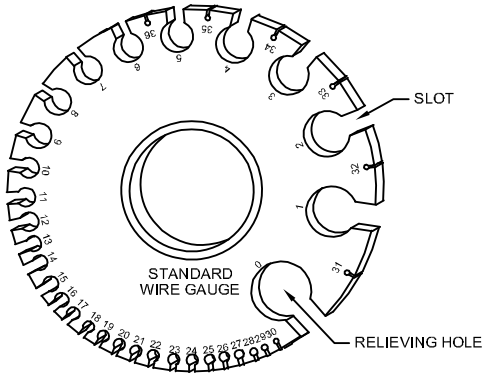
Standard wire gauge

Objectives: At the end of this lesson you shall be able to
- **state the use of the standard wire gauge**
- **state some important hints in using standard wire gauge**
- **state the metal thickness in mm for the given gauge numbers.**

The job drawing indicate only gauge or thickness of the sheet to be used. Before starting the work identify the correct thickness of the sheet. The thickness of the sheet is measured with the help of the standard wire gauge.

The gauge consist of a disc shape smoothened steel metal piece with numerous slots around the outside edge. These slots are of various width and correspond to certain gauge number. (Fig 1)

Fig 1



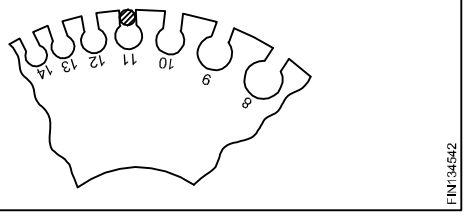
STANDARD WIRE GAUGE

Gauge number is stamped on one side of each slot and on the other side, the decimal part of an inch is stamped to show the thickness of the sheet and the diameter of the wire.

Thickness of the sheet is checked by inserting the edge of the sheet in the appropriate slot of the standard wire guage.

Wire diameter is checked by inserting the wire only in the slot, and not in the circle. (Fig 2)

Fig 2

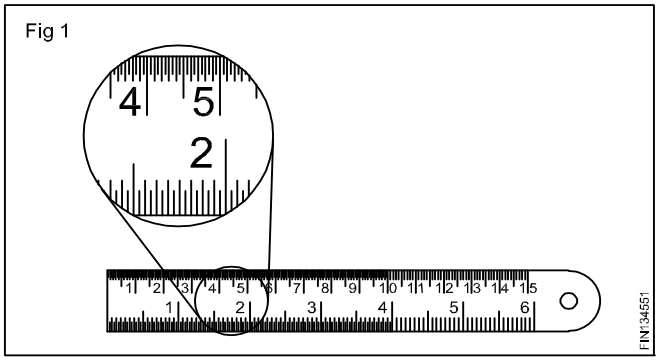


Steel rule

Objectives: At the end of this lesson you shall be able to
- **state the purpose of a steel rule**
- **state the precautions to be followed while using a steel rule.**

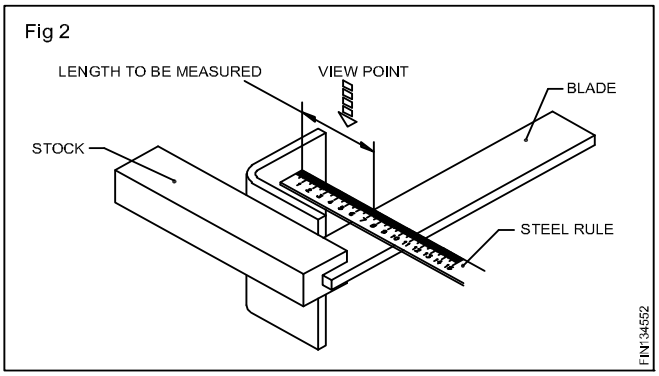
Engineer's steel rules (Fig 1) are used to measure the linear dimensions of workpieces. Steel rules are made of spring steel or stainless steel. These rules are available in lengths of 150 mm, 300 mm and 600 mm and 1000 mm. The reading accuracy of the steel rule is 0.5 mm.

Fig 1



For accurate reading it is necessary to read vertically to avoid errors arising out of parallax. (Fig 2)

Fig 2



For maintaining the accuracy of the steel rule, it is important to see to it that its edges and surfaces are protected from damage and rust.

Do not place a steel rule with other cutting tools.

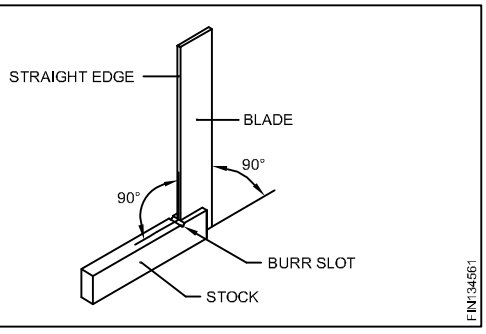
Apply a thin film of oil when not in use.

Try square

Objectives: At the end of this lesson you shall be able to
- **name the parts of a try-square**
- **state the uses of a try-square.**

The try-square (Fig 1) is a precision instrument which is used to check the squareness of a surface and the flatness of surfaces.

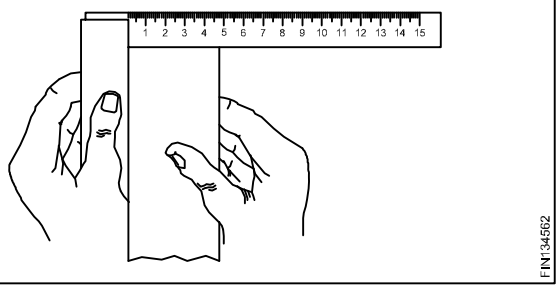
Fig 1



The accuracy of measurement by a try-square is about 0.002 mm per 10 mm length, which is accurate enough for most workshop purpose. The try-square has a blade with parallel surfaces. This blade is fixed to the stock at 90^0. Burr slot is provided on the stock at meeting point of blade to accommodate the burr, if present on the component, to avoid inaccuracy in measuring squareness.

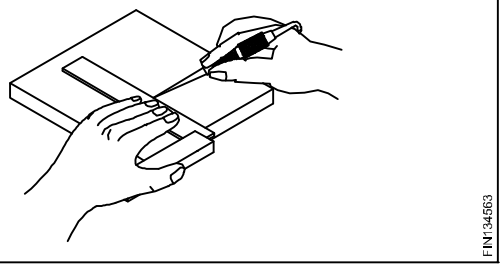
Uses: The try square is used to check the squareness of a sheet. (Fig 2)

Fig 2



To mark lines at 90° to the edges of a workpiece. (Fig 3)

Fig 3

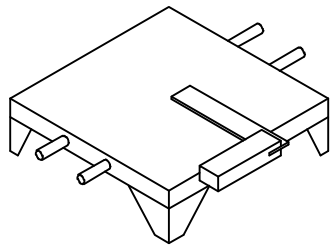


Try squares are specified according to the length of the blade i.e. 100 mm, 150, 200 mm.

To check the trueness of a trysquare.

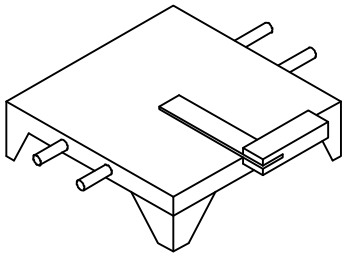
Clean the surface of the surface plate. Place the marking media on the face of the surface plate. Keep the try square blade on the surface and stock to the side of the surface plate as shown in Fig 4. Scribe straight line.

Fig 4



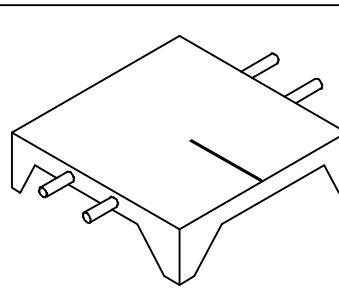
Place the trysquare as shown in Fig 5 at the edge point of marking and scribe straight line.

Fig 5



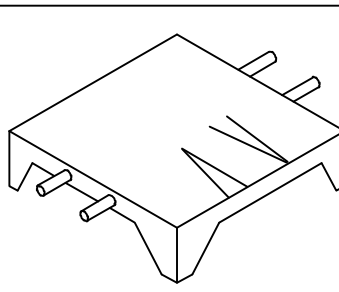
If the two marked lines are in one line as shown in Fig 6. Trysquare blade is 90° to the stock and it is correct.

Fig 6



If the two marked lines do not stand on the same line as shown in Fig 7 means the blade is not 90° to the stock.

