be checked for splits and cracks. Never use a file or rasp without a sound handle. The tang is usually tapered to a sharp end and numerous cases of the tang piercing the users palm have occurred in the past.

Sufficient Effort

There is little to be gained by exerting unnecessary pressure on say, a spanner or a screwdriver. If either should slip, the large amount of energy stored in your muscles is released instantaneously and the risk of injury is increased. When using a hammer, steady, well-aimed blows are safe than wild swings. Never hammer towards your own body, always away. Similarly with cutting tools such as a Stanley Knife. Always cut away from and not towards your body.

Safe Pace

Working at an unnecessarily fast rate increases the risk of accidents and quite often does not reduce the overall time taken to do the work. It is better to work methodically and at a steady pace. It is a remarkable fact that the person in a working group who appears to be the hardest worker is often the least productive over a period of time, usually because they work in a disorganised way.

Right Stance

Never work in an “out of balance” position where, if a spanner etc slips, you will fall over. It is also important to avoid over-reaching to accomplish a task; this could again result in a fall. Figure 21 shows the faults which can develop with hammer increasing the risk of accidents.

Similarly, damaged or worn spanners as shown in Figure 22 can result in slips and bruised knuckles. The chisels shown in Figure 23 are examples of good and bad practice. A chisel which develops a “mushroomed” head should never be used and protective screens are necessary to avoid injury to people around you.

Figure 21

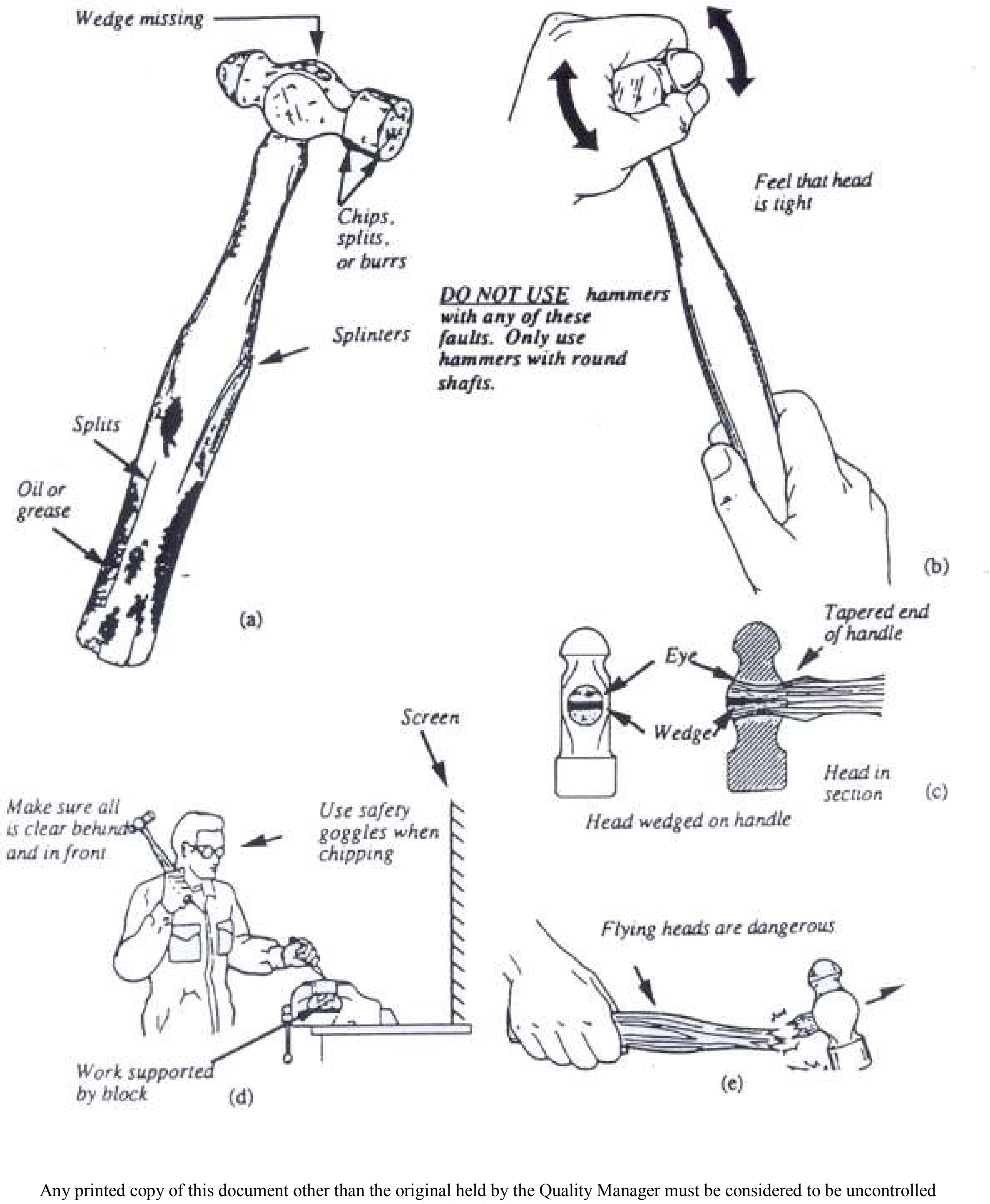


Figure 22

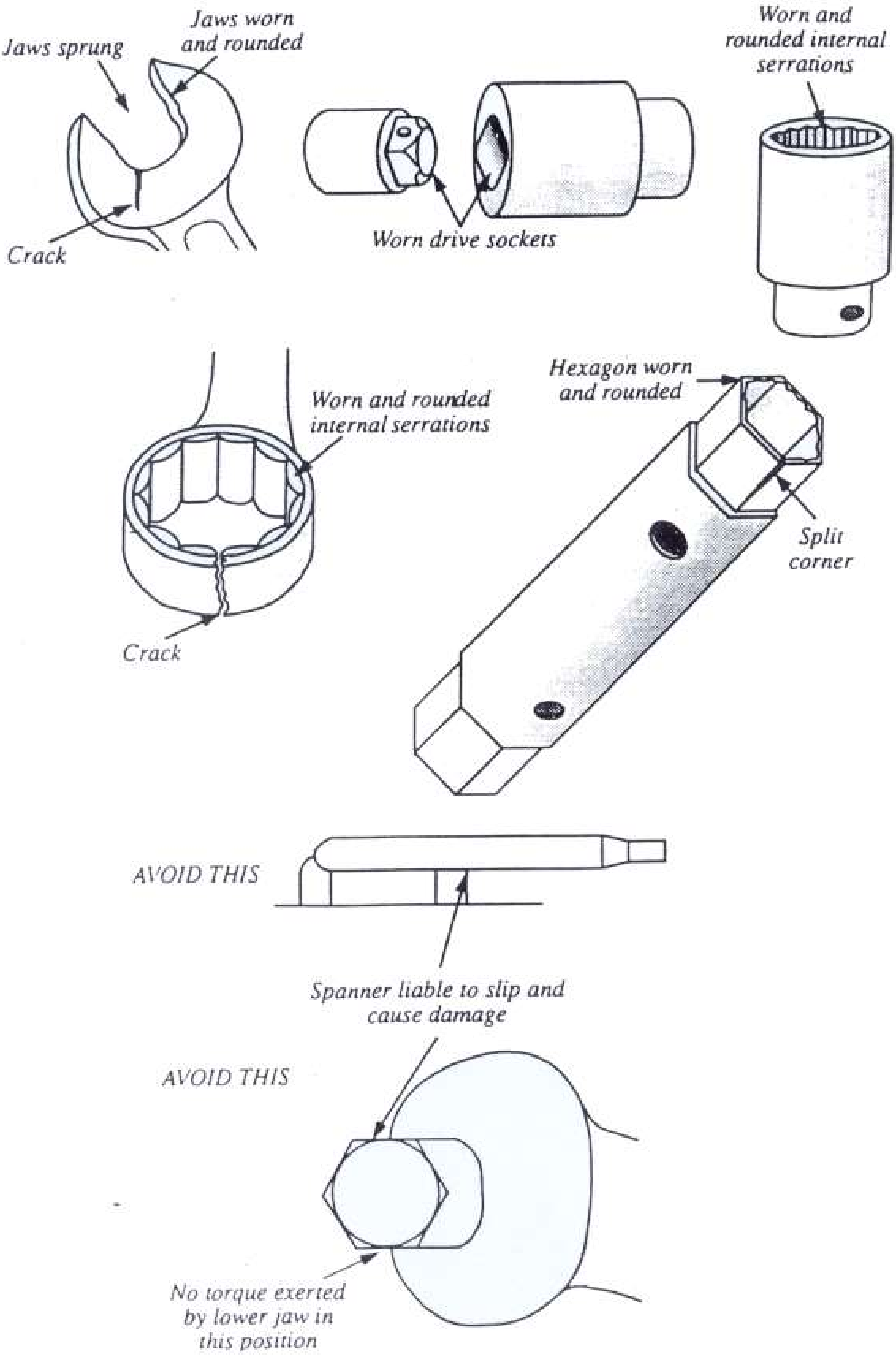
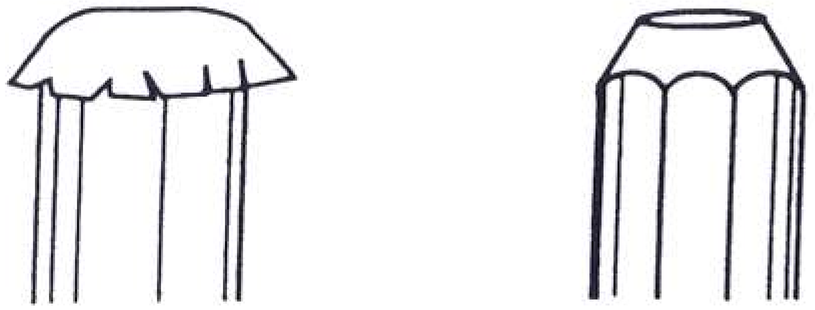

Jaws sprung
Jaws worn and rounded
Crack
Worn drive sockets
Worn and rounded internal serrations
Worn and rounded internal serrations
Crack
Hexagon worn and rounded
Split corner
AVOID THIS
Spanner liable to slip and cause damage
AVOID THIS
No torque exerted by lower jaw in this position

