

GOVERNMENT POLYTECHNIC, BALANGIR



LARKIPALI, BALANGIR

State Council Regd. No. F22110005008

Name. Jagan Sahu

Roll No. 5008 Semester. 3rd Session. 2023-2024

Branch. Automobile Group

Subject. Workshop - II

GOVERNMENT POLYTECHNIC, BALANGIR

DEPARTMENT OF Automobile



INDEX PAPER

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04	To Make a dovetail Chisel through Black Smithy	8/12/23	34-47	Subash 8/12/23



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SECTION : Fitting shop

JOB. NO 01

DATE OF STARTING : 10/08/2023

DATE OF FINISHING : 31/08/2023

DATE OF DIPOSIT : 04.09.2023

GRADE AWARD OF : _____

1. NAME OF THE JOB :

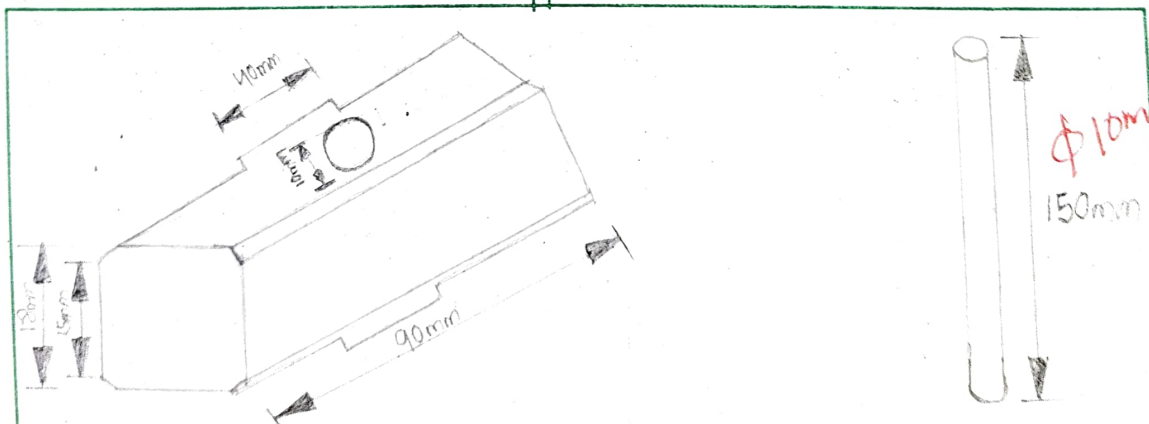
Preperation of sledge hammer

2. RAW MATERIAL REQUIRED :

M.S. square 95x20 mm

3. JOB PERFORMANCE ;

JOB SKETCH



ALL DIMENSION ARE IN MM

TOLERANCE: +

TOOL'S AND EQUIPMENT REQUIRED

1/ Bench vice	9/ Angle plate
2/ Try square	10/ punch
3/ steel rule	11/ Hammer
4/ Hack saw	12/ Drill bit
5/ Bastard file	13/ Drilling machine
6/ Smooth file	
7/ vernier height Gauge	
8/ surface plate	

4. SEQUENCE OF OPERATION

Measuring → Marking → cutting → Filing

4. PROCEDURE Fitting ← Drilling ← Finishing

- Study the drawing properly
- cut the work piece of required dimensions $95 \times 20 \times 16$ m.s square.
- perform some filing operation on the work piece to achieve the dimensions $90 \times 18 \times 15$ mm which

is shown in the figure.

- There are two work piece to be made of dimension $90 \times 18 \times 15$ for female and male part of the fitting dimension 15×1 cm of the figure.
- The marking operation on the work place using vernier height gauge, Angle plate, surface plate then punching of the marking line.
- For the female part of the work piece a $90 \times 18 \times 15$ dimensions of cylindrically block to be removed by the mid portion using hack saw tool.
- Do the filing operation at the edges using smooth file.
- Drilling is a cutting process where a drill bit is spun to cut a hole of circular cross-section in solid materials.
- Drilling operation will be done of depth ~~80~~ ⁸⁰ mm using a drill bit 1mm dia.
- A fabrication process where by two or more parts are fused together by means of heat,



pressure or both forming a join as the parts cool.

- welding is ~~use~~ usually used on metals & thermo-plastics but can also be used on wood.