Fig 7

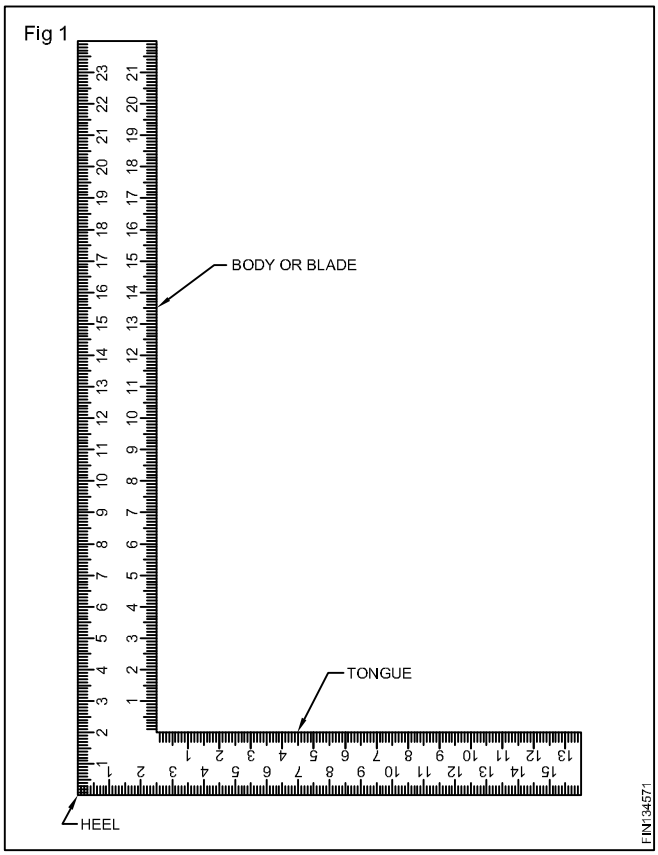


Tinman's "L" square

Objective : At the end of this lesson you shall be able to
- **state the use of the Tinman's "L" square.**

A Tinman's "L" square is an "L" shaped piece of hardened steel with graduation marks on the edges of the Tongue and Body or blade (Fig.1). It is used for marking in the perpendicular direction to any base line and to check the perpendicularity.

Fig 1



The short arm of the "L" square is called the tongue and the long arm is called the body or blade and the corner is called the heel. The angle between the tongue and the body of the "L" square is 90°.

The size of the "L" square is specified by the length of the body and the tongue.

It is also called as Tinman's square.

Straight edge

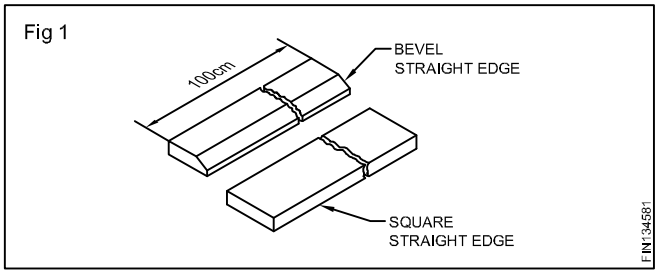
Objectives: At the end of this lesson you shall be able to
- **state the uses of straight edge**
- **list the types of straight edge.**

Straight edge: Straight edge is a flat bar of steel.

It is used to mark straight lines on a sheet metal surface.

Types (Fig 1)

Fig 1



Straight edges are available in two types.

1 Square straight edges

2 Bevel straight edge.

Straight edges are available in 600 mm, 1 to 3 mtrs in length. While marking with the help of a straight edge, place the straight edge on the sheet and hold it by your left hand.

Scriber/Scratch awl

Objectives: At the end of this lesson you shall be able to
- **state the features of scribers**
- **list the types of scribers**
- **state the uses of a scriber.**

In layout work, it is necessary to scribe lines to indicate the dimensions of the workpiece to be cut or folded.

It is made out of high carbon steel about 3 to 5 mm dia. for drawing clear lines on sheet metal, working point is ground at one end angle of 10° to 20°. Scriber working point is hardened and tempered.

Scribers are available in different types and sizes.

Types of scribers (Fig 1)

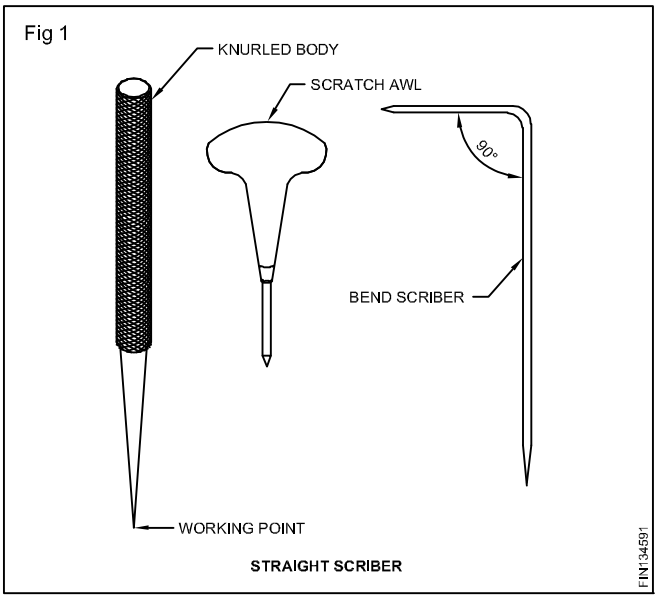
– Straight scriber

– Bend scriber

– Scratch AWL

Scriber points are very sharp and they are to be handled very carefully. Do not put the scriber in your pocket. Place a cork on the point, when not in use to prevent accidents.

Fig 1



Types of marking punches

Objectives: At the end of this lesson you shall be able to
- **state the different punches used in marking**
- **state the feature of each punch and its uses.**

Punches are used in order to make certain dimensional features of the layout permanent. There are three types of punches. They are

– Centre punch

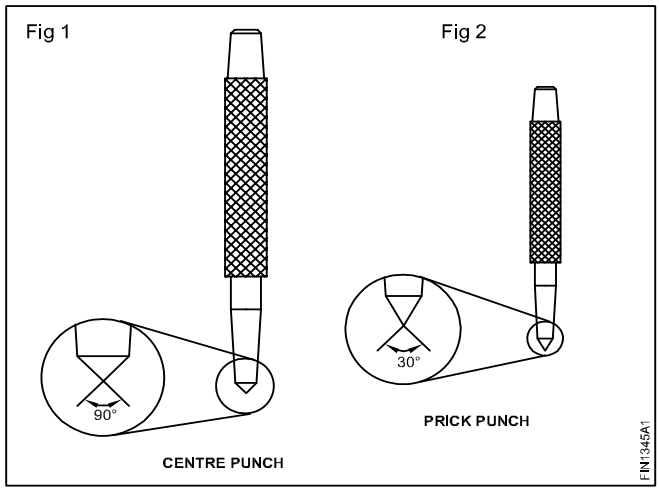
– Prick punch

– Dot punch.

Centre punch: The angle of the point is 90^0 in a centre punch. The punch mark made by this is wide and not very deep. This punch is used for locating holes. The wide punch mark gives a good seating for starting the drill. (Fig 1)

Prick punch: The angle of the prick punch is 30^0. This punch is used for making light punch marks needed to position dividers and trammels. The divider leg will get a proper seating in the punch mark. (Fig 2)

Fig 1 Fig 2



Ball pane hammer

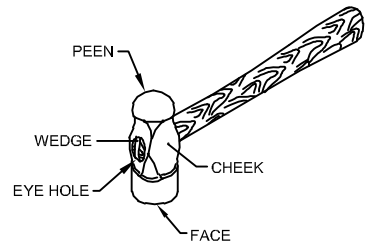
Objectives: At the end of this lesson you shall be able to
- **state the construction of the ball pane hammer**
- **identify the parts of the ball pane hammer**
- **state the use of the ball pane hammer.**

A hammer consist of a head and a wooden handle.

Hammer is used for light tapping and hard striking purposes while punching, bending, straightening, chipping, forging, riveting and planishing.

Major parts of the hammer are shown in Fig 1.

Fig 1

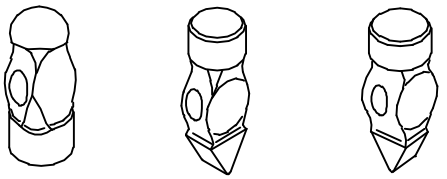


The handle is fixed in the eye hole of the hammer at right angle to the head.

Face: The face is the striking portion. Slight convex is given to avoid the digging of the edges.

Peen: The peen is the other end of the head. It is used for shaping, forming, riveting and bending. The peen is of different shapes like, ball peen, cross peen and straight peen as shown in (Fig 2). The face and peen are hardened.