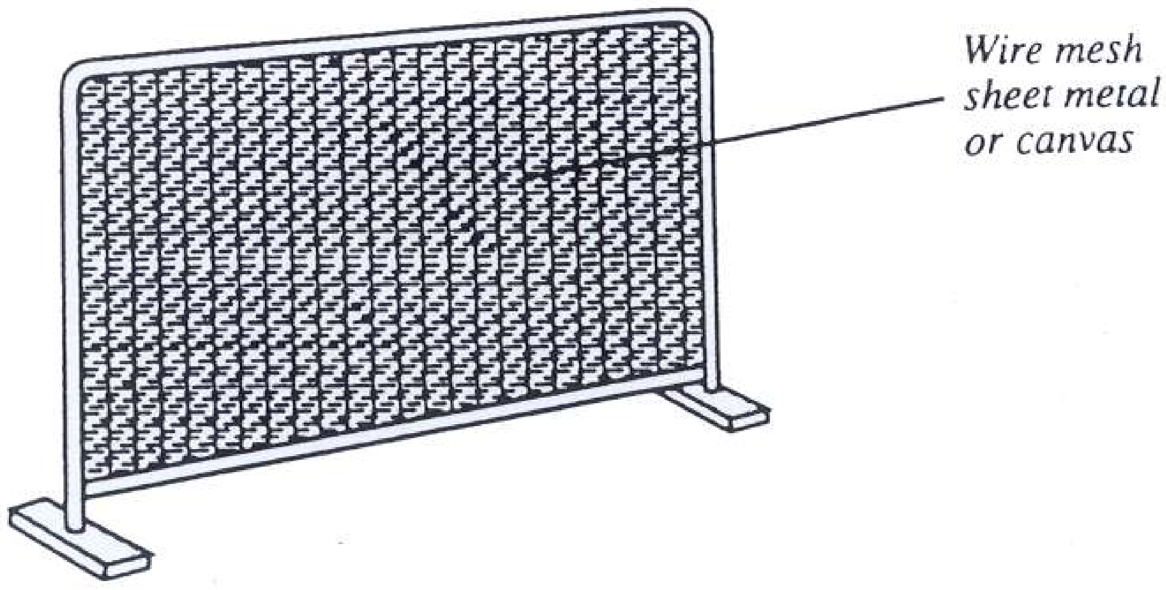
Figure 23

Do not use a chisel with a 'mushroom' head



Always wear safety goggles when chipping

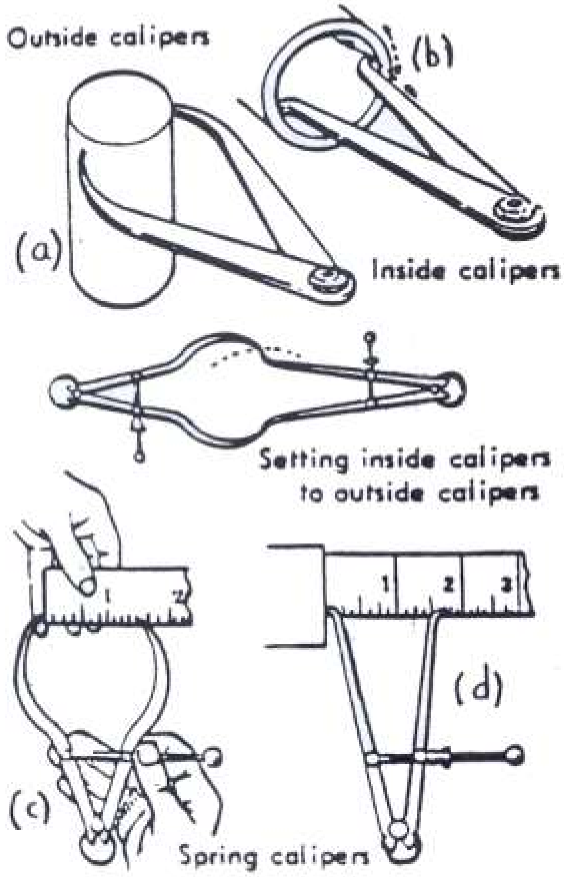
Always chip away from you and provide chipping screens to protect other workers from chips flying from the job.

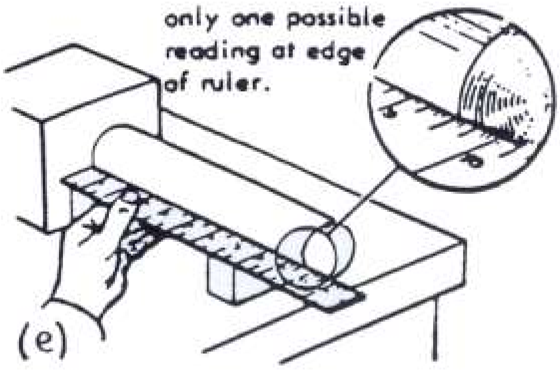


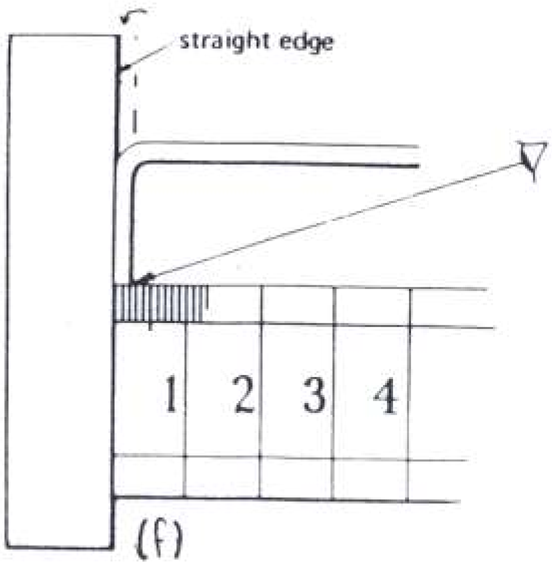
Chipping Screen

MEASURING

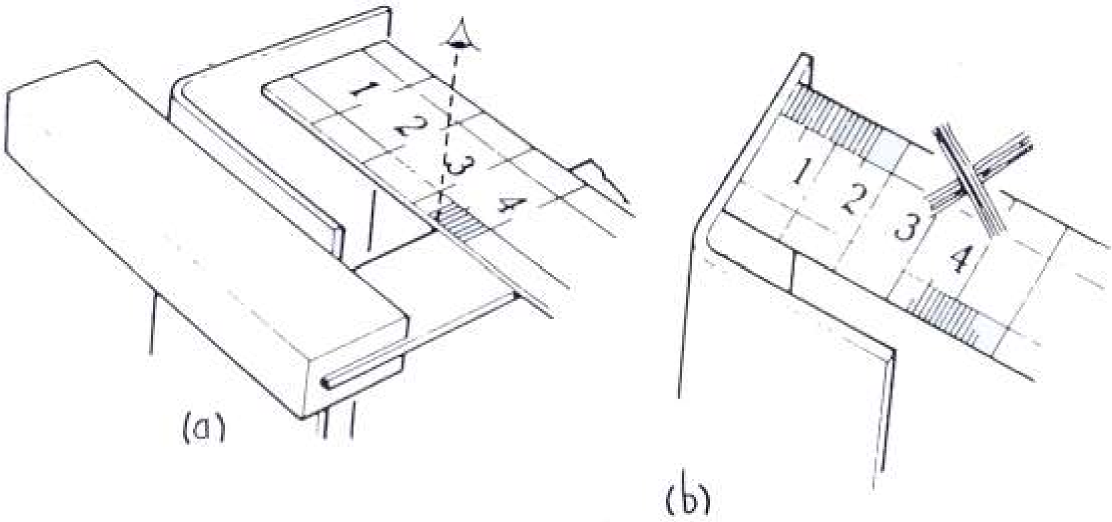
Measuring must be accurate, the instruments used for measuring are precision made, but the results will only be accurate if they are used correctly. To maintain their accuracy, measuring instruments must be used only for the purposes for which they were intended and they must be well cared for. Below (a) shows a pair of outside callipers being used to measure the outside diameter of a round bar and at (c) the setting is transferred to steel rule. (b) shows an inside calliper measuring the inside diameter of a tube; the setting can be read off with the ruler and the calliper tip against a datum edge so that the point of observation is unchanging. The same principle of positive datum is used at (e) and (f). Settings can be transferred from one calliper to another to allow for better observation as suits the situation and facilities.





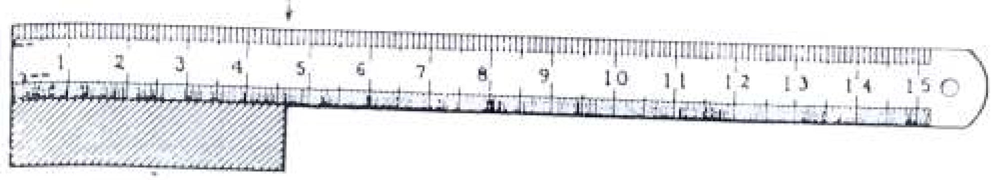


Avoid trying to measure across a gap as at (b), the point of observation is open to opinion, the correct method is shown at (a) where positive datum is supplied by using an engineers square laid flat one side of the angle.



Dimensions of less than 1 millimetre are written in decimal form.

(c)



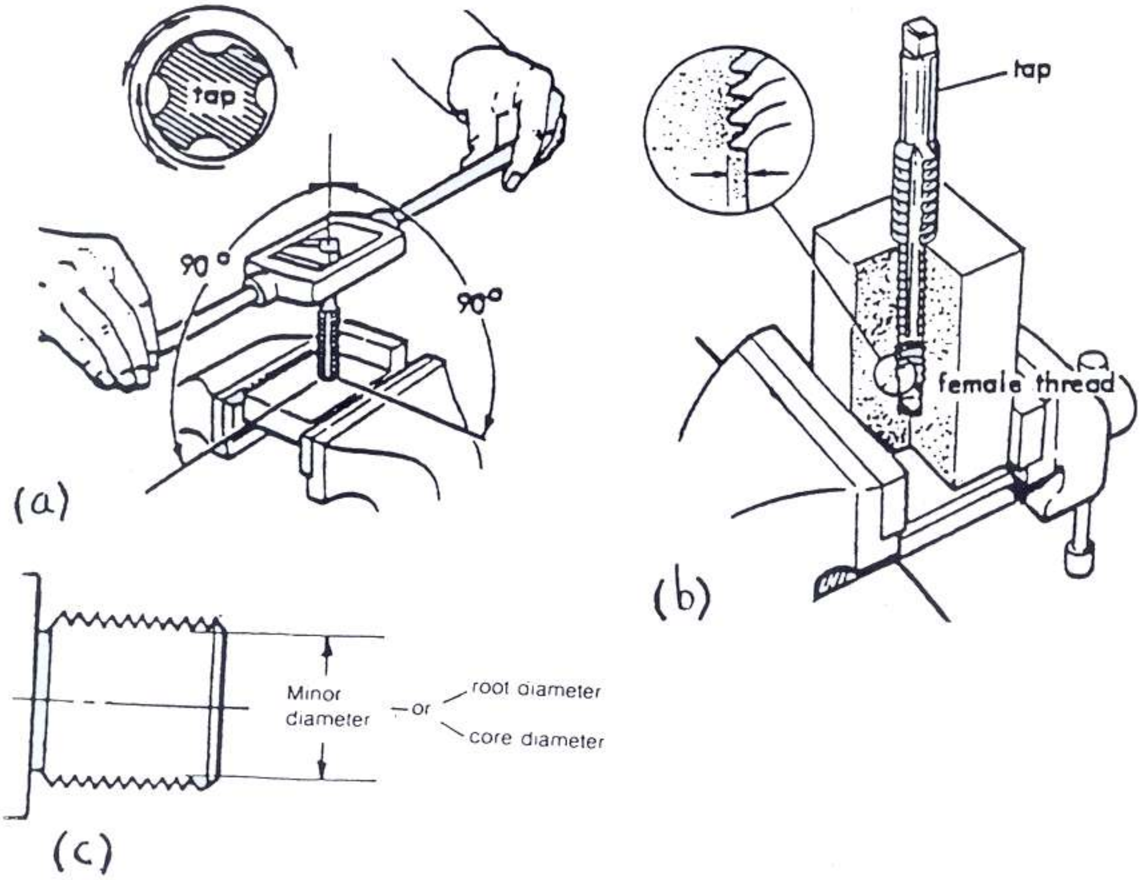
How long is the bar? — Answer 46.5 mm.

