AutomobileRelated Theory for Exercise 1.2.09Mechanic Diesel - Measuring, marking & workshop tools

Marking material

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

- name the common types of marking material
- select the correct marking material for different applications.

Common types of Marking Materials

The common marking materials are Whitewash, Cellulose Lacquer, Prussian Blue and Copper Sulphate.

Whitewash

Whitewash is prepared in many ways.

Chalk powder mixed with water

Chalk mixed with methylated spirit

White lead powder mixed with turpentine

Whitewash is applied to rough forgings and castings with oxidised surfaces. (Fig 1)



Whitewash is not recommended for workpieces of high accuracy.

Cellulose Lacquer

This is a commercially available marking medium. It is made in different colours, and dries very quickly.

Prussian Blue

This is used on filed or machine-finished surfaces. This will give very clear lines but takes more time for drying than the other marking media. (Fig 2)

Cleaning tools

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

- state the different types of Cleaning Tools and their use
- state the precautions to be observed in the use of Cleaning Tools.

Mechanical Cleaning Involves, brushing and abrasive Cleaning. It should be used very carefully on soft metals. Heavy deposits that exists even after chemical Cleaning can be removed by mechanical cleaning.

The General Cleaning Tools are

- 1) Wire brushes
- 2) Emery sheets.



Copper Sulphate

The solution is prepared by mixing copper sulphate in water and a few drops of nitric acid. The copper sulphate is used on filed or machine-finished surfaces. Copper sulphate sticks to the finished surfaces well.

Copper sulphate needs to be handled carefully as it is poisonous. Copper sulphate coating should be dried well before commencing marking as, otherwise, the solution may stick on the instruments used for marking.

The selection of marking medium for a particular job depends on the surface finish and the accuracy of the workpiece.

Wire Brushes

Wire brushes are generally used for cleaning the work surfaces.

It is made of steel wires (or) Nylon bristles fitted on a wooden piece.

The steel wires are hardened and tempered for long life to ensure good cleaning action. Different types of wire brushes is shown in Fig 1.

Applications

- 1 Wire brushes can be used for cleaning uneven Surfaces
- 2 A hand wire brush can be used on exterior of the block and on the head.
- 3 A round wire brush fixed with a hand drill motor spindle can be used for cleaning of combustion chamber and parts of the head.
- 4 A wire wheel can be used to clean the valves.
- 5 Nylon bristles with impregnated abrasive brush can be used for Engine boring
- 6 A washing brush can be used to clean the cylinders by using Soap and Water.
- 7 Oil passages of cylinder block can be cleaned by running a long bottle type brush through all holes in the cylinder block.
- 8 It is used to clean work surface before and after welding

Safety precautions

Steel wire brushes should be used carefully on soft metals.

It should not make any scratches on the finished surface.

EMERY Sheet (Fig 2)

This is a type of paper used for sanding down hard and rough surfaces and also used for resistant technology purposes to give a smooth, shiny finish to manufactured products.

Emery paper is defined as a paper coated with abrasive particles in one side and used to produce smooth, shiny finish to manufactured products.

Description

The each and every abrasive particle act as a cutting edge. The emery is considered for a suitable abrasive for workshop practices and the final adjustment of steel parts for a perfect fit. The emery paper is also used for cleaning, to remove rust from polished metal components.

The emery is graded by numbers and the Common sizes are from coarse to fine: 40, 46, 54, 60, 70, 80, 90. 100. 120, F and FF.

Safety Precautions

After cleaning with emery paper, component should be rinsed properly.



Automobile : Mechanic Diesel (NSQF LEVEL - 4) Related Theory for Exercise 1.2.09 Copyright @ NIMI Not to be Republished

Scrapper

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

- name the different type of scrappers
- state the features of each type of scrapper
- state the precaution to be observed while uses scrapper.

Scraper is a hand tool which is used to scrap the workpiece surface by removing the smallest metal particles.

Application

It is used to obtain a smooth non scored and uniformly bearing surface which is required for sealing, sliding and guiding surface.