Fig 2



Cheek: The cheek is the middle portion of the head. The weight of the hammer is stamped here. This portion of the hammer head is left soft.

Eye hole: An eye hole is meant for fixing the handle. It is shaped to fit the handle rigidly. The wedge is used to fix the handle tight in the eye hole as shown in Fig 3 & 4.

Fig 3

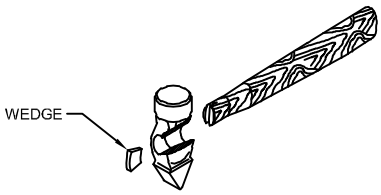
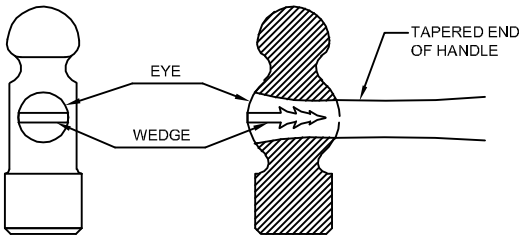


Fig 4



The semi-spherical shape of the peen is suitable for riveting and hollowing.

The face is used for flattening and striking purposes.

Specification: The hammers are specified by weight and the shape of the peen. The weight varies from 125 grams to 1500 grams. 250 grams ball peen hammer is used for marking purpose.

Before using a hammer

– Make sure that the handle is properly fitted.

– Select a hammer with the correct weight, suitable for the job.

– Check the head and the handle for any cracks.

– Ensure that the face of the hammer is free from oil or grease.

Dividers

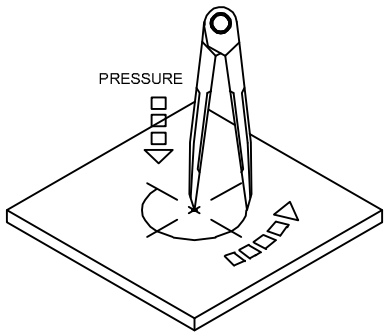
Objectives: At the end of this lesson you shall be able to
- **state the uses of dividers**
- **state the specification of dividers**
- **state the important aspects to be considered in respect of divider points.**

Dividers are used for scribing arcs and circles, and stepping of distances. (Figs 1,2&3)

Dividers are available with firm joints and spring joints. (Fig 1 & 4) The measurements are set on the dividers with a steel rule.

Constructional features: Spring dividers are made of tool steel, sharp pointed legs. The points are hardened and tempered. The legs are joined by a fulcrum roller and bow spring. The distance should be adjusted between the points with a ball headed screw and knurled nut. A peg is provided on the top of the bow spring for easy handling.

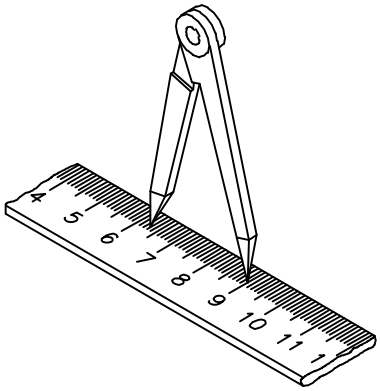
Fig 1



FIRM JOINT DIVIDER

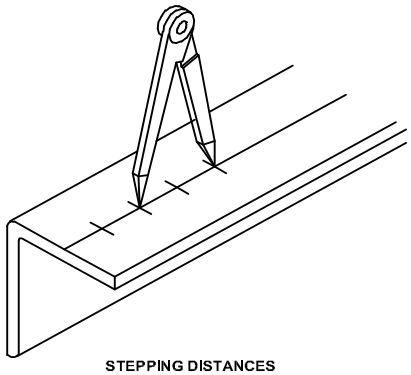
FIN1345C1

Fig 2



FIN1345C2

Fig 3

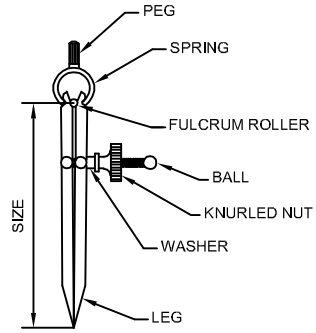


STEPPING DISTANCES

FIN1345C3

The size of dividers ranges from 50 mm to 200 mm. The distance from the point to the centre of the fulcrum roller (pivot) is the size of the divider. (Fig 4)

Fig 4



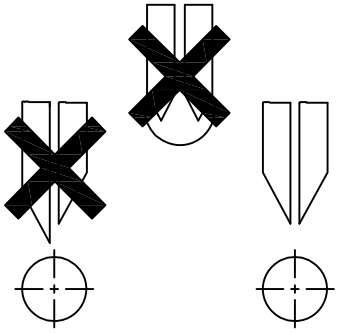
SPRING JOINT DIVIDER

FIN1345C4

For the correct location and seating of the divider legs, prick punch marks of 30° are used.

The two legs of the divider should always be of equal length. (Fig 5)

Fig 5



FIN1345C5

Dividers are specified by the type of their joints and length.

The divider point should be kept sharp in order to produce fine lines. Frequent sharpening with an oilstone is better than sharpening by grinding.

Sharpening by grinding will make the points soft.

Wing compass

Objectives: At the end of this lesson you shall be able to

- **Name the parts of a wing compass**
- **state the uses of the wing compass**
- **state the specification of the wing compass**
- **state some important hints on the wing compass**
- **state the uses of a trammel beam.**

Wing compass is used for scribing circles, arcs and for transforming and stepping off distances. (Fig 1,2 and 3)

Compasses are available with (A) Firm joints (B) Wing (C) Spring joints and (D) Beam Compass or Trammel. (Fig 4)

The measurements are set on the wing compass with a steel rule.

The sizes of a wing compass range between 50 mm to 200 mm. The distance from the point to the centre of the rivet is the size of the wing compass. (Fig 5)

Fig 1

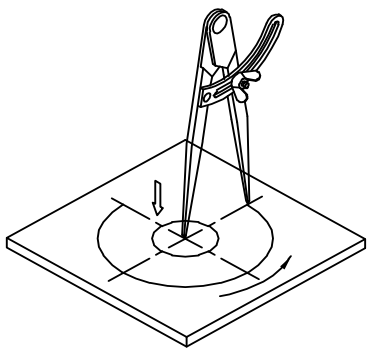


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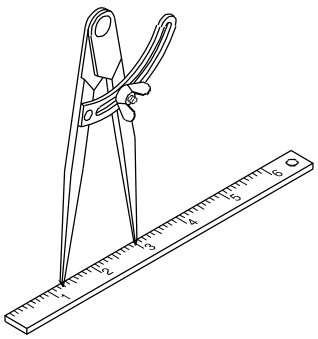
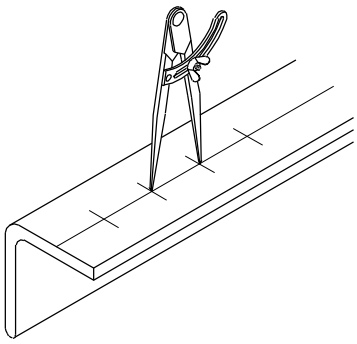
Fig 2



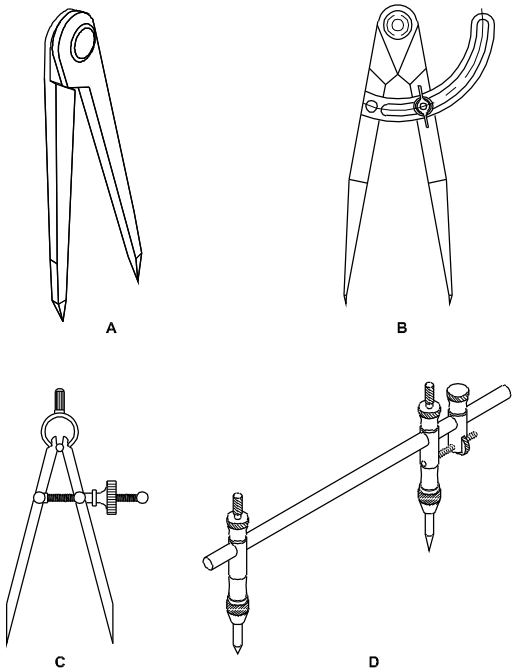
FIN1342D2

Fig 3



FIN1342D3

Fig 4



FIN1342D4

For the correct location and seating of the wing compass legs, 60^0 dot punch mark is indented. (Fig 6)

The beam compass (or) Trammel is used to scribe a circle or an arc with a large diameter which cannot be scribed by a wing compass. (Fig 7)

Parts of the wing compass are shown in Fig 8.

