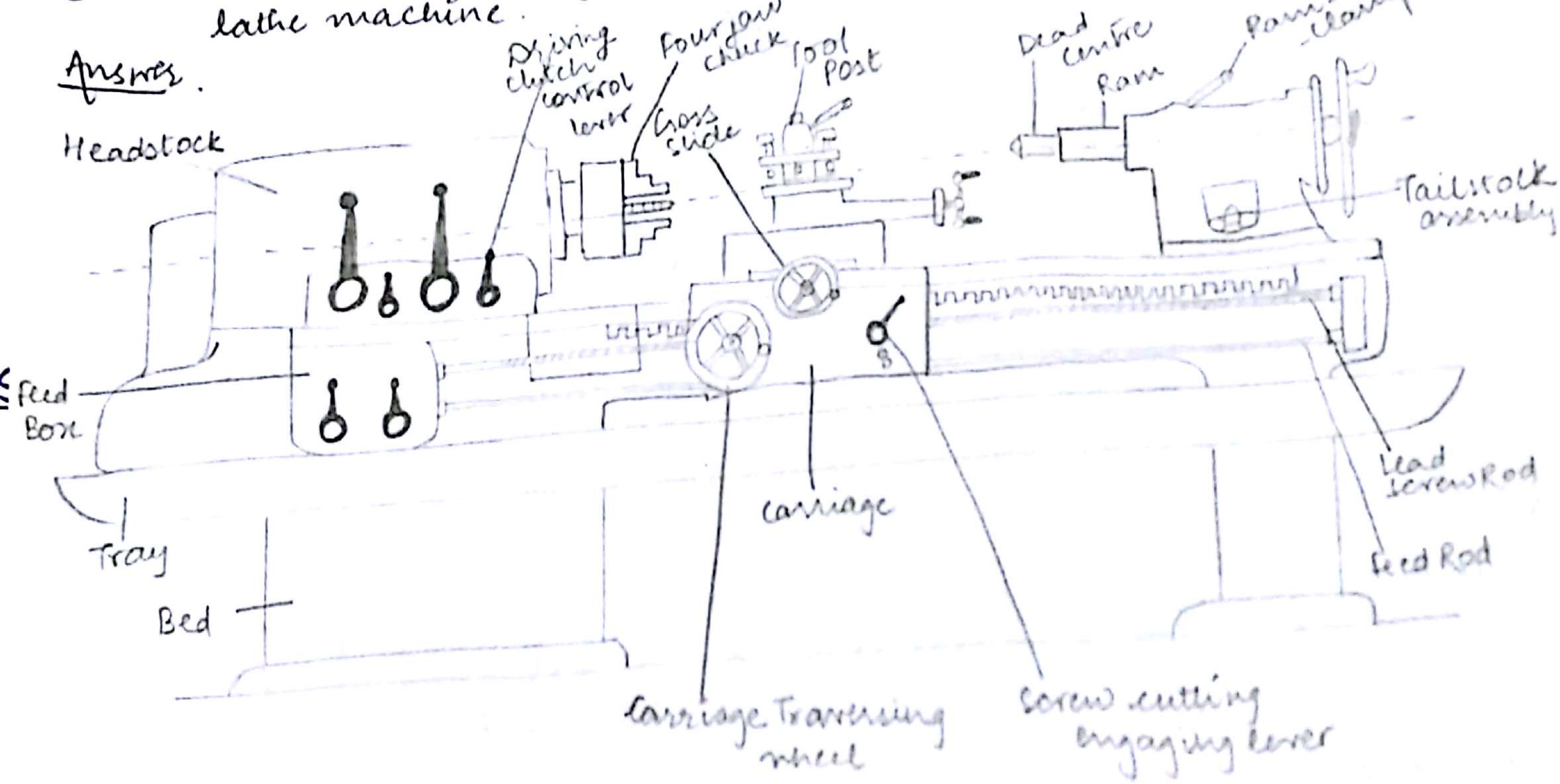
Question 1. Draw lathe diagram and explain types of operation on lathe machine.