How long is the bar? Answer: 46.5mm

BREAKDOWN MAINTENANCE – USING TAPS

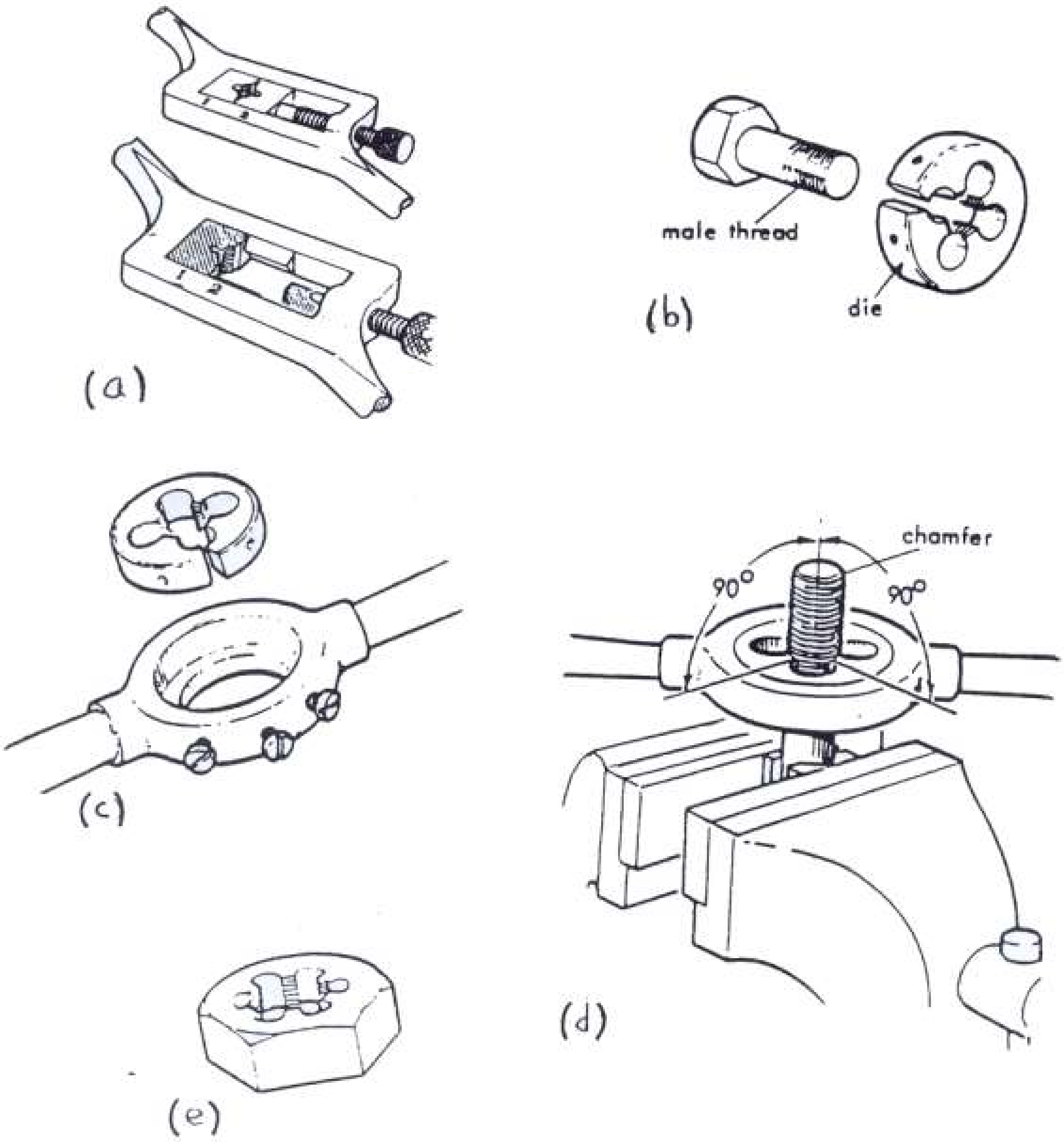
A TAP cuts an internal thread either left or right hand. Taps are made of hardened steel, screw threaded and fluted to form cutting edges. They are usually made in sets of three; a taper tap, a second or intermediate tap and a plug or bottoming tap.

The taps are then used in sequence starting with the taper tap. To cut an internal thread it is first necessary to drill a hole of correct size for a particular size of tap to be used. The hole size is known as the tapping drill size and is approximately equal to the root or core diameter of the thread, as at (c). Hand taps have a square formed on the end so they can be securely gripped in the vee shape formed by the sliding jaw of a wrench shown at (a). First the taper tap is fitted to the wrench and the tapered end entered into the hole, the tap should enter by two or three threads, the tap is turned clockwise while downward pressure is applied, at this stage it is important to check that the tap is cutting squarely to the hole. Where the tap can pass through a workpiece, it is not always necessary to use all three taps, but where a blind hole is to be tapped then all three taps must be used. During all tapping operations the correct lubrication should be used.



SCREW THREADS – STOCK AND DIES

A Die, as indicated at (b), cuts an external thread, which may be right or left hand and is made of high quality tool steel, suitably heat treated. There are button-dies, half-dies and solid die-nuts. Button dies as shown at (b) are circular in shape and are held in position in the stock by a set-screw which passes through the wall of the stock and fits into a recess in the die. Half-dies, shown at (a), are made in two halves, each half being marked with the type and size of thread, these dies are generally used when two or three cuts are necessary to form the thread, the two halves being brought more closely together by the adjusting screw after each cut. A solid die-nut, shown at (e) should only be used to repair damaged threads; the nut has not sufficient clearance to allow new threads to be cut. (d) shows a thread being cut with a button-die.

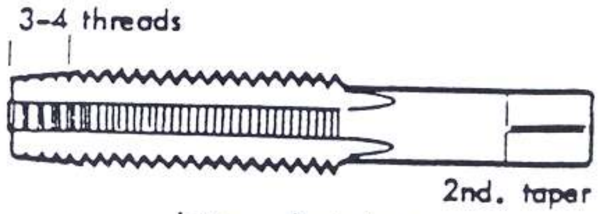


SCREW THREADS

Taps are usually made in sets of three, the taper tap, the intermediate tap and the plug tap. They are made from high quality tool steel suitably heat-treated. The taper tap at (a) is tapered off for 8 or 10 threads and is used first, cutting to full depth of thread gradually, the Intermediate tap (b) usually, has two or three threads chamfered and can finish a through hole. The Plug tap (c) has a full-sized untapered thread to the end and is the main finishing tap. In the case of a blind hole a plug tap must be used.

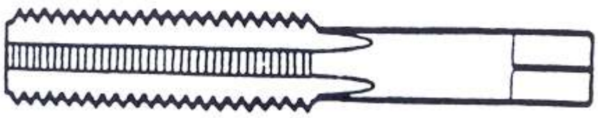
(a)

Taper tap



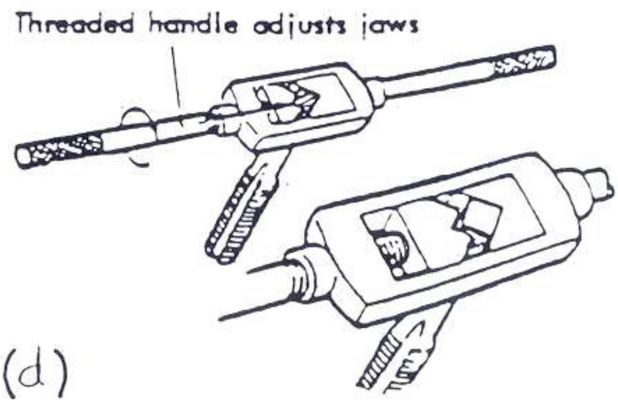
(b)

Intermediate tap



(c)

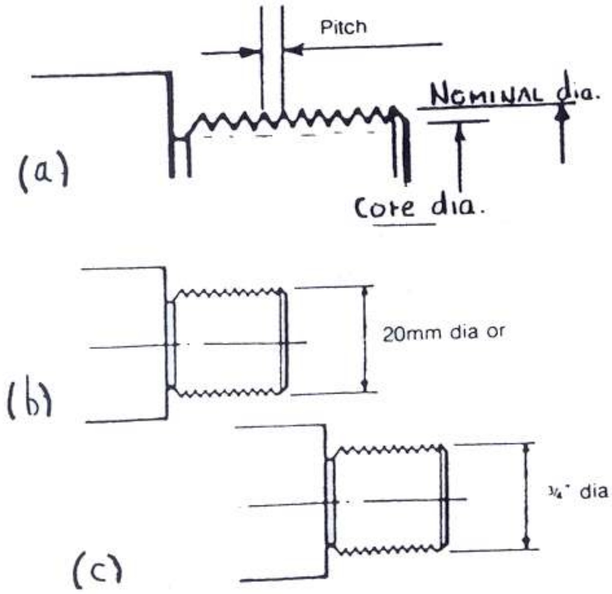
Plug tap



(d)

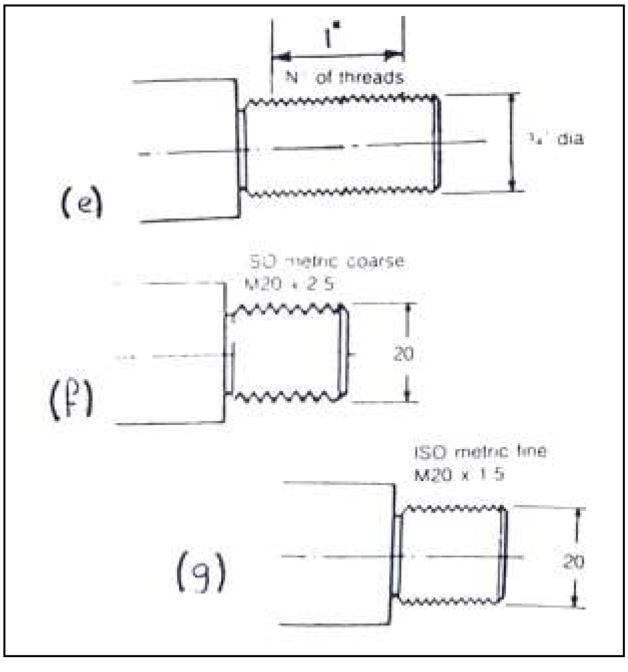
BREAKDOWN MAINTENANCE – SCREW THREADS

In the engineering industry there is a range of screw threads for a variety of applications, the most common are those used on nuts, bolts, setscrews and studs. A screw thread is identified by its basic or nominal diameter, type of thread form and the Pitch or number of threads per inch ie, tpi. Metric threads are identified by pitch, whilst BS are identified by tpi. The thread form is usually indicated by capital letters ie, M = metric form BSW – British Standard Whitworth, BA – British Association, ISO = Isometric coarse or Isometric Fine, UNC – Unified Course, UNF – Unified Fine. Usually coarse threads are for general duty purposes while fine threads are used for fastenings where vibration may occur, or where fine adjustment may be required. The table at (d) shows a list of ISO thread sizes and indicates the drill that should be used before tapping the hole ie, 12mm thread should be drilled first with a 10.20mm drill.