In automobiles it is used to remove carbon particles from cylinder head, piston head and manifold pipes

It is also used to scrap the bearings of cranks halt and sometimes the cylinder liner.

Type of scrapers

- 1. Flat scraper
- 2. Special scraper

Flat scraper

The cross section of this scraper is Flat. The cutting edge has Flat surface.

Use

It is used to scrap the high spots of a flat Surface

Special Scrapper

Special scraper is available for scraping and finishing curved surfaces.

They are :

- half round scraper
- three-square scraper
- bull nose scraper

Half round scraper

The cross- section of this scraper is a segment and it tapers to a rounded point (Fig 1)



The round bottom face is curved and is hollow in the middle.

The bottom facet and the flat surfaces are ground along the edge to form the cutting edge. (Fig 2)

The cutting angle is between 45° and 65°.



The curvature at the cutting edge helps to make point contact while scraping, and also helps to remove small spots. (Fig 3)



Three- square scraper (Fig 4)

This scraper is used for scraping small diameter holes and deburring the edges of holes.

The cross-section of this is triangular. This has more number of cutting edges and the hollow portion between the cutting edges helps in re-sharpening easily.





This scraper has the cutting edge shaped into a flat circular disc. The cutting edge forms about two thirds of the circle.



It is useful for scraping large bearings. (Fig 6) This scraper can be used in a longitudinal direction lika a flat scraper or with a circumferential movement like a half round scraper. This dual action helps to prevent ridges on the scraped surfaces.

Always use scrapers with firmly fitted handles.

Protect the cutting edges with a rubber cover when not in use.

Apply oil or grease on the cutting edges when not is use.

Surface plates

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

- state the constructional features of surface plates
- state the application of different grades of surface plates
- specify surface plates and state the uses of marking tables.

Surface plates - their necessity

When accurate dimensional features are to be marked or to be checked it is essential to have a datum plane with a perfectly flat surface. Marking using datum surfaces which are not perfectly flat will result in dimensional inaccuracies. (Fig 1) The most widely used datum surfaces in machine shop work are the surface plates and marking tables.



Materials and construction

Surface plates are generally made of good quality cast iron which are stress-relieved to prevent distortion. The work-surface is machined and scraped. The underside is heavily ribbed to provide rigidity. (Fig 2)





For the purpose of steadiness and convenience in leveling. a three point suspension is given.

Smaller surface plates are placed on benches while the larger surface plates are placed on stands.

Other materials used

Granite is also used for manufacturing surface plates. Granite is a dense and stable material. Surface plates made of granite retain their accuracy, even if the surface is scratched. Burrs are not formed on these surfaces.

Classification and uses

Surface plates used for machine shop work are available in three grades - Grades 1, 2 and 3. The grade 1 surface plate is more acceptable than the other two grades.

Specifications

Cast iron surface plates are designated by their length, breadth, grade and the Indian Standard number.

Example

Cast iron surface plate 2000 x 1000 Gr1. I.S.2285.

Marking-off tables (Fig 3)



Automobile : Mechanic Diesel (NSQF LEVEL - 4) Related Theory for Exercise 1.2.09 Copyright @ NIMI Not to be Republished These are heavily ribbed cast iron tables fitted with strong rigid legs. The top surface is accurately machined flat, and the sides square.

These are used for carrying out marking on heavy components. On certain types-parallel lines are engraved in both directions at a set distance.

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 squareness (angles of 90°) of a surface.



The accuracy of measurement by a try square is about 0.002 mm per 10 mm length, which is accurate enough for most workshop purposes. The try square has a blade with parallel surfaces. The blade is fixed to the stock at 90°.

Uses

The try squareness is used (Figs 2 & 3)



These lines serve as guides for positioning components while setting and marking.

• check flatness of surfaces (Fig. 3)



mark lines at 90° to the edges of workpieces (Fig. 4)



 set workpieces at right angles on work. holding devices. (Fig. 5)



Try squares are made of hardened steel.