Answer.



LATHE MACHINE

Operations on a lathe machine are :-

(1) TURNING : In this operation, the work piece is rotated at a suitable r.p.m, so that metal cutting may take place at the recommended cutting speed. This process have to be repeated several times until the desired diameter is Reached. In this process cylinderical shape is generated.

(2) FACING : In this operation, the work piece is rotated as before, but the tool is moved across by cross slide. The carriage remains fixed in one position. Result is a flat circular section at one end of the cylinder.

(3) TAPER TURNING:

It means production of a conical surface by gradual reduction in diameter as we proceed along the length of the cylinder. A conical surface will be produced, if the cutting tool moves along a line which is inclined to the longitudinal axis instead of moving parallel to it.

(4) PROFILE OR FORM TURNING:

In this operation, taper turning happens with the help of a form tool. Form tools should have a short profile, otherwise the work piece and the tool tend to vibrate each other.

(5) PARTING OFF:

This operation is performed with a parting tool. Diameter of the work piece Reduces, parting it into 2 parts, ~~and~~ ultimately, the left hand piece will remain clamped in the chuck, while the right hand piece will separate out

(6) BORING:

Boring means enlarging an existing hole. The boring operation is really an internal turning operation but not being able to see the actual cutting makes the operation Tricky and delicate.

(7) THREADING:

Threading is an operation of cutting threads or helical grooves on the external cylindrical surface of the job.

(8) KNURLING:

For a better grip, some work pieces are provided with a shallow diamond shaped pattern on its circumference. Knurling rollers have a similar pattern cut on their surface are hardened, which. As the roller and work piece surface rotate together, the pattern is etched into the surface of the work piece.

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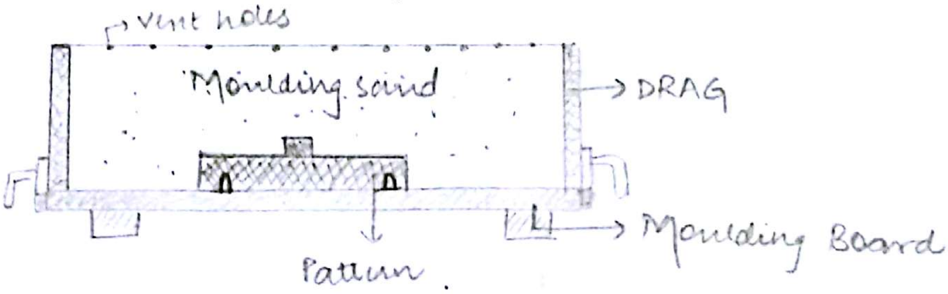
Question 2. Discuss the steps of mould making with neat diagram.

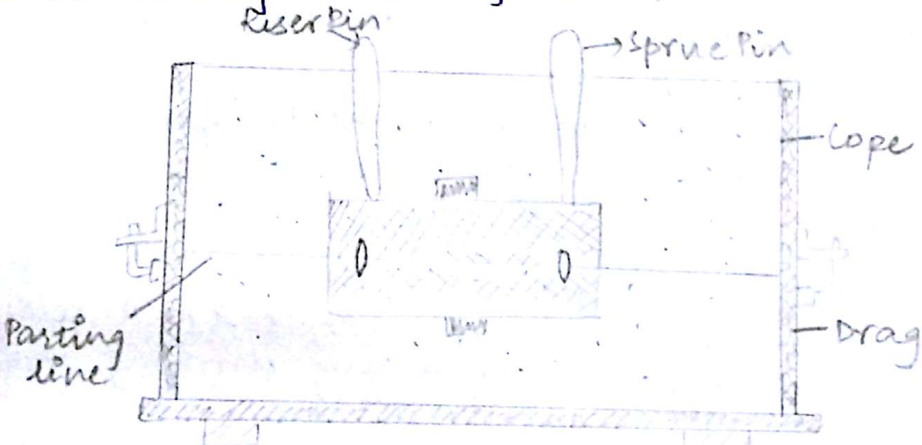
Answer: The steps of mould making are as follows:

Step 1: First, pattern is placed with its flat surface on a mould board and drag is placed on the same board. Pattern is powdered with the help of parting sand. Then green sand is put, compacting each layer with rammers. The top of the mould is rammed by the butt end of a rammer. Then, a strickle is used to scrape off the excess sand. Then mould is vented by sticking it with a fine stiff wire at a numerous places at 15-20mm above the pattern.



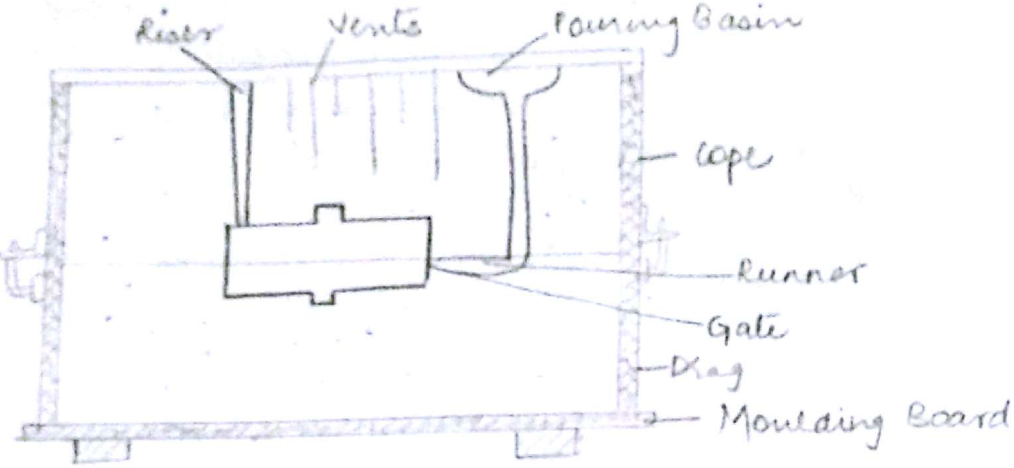
STEP-1

Step 2: After sprinkling some parting sand on the mould, drag is rolled over and parting sand is again sprinkled. The remaining part of the mould is put and cope section of flask is placed. Tapered wooden pegs to serve as sprue & riser is placed in proper position and then cope is filled with green sand. Then same filling, ramming and venting takes place.



STEP 2

Step 3: Then, wooden pegs are withdrawn from the cope and a funnel shaped opening is scooped out at the top of the sprue to form pouring basin. Cope is lifted off and placed on a board with parting line upward. Pattern is taken out and runner and gate are cut in the drag from pattern to sprue. Loose particles of sand are brushed off with foundry blackings. Finally, mould is assembled, the cope being carefully placed on the drag so that the flask pins fit into the bushes.



COMPLETE MOULD

Question 3 Explain the properties of moulding material and explain the types of sand used in moulding process.

Answer: PROPERTIES OF MOULDING MATERIAL:

(1) POROSITY: The sand must be sufficiently porous to allow the gases or moisture present or generated within the moulds to be removed freely when the moulds are prepared.

(2) FLOWABILITY: It refers to its ability to behave like a fluid so that, when rammed it will flow to all portions of the mould and pack all-round the pattern and take the required shape.

(3) COLLAPSIBILITY: After the molten metal gets solidified, the sand must be collapsible so that to avoid the tearing, cracking of the contracting metal.

(4) ADHESIVENESS: The sand particles must be capable of adhering to another body i.e. they should cling to the sides of moulding boxes.

(5) COHESIVENESS OR STRENGTH: This is a ability of sand particles to stick together. Insufficient strength may lead to a collapse in mould or its partial destruction during conveying, turning or closing.

