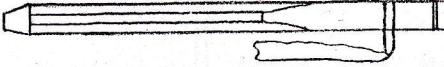
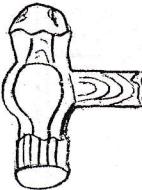
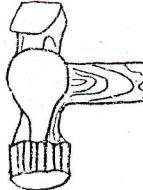
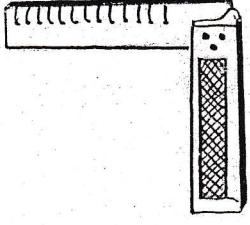
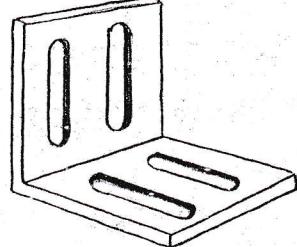
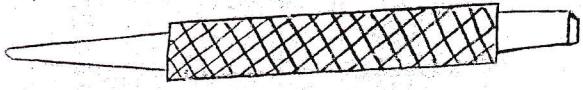
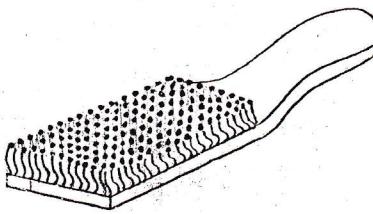


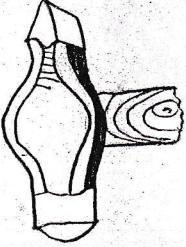
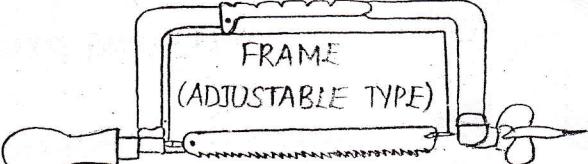
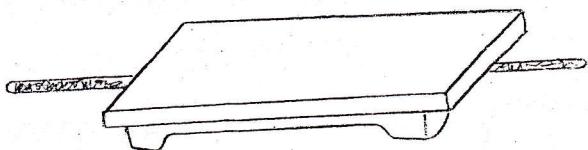
FITTING WORK