The two legs of the compass should always be equal in length. (Fig 9)

Compass are specified by the type of the joints and length. When using spring type wing compass the measurement once taken will not vary while marking.

Fig 5

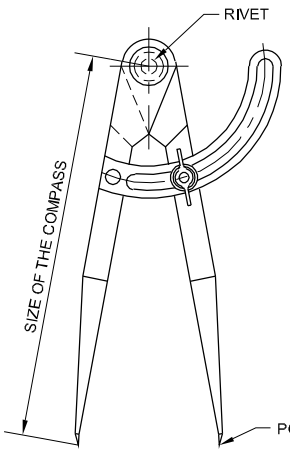


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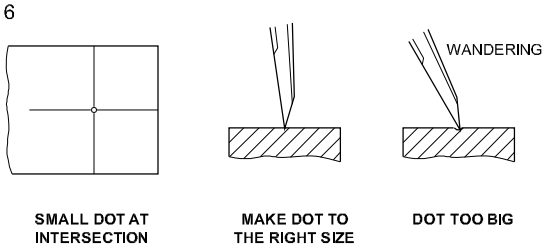
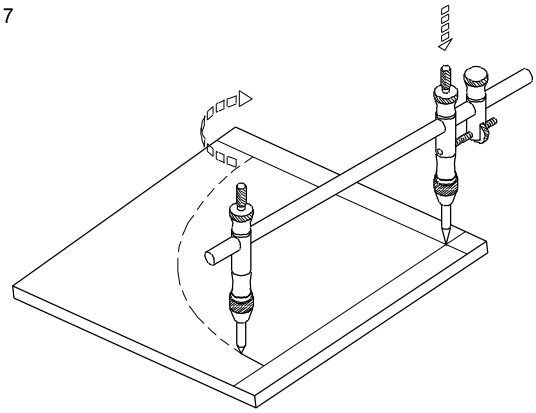
Fig 6



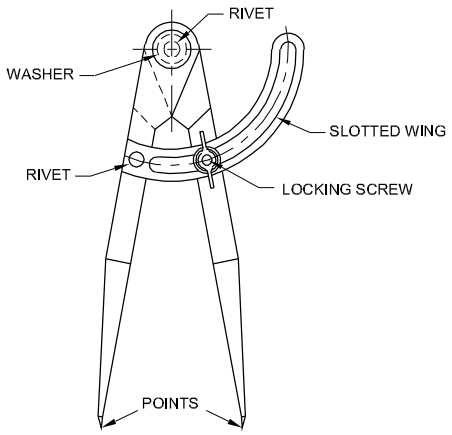
FIN1342D6

Fig 7



FIN1342D7

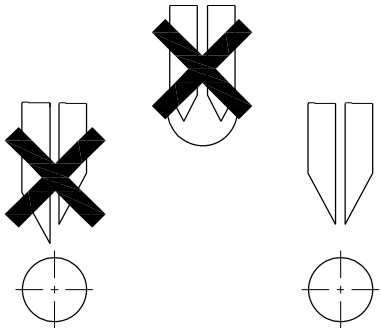
Fig 8



FIN1342D8

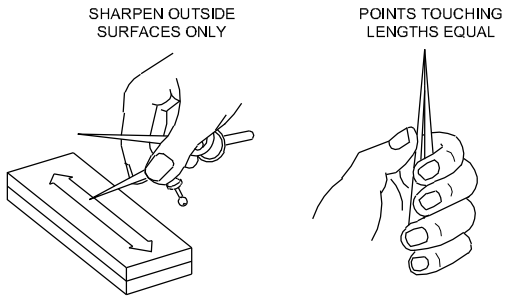
The compass point should be kept sharp, in order to produce fine lines. Frequent sharpening with an oilstone is better than sharpening by grinding. (Fig 10) Sharpening by grinding will make the points soft.

Fig 9



FIN1342D9

Fig 10



FIN1342DA

Straight snips

Objectives: At the end of this lesson you shall be able to

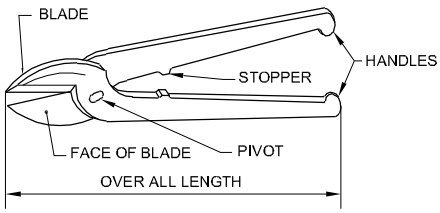
- **state the uses of straight snips**
- **state the parts of straight snips**
- **state care and maintenance.**

A snip is also called a hand shear. It is used like a pair of scissors to cut thin soft metal sheets. Snips are used to cut sheet metal upto 20 S.W.G.

Uses of straight snips: The straight snips are used to cut sheet metal along straight lines and outer sides of curves.

Parts of straight snips are shown in Fig 1.

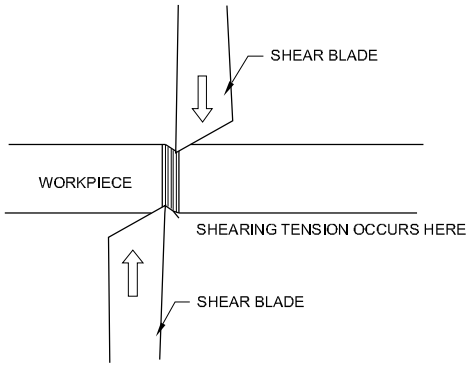
Fig 1



FIN1342F1

While cutting a sheet metal, blades are pressed against the sheet, which causes shearing tension from both sides as shown in Fig 2 and the cutting action takes place.

Fig 2

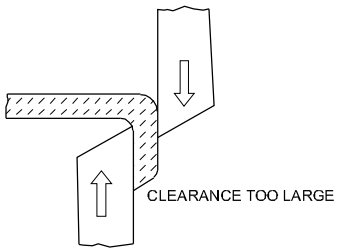


FIN1342F2

Cutting edge of the blade and clearance: Clearance between the blades should be free but without gap. For straight snips, cutting angle is 87°.

If the clearance is too large it cause unclean cut, chamfered and jamming of workpiece as shown in Fig 3.

Fig 3



FIN1342F3

Types: There are two types of snips

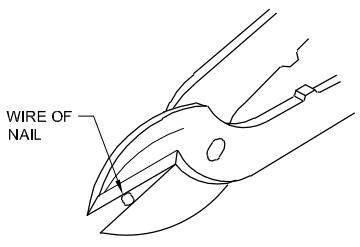
1 Straight snip

2 Bent snip

Specification: Snips are specified by its overall length and the shape of the blade. (snips are available in 150 mm, 200mm, 300 and 400 mm overall length) Ex.200 mm, straight snips.

Safety: Avoid cutting wires and nails, if so the cutting edge of the blade becomes damaged (Fig 4).

Fig 4

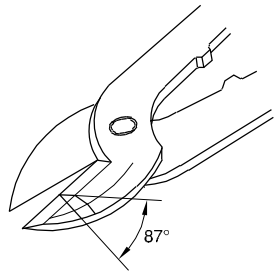


FIN1342F4

Avoid cutting hard sheet metal, if so the blade becomes blunt.

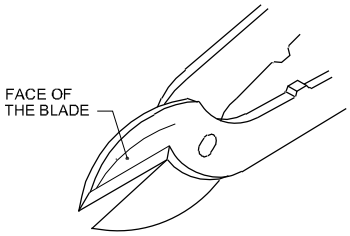
Due to wear and tear, the cutting edge of the blades becomes blunt. To resharpen the blade, the cutting angle alone should be ground to an angle of 87° (Fig 5) and should not grind the face of the cutting side of the blade. (Fig 6)

Fig 5



FIN1342F5

Fig 6



FIN1342F6

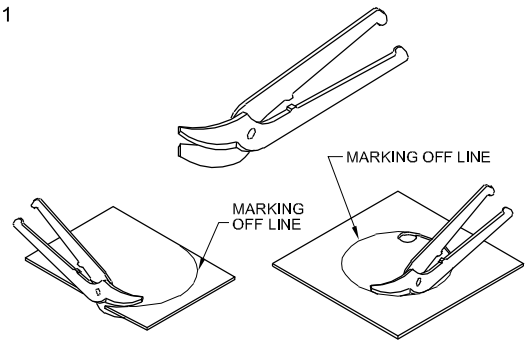
Bend snips

Objectives: At the end of this lesson you shall be able to

- **state the use of the bend snips**
- **state the parts of the bend snips**
- **state the specification of the bend snips**
- **state types of shears and their application.**

The bend snips are used to cut the inside curved lines and for trimming curved edges as shown in (Fig 1).