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

Use of a try square and steel rule.

Fig 6 shows the method of using a try square and a steel rule for accurate measurements.

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

An experienced person can transfer measurements from a steel rule very accurately.

The steel rule graduations are accurately engraved, with the line thickness ranging from 0.12 to 0.18 mm.

Do not place a steel rule with any cutting tools. Apply a thin layer of oil when not in use.

For Accurate reading it is necessary to read vertically to avoid errors due to parallax

Fig 6 VIEW POINT LENGTH TO BE MEASURED BLADE STOCK STEEL RULE

Types of calipers

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

- name the commonly used calipers
- compare the features of firm joint and spring joint calipers
- state the advantage of spring joint calipers.
- state the uses of inside and outside calipers

Calipers are simple measuring instruments used to transfer measurements from a steel rule to objects, and vice versa.

Calipers are of different types depending on the type of joint and the shape of leg.

Types of joint

The commonly used calipers are:

- firm joint calipers
- spring joint calipers.

Firm Joint calipers (Fig. 1)

In the case of firm joint calipers, both legs are pivoted at one end. To take measurements of a workpiece. It is opened roughly to the required size. Fine setting is done by tapping the caliper lightly on a wooden surface.



Spring joint calipers (Fig. 2)

For this type of calipers, the legs are assembled by means of a pivot loaded with a spring. For opening and closing the caliper legs, a screw and nut are provided.

Spring joint calipers have the advantage of quick setting. The setting made will not change unless the nut is turned. The size of a caliper is specified by its length - which is the distance between the pivot centre and the tip of the leg.

The accuracy of the measurement taken depends very much on the sense of feel an touch. While measuring the job, you should get the feel when the legs are just touching the surface.



Types of legs

Outside and inside calipers are differentiated by the shape of the legs.

Calipers used for outside measurements are known as outside calipers. The calipers used be internal measurements are known as inside calipers.

Calipers are use along with steel rules, and the accuracy is limited to 0.5 mm; parallelism of jobs etc. can be checked with higher accuracy by using a caliper.

Automobile : Mechanic Diesel (NSQF LEVEL - 4) Related Theory for Exercise 1.2.09

Jenny calipers

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

- state the constructional features of jenny calipers
- name the types of jenny calipers
- state the uses of jenny calipers.

Jenny calipers are used for marking and layout work.

These calipers are also known as hermaphrodite calipers, odd leg calipers, and leg and point calipers.

Jenny calipers have one leg with an adjustable divider point, while the other is a bent leg. The legs are joined together to make a firm joint.

USES

Jenny calipers are used for marking lines, parallel to inside and outside edges and for locating the centre of round bars.

These calipers are available with the usual bent leg or with a heel. The calipers, with ordinary bent legs, are used for drawing lines parallel along an inside edge, and the heel type is used to drawing parallel lines along outer edges (Figs 1 & 2).

The jenny calipers should be slightly inclined while scribing lines.





Jenny calipers can also be used for scribing lines along curved edges (Figs 3 & 4). While setting dimensions and scribing lines, both legs should be of equal length.





While setting dimensions for accurate setting the jenny caliper point should `click' into the graduation (Fig. 5).



Dividers

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

- name the parts of a divider
- state the uses of dividers
- state the specifications of dividers

state the important aspects of be considered in respect of divider points.

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



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



Surface Gauges

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

- state the constructional features of surface gauges
- name the types of surface gauges
- state the uses of surface gauges
- state the advantages of universal surface gauges.

The surface gauge is one of the most common marking tools used for.

scribing lines parallel to a datum surface

Types of surface gauges

- Surface gauges/scribing blocks are of two types.
- Fixed
- Universal (Fig. 1)

The sizes of dividers range between 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 5)

For the correct location and seating of the divider legs, prick punch marks of 30° are used. (Fig 6)



Both the legs of the divider should always be of equal length.

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

The divider point should be kept sharp in order to produce timelines. Frequent sharpening with an oil stone is better than sharpening by grinding. Sharpening by grinding will make the points soft.