(6) REFRACTORINESS: The sand must be capable of withstanding the high temperature of the molten metal without fusing and should not burn on casting.

TYPE OF MOULDING SAND:

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(1) GREEN SAND:
It is a mixture of silica sand, 18-30% clay and 6-8% water. when applied pressure, it retains its shape. Mould prepared with this sand is called green mould sand.

(2) DRY SAND:
Green sand that has been dried or baked after the mould is made is called dry sand. They are suitable for larger castings. Moulds prepared in this sand are known as dry sand moulds.

(3) LOAM SAND:
Loam sand is high in clay, as much as 50% or so, and dries hard. This is particularly employed for loam moulding usually for large castings.

(4) PARTING SAND:
It is used to keep the green sand from sticking to the pattern and also allow the sand on the parting surface to the cope and drag to separate without changing. This is clean clay-free silica and which serves the same purpose as parting dust.

(5) CORE SAND:
Sand used for making cores is called core sand. sometimes called oil sand. This is silica mixed with core oil which is composed of linseed oil, resin, light mineral oil and other binding materials.

Question 4: Explain different types of pattern allowances.

Answer: Patterns are not made the exact same size as the desired casting for several reasons such as pattern which are undersized, must be allowed for shrinkage, draft, finish, distortion and rapping.

(1) SHRINKAGE ALLOWANCE:
As a metal solidifies and cools, it shrinks and contracts in size. To compensate for this, a pattern is made larger than the finished casting by means of shrinkage or casting allowance. In laying measurements for the pattern, the patternmaker allows for this by using shrink or contraction rule of the metal wh

is slightly longer than the ordinary rule of the same length. Different metals have different shrinkages, therefore, there is a shrinkage rule for each type of metal used in casting. A master pattern from which metal patterns are cast may have double shrinkage allowance.

(2) DRAFT ALLOWANCE :

When a pattern is withdrawn from the mould there is a possibility of injuring the edges of the mould. This possibility can be easily decreased by tapering the vertical surfaces slightly inward. This slight taper inward on the vertical surfaces of the pattern is known as the draft. The amount of draft needed in each case depends upon

(1) Length of vertical side
(2) Intricacy of pattern
(3) the method of moulding

(3) MACHINING ALLOWANCE :

Rough surfaces of casting that have to be machined are made with some extra amount of metal than needed for the finished drawing. The extra amount of metal provided on the surfaces to be machined is called machine finish allowance.

Amount of metal to be added depends upon:

(1) kind of metal used
(2) shape & size of casting
(3) Method of casting mould.

(4) DISTORTION OR CAMBER ALLOWANCE :

Some castings, because of their shape and type of metals tend to warp (twist) or distort during the cooling period. This is a result of uneven shrinkage and is due to uneven metal thickness or to one surface being more exposed than other, causing it to cool more fastly. The shape of the pattern is thenbent in opp direction to overcome this distortion. This feature is called distortion or camber allowance.

(5) RAPPING ALLOWANCE:

When a pattern is rapped in the mould before it is withdrawn, the cavity in the mould is sligutly increased. In every case where casting must be uniform and true to pattern, rapping or shake allowance is provided for by making the pattern sligutly smaller than the actual size to compensate for rapping of the moulds.

Question 5: what are the various types of milling and drilling operations?

Answer: The following are the different operations performed in a milling machine:

(1) Plain milling
(2) Face Milling
(3) Side Milling
(4) Straddle Milling
(5) Angular Milling
(6) Gang Milling
(7) Form Milling
(8) Profile Milling
(9) End Milling
(10) Saw Milling
(11) Milling key ways, grooves and slots
(12) Gear Milling
(13) Helical Milling
(14) Cam Milling
(15) Thread Milling.

The following are the different operations performed in a drilling machine:

(1) Drilling
(2) Reaming
(3) Boring
(4) Counter Boring
(5) Counter sinking
(6) Spot facing
(7) Tapping
(8) Trepanning.