FITTING TOOLS

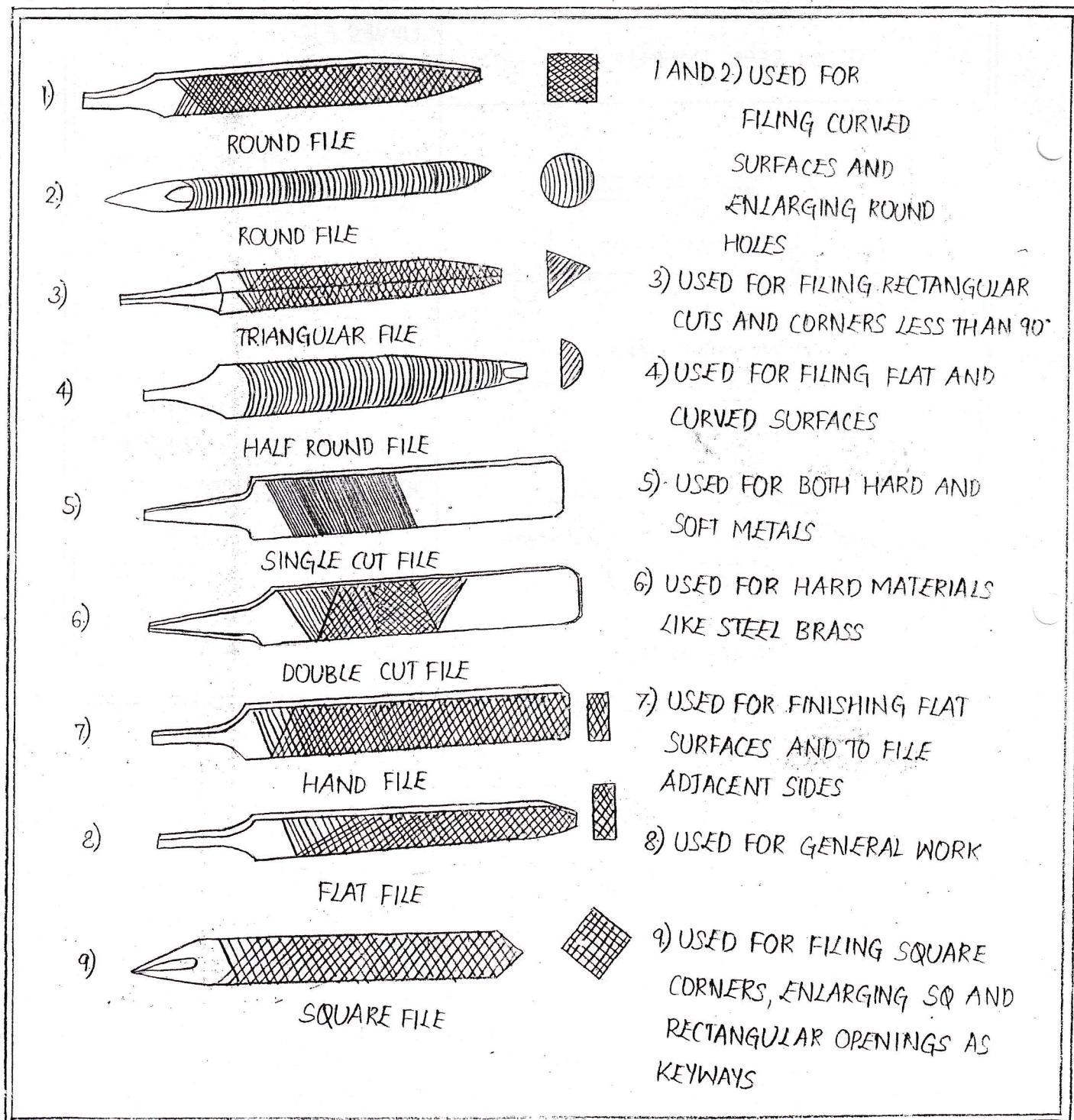
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SKETCH	SPECIFIC USE
	IT IS A GENERAL PURPOSE CHISEL. IT IS MAINLY USED FOR CHIPPING MATERIAL FROM FLAT SURFACES. IT IS ALSO USED FOR CUTTING SHEET METAL OF HEAVIER THICKNESS, RIVETS, BOLTS ETC IN COLD STATE.
	IT IS USEFUL FOR CHIPPING, RINETING & GENERAL PURPOSES. THE BALL PEEN IS USED FOR PREPARING BOWL SHAPE BY HAMMERING, SPREADING THE MATERIAL, INTERNAL BENDING WORK ETC.
	IT IS USED FOR SKETCHING OR PINING THE METAL. IT IS ALSO USED TO HAMMER AT CLOSED AND OBSTRUCT PLACES.

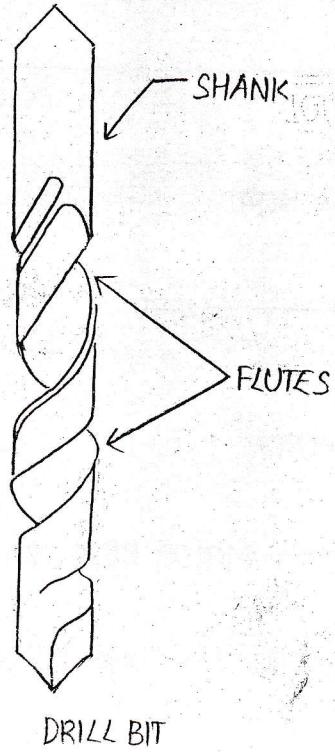
SKETCH	SPECIFIC USE
 TRI SQUARE	<p>IT IS USED</p> <ul style="list-style-type: none"> a) TO DRAW PERPENDICULAR LINES WITH REFERENCE TO FINISHED SIDE b) TO CHECK PERPENDICULARITY OF THE SIDES c) TO CHECK PLAIN SURFACES OF THE FLAT JOBS
 ANGLE PLATE	<p>IT IS USED TO SUPPORT THE JOB WHILE MARKING.</p> <p>MANY JOBS HAVE VERY SMALL THICKNESS SO IT NEEDS A REST OF ITS HEIGHT. IT IS USEFUL FOR RESTING THE JOB.</p>
 CENTRE PUNCH	<p>IT IS USED TO PUNCH A DEEP MARK AT THE CENTRE TO BE MARKED FOR DRILLING OPERATION</p>
 FILE CARD	<p>FILING OF SOFT METAL CAUSES FILE TEETH TO BECOME CLOGGED WITH PARTICLES OF METAL. THE CLOGGED TEETH ARE CLEANED BY FILE CARD.</p>