Do not sharpen the divider points on grinding wheels.

Surface gauge-fixed type (Fig. 2)

- setting jobs on machines parallel to a datum surface
- checking the height and parallelism of jobs
- setting jobs concentric to the machine spindle.

The fixed type of surface gauge consists of a heavy flat base and a spindle, fixed upright, to which a scriber is attached with a snug and a clamp-nut.



Universal surface gauge (Figs 3 & 4)

This has the following additional features.

- The spindle can be set to any position.
- Fine adjustments can be made quickly.
- can also be used on cylindrical surfaces.



ROCKER ARM

MDN120194

GUIDE PIN



Scriber

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

- state the features of scribers
- state the uses of scribers.

In layout work, it is necessary to scribe lines to indicate the dimensions of workpieces to be filed or machined .

The scriber is a tool used for this purpose. It is made of high carbon steel which is hardened. For drawing clear and sharp lines, a fine point is ground at one end.

Scribes are available in different shapes and sizes. The one most commonly used is the plain scriber (Fig. 1).



While scribing lines, the scriber is used like a pencil so that the lines drawn are close to the straight edge (Fig.2).

The point of the scriber should be ground and honed frequently for maintaining its sharpness.



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.(when it is not in use)

Wheelbase, wheeltrack and measuring tape

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

- define wheelbase
- define wheeltrack
- state measuring tape, its types and uses. •

The wheelbase of a vehicle equals the center distance between its front and rear wheels. (Fig 1)

Wheel/Track : The wheeltrack of a vehicle equals the center distance between its front wheels. As shown in the diagram. (Fig 4)

Measuring tape is a flexible ruler. It is made of ribbon cloth plastic fiber glass metal strip with lines for measurements. It is very common measuring tool used by many people. The available range are 3m, 5m and 10m.

Types

- 1. Plastic Tape (Fig 3)
- 2. Metal Tape (Fig 2)
- 3. Fibre glass
- 4. Ribbon cloth











Application

Dress makers

Civil Engineers

Mechanical Engineers

Surveyors

Carpenters

Medical field

Accuracy

Measuring tapes are marks in metric and British system. The accuracy in metric system is 1mm and in British system is 1/8".

Limitation: Accouracy is not possible, because the tape is flexible and likely to elongate while measuring long ranges and distances.

AutomobileRelated Theory for Exercise 1.2.11Mechanic Diesel - Measuring, marking & workshop tools

Length measurement

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

- name the base unit length measurement as per the International system of units of measurement (SI)
- state the multiples of a metre and their values.

When we measure an object, we are actually comparing it with a known standard of measurement.

The base unit of length as per SI is the METRE Length SI UNIT and MULTIPLES

Base Unit

The base unit of length as per the System International is the metre. The table given below lists some multiples of a metre.

METRE (m)	=	1000 mm
CENTIMETRE(cm)	=	10 mm
MILLIMETRE (mm)	=	1000 mm
MICROMETRE (m)	=	0.001 mm

Measurement in engineering practice

Usually, in engineering practice, the preferred unit of length measurement is the millimetre (Fig. 1).

Both large and small dimensions are stated in millimetres



The British system of length measurement

An alternative system of length measurement is the British system. In this system, the base unit is the Imperial Standard Yard. Most countries, including Great Britain itself, have, however, in the last few years, switched over to SI units.

However in a regular Steel rule & in vernier caliper the main scale readings of metric in the bottom and imperial in inches in the top wih corrosponding vernier scales.

Engineer's steel rule

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

- state the constructional features of an engineer's steel rule
- explain the uses of a steel rule
- state the maintenance aspects to be considered in respect of steel rules.

When dimensions are given in a drawing without any indication about the tolerance, it has to be assumed that measurements are to be made with a steel rule.

Steel rule are made of spring steel or stainless steel. The edges are accurately ground to form straight edges.

The surface of the steel rule is satin-chrome finished to reduce glare, and to prevent rusting.