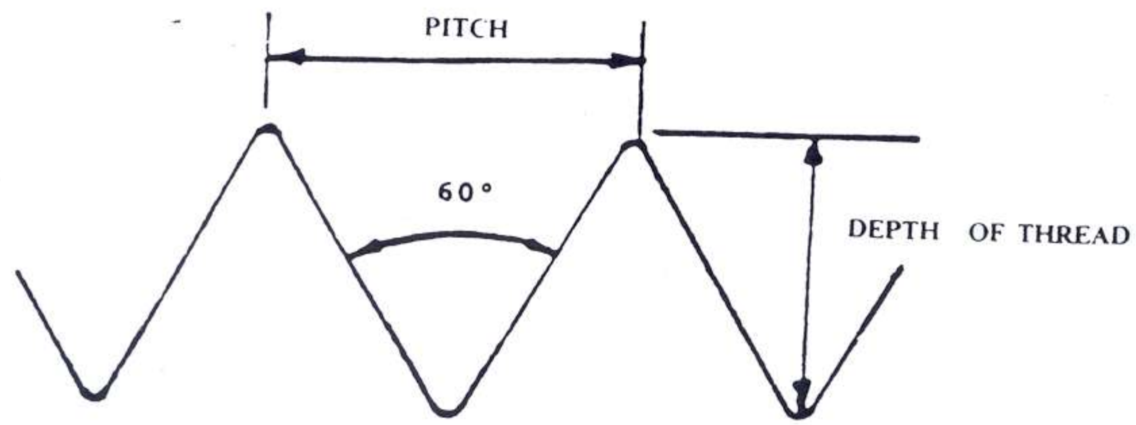
(d) ISO metric coarse pitch threads

Nominal Diameter mm	Pitch mm	Minor Diameter (basic) mm	Tapping Drill Size mm
1	.25	.729	.75
2	.40	1.567	1.60
3	.50	2.459	2.50
4	.70	3.242	3.30
5	.80	4.134	4.20
6	1.00	4.917	5.00
7	1.00	5.917	6.00
8	1.25	6.647	6.80
9	1.25	7.647	7.80
10	1.50	8.376	8.50
11	1.50	9.376	9.50
12	1.75	10.106	10.20
14	2.00	11.835	12.00



THREAD FORMS

Threads of 60° included angle

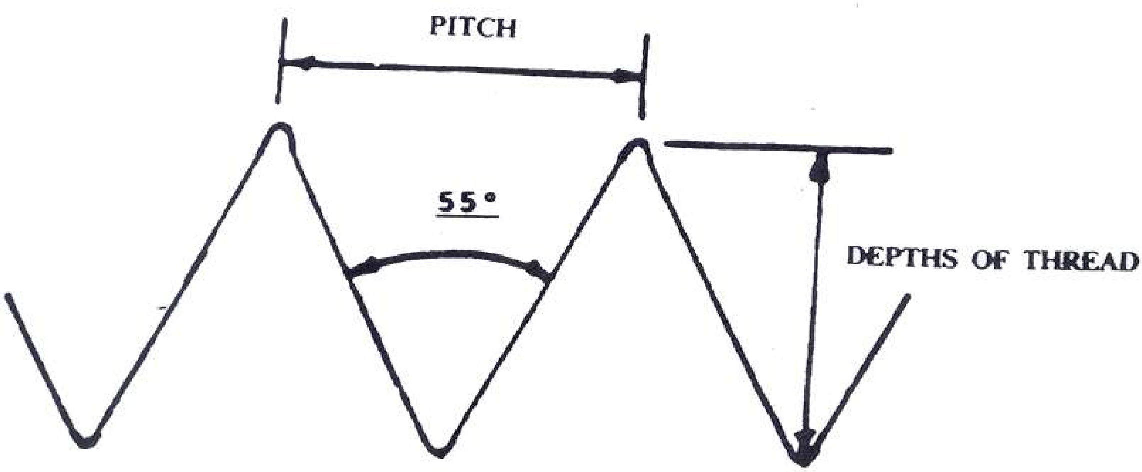


Threads having this form being: -

Unified Coarse	(Flat Crest)	(UNC)
Unified Fine	(Flat Crest)	(UNF)
Metric ISO		(MM)
Spark Plug	(Metric)	(MM)
Cycle Engineers Thread		(CE)

THREAD FORMS

Threads of 55^{o} included angle

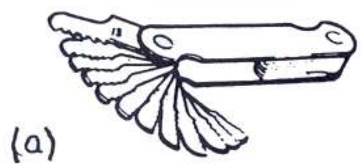


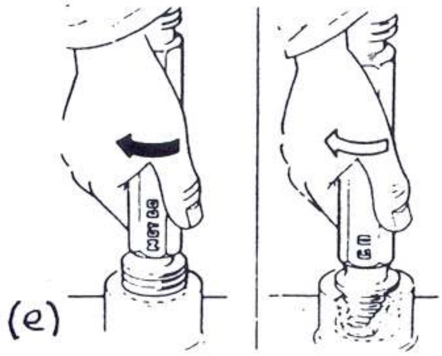
Threads having this form being:

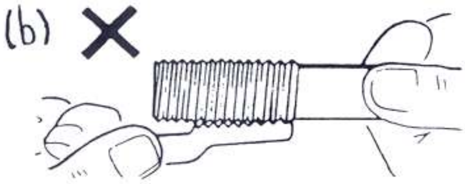
British Standard Whitworth	(BSW)
British Standard Fine	(BSF)
British Standards Pipe	(BSP)
British Standard Brass	(BSB)
British Standard Conduit	(BSC)
Model Engineer Thread	(ME)
Copper Tube Thread	(CT)
Instrument and Watch Maker's Thread	

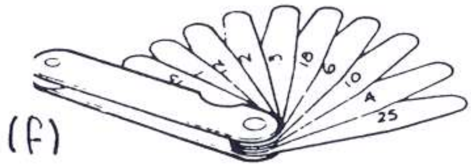
MEASURING AND CHECKING

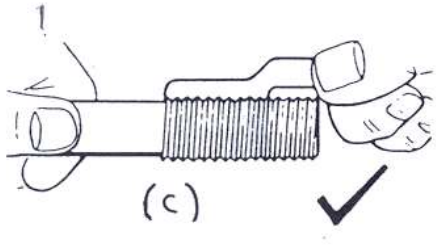
Below are a selection of items used to assist in the maintenance of quality control, at (a) is a screw pitch gauge and is used to determine the pitch of a thread on a screw or bolt of any diameter, (b) shows the incorrect gauge held against the thread, while at (c) the correct pitch gauge can be seen to fit perfectly into the threads, on many jobs sharp corners have to be eliminated and specified radii applied, the best way is to check these radii, which can be either concave or convex as shown at (d). The set of feeler gauges shown at (f) are used to measure gaps, and the thickness of each gauge is indicated by a number on the blade, either in thousandths of an inch or hundredths of a millimetre. (g) and (h) show feeler gauges being used to check flatness of a workpiece on a surface table, at (e) a thread plug gauge is used to check a threaded hole, each end is marked with ‘go’ or ‘not go’, if the ‘not go’ end screws into the hole, then the thread is oversize.

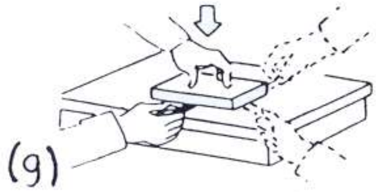


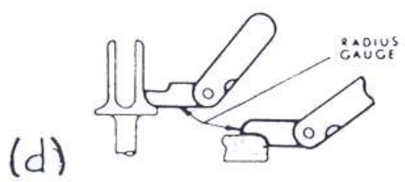


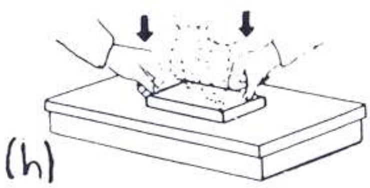












PERSONAL SAFETY

In the interests of your own safety, it is necessary to adopt sensible practices when working as follows:

1. **Safety Equipment**

Certain items of equipment are installed in working areas for safety purposes. These include such items as fire extinguishers and blankets, eye wash facilities, guards, screens, posters, handrails, safety locks, first aid kits etc. Use these appropriately and treat them with respect. The next person to be saved from injury by these items could be you. Remember that whatever tasks are allocated to you, it is vital that you have the training and experience to carry them out safely. If you have the slightest doubt ask for advice and help. This can sometimes be embarrassing, but your safety should be the prime consideration and also the safety of your workmates.

2. **Personal Protection**

Overalls are intended to contain all loose clothing and to protect your own personal clothing from being stained with oil, grease, chemicals etc. They must be worn and fastened correctly. Cuffs and sleeves must not be allowed to hang over workpieces or moving parts. Ripped overalls are a hazard in themselves. They should be handed in to the stores and be replaced with a sound garment.

Safety shoes should be worn in working areas particularly when heavy equipment is being hauled. If a tie is worn it is essential to ensure that it cannot hang loose and become entangled in moving parts.

Hair styles are very must a personal preference, but if worn long then a cap or some other means of preventing the hair from being caught up with moving parts is essential. There have been many cases of people being ‘scalped’ in the past.

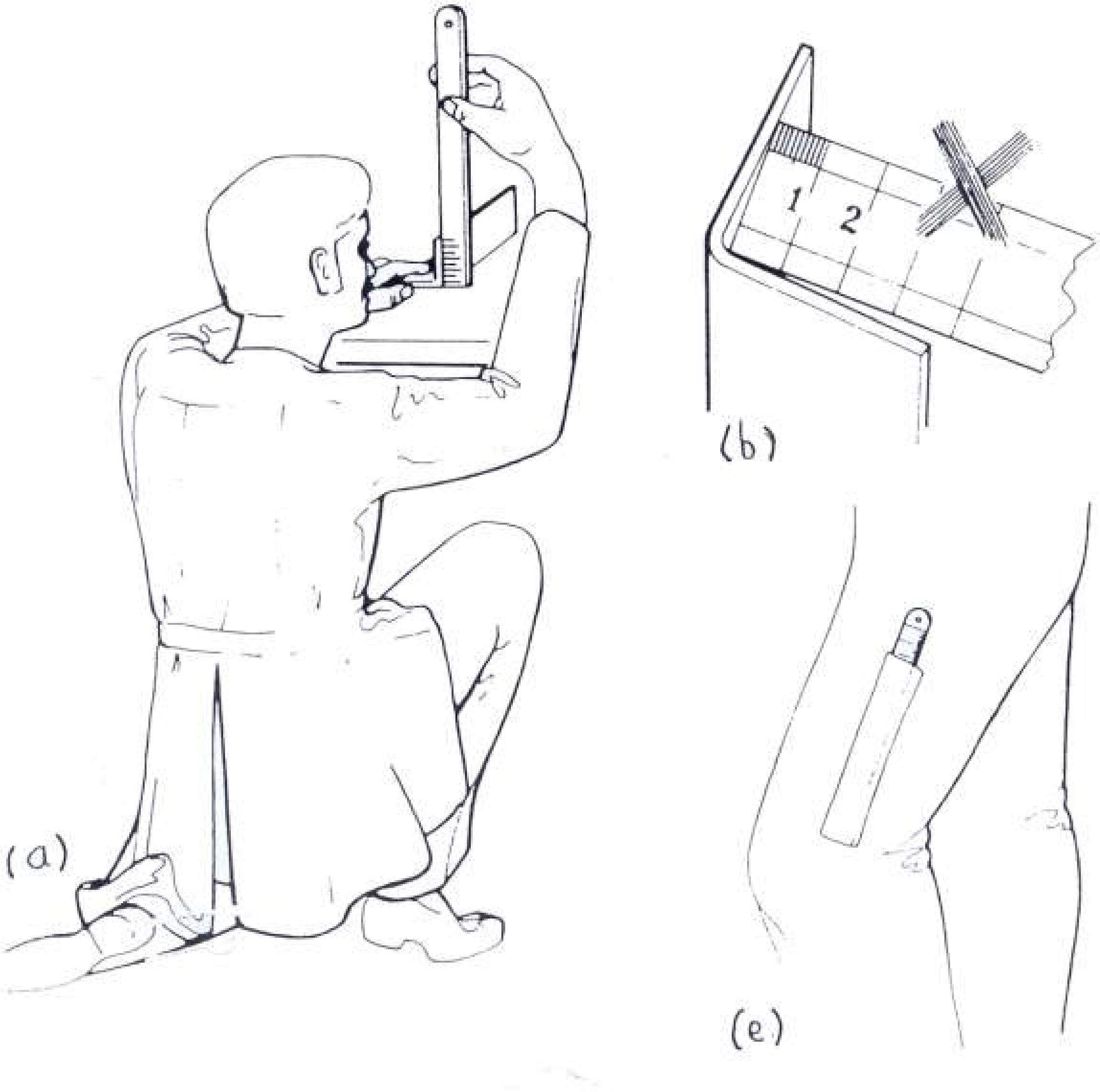
In a situation where demolition or construction is in progress it is necessary to wear a hard hat. This can also be a protection against drips of acidic or caustic fluids.