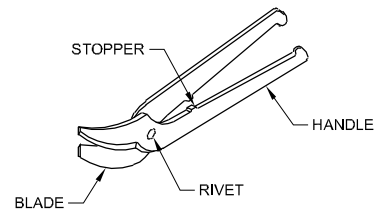
Fig 1



FIN1342G1

Parts of the bend snips are shown in fig 2. The blades of the bend snips are curved. (Fig 2)

Fig 2



FIN1342G2

Specification: Bend snips are specified by their overall length. Bend snips are available in 150, 200, 300 and 400 mm length.

Type of shears

1 Tinman's shears is sometimes called straight shears.

2 Universal combination shears or Gilbow shears.

3 Pipe shears

4 Scotch shears

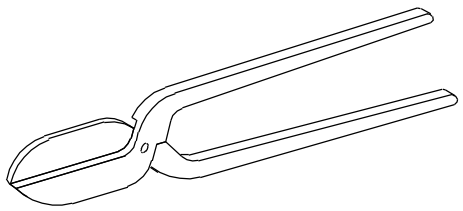
5 Block shears

6 Rohdes shears

Uses

Tinmans shears (Fig.3): It is used for making straight cuts and large external curves upto the thickness of 18 SWG. Cutting angle of a shears is 87°. The cross sectional view of the cutting blades is shown in Fig 3. Never grind the face of the blade.

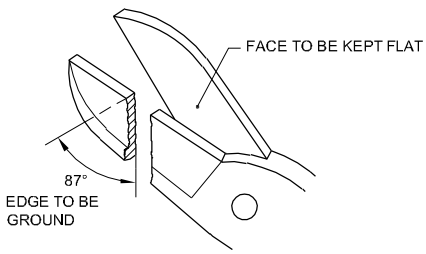
Fig 3



FIN1342G3

Universal combination shears or Gilbow shears (Fig 4)

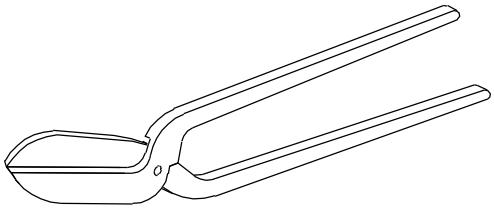
Fig 4



FIN1342G4

Its blades are designed for universal cutting, straight line or internal and external cutting of curves may be right hand or left hand, easily identifiable as the top blade is either on the right or the left. (Fig 5)

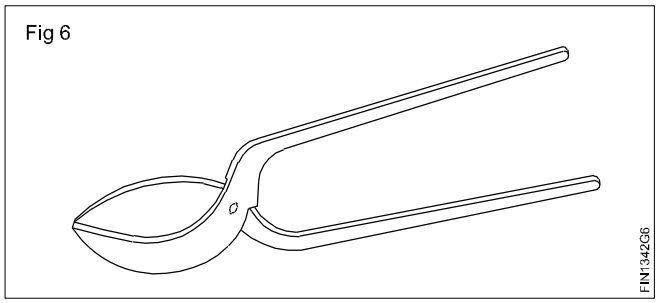
Fig 5



FIN1342G5

Pipe shears (Fig.6): It is applied as bend shears in all cases. Particularly it is used to time the edges of the pipes.

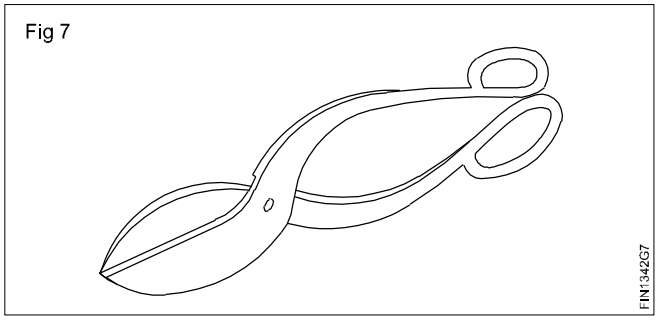
Fig 6



FIN1342G6

Scotch shears (Fig.7): It is a shape as shown in the fig.9 its handles are formed as eye holes to give extra grip to the hands. It is also used as Tinman's shears.

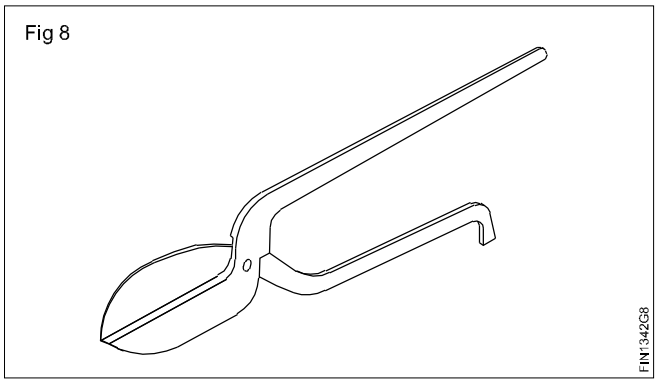
Fig 7



FIN1342G7

Block shears (Fig.8): One of the handle of the shear is bent downwards as shown in the figure. The bending portion should be fixed on the iron plates hole and the upper handle will be held by the worker. It is used in mass production purposes.

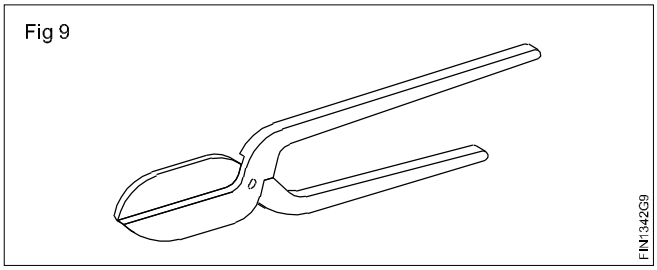
Fig 8



FIN1342G8

Rohdes shears: Its one handle is shorter in length as compared with the other handle as shown in Fig.9.

Fig 9



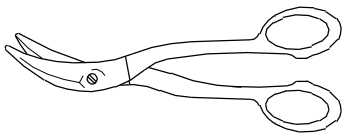
FIN1342G9

The short handle is to be pressed by the right leg of the worker and the other handle should be held by the right hand. It is used to cut lengthy sheets.

Shearing force: To produce the maximum cutting force, the hand must be kept far from the rivet and the metal being cut must be kept close to the rivet.

Hawk billed shears (Fig.10)**:** It is used for the inside cutting of an intricate work. The snips have narrow curved blades that allow you to make sharp turns without bending the metal.

Fig 1

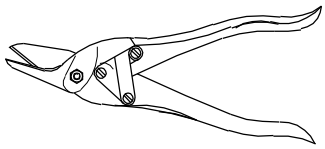


HAWK-BILLED SHEAR

FIN13421I

Aviation shears (Fig.11)**:** It can be used for all kinds of cutting. These are made with left, right or universal cutting blades.

Fig 2



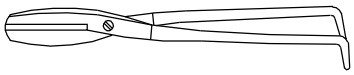
AVIATION SHEAR

FIN13421J

Bench shears (Fig.12)**:** These are designed to have one handle held in a vice or bench plate, while the other handle is moved up and down.

They can cut 16 gauge to 18 gauge thickness sheet metal.

Fig 3

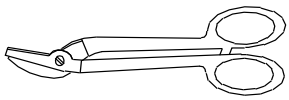


BENCH SHEAR

FIN13421B

Double cutting shears (Fig.13)**:** These shears have three blades used to cut around cylindrical objects, such as cans and pipes. A single blade is pushed through the metal to sheet to cut.

Fig 4



DOUBLE CUTTING SHEAR

FIN13421H

Electric portable shear (Fig.14)**:** Electric shears are used to cut corrugated metal sheets or a sheet metal of 18 gauge thickness or lighter sheet metals.

The shear point can be inserted with a light hammer blow. Successive blows will drive the shear on a scribed line for almost any shape like inner circles, zig zag, curvature line easily. A strip of metal about 3"/32 (2.5 mm) wide is removed in this shearing operations.

Fig 5

FIN1345G5

Sheet metal mallets & hammers

Objectives: At the end of this lesson you shall be able to
- **state the different types of mallets**
- **state the uses of mallets**
- **state the care and maintenance.**

Mallet is a shaping tool used for general purpose work like flattening, bending and forming to required shape of sheet metal.

These are made of hard wood

When using any metal hammer for flattening the sheet metal, the face of the hammer may damage or leave impression on the sheet more than what is required for the job. To avoid such damage and a impression, mallets are used.