Sizes of steel rules (Fig. 1)

Steel rules are available in different lengts, the common sized being 150mm, 300 mm and 600 mm.

The engineer's steel rule is graduated in 10 mm, 5 mm, 1mm and 0.5 mm.

The reading accuracy of the steel rule is 0.5 mm.



Air impact wrench, air ratchet

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

- · explain the use of air impact wrench
- explain the working principle of air impact wrench.

Air impact wrench (Fig. 1)

Air Impact Wrench (also known as an impact or, Air Rattle Gun windy gun), Air wrench is a socket wrench power tool, which is used to deliver high torque. It works by storing energy in rotating mass and suddenly delivering it to output shaft.

Compressed Air is commonly used as the power source. Electric power can also be used as the source of power. cordless Electric devices are also used, and are very popular due to ease of working.



The Air impact wrench is to be used along with a specially hardened impact socket extension and joints to withstand sudden force.

Generally a special 6 inch pin socket is used with air impact wrench. (Fig. 2)



Air Ratchet (Fig.3)

An Air Ratchet is a quite identical to General ratchet wrench.

It is also having square drive at different sizes.

The socket drive is turned by a Air Motor. When we pull the trigger, Air motor gets activated it turns the socket drive.

The direction of socket drive can be changed to clockwise (or) anti clockwise as per the user requirement.

Air Ratchet operates with more speed unless torque. In case where more torque is required we should use Air impact wrench.

Air Chisel

Air chisel is used for cutting the bolts to nuts of vehicle body sheet.



The compressed Air provides more force and much efficient than a hand chisel and Hammer.

Air chisel can be used with different types of chisel kit, depending upon the job.

AutomobileRelated Theory for Exercise 1.2.13Mechanic Diesel - Measuring, marking & workshop tools

Hand tools

Objectives: At the end of this lesson you shall be able to • state the application of punches.

Punches are used in sheet metals and other work to mark position on work. (Fig 1)

Prick punches



These punches are used to make witness marks on scribed lines. (Fig 2)



This makes it easier to see accurate marking out lines.

- to check the location of the centre positions before centre punching. (Fig 3)
- to locate the pivot points of compasses for scribing circles. (Fig 4)

A 100 mm prick punch with a 7 mm diameter body could have a 2.5 mm diameter point ground to an angle of 60° or 30° $\,$

Centre punches

These punches are similar to prick punch, and it is generally larger then prick punch.

A 100 mm centre punch could have a 10 mm diameter body and a 6 mm diameter point ground to an angle of 90°



Centre punches are used:

 to make deeper witness marks on scribed lines and to locate a centre position and make it easier for the drill to start correctly. (Fig 5)



Copyright @ NIMI Not to be Republished

Solid punch (Fig 6)



In riveting sheet metal, holes must be equally spaced and lined up. The holes in the metal are usually punched with solid punches.

Letter and number punches

Also known as letter stamps or number stamps, letter punches are used to emboss the impression of a letter of number into a workpiece. They are most common in the reverse image, this allows the end result to be immediately readable, however they may be made as a positive image. This is essential in the case of die or mold making and ensure that the finished product will be readable, as a die is a negative image.

Hollow punch (Fig 7)



These punchase are also used to punch holes in thin sheet metal, leather, plastic cork etc. Gaskets, seals and spacers are made using hollow punches.

While using solid or hollow punches, the materials is rigidly supported with a block of wood (with the end of grain up) or lead. This will also avoid any damage to the tip of the punch while punching.

Pin punches (Fig 8)

Pin punches are used to drive locating or locking pins, dowels and rivets out of their holes.

Pin punches are available in a set of 5 pins of dia.3,4,5,6 and 8 mm with a knurled body to a length of approximately 150 mm.



Chisel

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

- list the uses of a cold chisel
- name the parts of a cold chisel
- state the different types of chisels.

The cold chisel is a hand cutting tool used by fitters for chipping and cutting off operations. (Fig. 1)



Chipping is an operation of removing excess metal with the help of a chisel and hammer. Chipped surfaces being rough, they should be finished by filing.