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Question 6 What is sheet metal and explain its various types of operations?

Answer: Sheet metal work is generally regarded as the working of metal from 16 gauge down to 30 gauge with hand tools and simple machines into various forms by cutting, forming into shape, and joining. It has its own significance as a useful trade in engineering works.
Common examples of sheet metal work are hoppers, cannisters, guards etc.

The major type of operations are given below:

(1) SHEARING:

It designates a cut in a straight line across a strip, sheet or bar. This procedure leaves a clean edge on the piece of metal that is sheared or cut.
Shearing action has three basic stages: plastic deformation, fracture and shear.

(2) BENDING:

Bending and forming are sometimes thought to be synonymous terms. However, bending occurs when forces are applied to localised areas, such as in bending a piece of metal into a right angle, and forming occurs when complete items or parts are shaped. Bending incorporates angle bending, roll bending, roll forming and seaming.

3) DRAWING:

Drawing is the operation of producing thin-walled hollow or vessel shaped parts from sheet metal. The drawing process can be divided into two categories, deep drawing and shallow drawing.
In deep drawing, the length of the object to be drawn is deeper than its width, while, in shallow, or son drawing the length of the object to be drawn is less than the width.

(4) SQUEEZING:

Squeezing is a quick and widely used way of forming ductile metal. The squeezing operations of sizing, coining, hobbing, ironing, riveting etc. mostly used on sheet metals.

Question 7: What are the various types of defects in casting process?

Answer: Various types of defects in casting process are:

(1) SHIFTS: This is an external defect in a casting caused due to core misplacement or mismatching of top & bottom parts of the casting.

(2) WARPAGE: Warpage is unintentional and undesirable deformation in a casting that occurs during or after solidification.

(3) FIN: A thin projection of metal, not intended as a part of casting is called a fin. Fin usually occurs at the parting of the mould or core sections.

(4) SWELL: A swell is an enlargement of the mould cavity by metal pressure, resulting in localised or overall enlargement of the casting.

(5) BLOW HOLES: Blowholes are smooth-round holes appearing in the form of a cluster of a large number of small holes below the surface of a casting.

(6) DROP: A drop occurs when the upper surface of the mould cracks and pieces of sand fall into the molten metal. This is caused by low strength and soft ramming of sand.

Question 8: Explain the working and principle with neat sketch of the following terms:

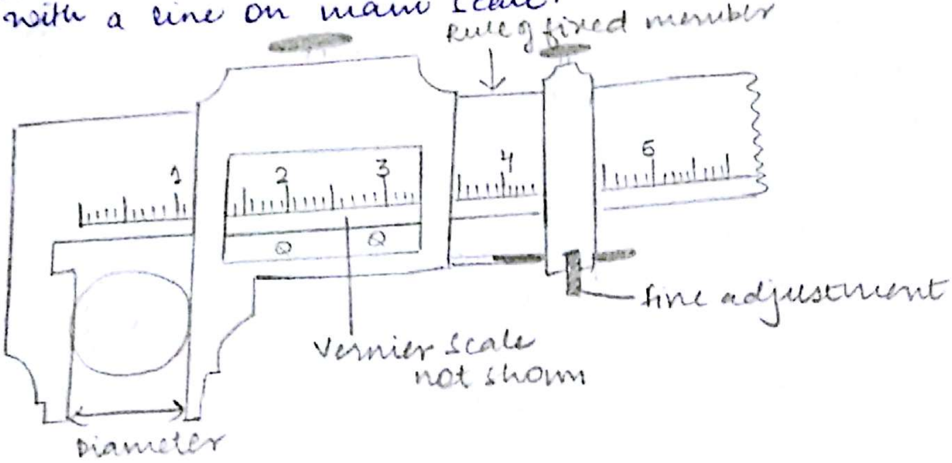
(1) Vernier Calliper:

The vernier caliper is primarily intended for measuring both inside and outside diameters of shafts, thickness of parts etc. to an accuracy of 0.02 mm by a vernier scale attached to the caliper.
The instrument comprises a beam or main scale which carries the fixed graduations, two measuring jaws, a vernier head having a vernier scale engraved on it, and an auxillary scale head of a vernier clamp which is used for a specified dimension by a micrometer screw.