Whenever small particles of foreign matter are released for example, when using an angle grinder, it is essential to wear safety spectacles. Just a moment of carelessness can make for a lifetime of regret.

Hands should be kept away from hazardous areas by using care and the appropriate hand protection ie; barrier creams or gloves where suitable. Gloves should never be worn when using machinery or in the presence of moving parts. It is also advisable to remove rings, bracelets and medallions before working with machinery.

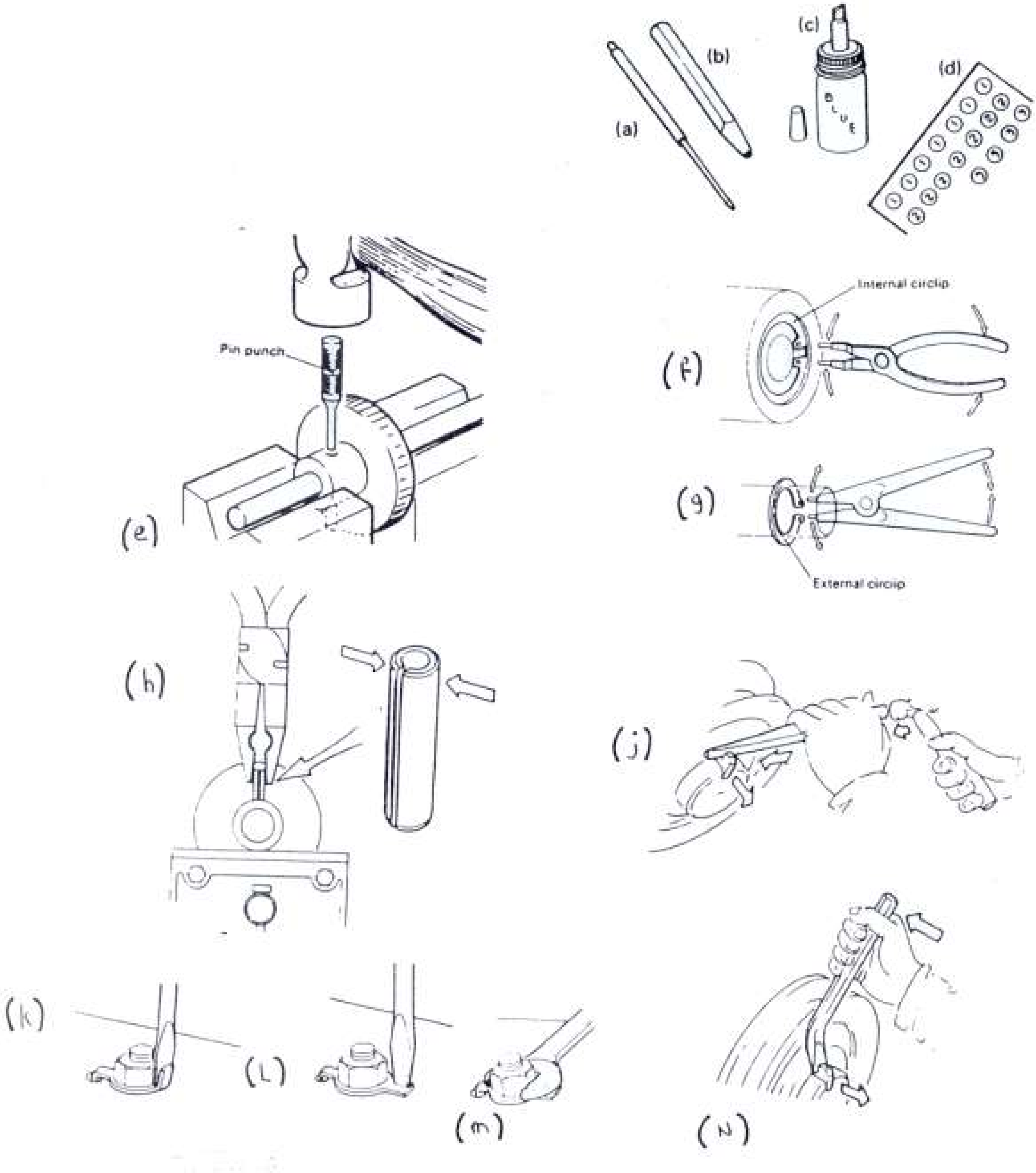
MEASURING

Figure (b) shows the incorrect way to measure the angle bracket length; the correct method using a positive datum base is indicated at (a). When you have finished measuring with your rule, put it in a suitable pocket, as at (e), if your rule is not to be used for sometime, apply a light coating of oil to prevent it rusting.



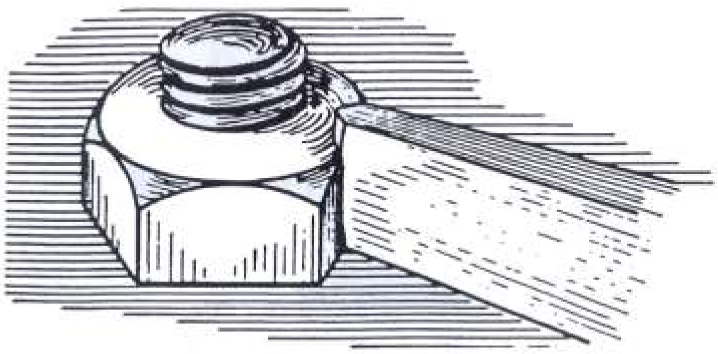
DISMANTLING TECHNIQUES

Shown below are a few examples of dismantling methods in relation to the devices illustrated. Before dismantling a piece of equipment it should be proof marked and shown at (a), (b), (c) and (d) are a scriber, a punch which can be numbered, lettered or centred, a non fading felt tip and self adhesive letters or numbers. (e) and (h) show the method for removing a spring pin. (f) and (g) show the difference between internal and external circlips and circlip pliers, (j) and (n) indicate the tools and the method used for removing a Gib-head key and (k), (l) and (m) show the three steps necessary to release the fastening tab away from the nut face.

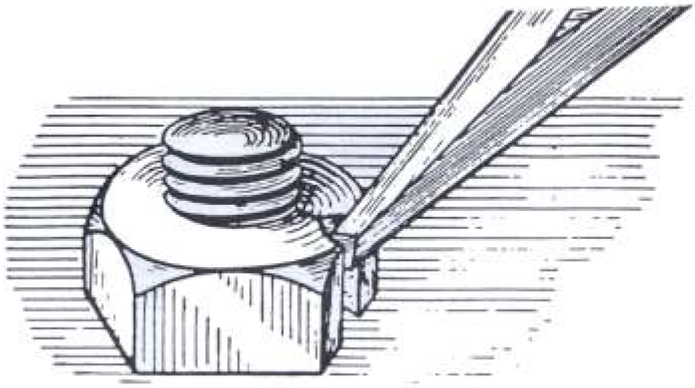


BREAKDOWN MAINTENANCE

A common breakdown in plant engineering is the seizure of nuts and bolts or studs, the first stage in the removal of a seized nut would be with a ring spanner after a previous application of penetrating oil, if circumstances permit, the heat from a blowlamp or torch can be used with success, but if the situation is not compatible with a naked flame and the siting of the nut does not permit the use of a hacksaw or mechanical saw, then the only alternative is to split the nut with a sharp chisel as shown at (a) and (b). Method (a) can distort the stud and the chisel edge may cut into the thread, so if the stud is to be used again method (b) may be the better alternative, using a diamond shape cross-cut chisel a groove is cut to about thread depth, the direction of the chisel cut is then changed to the direction of tightening the nut, which eventually will split the remaining portion of the nut.



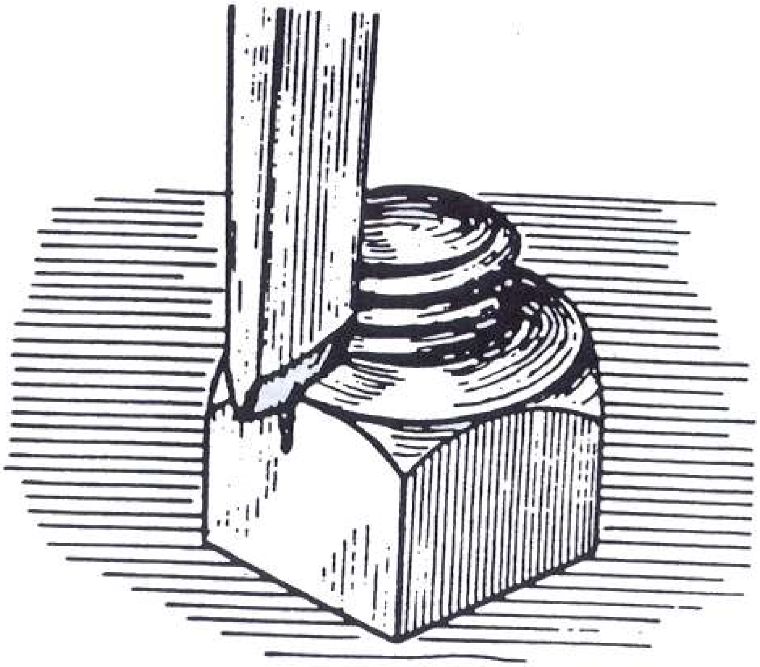
(a)



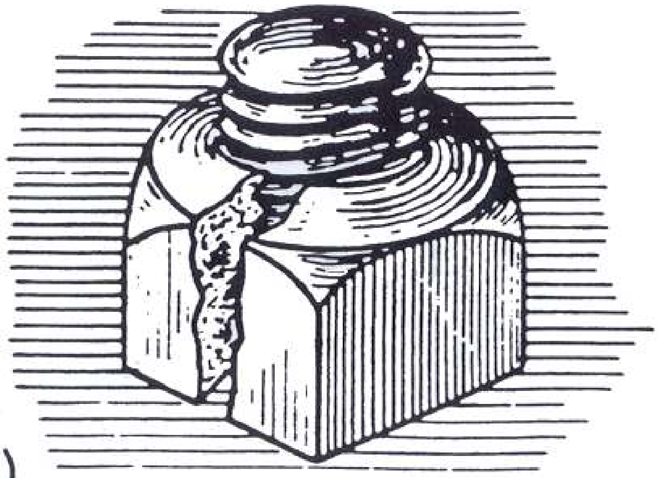
(b)

BREAKDOWN MAINTENANCE

If the nut is situated in a position, which is inaccessible, then it may be necessary to split the nut from the top downwards as shown at (a), care must be taken to keep the chisel vertical so as not to dig into the threads.