Parts of a chisel (Fig. 2)



A chisel has the following parts.

Head

Body

Point or cutting edge

Chisels are made from high carbon steel or chrome vanadium steel. The cross-section of chisels is usually hexagonal or octagonal. The cutting edge is hardened and termpered.

Common types of chisels

There are four common types of chisels

- Flat chisel (1)
- Cross-cut chisel (2)

- Hall round nose chisel
- Diamond point chisel

Flat chisels (Fig. 3)



They are used to remove metal from large flat surfaces and chip excess metal of weld joints and castings.

Cross-cut or cape chisels (Fig. 3)

These are used for cutting keyways, grooves and slots.

Half round nose chisels (Fig. 4)

They are used for cutting curved grooves (oil grooves)



Diamond point chisels (Fig. 5)

These are used for squaring materials at the corners.





These chisels are used for separating metals after chain drilling.

Angles of chisels

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

- select the point angles of chisels for different materials.
- state the different cutting angles of a chisel
- state the effect of rake and clearance angles.

Point angles and materials (Fig 1)

Correct point/cutting angles of the chisel depends on the materials to be chipped. Sharp angles are given for soft materials, and wide angles for hard materials.

The correct point angle and angle of inclination generate the correct rake and clearance angles.

Rake angle (Fig. 1)

Rake angle γ is the angle between the top face of the cutting point, and normal to the work surface at the cutting edge.



Clearance angle (Fig. 1)

Clearance angle α ' is the angle between the bottom face of the point and tangent to the work-surface originating at the cutting edge.

Chilsels are specified according to their

- length
- width of cutting edge
- type
- cross-section of body

The length of the chisels ranges from 150mm to 400mm. The width of the cutting edge varies according to the type of chisels.



If the clearance angle is too low or zero (Fig. 2), the rake angle increases. The cutting edge cannot penetrate into the work. The chisel will slip.



If the clearance angle is too great (Fig. 3), the rake angle reduces. The cutting edge digs in, and the cut progressively increases.



Automobile : Mechanic Diesel (NSQF LEVEL - 4) Related Theory for Exercise 1.2.13 *Copyright @ NIMI Not to be Republished*

Material to be cut	Point angle	Angle Inclination
High carbon		
steel	65°	39.5°
cast iron	60°	37°
Mild steel	55°	34.5°
Brass	50°	32°
Copper	45°	29.5°
Aluminium	30°	22°

Chipping goggles (Fig. 4): It is used to protect the eyes while chipping the slag or grinding the job.

Hammers

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

- · state the uses of an engineer's hammer
- · list the parts of an engineer's hammer and state their functions
- name the types of engineer's hammers
- specify the engineer's hammer,

An engineer's hammer (Fig. 1) is a hand tool used for striking purposes while

- punching
- bending
- straightening
- chipping
- forging
- riveting



Major parts of a hammer (Fig. 2)

The major parts of a hammer are a head and a handle.

The head is made of drop-forged carbon steel, while the wooden handle must be capable of absorbing shock.

It is made of Bakelite frame fitted with clear glasses and an elastic band to hold it securely on the operator's head.

It is designed for comfortable fit, proper ventilation and full protection from all sides.





The parts of a hammer head are the

- face (1) pein (2)
- cheek (3) eyehole (4)
- wedge (5)

The face is the striking portion. Slight convexity is given to it avoid digging of the edge.

The pein is the other end of the head. It is used for shaping and forming work like riveting and bending. The pein is of different shapes like the (Fig. 3)



Automobile : Mechanic Diesel (NSQF LEVEL - 4) Related Theory for Exercise 1.2.13 Copyright @ NIMI Not to be Republished

- ball pein
- crosspein
- straight pein

The face and the pein are hardened.

The cheek is the middle portion of the hammer-head. The weight of the hammer is stamped here.

This portion of the hammer-head is left soft.