Reading: On the main scale, 1cm is divided into 10 parts, each being 1mm which is again divided into two giving 0.5mm.

The vernier scale has 25 divisions which are numbered from 0 to 25 every fifth division is numbered.

To read, note the cm, mm and half mm that the zero of the vernier has moved from the zero of the main scale. Then count the number of divisions on vernier scale that coincides with a line on main scale.

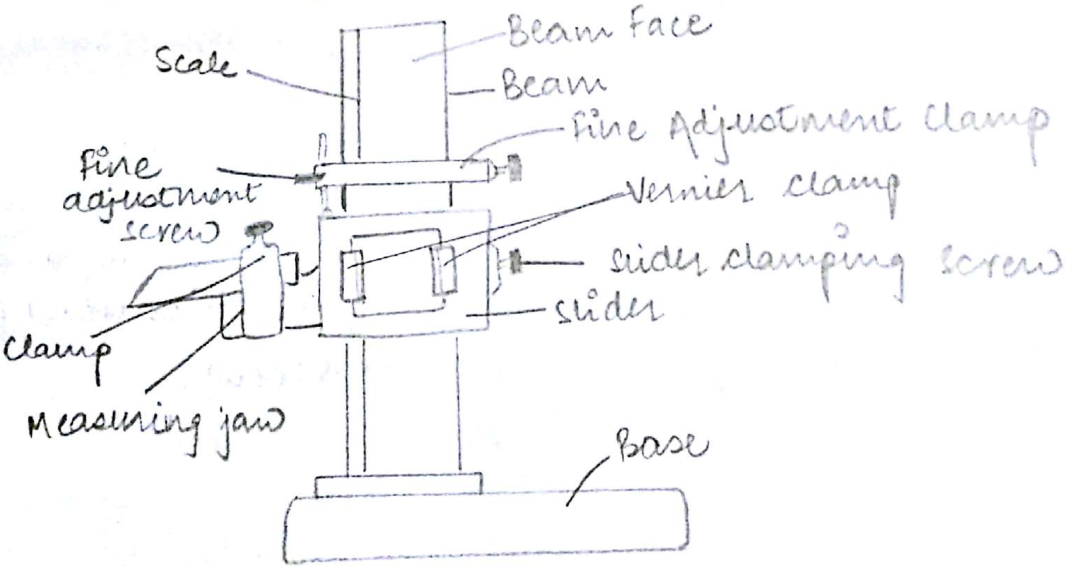


VERNIER CALIPER

(2) Height Gauge:

The vernier height gauge is used to measure the height of parts to an accuracy of 0.02mm in metric measurement and 0.001 in English Measurement.

Working: To find the height of the workpiece of the jaw from the surface plate ie. the lower measuring limit is to be added to the reading obtained from the scale. For marking out, scriber is set for the specified height and then the lines are scribed by moving the scriber along the workpiece.



VERNIER HIEGHT GAUGE

(3) MICROMETER:

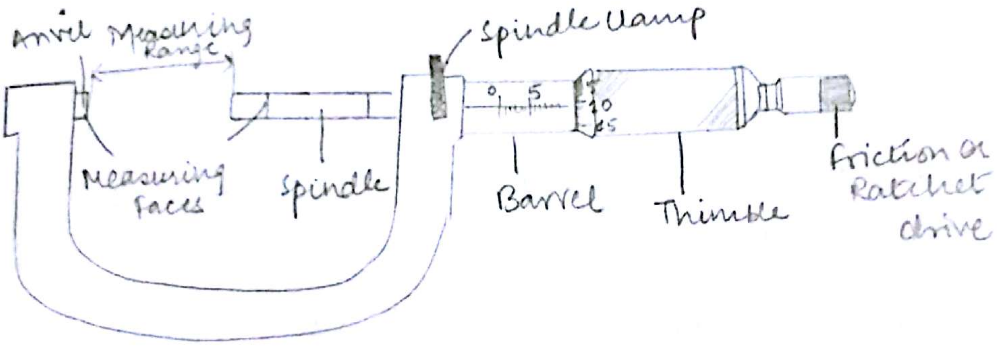
The external micrometer is primarily used to measure external dimension like diameter of shafts, thickness of parts, etc to an accuracy of 0.01mm.

Reading: The job is measured b/w the end of the spindle and the anvil which is fitted to the frame.

Note: (1) the number of main divisions in mm above reference line.

(2) the number of subdivisions below the reference line exceeding only the upper graduation

(3) the number of divisions in the thimble



MICROMETER

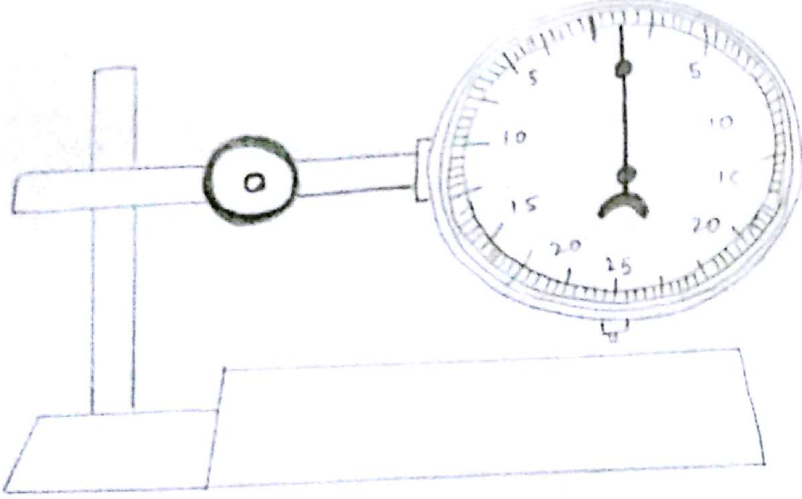
(4) DIAL INDICATOR:

Dial indicators are one of the primary measuring tools used in precision engine building

These are available for ranges of measurement of 0 to 3, 0 to 5, 0 to 10 mm.

Dial indicators are used to true and align machine tools, fixtures and work, to test and inspect the size and trueness of a finished work to an accuracy of 0.01 mm.

They are used in conjunction with other measuring instruments eg. depth gauge etc. to measure outside dimensions, flatness etc.



DIAL INDICATOR
AND
SURFACE PLATE

Question 9 what is a compractor? Explain 3 types of compractors.

Answer: compractors are instruments which derive their name from the fact that they are used for simple and accurate comparison of parts as well as working gauges and instruments with standard precision gauge blocks.

The compractors are classified according to the principles used for obtaining suitable degrees of magnification of the indicating device.

The common types are:

(1) MECHANICAL COMPRACTORS:

A mechanical compractor employs mechanical means for magnifying the small movement of the measuring stylus bought about due to the difference b/w the standard and the actual dimension being checked.

(2) ELECTRICAL COMPRACTORS:

Electrical compractors are used as a means of detecting and amplifying small movements of a work contacting elements. Electrical compractors offer a number of advantages over the mechanical type. They have no moving parts and therefore they can maintain their accuracy for long periods. Also, sensitivity and magnification is high in electrical compractors.

(3) OPTICAL COMPRACTORS:

Optical compractors have a high degree of precision and the magnification is obtained with the help of light beams which have the advantage of being straight and weightless. Optical compractors, therefore, suffer less wear during usage than the mechanical type.