SKETCH	SPECIFIC USE
 <p>CROSS PEEN HAMMER</p>	<p>THIS HAMMER IS WIDELY USED IN SHEET METAL SHOPS FOR BENDING, PROVIDING CHANNEL IN SHEETS, PROVIDING COLLAR INSIDE CURVES ETC.</p>
 <p>HAND HACK SAW</p>	<p>THE HACK-SAW IS USED TO SAW METALS.</p>
 <p>SURFACE PLATE</p>	<p>IT IS USED FOR MARKING, AND MEASURING PRECISION JOBS; USUALLY PRE-MACHINE JOBS. IT IS ALSO USED TO TEST FLATNESS OF WORK.</p>

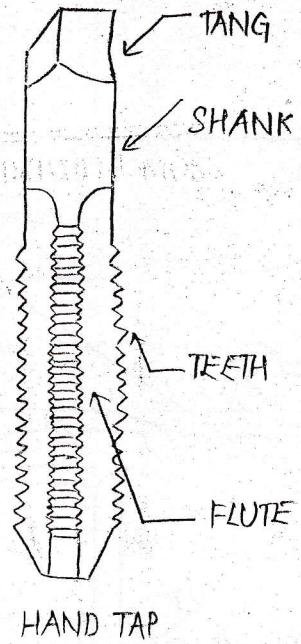
TYPES OF FILES AND THEIR SHAPES



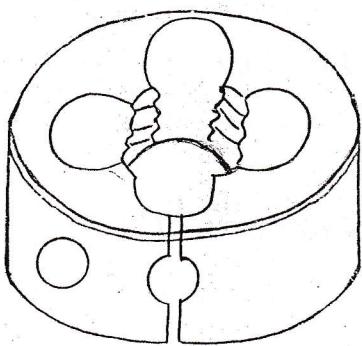
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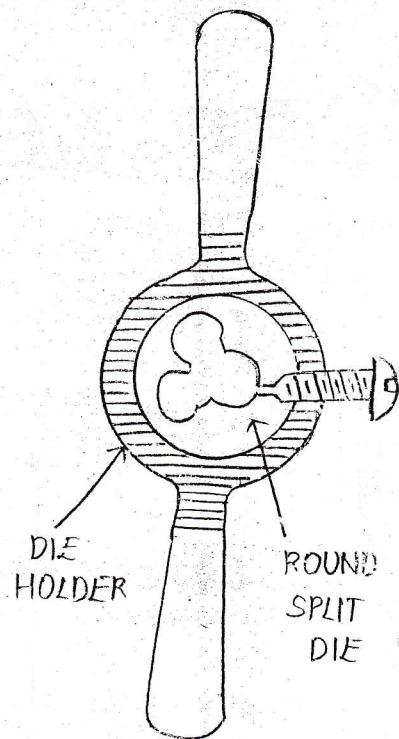
DRILL BIT