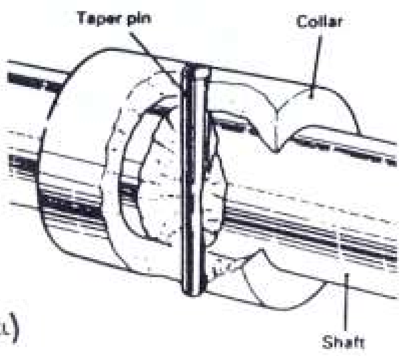
(a)



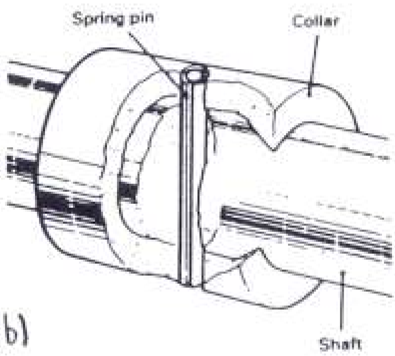
(b)

DISMANTLING TECHNIQUES

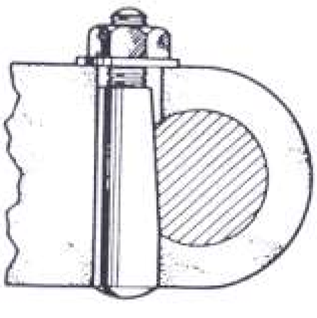
A taper pin as shown at (a) is used to position two parts accurately. The standard taper pin has a 1 in 48 taper and are fitted with a taper reamer. The Roll or Spring pin at (b) eliminates the need for reaming, but after fitting, slight flexing of the parts can occur. To withdraw, identify the smaller end of the taper pin and tap out using a pin punch and light hammer, the same procedure is used when withdrawing the Roll pin. Components to shafting designed to withstand shock loading are advised to use taper Cotter pins. The nut tightening effect draws the pin into the taper, to dismantle and slacken off the nut until the nut is flush with the top of the pin, then a sharp tap with a light hammer will break the pin from the taper and not damage the threads.



(a)



(b)

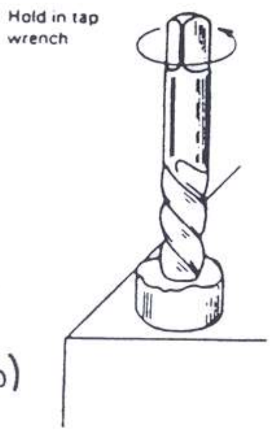


(c)

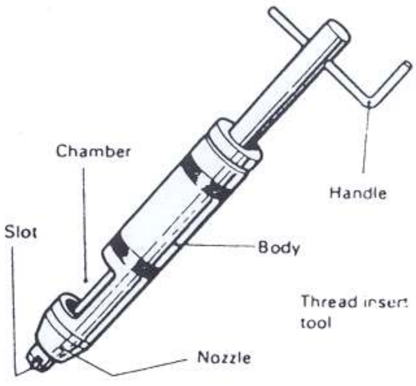
HANDTOOLS – BREAKDOWN MAINTENANCE

To remove a stud broken below the work surface, the ideal tool is the stud shown at (a) with a left-hand spiral known in the trade as an 'ezi-out'. Extractors come in a range of sizes, each with a recommended drilling size. After drilling the hole into the broken stud, the correct extractor is inserted and turned anti-clockwise. The left hand spiral bites into the stud and the left handed movement rotates the stud and unscrews it from the tapped hole, as shown at (b). A thread insert tool is shown at (c) and is used to insert thread liners into the worn or damaged original tapped hole. The damaged thread is drilled out to accommodate the external size of the insert, then after insertion, as at (e) and (f) the internal thread is ready for use.

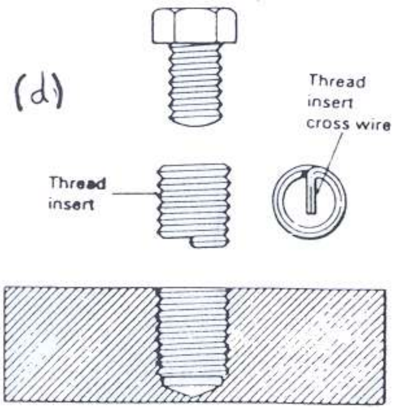

(a)



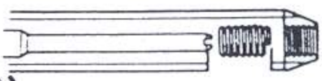
(b)

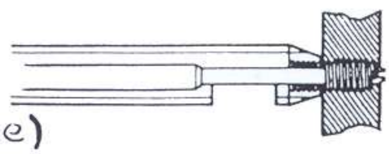


(c)



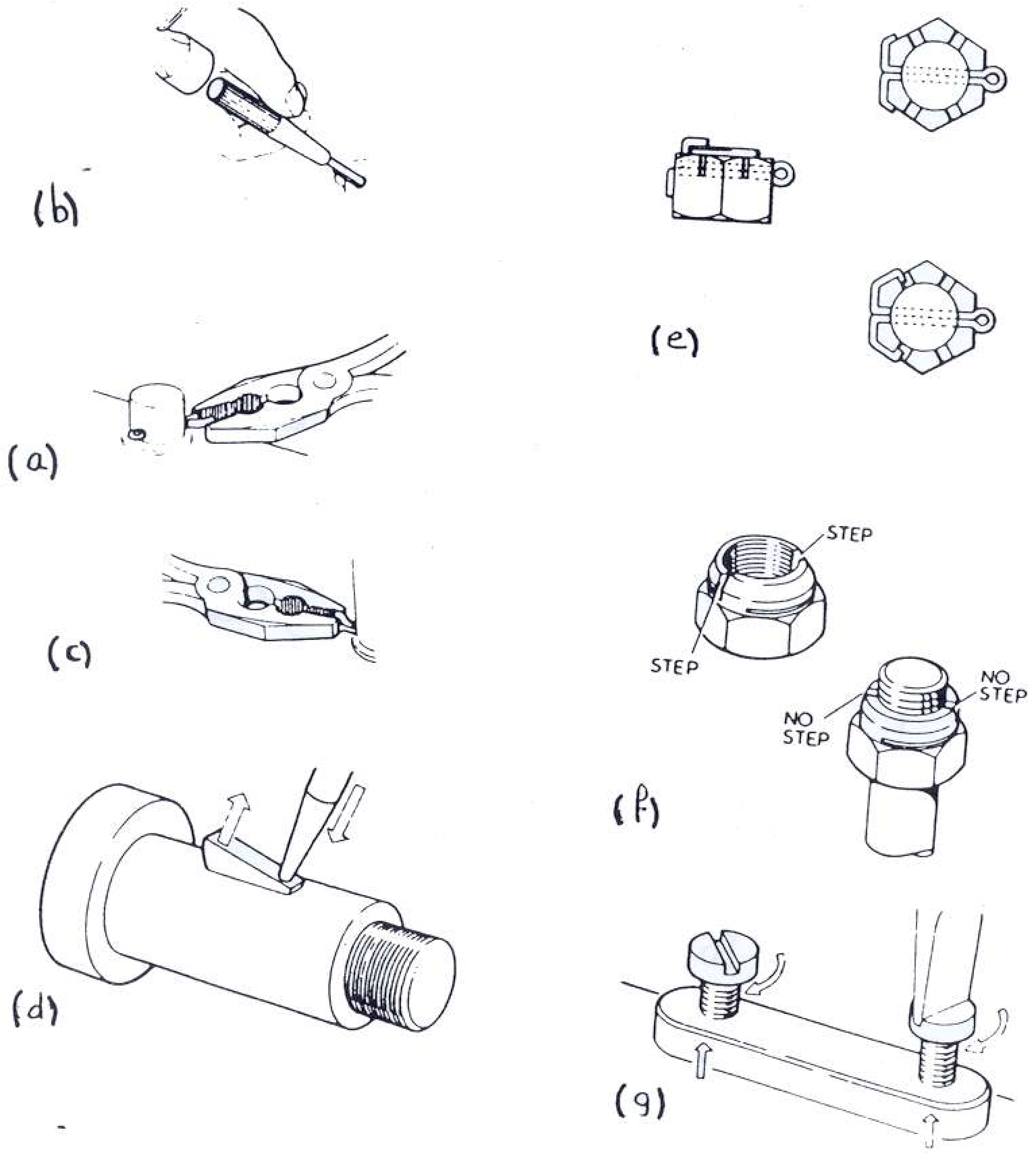
(d)


(f)


(e)

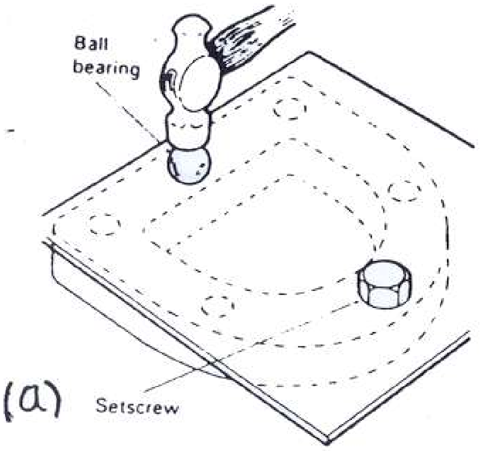
DISMANTLING TECHNIQUES – REMOVING LOCKING DEVICES

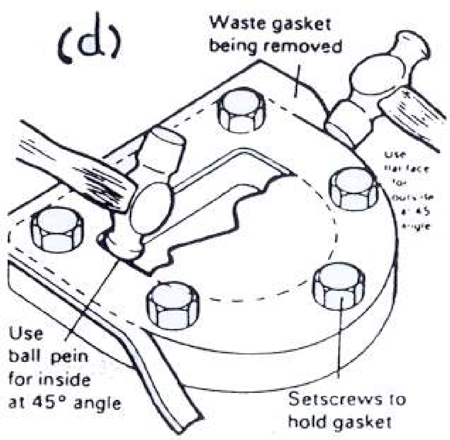
Split pins can be removed by the method shown at (a), (b) and (c). First straighten the legs with a pair of pliers, tap pin through shaft or nut until the head is fully exposed, then withdraw with a twisting action as shown at (c) with a pair of pliers. The various ways in which a split pin can be positioned in relation to the nut faces are shown at (e), a woodruff key is removed by tapping one end with a soft metal drift as shown at (d) and when flat keys have to be removed, gently tighten setscrews into the tapped holes provided, as at (g), at (f) is a split nut in which locking is obtained by the split segments pressing onto the threads when tightened.