An eyehole is meant for fixing the handle. It is shaped to fit the handle rigidly. The wedges fix the handle in the eye hole. (Fig 4,5)



Specification

An engineer's hammers are specified by their weight and the shape of the pein. Their weight varies from 125 gms to 1.5 kg.

The ball pein hammers are used for general work in a machine/fitting shop.

Before using a hammer

make sure the handle is properly fitted

select a hammer with the correct weight suitable for the job

check the head and handle for any cracks

ensure the face of the hammer is free from oil or grease.

The figure shows the different parts of a hammer (Fig. 6). The handle is fitted in the eye-hole of the hammer.



The face of the hammer is used for general work, such as striking chisels and punches and levelling and working over joints. (Fig. 7)



Ball pein hammer (Fig. 8)

A ball pein head is used to spread metal in all directions.

This hammer has a semi-spherical pein suitable for riveting. (Fig. 9)

It is used for shaping the cylindrical end of a metal rivet to form a rivet head.

Cross pein hammer (Fig. 10)

A cross pein head is used to spread metal in one direction in the line of striking.

This has a blunt wedge-shaped pein at right angles to the axis of the handle.



Wooden Mallet

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

- · name the different types of mallets
- · state the uses of each type of mallets.

Mallets

Mallets are soft hammers and are made of raw hide, hard rubber copper, brase, lead or wood, and are used to strike a soft and light blow on the metal.

Straight pein hammer

A straight pein hammer is used to spread metal in one direction at right angles to the line of striking (Fig. 11)



This hammer has a blunt wedge-shaped pein in line with the axis of the handle.

A lump hammer or club hammer is a small sledgehammer (Fig. 12) whose relatively light weight and short handle allow single-handed use. It is useful for light demolition work, driving masonry nails, and for use with a steel chisel when cutting stone or metal. In this last application, its weight drives the chisel more deeply into the material being cut than lighter hammers.



Types and uses

Standard wooden mallets (Fig. 1) are used for general purpose work like flattening, bending etc.

Bossing mallets (Fig. 2) are used for hollowing panel beatings etc.

beatings etc. Automobile : Mechanic Diesel (NSQF LEVEL - 4) Related Theory for Exercise 1.2.13

Copyright @ NIMI Not to be Republished



An end-faked mallet (Fig. 3) is used for stretching, hammering etc.



Screwdrivers

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

- classify the hand-held screwdrivers
- state the features of standard screwdrivers
- · list out the different types of special screwdrivers and their specific uses
- · specify standard screwdrivers.

Screwdrivers are used to tighten or loosen screws which are fixed in the machine element.

Classification

- Standard type with tips to suit recessed head screw slots.
- Special type with tips to suit recessed head screws

Features of Standard screwdrivers (Fig. 1)

Screwdrivers must have:

- tips (1) of turn screws with slotted heads
- handles of metals, wood or moulded insulating material(2), shaped to give a good grip for turning (3).
- blades of hardened and tempered carbon steel or alloy steel
- round or square blade with length (4) ranging from 40mm to more than 350mm.

• flared tips which vary in length and thickness with the length of the blade.

Standard Screwdrives

Standard screwdrivers are classified as:

- heavy duty screwdrivers
- light duty screwdrivers
- stumpy screwdrivers

Heavy duty screwdrivers (Fig 2 & 3)

This screwdriver has a square blade for applying extra twisting force with the end of the spanner. Heavy duty screwdrivers of London pattern have a flat blade and are mostly used by carpenters.

42 Automobile : Mechanic Diesel (NSQF LEVEL - 4) Related Theory for Exercise 1.2.13 Copyright @ NIMI Not to be Republished





Light duty screwdrivers (Fig. 4)

This screwdriver has a round blade with parallel tips. This screwdriver is used by electricians. The blades are sheathed in insulation to avoid short circuting live parts.



Stumpy screwdrivers (Fig. 5)

These are small sturdy screwdrivers. They are used when other types of screwdrivers cannot be used due to the space limitations.