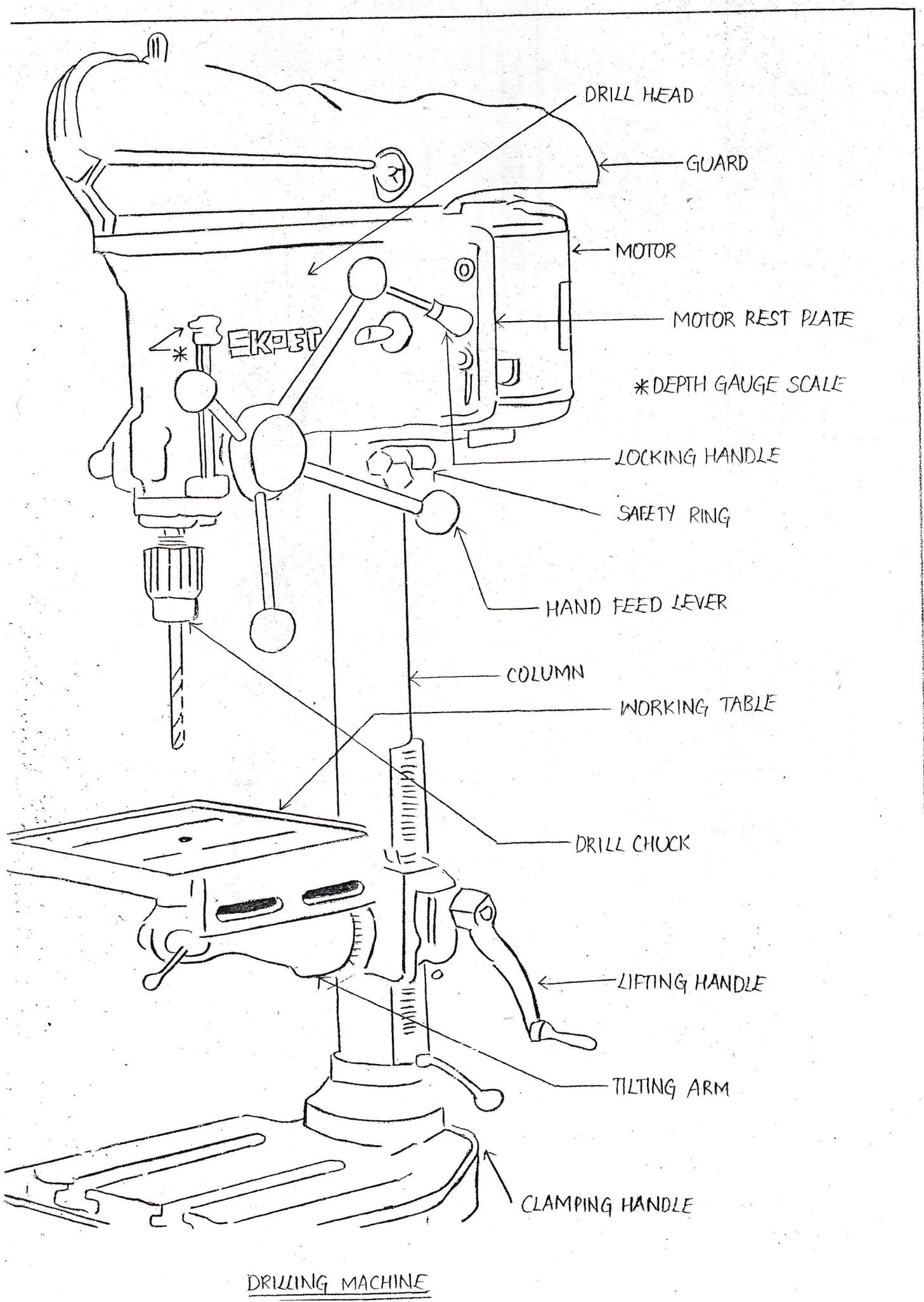


HAND TAP

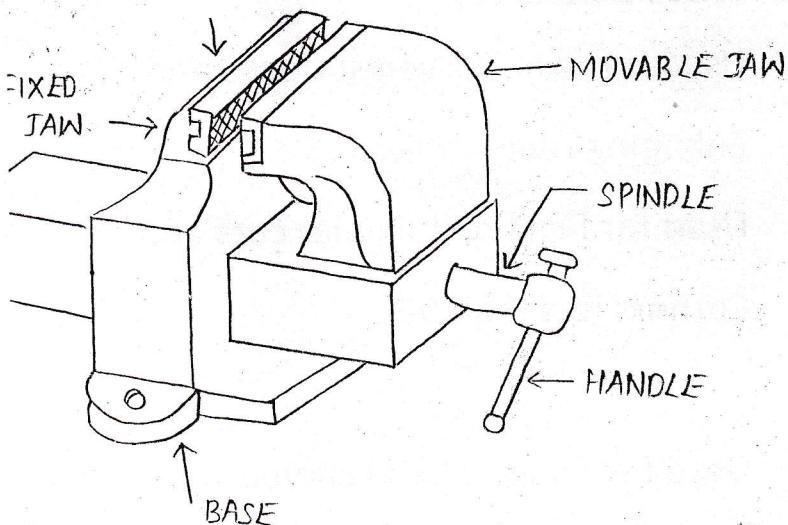


ADJUSTABLE ROUND
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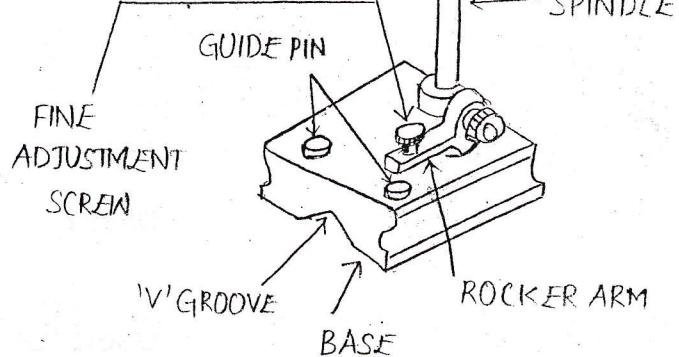
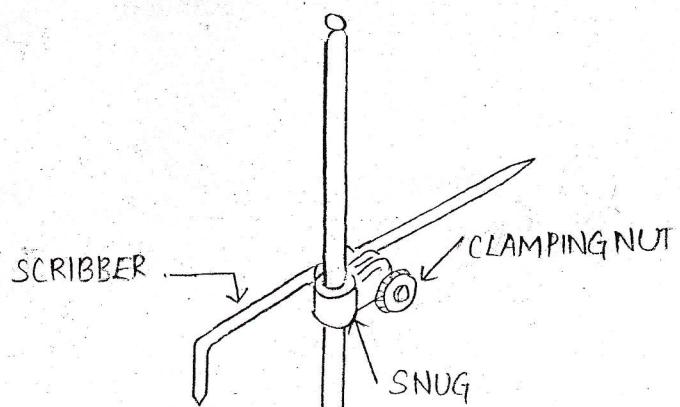
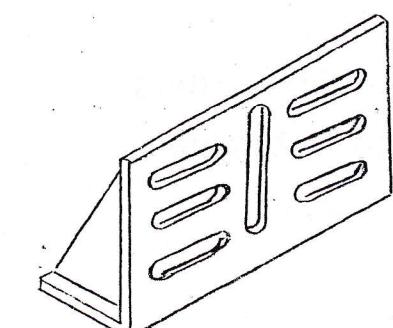
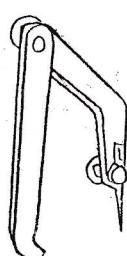




8

JAW PLATE

7

BENCH VICEUNIVERSAL SURFACE GAUGESURFACE PLATEANGLE PLATEODD LEG CALLIPER

~~OMIT~~

TYPES OF FILES AND THEIR SHAPES

- | | |
|--------------------|---|
| 1) ROUND FILE | Used for filing curved surfaces and
Enlarging round holes. |
| 2) TRIANGULAR FILE | Used for filing rectangular cuts and
Corners less than 90°. |
| 3) HALF ROUND FILE | Used for filing flat and curved
Surface |
| 4) SINGLE CUT FILE | Used for both hard and soft metals. |
| 5) DOUBLE CUT FILE | Used for hard materials like steel
brass. |
| 6) HAND FILE | Used for finishing flat surfaces and
to file adjacent sides. |
| 7) FLAT FILE | Used for general work |
| 8) SQUARE FILE | Used for filing square corners,
enlarging SQ and rectangular
openings as keyways. |

TOOLS OF FITTING WORK

i) BENCH VICE:

It is made up of cast iron or cast steel. It is used to hold work for filing, sawing, threading and other hand operations. The size of the vice is stated by the width of the jaws.

The following are the parts of bench vice:

- | | | |
|-----------------|------------------------|----------------|
| i) BASE PLATE | ii) FIXED JAW | iii) FIXED NUT |
| iv) MOVABLE JAW | v) HARDENED JAW PLATES | |
| vi) SPINDLE | vii) HANDLE | |

ii) UNIVERSAL SURFACE GAUGE :

It is one of the most common marking tools used for:

- Scribing lines parallel to a datum surface.
- Setting jobs on machines parallel to a datum surface.
- Checking the height and parallelism of jobs, setting jobs concentric to the machine spindle.

It has the following features:

The single can be set to any position. The single can be set to any position. Fine adjustment can be made quickly. Can be used on cylindrical surfaces also. Parallel lines can be scribed from any datum edge with the help of guide pines.

iii) ODD LEG CALIPER :

It is used for marking and layout work. It has one leg with an adjustable divider point while the other is a bent leg.