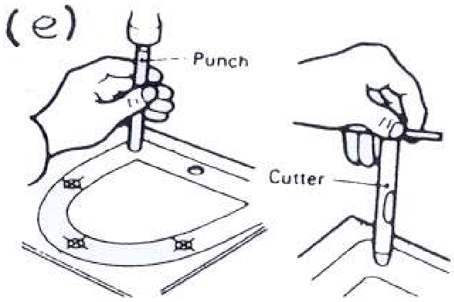


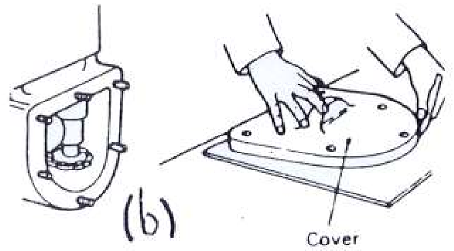
ASSEMBLY TECHNIQUES – GASKET MAKING

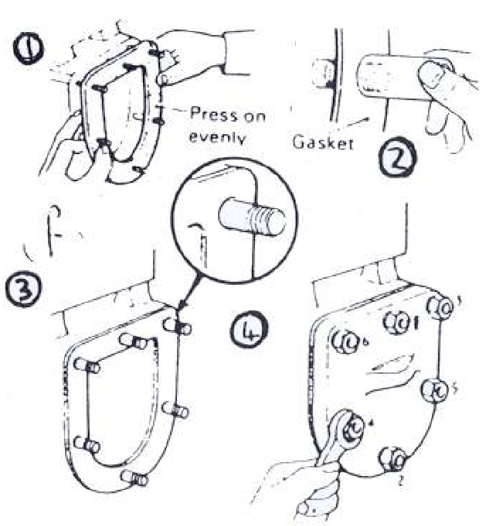
Shown below are various methods of gasket making. At (a) is the method using a ball bearing to cut the holes. Laying the cover on the gasket material and marking round it with a pencil or scriber, then cutting it out with scissors or a pair of gilbows as shown at (c) is preferred when the equipment may be susceptible to damage. If this method is used, the joint has to be laid onto the cover so that the position of the holes can be seen and then cut with a wadpunch as shown at (e). Figure (f) shows the procedure for assembly ie, 1: fit the gasket carefully to avoid tearing the joint on the threads. 2: make sure the joint is properly in position by using a tube that fits over the threads. 3: position the cover correctly, line up any identifying marks. 4: fit nuts and hand tighten, then tighten to the recommended torque value in a sequential manner, as shown at 4.

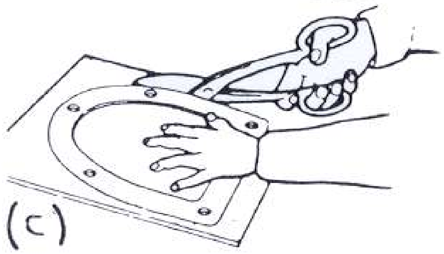






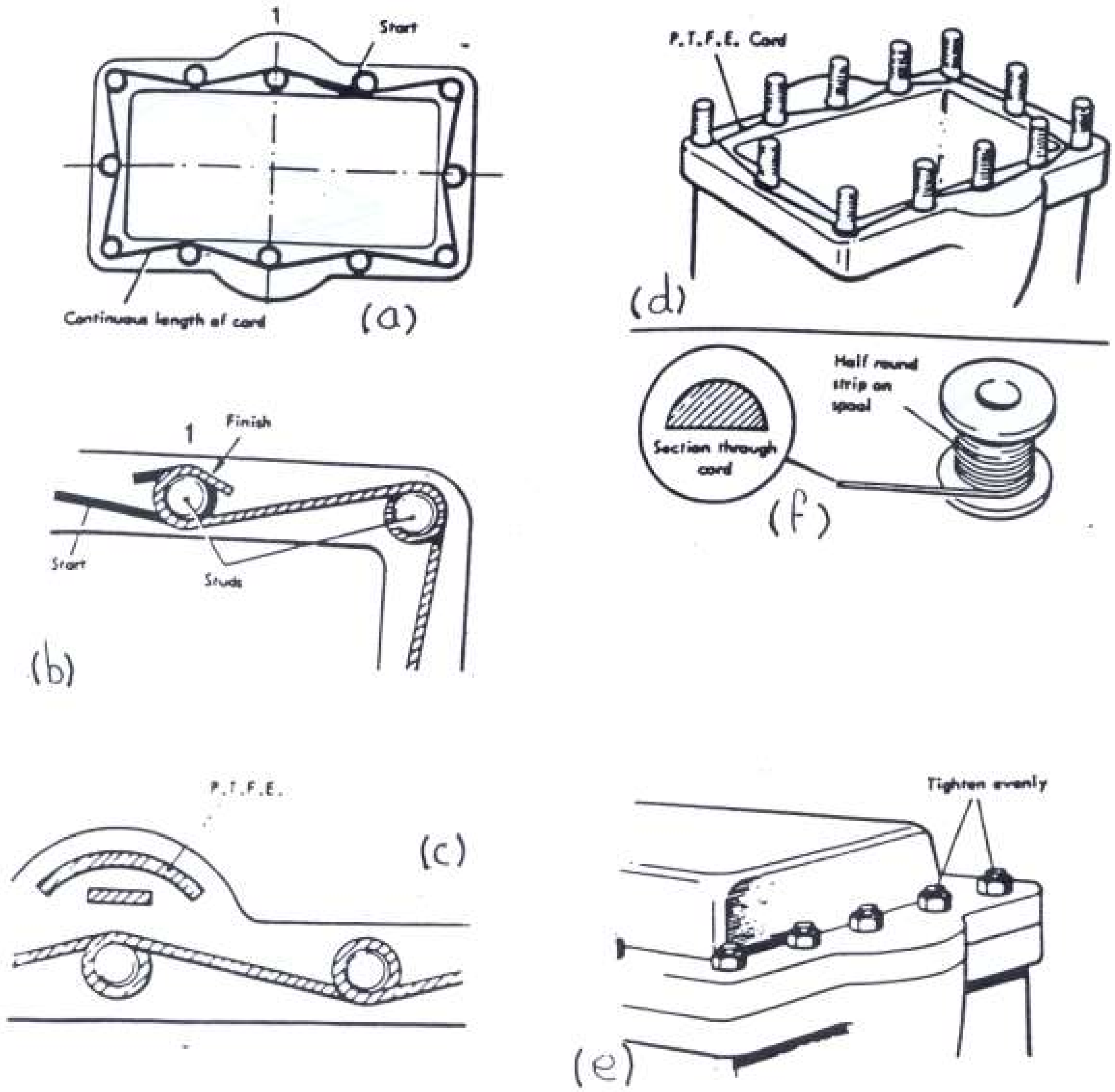






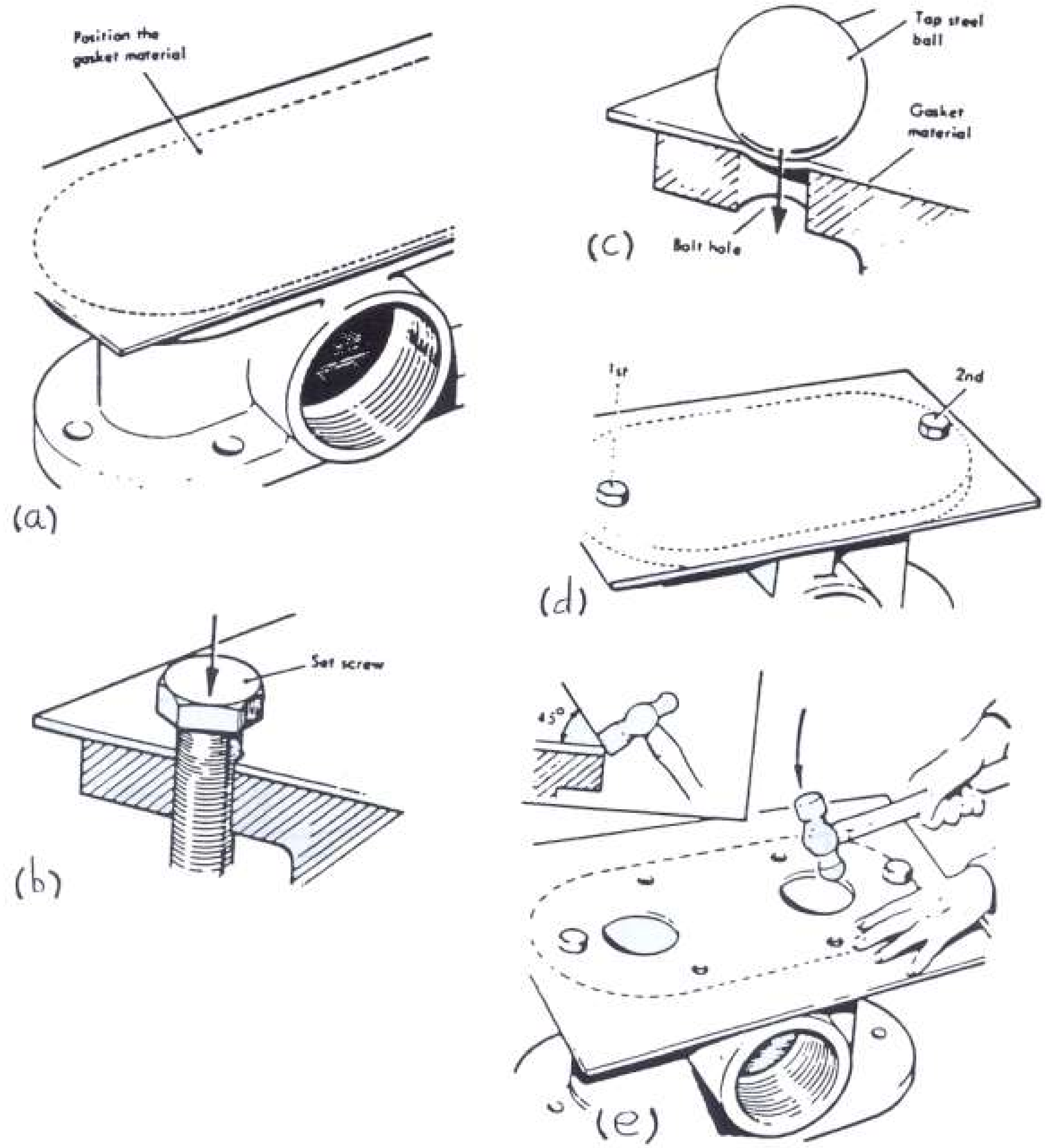
ASSEMBLY TECHNIQUES – REPLACING A GASKET

Shown below is a cord joint using PTFE from a spool, as shown at (f). PTFE is chemically inert and is suitable for use at very low temperatures. It is made as a soft flexible strip and can be used to make either flat seals or gland packings. The cord is started on a centre stud, as shown at (b), wraps around each stud and finishes on the same stud as it started.