INTRODUCTION:



Machine tools are capable of producing work at a faster rate, but, there are occasions when components are processed at the bench. Sometimes, it becomes necessary to replace or repair a component which must fit accurately with another component on re-assembly. This involves a certain amount of hand fitting. The assembly of machine tools, jigs, gauges, etc., involves a certain amount of bench work. The accuracy of work done depends upon the experience and skill of the fitter.

The term, "Bench work" refers to the production of components by hand on the bench, whereas fitting deals with the assembly of mating parts. Through removal of metal, to obtain the required fit.

Both the bench work & fitting requires the use of number of simple hand tools and considerable manual effort. The operations in the above works consist of fitting, chipping, scraping, sawing, drilling, tapping, etc.

Cutting Tools

Hacksaw The hacksaw is used for cutting metal by hand. It consists of a frame, which holds a thin blade, firmly in position. Hacksaw blade is specified by the number of teeth per centimetre. Hacksaw blades have a number of teeth ranging from 5 to 15 per centimetre (cm).

Blades having lesser number of teeth per cm are used for cutting soft materials like aluminium, brass and bronze. Blades having larger number of teeth per centimetre are used for cutting hard materials like steel and cast iron.

Workshop manual (Twist drill)

Twist drills Twist are used for making holes. These are made of high speed steel. Both straight and taper shank twist drills are used. The following are the sizes and designations of twist drills.