Types (Fig 1)

– Ordinary mallet

– Bossing mallet

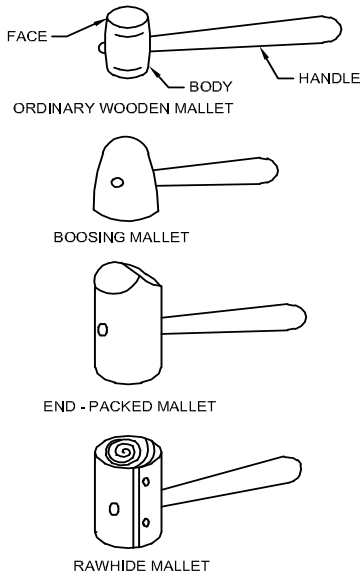
– End-faked mallet

– Raw hide mallet.

Ordinary mallet: Both the faces of the mallets are provided the little convexity. If the face is not in convex shape the edges of the mallet face will get frozen while beating the job.

Mallets are specified by the dia and the shape of the face. Mallets are available in 50 mm, 75 mm and 100 mm dia.

Fig 1



FIN1345-11

Avoid using the mallet as hammer for doing chipping and to drive nails and work on the sharp corners.

If so the face will get damaged and the mallet is liable to break.

Sheet metal hammers

Objectives: At the end of this lesson you shall be able to
- **state the names of sheet metal hammers**
- **state the constructional features of sheet metal hammers**
- **state the uses of sheet metal hammers**
- **specify the sheet metal hammers**
- **state safety precautions while using the hammers.**

In the previous lessons, you learned about the Engineering hammers such as Ball pane hammer, cross pane hammer and straight pane hammer. Apart from these, there are some special type of hammers used in sheet metal trade, which are called sheet metal hammers.

They are

1 Setting hammer

2 Riveting hammer

3 Creasing hammer

4 Stretching hammer

5 Hollowing hammer

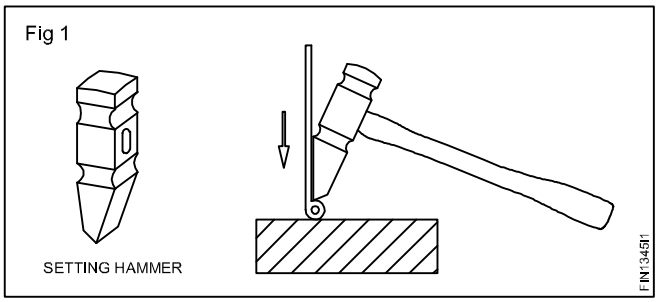
6 Bullet hammer

7 Planishing hammer

8 Peening hammer

Setting hammer: Its face is either round or square in shape. Its pane is tapered from the eye hole and the other side is straight to the handle. The tip of the pane is rectangular in shape, and slightly convexed. It is used to set up the seams, flaring the edge of the cylindrical jobs and to set up the long channel also. Its face is used for general purposes. (Fig 1)

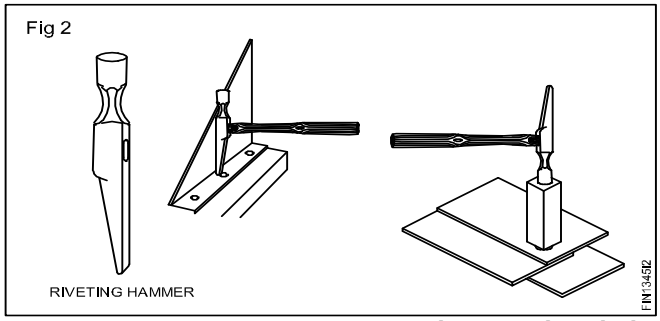
Fig 1



Riveting hammer: Riveting hammer's face is round in shape and the face is slightly convex. Its pane is long tapered and straight to the handle vertically. The tip of the pane is blended.

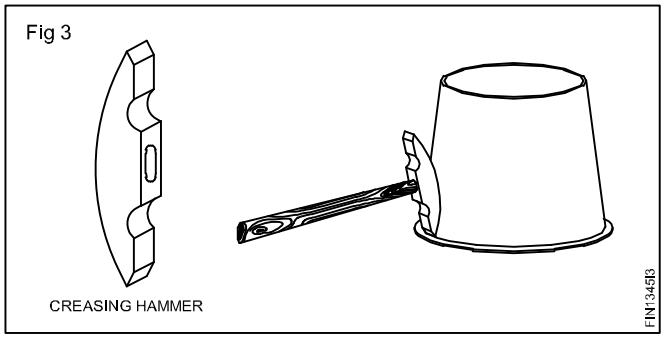
Riveting hammer is used to jump the rivet shanks and finish the rivet heads. (Fig 2)

Fig 2



Creasing hammer: Its both ends are sharpened and cross to the handle. It is used to finish the wired edges, false wiring edge and make corners of the sheet with the help of a creasing stake. (Fig 3)

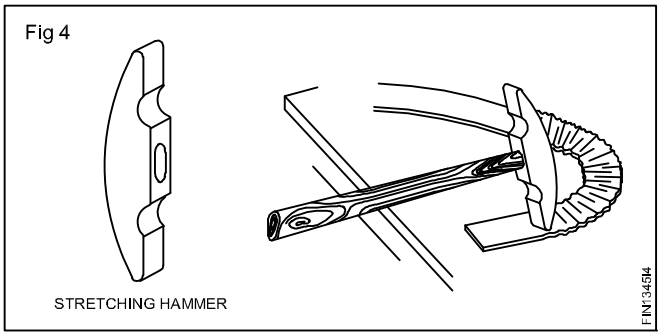
Fig 3



Stretching hammer: Its shape is like a creasing hammer but its pane ends are blended.

It is used to stretch the sheets to increase the length of the sheet. It is mostly used in raising operation. (Fig 4)

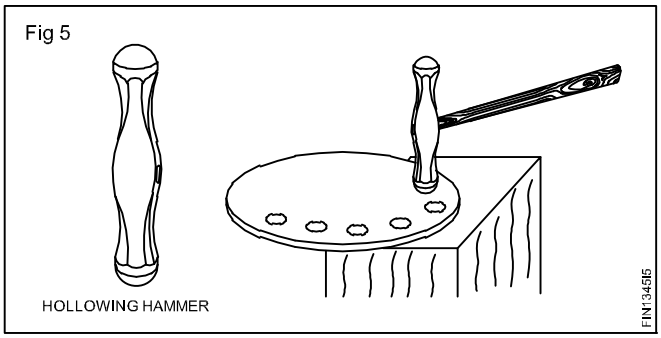
Fig 4



Hollowing hammer: Its both ends are shaped like ball and well polished.

It is used to make hollowing operation on the metal sheet and to remove the dents from the hollowed articles. This hammer is mostly used for panel beating work. (Fig 5)

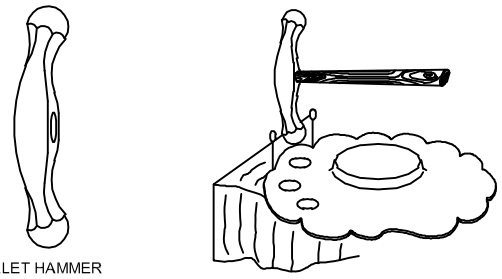
Fig 5



Bullet hammer: Its panes look like the hollowing hammer but the body is longer than the hollowing hammer and slightly bent. The pane ends are well polished and suitable to work on deep portion.

It is used to draw deep hollowing where the hollowing hammer cannot be used and also it is used to remove the dents from the deep hollow portion. (Fig 6)

Fig 6



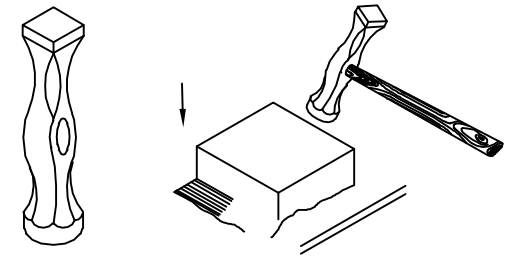
BULLET HAMMER

FIN13456

Planishing hammer: It's one face is square and other is round in shape and well polished. Its pane is slightly convex. This hammer is heavy in weight.