It is used for marking lines parallel to inside and outside edges and locating the centre of round bars.

iv) DRILL BIT :

It is made of high carbon steel or high speed steel. It is used for making holes in a metal or non-metal. The following are the parts of drill bit

- | | |
|-----------|---------------------|
| i) POINT | v) FLUTES |
| ii) SHANK | vi) LAND/MARGIN |
| iii) TANG | vii) BODY CLEARANCE |
| iv) BODY | viii) WEB |

There are three types of drills:

- i) FLAT DRILL
- ii) STRAIGHT FLUTED DRILL
- iii) TWIST DRILL

v) TAP:

Taps are made of carbon steel or high speed steel and are hardened and tempered. It is used to cut threads on the inside of a hole.

Following are the parts of the tap:

- | | |
|-----------|------------|
| i) TANG | iii) BODY |
| ii) SHANK | iv) FLUTES |

Types of tap:

- i) HAND TAP
- ii) SPECIAL TAP
- iii) PULLEY'S TAP
- iv) SPIRAL FLUTED TAP
- v) STAY BOLT TAP

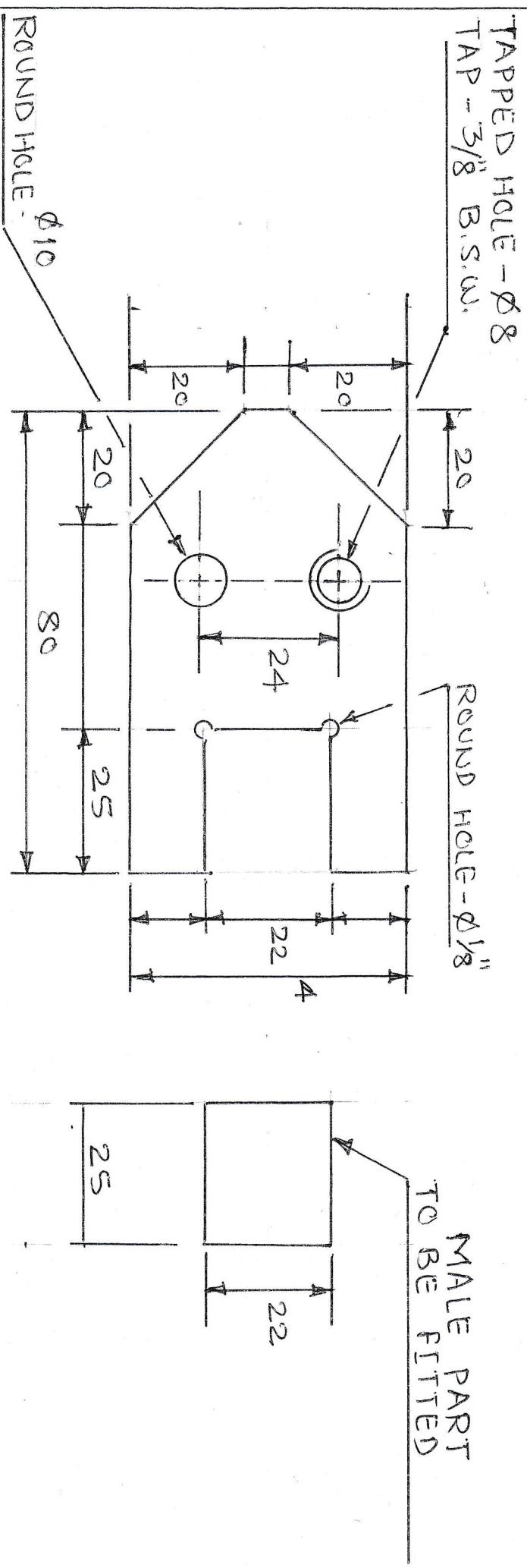
vi) **BENCH DRILLING MACHINE:**

It is a small machine used for drilling small holes in high speed in light jobs.

The base of machine is mounted either on a floor or on a bench. Hence, the name is given as 'BENCH DRILLING MACHINE'. The machine consists of a vertical column, a horizontal table, head supporting the motor and driving mechanism and vertical spindle for driving and rotating the drill. The drill is fed into the work by hand control. The operator can feel or sense the progress of drill because of hand feel. That is why, the machine is also called as 'sensitive drilling machine'.