Millimetres

Inches

Letter drills

Number drills

Taper shank drills

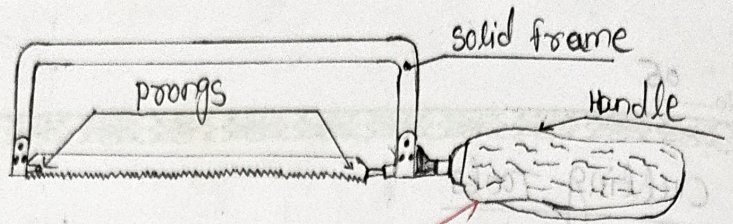
from 0.4mm onwards

from 1/64" onwards

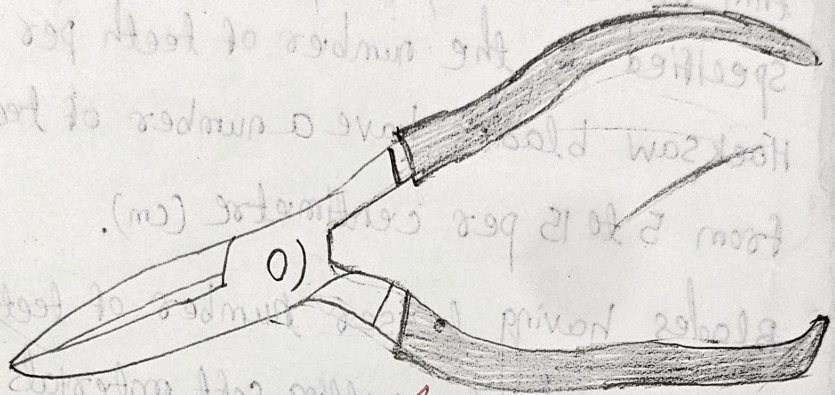
A to Z

60 to 20

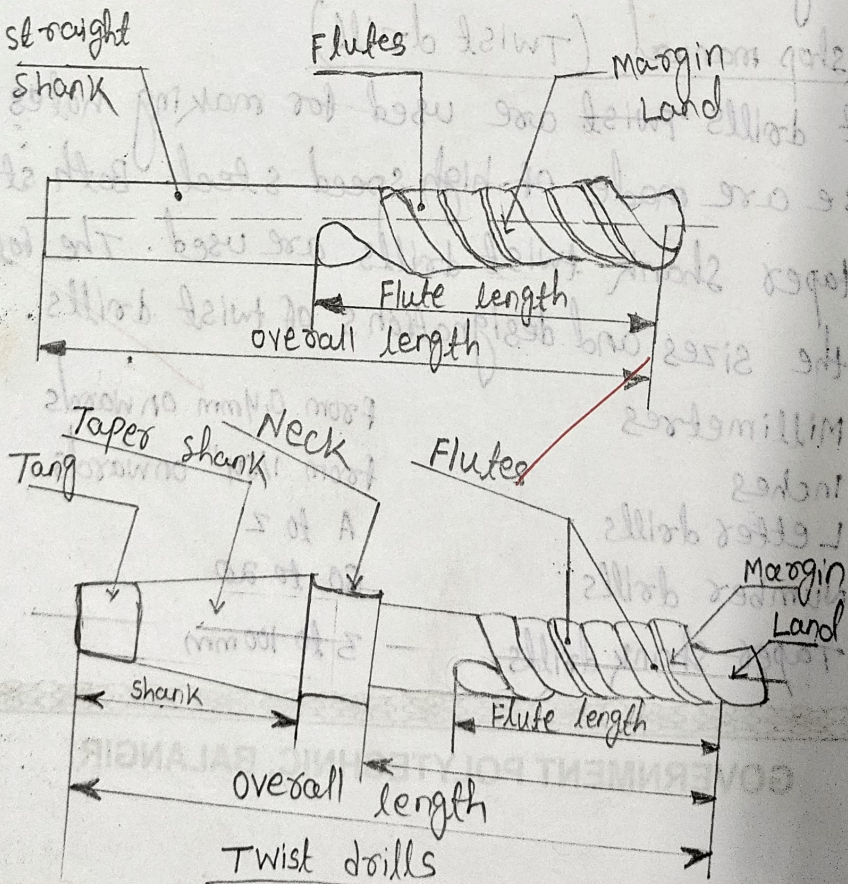
3 to 100 mm



Hack Saw frame blade



Nose pliers





The parallel shank twist drill can be held in an ordinary self-centering drill chuck, say that of a portable drilling machine, which has parallel jaws.

The taper shank twist drill has two helical flutes, with a taper shank for handling and driving the drill. The tapered shank fits into a corresponding tapered bore provided in the drilling machine spindle.

Bench drilling

Bench drilling machine Holes are drilled for fastening parts with rivets, bolts or for producing internal threads. Bench drilling machine is the most versatile machine used in a fitting shop for the purpose. Twist drills, made of tool or high speed steel are used with the drilling machine for drilling holes. Following are the stages in drilling work.



Finishing Tools

Files Filing is one of the methods of removing small amounts of material from the surface of a metal part. A file is a hardened steel tool, having slant parallel rows of cutting edges or teeth on its surfaces. On the faces, the teeth are usually diagonal to the edge. One end of the file is shaped to fit into a wooden handle. The parts of a hand file. The hand file is parallel in width and tapering slightly in thickness, towards the tip. It is provided with double cut teeth on the faces, single cut on one edge and no teeth on the other edge, which is known as the safe edge.

Miscellaneous Tools

Ball-peen hammers are named, depending upon their shape and material and specified by their weight. A ball-peen hammer has a flat face, which is used for general work and a ball end, particularly used for riveting.



Angle plate:

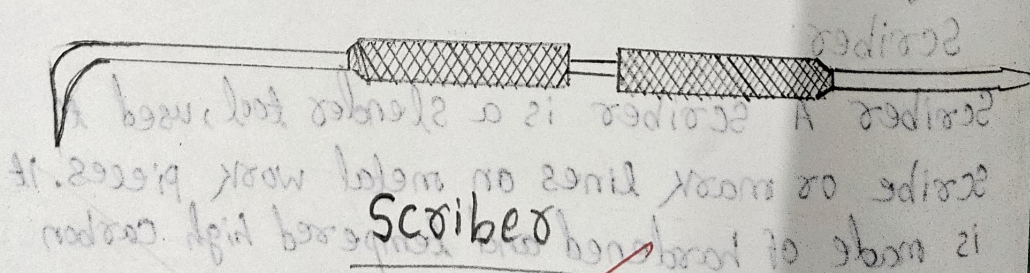
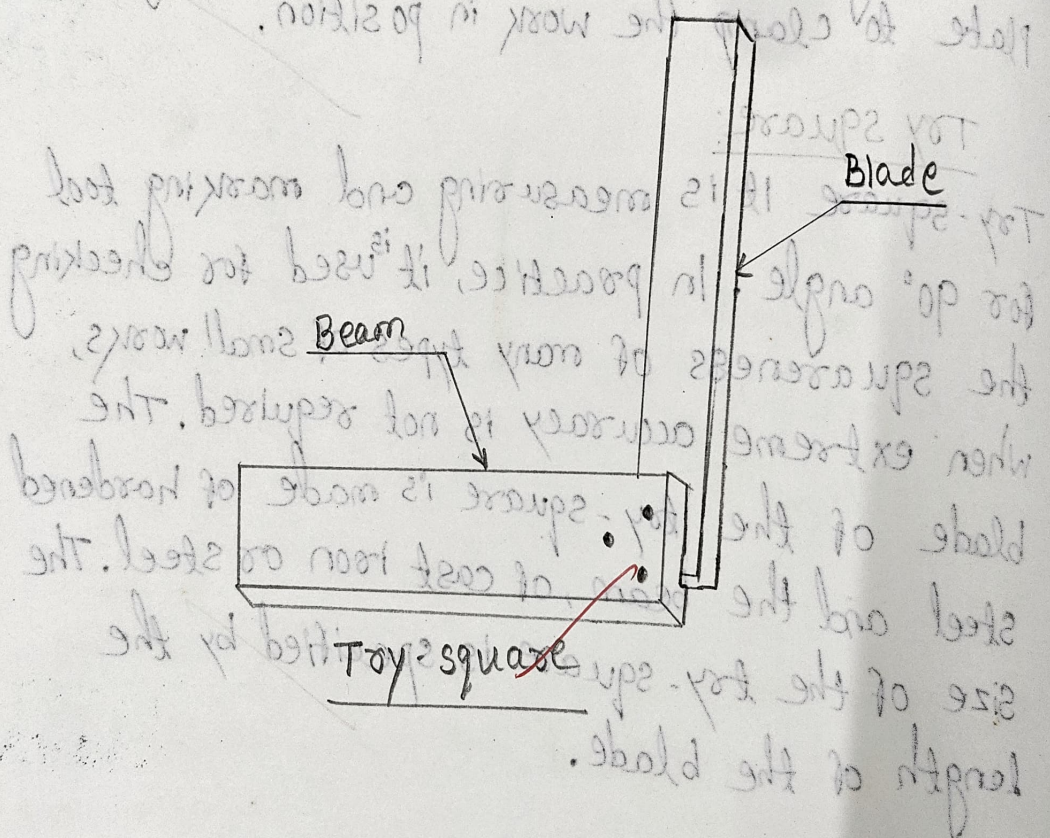
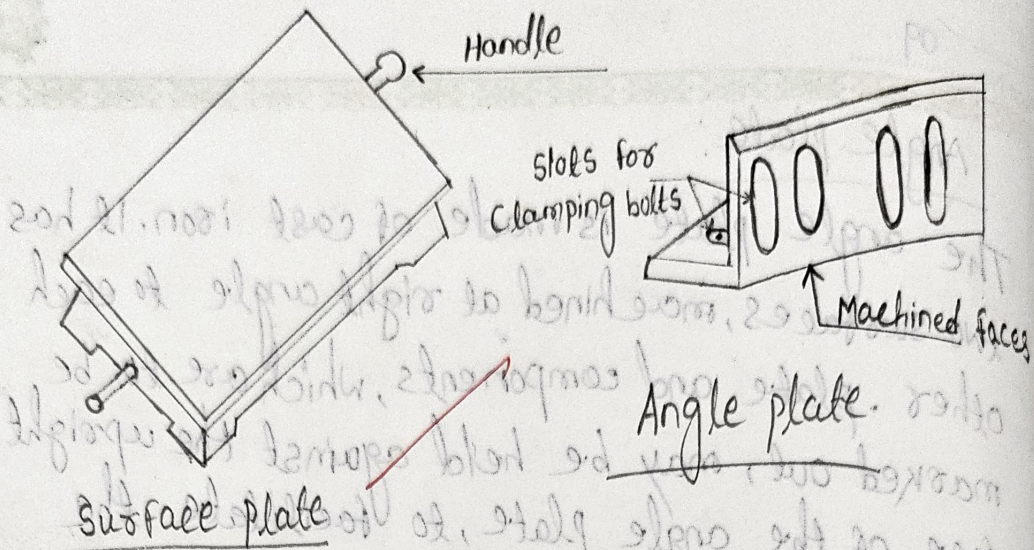
The angle plate is made of cast iron. It has two surfaces, machined at right angle to each other. plate and components, which are to be marked out, may be held against the upright face of the angle plate, to facilitate the marking. Slots are provided on the angle plate to clamp the work in position.

Try square:

Try-square It is measuring and marking tool for 90° angle. In practice, it is used for checking the squareness of many types of small works, when extreme accuracy is not required. The blade of the try-square is made of hardened steel and the beam, of cast iron or steel. The size of the try-square is specified by the length of the blade.