It is used to give smooth surface finish to the jobs which are hollowed and raised, and to planish the surface of the plain sheets. (Fig 7)

Fig 7

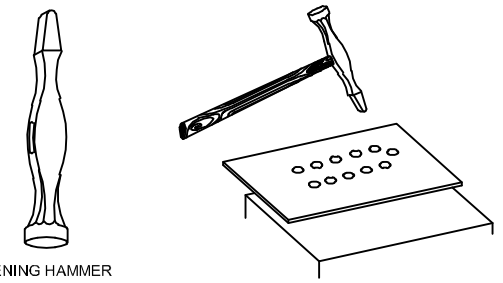


PLANISHING HAMMER

FIN13457

Peening hammer: It's face is round and slightly convex and a pane is just like stretching hammer. This hammer is used to peen polished impressions on the spinned aluminium job and hollowed copper, brass house hold vessels. (Fig 8)

Fig 8



PEENING HAMMER

FIN13458

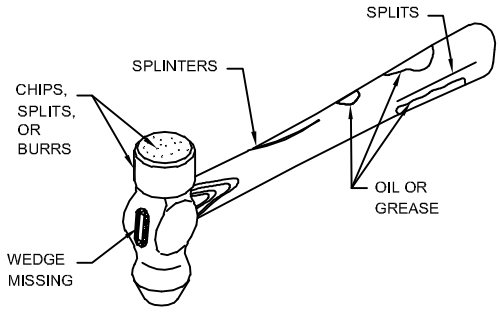
Specification: The sheet metal hammers are specified by the Type of pane and the weight of the hammer.

Example

1 lb Planishing hammer

Safety precautions (Fig 9)

Fig 9



DO NOT USE HAMMERS WITH ANY OF THESE FAULTS

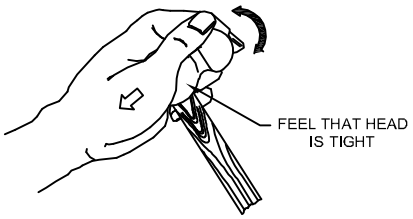
FIN13459

– Always handle and face of the hammers should be free from oil and grease.

– Face of the hammers should be free from scratches, dents, splits, burrs, chips etc.

– The handle should be securely fitted to the head. The wedge should be tight. (Fig 10)

Fig 10

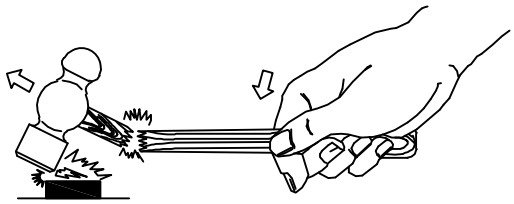


SAFETY CHECK

FIN13459A

– Hammers fitted with broken, cracked, splinted handles should not be used. Replace the handles immediately. (Fig 11)

Fig 11



FLYING HEADS ARE DANGEROUS

FIN13459B

– Heads flying from poorly fitted or broken handle can cause serious injuries.

– Always use a piece of soft metal between the hammer and the hard steel.

– Never hit two hammer faces together because the faces would split and the chips would fly dangerously.

– Select the right hammer for that particular job.

Soldering iron (soldering bit)

Objectives: At the end of this lesson you shall be able to
- **state the purpose of soldering iron**
- **describe constructional features of soldering iron**
- **state different types of copper bits and their uses.**

Soldering iron: The soldering iron is used to melt the solder and heat metal that are joined together.

Soldering irons are normally made of copper or copper alloys. So they are also called as copper bits.

Copper is the preferred material for soldering bit because

– it is a very good conductor of heat

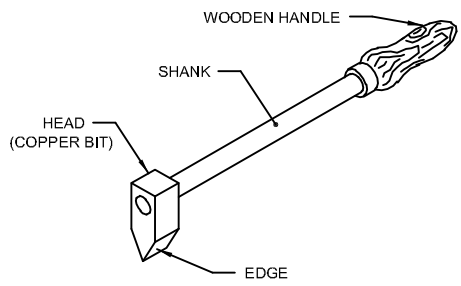
– it has affinity for tin lead alloy

– it is easy to maintain in serviceable condition

– it can be easily forged to the required shape.

A soldering iron has the following parts. (Fig 1)

Fig 1



SOLDERING IRON (HATCHET TYPE)

FIN1345J1

– Head (copper bit)

– Shank

– Wooden handle

– Edge

SOLDERING COPPER BIT

Types of soldering copper bits: There are 7 types of soldering copper bits in general use,

They are

– The pointed soldering copper bit.

– The electric soldering copper bit.

– The gas heated soldering copper bit.

– Straight soldering copper bit.

– Hatchet soldering copper bit.

– Adjustable copper bit.

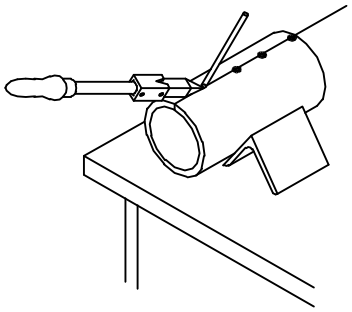
– Handy soldering copper bit.

The bits of soldering irons are made in various shapes and sizes to suit the particular job. They should be large enough to carry adequate heat to avoid too frequent reheating and not too heavy to be awkward to manipulate.

Soldering bits are specified by the weight of the copper head. For general soldering process, the shape of the head is a square pyramid but for repetition, or awkward placed joints, other shapes are designated.

Point soldering copper bit: This is also called a square pointed soldering iron. The edge is shaped to an angle on four sides to form a pyramid. This is used for tacking and soldering. (Fig 2)

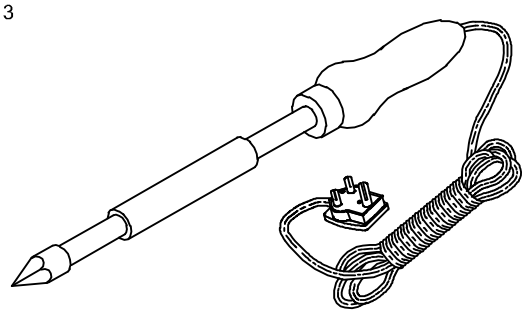
Fig 2



FIN1345J2

Electric soldering copper bit: The bit of the electric soldering iron is heated by an element. This type is preferred, if current is available because it maintains uniform heat. Electric soldering irons are available for different voltages and are usually supplied with a number of interchangeable tips. They can be made quite small and are generally used on electrical or radio assembly work. (Fig 3)

Fig 3

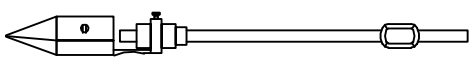


ELECTRIC COPPER SOLDERING

FIN1345J3

Gas heated soldering copper bit: A gas heated soldering copper bit is heated by a gas flame which impinges on the back of the head. High pressure gas is used and the bits is large enough to have a good heat storage capacity. Liquified petroleum gas (LPG) flame is used extensively for this purpose. Soldering kit normally includes many sizes and shapes of bits which can be used to make most kinds of soldering connections. (Fig 4)

Fig 4

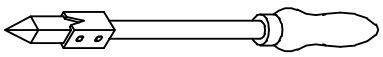


GAS HEATED SOLDERING COPPER BIT

FIN1345J4

Straight soldering copper bit: This type of soldering iron is suitable for soldering the inside bottom of a round job. (Fig 5)

Fig 5

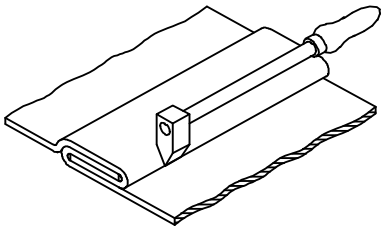


STRAIGHT SOLDERING COPPER WITH HANDLE

FIN1345J5

Hatchet soldering copper bit: This type of soldering iron is very much suitable for soldering on flat position lap or grooved joint outside round or square bottom. (Fig 6)

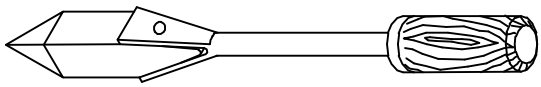
Fig 6



FIN1345J6

Adjustable soldering copper bit: This type of soldering iron is used for soldering where straight or hatchet bit cannot be used for soldering. Adjustable soldering bit can be adjusted in any position for soldering. (Fig 7)

Fig 7

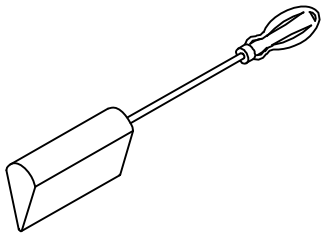


ADJUSTABLE SOLDERING BIT

FIN1345J7

Handy soldering copper bit: It is like a hatchet type but bigger in size than the hatchet. It is used for soldering heavy gauge of metal. It should not be used for soldering on light gauges of metal because additional heat will cause the metal to buckle. (Fig 8)

Fig 8



HANDY SOLDERING COPPER BIT

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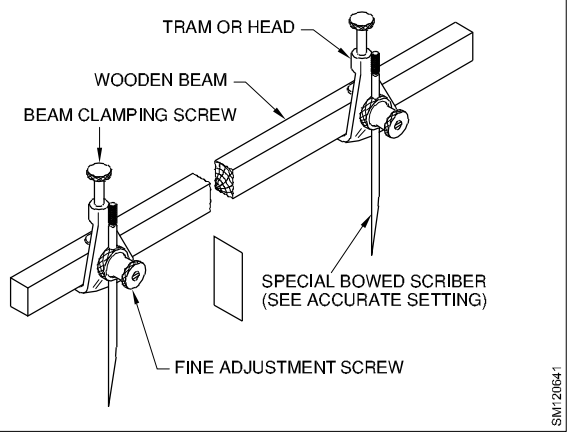
Trammels

Objectives: At the end of this lesson you shall be able to

- **state the uses of Trammels.**

Beam Trammels and taper measures: Trammel set is used for striking lines at 90° to each other, and also for measuring the distances accurately. It is a usual practice for the craftsman to use a pair of trammel heads or 'trams' and any convenient beam such as a length of wooden batten. The arrangement of the trammel for fine adjustment for accurate marking out is shown in Fig 1.