ASSEMBLY TECHNIQUES – GASKET MAKING

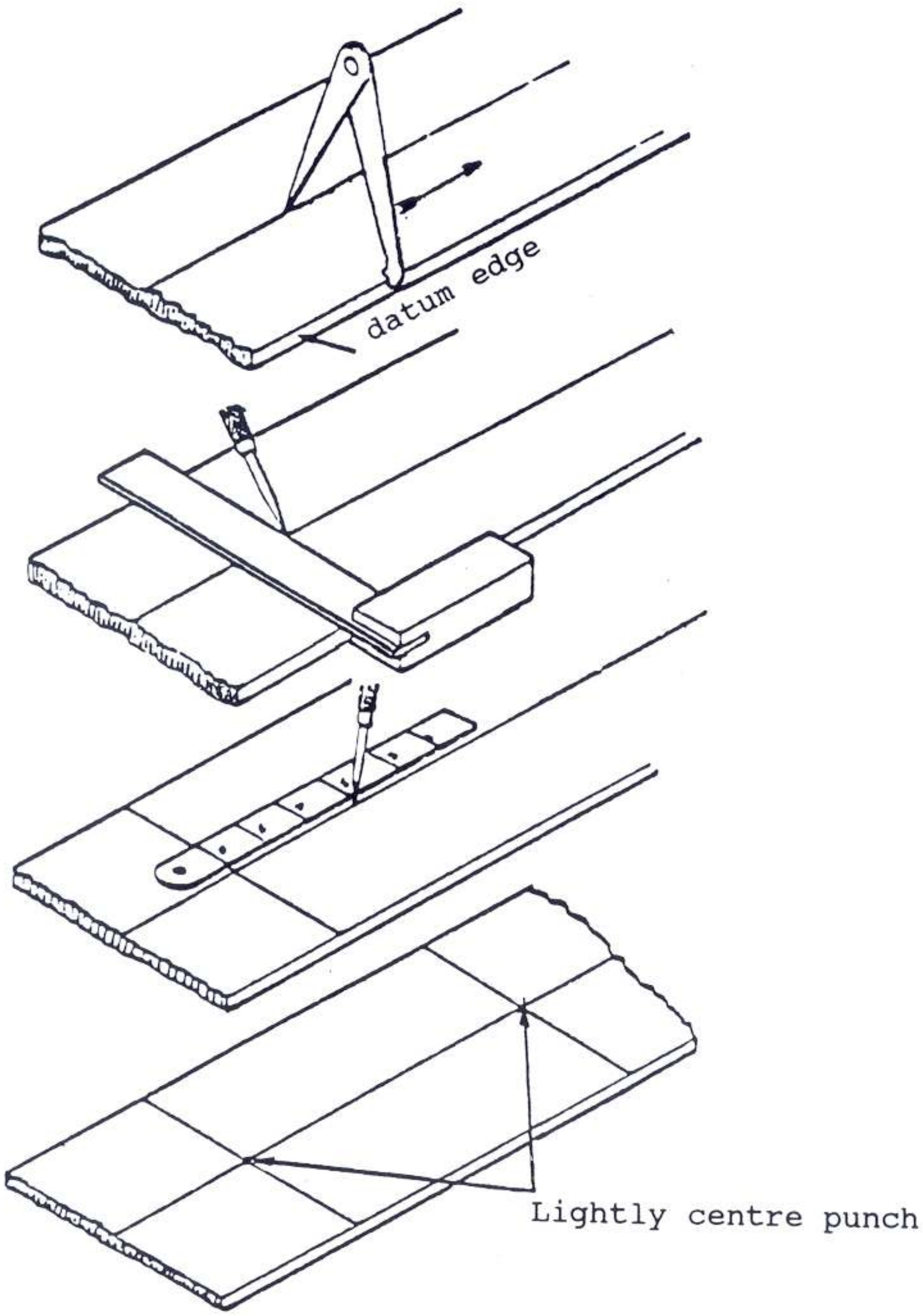
When a replacement gasket is required, find out whether a ready-made replacement is available and use it. If no replacement is available, find out what material the existing gasket is made from and use identical or approved alternative material for the replacement gasket. A variety of sheet and cord materials are used such as: Compressed cork, Composite materials, Paper, PTFE cord, Rubber, Graphite impregnated cloth. Several methods are used to make a gasket and the examples below show how to make a joint by hammering. This method should not be used if the equipment is of a delicate nature and might damage easily. First position the material as at (a), then a ball bearing placed in the hole and lightly tapped with a hammer will produce a hole, if a screw is placed in the hole while another is similarly done and then two bolts will be inserted as at (d) then the gasket is stabilised whilst the rest of the joint is made, as at (e).

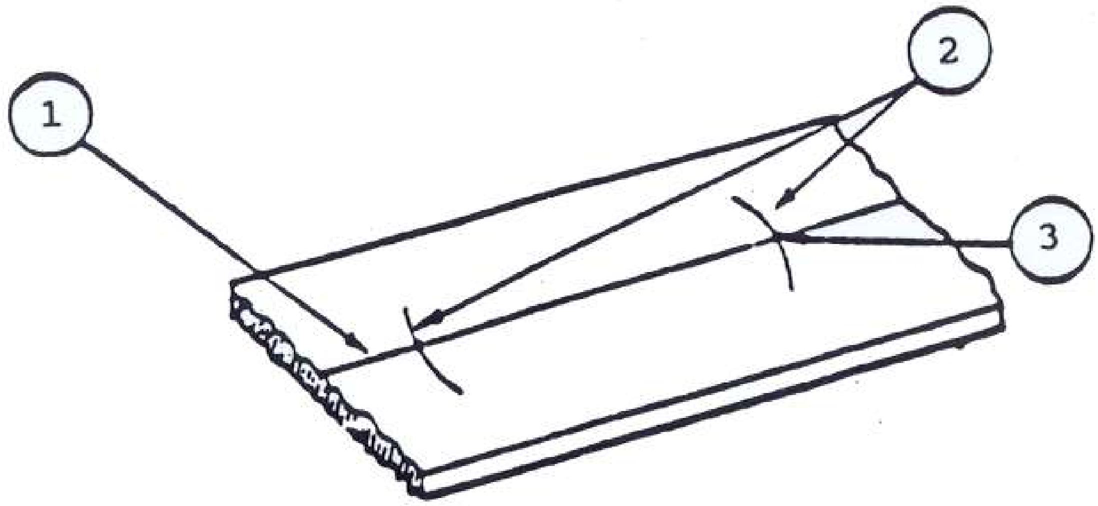


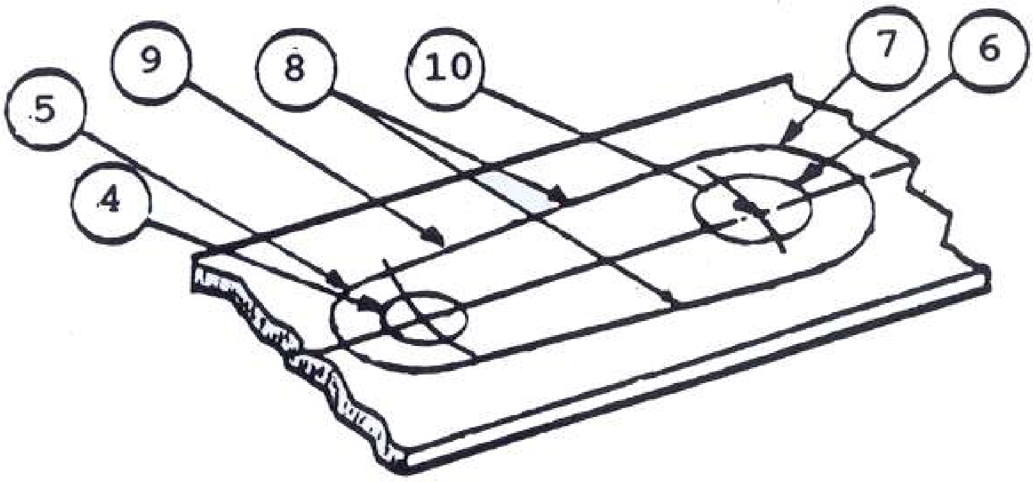
MARKING OUT AND FILING EXERCISE

Use of a datum line is usually reserved for simple components, such as the example chosen for components made from large plates, where the production of a datum edge(s) is a major operation. In the component chosen, only one datum line is required. However, most components require two datum lines or edges, which must be marked out, machined or filed accurately at right angles to each other.

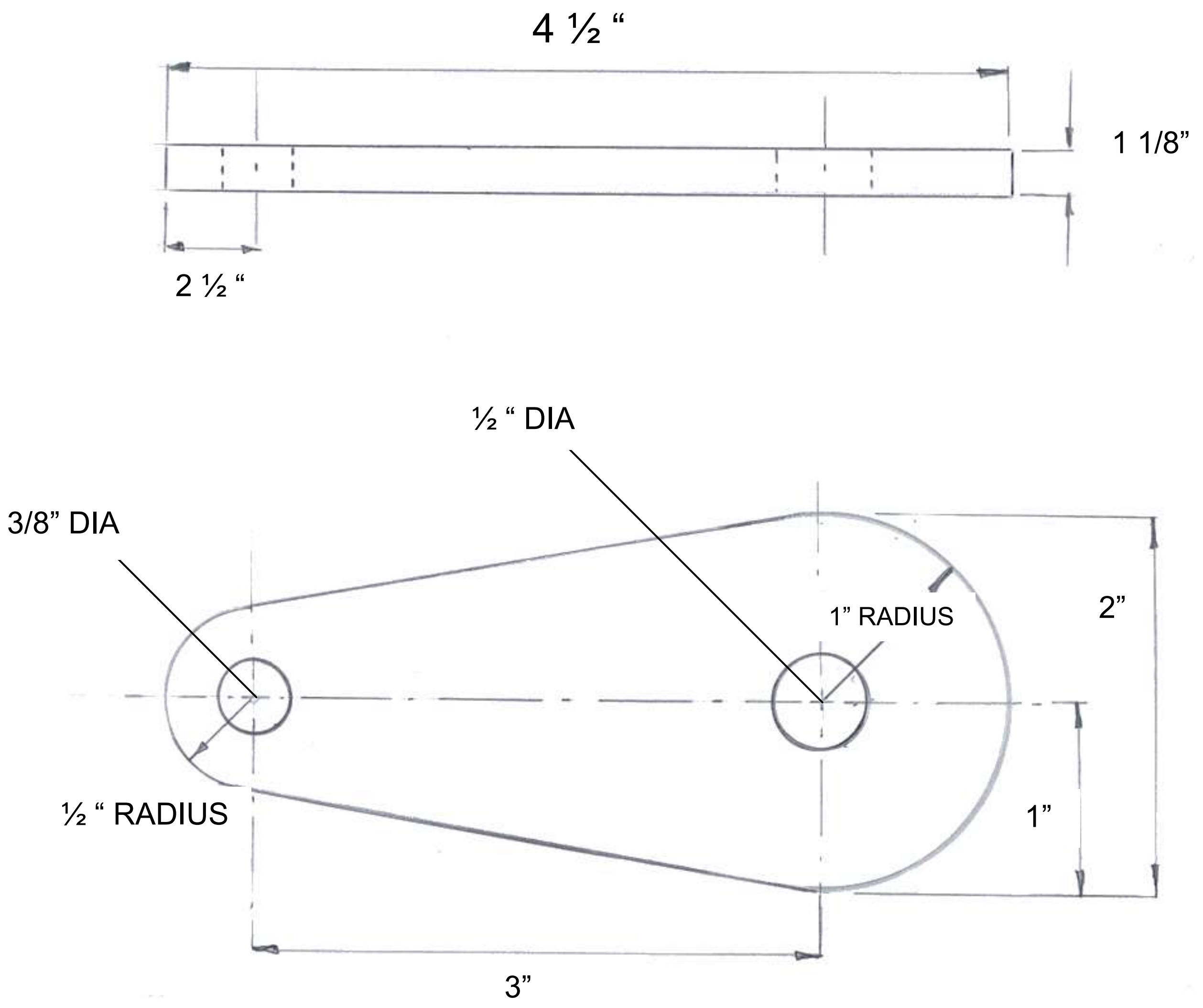
Figure below shows the steps in marking out this component from a datum edge.







1. Scribe centre line
2. Step off 3” hole centre with dividers
3. Lightly centre punch hole centres
4. Scribe in 3/8” diameter hole with dividers
5. Scribe in ½” radius with dividers
6. Scribe in ½” diameter hole with dividers
7. Scribe in 1” radius with dividers
8. Join ½” and 1” radii with tangential lines using rule and scriber
9. Lightly centre punch outline
10. Enlarge hole centre marks with centre punch for drilling



ALL LINEAR DIAMENIONS ± 1/64	DRAWN	AR	DRG No
MATERIAL 2” X 1/8” MSB	SCALE	1/1	1.006
No OF ONE	DATE	25/11/99	
	REV	0	