Scriber:

Scriber A scriber is a slender tool, used to scribe or mark lines on metal work pieces. It is made of hardened and tempered high carbon





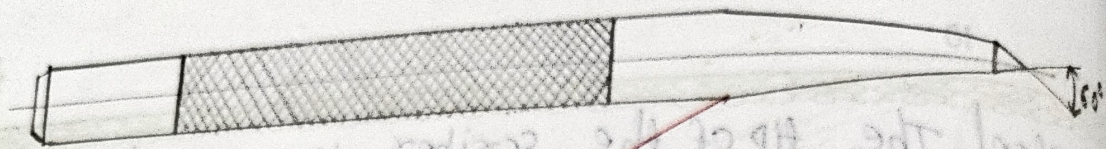
steel. The tip of the scriber is generally ground at 12° to 15° . It is generally available in lengths, ranging from 125 mm to 250 mm. It has two pointed ends. The bent end is used for marking lines where the straight end can not reach.

Punches:

These are used for making indentations on the scribed lines, to make them visible clearly. These are made of high carbon steel. A punch is specified by its length and diameter, say as 150' 12.5 mm. It consists of a cylindrical knurled body, which is plain for some length at the top of it. At the other end, it is ground to a point. The tapered point of the punch is hardened over a length of 20 to 30 mm.

Vernier height gauge:

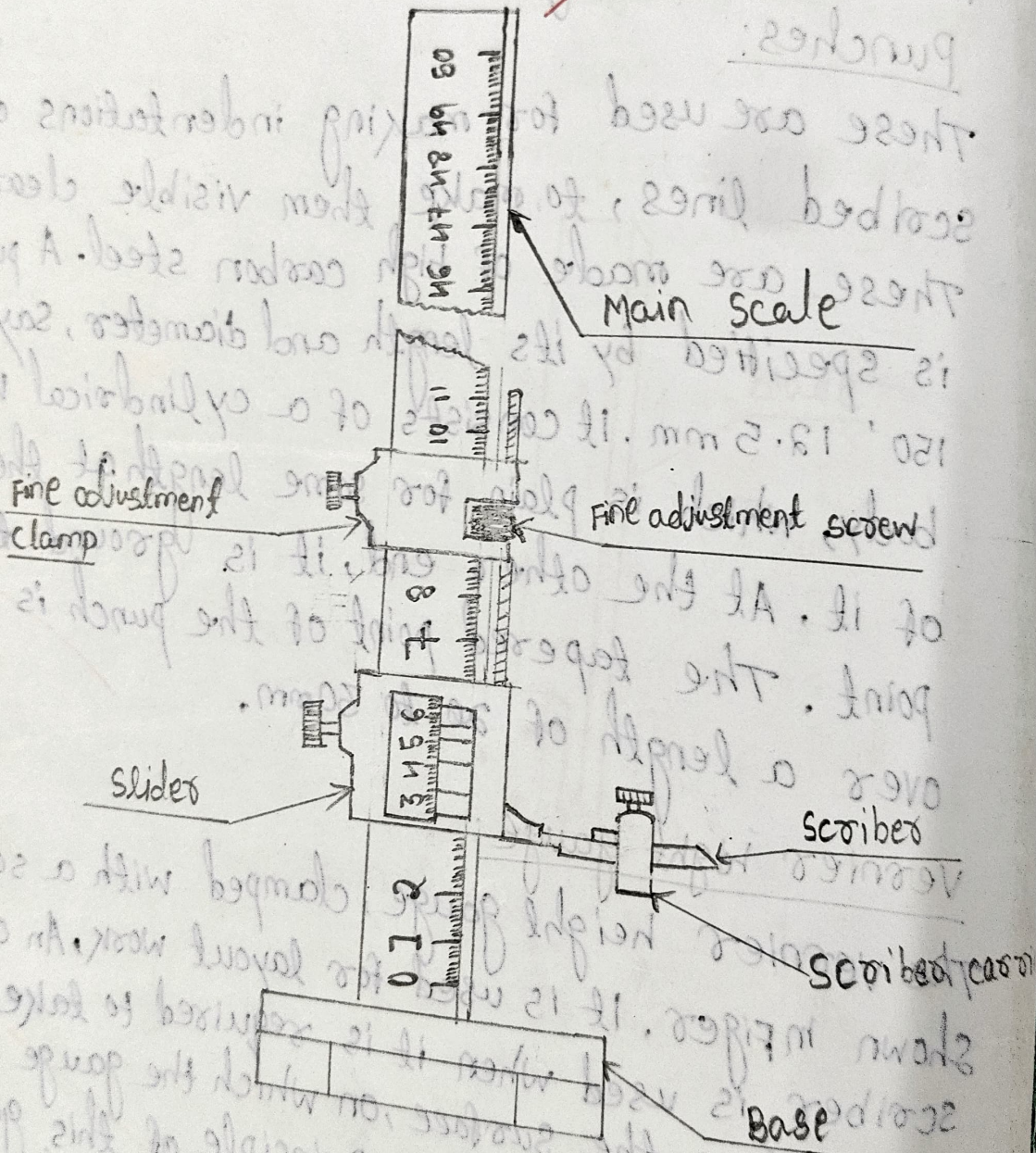
The vernier height gauge, clamped with a scriber, is shown in fig. It is used for layout work. An off-set scriber is used when it is required to take measurements from the surface, on which the gauge is standing. The accuracy and working principle of this gauge are the same as those of the vernier caliper. Its size is specified by the maximum height that can be measured by it. It is made of nickel-chromium steel.