Fig 1



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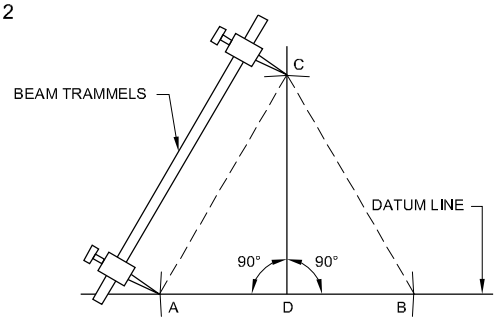
The 90^0 angle lines i.e lines square with each other, may be set out, with the aid of the beam trammel set or steel tape as shown in Fig 2.

The normal accuracy obtainable when marking out with the dividers, and the trammels is within 0.15 mm of the true dimension. Fig 3 show how the properties of a right angled triangle can be used to set out a perpendicular line by using trammel set.

Fig 2



(AD = DB AND AC = CB)

USE OF TRAMMELS TO CONSTRUCT A RIGHT ANGLE

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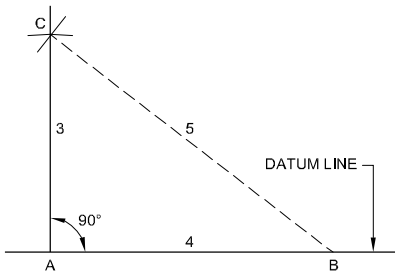
Fig 3



USE OF TRAMMELS AND STEEL TAPE TO CONSTRUCT A RIGHT ANGLE.

APPLICATIONS OF BEAM TRAMMELS AND STEEL TAPE (MAKING OUT)

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Groovers

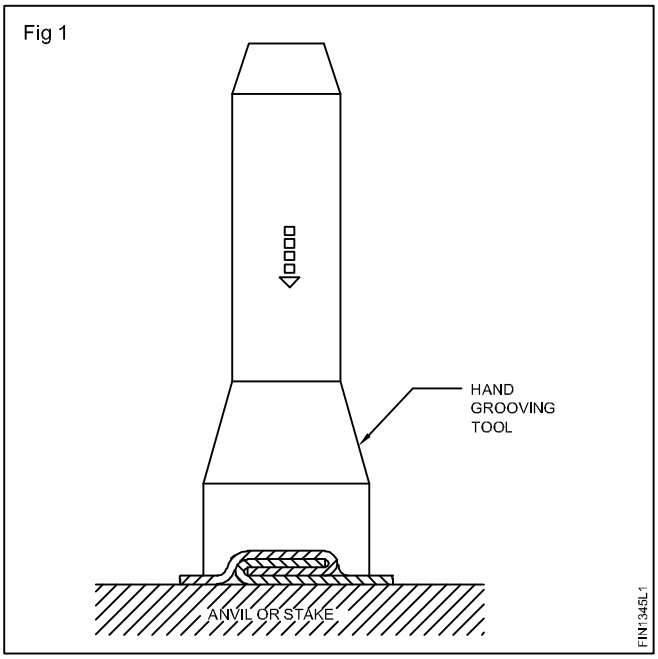
Objectives: At the end of this exercise you shall be able to
- **state what is groover**
- **state the size of the groovers**
- **state the uses and applications of groovers.**

Any seam in sheetmetal should be locked or closed property for effective functioning. Otherwise the joint will be a failure.

What is a groover?

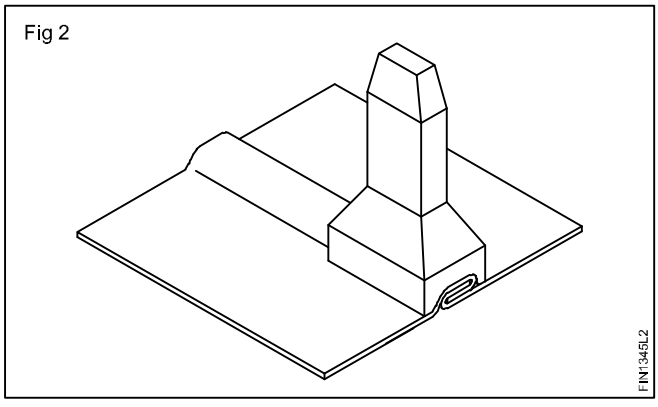
A groover is hand tool used for closing and locking of seams in sheetmetal work. (Fig 1)

Fig 1



The end of the tool is recessed to fit over the lock making the grooved seams. (Fig 2)

Fig 2



Sizes

Groovers are available in various sizes viz. 3mm, 4mm, 5mm etc.

Generally a groover 1.5mm wider than the width of the fold is used.

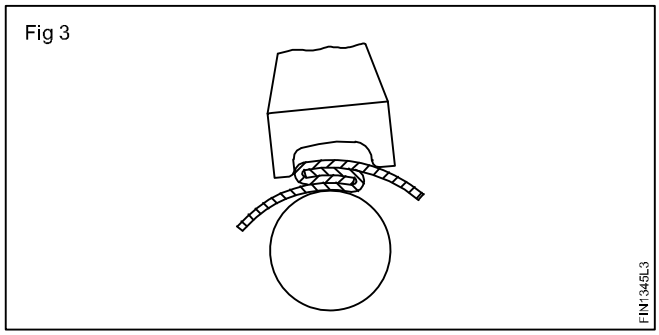
For thicker materials, a groover 3mm larger than the width of the fold is used.

The width of the groove is stamped on the tool body.

Closing and locking

First the joint is held in position and then it is closed with a mallet. (Fig 3)

Fig 3



Then the groover is placed over the closed end of the joint. The groover is positioned at a very slight angle. The edge of the joint acts as a guide to position the groover.

The grooving operations are repeated for the other end of the joint. (Fig 4 and 5).

Fig 4

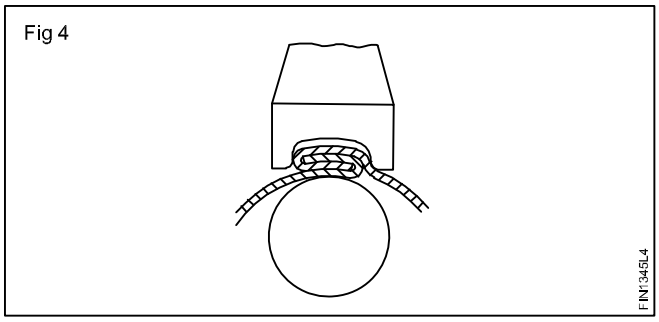
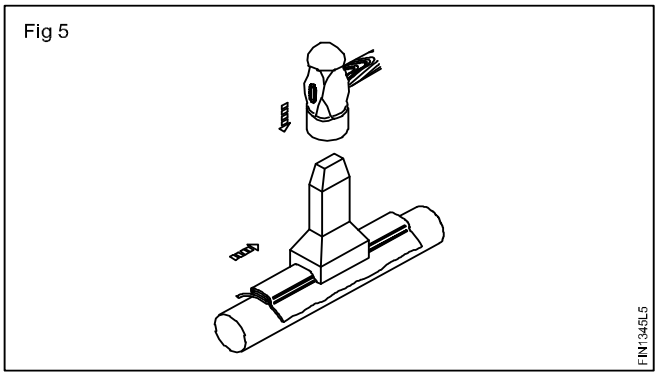


Fig 5



The joint is locked working along the joint in stages.

The seam is tighted using a mallet or a light planishing hammer.

Failure to lock the joints in stages with the end of the groover will result in bite marks along the joint.

Using too small a groover will mark the metal and prevent locking.