This machine can used the drills of diameter from 1.5 mm. to 15.5mm.

FITTING WORK



NOTE : ALL THE DIMENSIONS ARE IN MM.

SCALE - 1^o1

NAME OF THE EXPERIMENT: A fitting job for various operations.

AIM : To integrate the fitting operations (skills given below) and check the product as per specification.

A) TOOLS AND EQUIPMENTS REQUIRED :

- | | |
|----------------------|---|
| i) Steel rule | x) Universal marking block |
| ii) Scriber | xi) Hack saw |
| iii) Tri square | xii) Bench type drilling machine |
| iv) Odd leg caliper | xiii) Straight shank drill bit of size
1.8", 8 mm , 10 mm dia. |
| v) Dot punch | xiv) Hand tap of size 3/8" B.S.W. |
| vi) Ball peen hammer | xv) Flat file (12" long, double cut) |
| vii) Surface plate | xvi) Safe edge file |
| viii) Angle plate | |

B) OPERATIONS INVOLVED:

- | | |
|--------------------|-------------------------|
| i) Filing | v) Tapping |
| ii) Layout marking | vi) Male female fitting |
| iii) Sawing | vii) Surface polishing |
| iv) Drilling | |

RAW MATERIAL: Mild steel flat

Size: 102 x 50 x 6 mm.

82

LEARNING OBJECTIVES:

- a) **CONCEPT LEARNING** – Understanding facts, concepts, principles, procedure of fitting, marking, sawing, drilling, tapping.
- b) **INTELLECTUAL SKILLS** – Read and interpret drawing given to identify tools used for bench work.
- c) **MOTOR SKILLS** – To acquire skills like sawing, drilling, tapping. To integrate above skills and check products as per specifications.

STEPWISE PROCEDURE TO CARRY OUT THE EXPERIMENT

Read the job drawing to study dimensions, shape operations involved.
Take raw materials and check dimensions.

Make all four side edges of workpiece flat, uniform and perpendicular.
First do the fitting on one of the rolling sides then any of the adjacent
sides and thereafter rest of the two sides according to the length and
breadth of the job.

For marking length and breadth of the workpiece, use odd leg caliper,
steel rule, dot punch and hammer.

After filing all the sides, mark the layout on any one surface of the
workpiece.

Afterwards, make the round holes by using drill bits of correct diameter
in appropriate place.

Make sound holes with the help of bench type drilling machine.

After drilling operation, make screw threads of given size by tapping
process in a hole of 8 mm. diameter.

As per the job diagram, a rectangular part of size 25 mm. lengthwise
and 22 mm. breadthwise is to be cut at the bottom of the workpiece.

Cut the part vertically by using a hack saw and horizontally by chain
drilling process.

Use the cold chisel and ball peen hammer to remove the cut part.
While filling, check the sides for flatness, evenness and perpendicularity
by using tri square.

Take a piece of mild steel of size 27×25 mm. as a male part to fit in the rectangular slot [i.e. the female part].

First make the adjacent sides flat, smooth, uniform and perpendicular.
While filling, check the sides using tri square.

Carry on filing of the third side of the make part till it fits in the female part. While filing, check frequently whether the female part in the make part fits as it is very important.

After fitting of male female parts, do the fitting of remaining side of the male part according to depth of female part.

At last, polish all surfaces of the workpiece by filing process. After polishing, smoothen all corners and edges of workpiece by hand file and apply machine oil all over the job to prevent it from rusting.

JOB OPERATIONS

15

I FILING:

Fix the job in the bench vice taking proper care.

Keep the job above jaws approximately by 5 to 10 mm. to get an access for working.

Keep the job and the surface to be filed in parallel line. This is to be done by eye judgment.

The vice should be tightened so that the job doesn't shake or shift.



a) HOLDING THE FILE:

- 1) Hold the file handle firmly by right hand and support the end of the file by left hand while working.
- 2) Keep the working surface of the file flat and parallel to the bench vice.
- 3) Apply pressure equally at each end.
- 4) Apply pressure during forward stroke and release pressure during return stroke.
- 5) Use the full length of the file and filing should be done at a slow and steady speed.



b) CHECKING AND INSPECTION OF THE JOB :

- 1) Check flatness, evenness, perpendicularity dimensions.
- 2) Use tri square and scale for same visual inspection.

c) STRAIGHTNESS :

- 1) Hold the job in the left hand
- 2) Set the tri square blade on the surface of the job.
- 3) See through light, if job is perfect, light will not pass.