a - Dot punch



b - Centre punch



Veriner Height gauge



SAFETY POINTS

SAFETY FRECAUTIONS:

- Learn safe way to doing the job before the start.
- Think your safety shoes, hand gloves and carefully anytime.
- Follow the all safety rule & proportion that can be protect you.

PARSONAL SAFETY RULES:

- Dicipline should be maintain in the work shop.
- Always are proper safety apron, gloves and shoes.
- keep tools clean and sharp. Turn the switch off immediately if the power tool stalls or jams.

WORK SHOP SAFETY RULES:

- Never used workshop floor. The floor should be dry and clean.
- It immidiatly report to the instructors.

HAND TOOL'S SAFETY RULES:

- Don't used the tools which have no handle.
- Tools & equipment should be used with proper care.
- Don't use penlike as scribes.



MACHINE SAFETY RULES:

- Machine should be in proper care and maintain.
- while machine is in running condition tools should not be change.
- while machine is in running don't change their gear system.

JOB SAFETY RULES:

- Job should be in proper care & maintenance.
- Job should be proper covers also.

6. CONCLUSION

- By performing above experiment and following the procedures. I prepared a ~~slodge~~ slodge hammer.

NAME OF THE STUDENT Jagan Sahu
 BRANCH Automobile
 SEMESTAR 3rd
 REGD NO F22110005008
 GROUP _____

Snehasi
4/09/23

SIGNATURE OF THE (WORKSHOP) LECTURER/ ASST. LECTURER



SECTION : Welding

JOB NO. 02

DATE OF STARTING 11/09/2023

DATE OF FINISHING : 06/11/2023

DATE OF DIPOSIT : 09/11/2023

GRADE AWARD OF _____

1. NAME OF THE JOB :

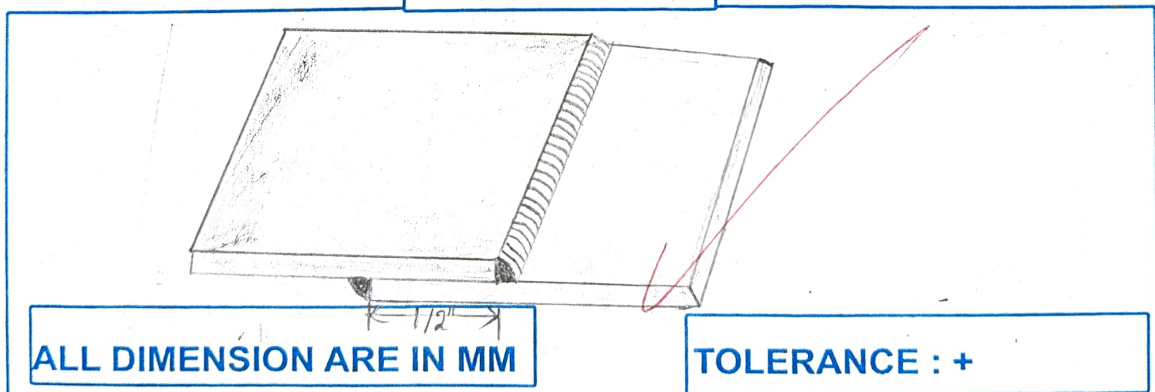
Making a lap joint by arc welding process.