Special screwdrivers and their uses

Offset screwdriver (Fig. 6)

Offset screwdrivers are used on screws which are placed in blind spaces.

They are made with short blades and with the tips at right angle.

Greater turning force can be applied on screws by these screwdrivers because of their leverage.



Ratchet screwdriver (Fig. 7)

44

The following are the features of ratchet screwdrivers.

These screwdrivers are made with a three-position ratchet contol for screwing, unscrewing of a screw and also providing a neutral position.

They are used for tuning screws in confined spaces.

They can be operated without changing the hand grip.

They are used for slackening or tightening with a medium force.

They are used in mass production.



Phillips (cross-recess) screwdrivers (Fig. 8)

Phillips screwdrivers have cruciform or cross-shaped tips that are unlikely to slip from the cruciform slots in Philips recessed head screws.

The end of the four flats is tapered to an angle of 53°

The extreme end is ground to 110°.



Automobile : Mechanic Diesel (NSQF LEVEL - 4) Related Theory for Exercise 1.2.13 Copyright @ NIMI Not to be Republished Four different sizes to cover the full range of screws are available. These are specified by point sizes 1,2,3 & 4 which correspond to the size of the Phillips screw heads.

For quicker application ratchet offset screwdrivers are also available with renewable tips. (Fig. 9)



Specification

Screwdrivers are specified (Fig. 10) according to the

- length of the blade (a)
- width of the tip (b).

Normal blade length : 45 to 300mm. Width of blade : 3 to 10mm.

The blades of screwdrivers are made of carbon steel or alloy steel, hardened and tempered.



Screwdrivers for special uses

Small sturdy screwdrivers (Fig. 11) are available for use where there is limited space.



Screwdrivers with blades sheathed in insulation are available for the use of electricians (Fig. 12)



Precautions

Use screwdrivers with tips correctly fitting into the screw slot. (Fig. 13)



Make sure your hand and the handle are dry.

Hold the screwdrivers axis in line with the axis of the screw.

While using a Philips screwdriver apply more downward pressure.

Keep your hand away to avoid injury due to slipping of the screwdriver. (Fig. 14)



Do not use screwdrivers with split or defective handles. (Fig. 15)



In the case of damaged screwdrivers, the blades can be ground (the faces will be parallel with the sides of the screw slot) and used. While grinding ensure the end of the tips is as thick as the slot of the screw.

While using screwdrivers on small jobs, brace the job on the bench or hold them in a vice.

Specification of a screwdriver

Screwdrivers are specified according to the

- · length of the blade
- width of the tip

The normal blade length varies from 45mm to 300mm and the width of the blade varies from 3mm to 10mm.

Allen keys

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

- state the features and uses of hexagon socket screw keys
- specify hexagon socket screw keys.

Hexagon socket screw keys/Allen keys are made from hexagonal section bars of chrom vanadium steel.

These are hardened and tempered. These are bent to `L' shape. The size of an Allen key is identified by the size across the flat of the hexagon.

Uses

They are used to tighten or loosen screws having internal hexagon sockets, (Fig.1)



Screw driver (Fig 16): There are several different size of screw drivers of the standard, reed & prince & phillips types.

The offset screw driver is useful in tight quarters where even a "Stubby" cannot be used.

Safety:

- 1 Always use correct type and size screw drivers.
- 2 Don't do repair work by holding the job on the hand with the help of screw driver, if may slips it pierce the hand.



Allen keys, available in different sets in plastic wallets, surprise of a set of 8 (2 to 10mm)

2,3,4,5,6,7,8 and 10mm

Sizes of Allen keys (Fig. 1)

Individual pieces are available as follows.1, 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10, 12, 14, 17, 19, 22, 24, 27, 32 and 36.

Designation of Allen keys (Fig. 2)

A hexagonal socket screw key of width across flat 8 mm shall be designated as Key 8 IS:3082.



Automobile : Mechanic Diesel (NSQF LEVEL - 4) Related Theory for Exercise 1.2.13 Copyright @ NIMI Not to be Republished