16

d) FLATNESS :

- 1) Keep beam touching to the reference side.
- 2) Keep blade on the adjacent side to be viewed and check for visual inspection.
- 3) Beam should be kept on finished side and blade should touch the complete surface which is to be checked.

II LAYOUT MARKING:

- 1) Apply chalk paste (yellow color) on the surface to be marked.
- 2) Allow it to dry.
- 3) Wipe out the edges so that chalk paste remains only on the surface.
- 4) First clean the top surface, surface plate with a dry cloth.
- 5) Touch the angle plate so that perfect dimensions are marked with correct angle and without till.

Set the scriber as follows:

- 1) Place the scriber on surface plate in front of the steel rule.
- 2) Set the required measurement and keep scriber block in front of the job.
- 3) Touch scriber point and mark the line.
(NOTE: It should be kept perfectly parallel)

*PRECAUTION: Do not make full marking, first make representative marking and check, then make full marking.

All the necessary marking is to be punched properly and then only the chalk mark is to be removed.

III SAWING

TOOL USED: Hack saw blade with handle.

- 1) Adjustment of the blade tension: Insert the blade and tighten the wing, nut and adjust the tension.
- 2) Teeth direction of the blade should face wing nut.
- 3) Keep the line of cutting perpendicular to the jaw plate.
- 4) Cutting should be done slightly away from the marking line and should be in the unwanted portion.
- 5) Give the support of the thumb at the start.
- 6) Movement of the blade should be smooth and steady. (Do not handle the blade roughly as it may break).
- 7) Use the full length of the blade and do not apply excess pressure.
- 8) Apply pressure while forward stroke. Release when taking back.
- 9) Do not turn or twist the blade while cutting as it may break and cause injury.
- 10) Keep watch on the marking line as it is very important.

IV DRILLING

- 1) Mark the position to be drilled initially by scriber and then with a centre punch to make it deep and broad, so that drill bit gets in properly. This is done so that drill bit does not slip in the middle of the work.
- 2) Place the job in the centre of the vice and parallel to the surface of the jaw plate.
- 3) Loosen the clamping handle of the drilling work table and adjust the table and take centre mark exactly below the cutting edge of the drill bit, then tighten the clamping handle.
- 4) Switch on the machine.

18

- 5) By rotating the hand feed lever, take drill bit down. Check again whether the cutting edge of the drill bit is exactly on the punch mark or not.
- 6) Apply necessary and correct feed pressure so that drilling takes place correctly, without bending or breaking of the drill bit.
- 7) Put the coolant at the bottom of the drill bit to cool it and reduce friction between the job and drill bit.
- 8) When the work is complete, you will find the feed pressure is less.
- 9) At that time, reverse feed movement and release drill bit from the job.
- 10) Switch off the machine.
- 11) Check for dimensions and location of the hole.

V. TAPPING:

Fix the job in the bench vice taking care of all usual precautions as follows:

- 1) Job should be kept parallel and in perfect alignment.
- 2) The following taper taps will be used.
 - i) Taper tap of required dimension will be used.
 - ii) Second step, we will use the intermediate tap.
 - iii) At the end, the final tap will be used.
- 3) Take the tap wrench and place the tap perpendicular to the job.
- 4) After engagement, rotate the tap clockwise and anticlockwise.
- 5) This is done so that the material removed falls down and does not interfere with further tapping.
- 6) Used lubricant to reduce further friction.
- 7) Do not use complete threaded portion of the tap. Otherwise removal of the tap will be a problem. It may break the tap.
- 8) After completion of the job, use the standard gauge along with trisquare to check the perpendicularity and dimension.
- 9) Half round smooth file should remove any burr present.

VI. SURFACE POLISHING:

- 1) Fix the job in the bench vice and keep it slightly above jaw plate.
- 2) Keep the jaw in proper parallel position.
- 3) The filing length should be done on the maximum length only.
- 4) Touch the file straight while doing the work and do not till or shake while in operation.
- 5) Continue the operation till you get bright finish.