2. RAW MATERIAL RQUIRED :

M.S flat 50 X 65 X 6

3. JOB PERFORMANCE :

JOB SKETCH



ALL DIMENSION ARE IN MM

TOLERANCE : +



TOOL'S AND EQUIPMENT REQUIRED

1) Hack saw & Hack saw Blade	9) welding cable
2) steel Rule	10) welding electrodes
3) Try square	11) Ground connectors
4) Smooth file	12) Hand shield
5) Basted file	
6) scriber	
7) AC or DC welding supply	
8) Electrode holder	

4. SEQUENCE OF OPERATION

1. measuring
2. cutting
3. filling
4. welding
5. chipping

4. PROCEDURE

- study the drawing properly.
- cut the two workpiece of required dimension $50 \times 65 \times 6 \text{ mm}^3$
- Perform the marking operation on the workpiece using scriber.
- Perform some filling operation on the workpiece to achieve the specific dimension $48 \times 60 \times 5 \text{ mm}^3$.
- Now perform a welding operation in overlap position.
- After welding chipping is done by the help of chipping hammer to remove spatter.



THEORY :-

- * welding is a fabrication / metal joining process where by two or more parts are fused together by means of heat, pressure or both forming a join as the parts cool.
- * welding is usually used on metals & thermoplastics but can also be used on wood. The completed welded joint may be referred to as a weldment.

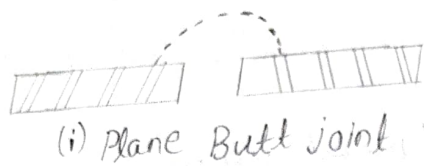
Types of welding :-

- (i) Gas welding
- (ii) Arc welding
- (iii) Resistance welding

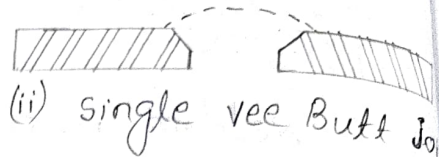
Types of welding joints :-

- (i) BUTT Joint
- (ii) CORNER Joint
- (iii) EDGE Joint
- (iv) LAP Joint
- (v) T- Joint

- * It is an arc welding process where the welded joint is produced by heating the workpiece with an electric arc, set up between a flux coated electrode & the workpiece.
- * The flux performs many functions like arc stability weld metal protection etc.



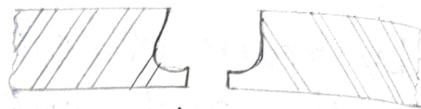
(i) Plane Butt joint



(ii) single vee Butt joint



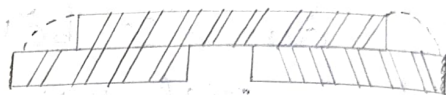
(iii) double vee Butt joint



(iv) U-shaped Butt joint



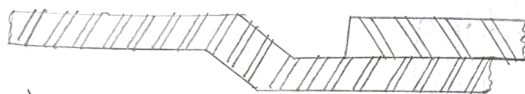
(v) Flange joint



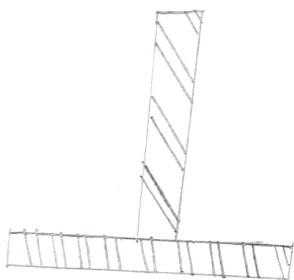
(vi) single stoap Butt joint



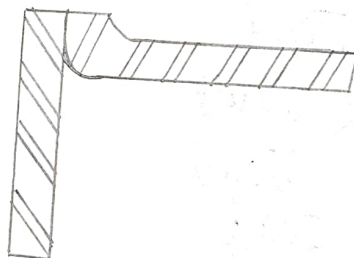
(vii) Lap joint (single or double fillet)



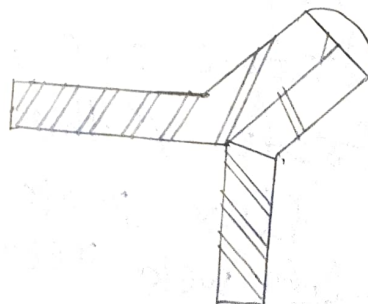
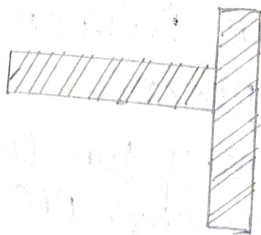
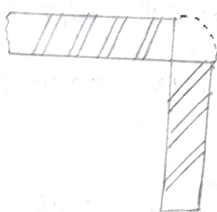
(viii) Joggled lap joint (single or double fillet)



(ix) T-joint



(x) Edge weld joint



(xi) corner joints



- * The electrode it-self melt & supplies the necessary filler metal.
- * Heat required for welding is obtained from the arc struck between the electrode & workpiece.
- * The arc temperature (arc heat) can be increased or decreased by employing higher or lower arc current.
- * The Arc melts the electrode end & workpiece. Metal droplets are transferred from the tip of electrode to the workpiece due to the arc heat & deposited along the joint to form a weld joint.
- * The flux coatings arc melts & produces a gaseous shield & slag to prevent atmospheric contamination of the molten weld metal.

Types of Joints:

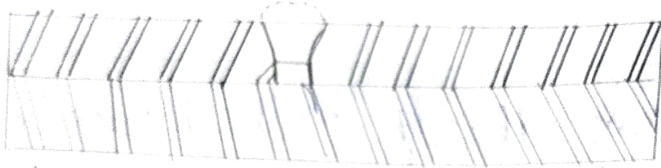
Basic types of welding joint are classified as under,

Butt Joint:

In this type of joint the edges are welded in the same plane with each other. V or U shape is given to the edges to make the joints strong. Some examples of butt joints are shown in the figure.

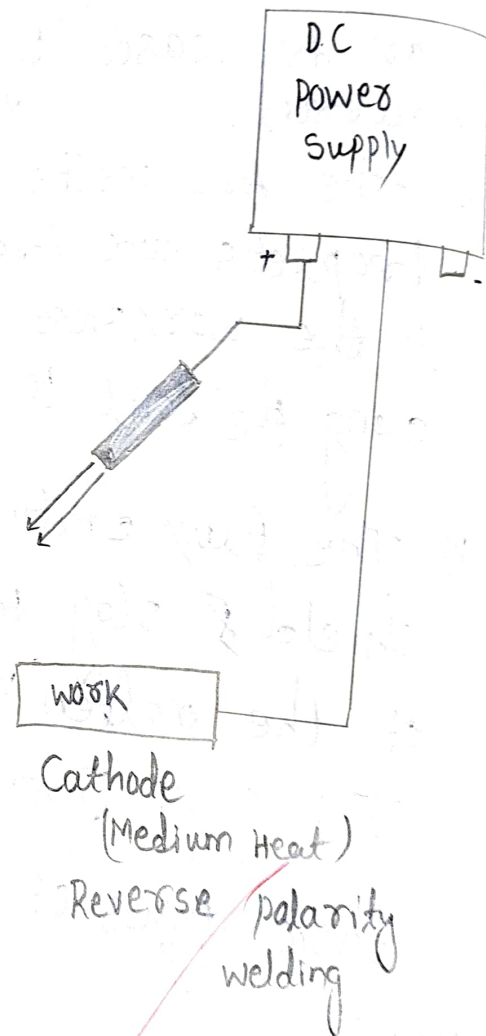
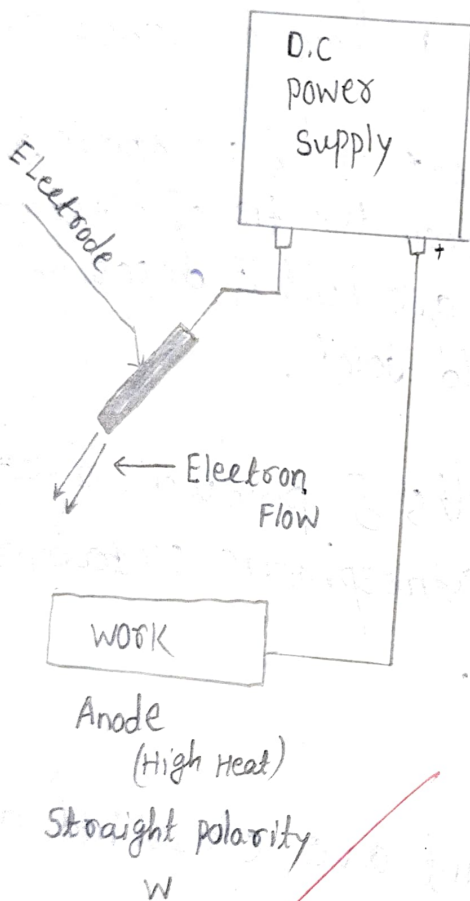
Lap joint:

This type of joint is used in joining two overlapping



(xii) Plug or Rivet Butt Joint

Types of Joint





plates so that the corner of each plate is joined with the surface of other plate. common types of lap joint are single lap, double lap or offset lap joint. single welded lap joint does not develop full strength as compared to double welded lap.

T-joint :-

When two surfaces are to be welded at right angles, The joint is called T-joint, The angle between the surfaces is kept 90° .

Corner joint :-

In this joint the edges of two sheets are joined & their surfaces are kept at right angle to each other. Such joint are made in frames, steel boxes etc.

Edge joint :-

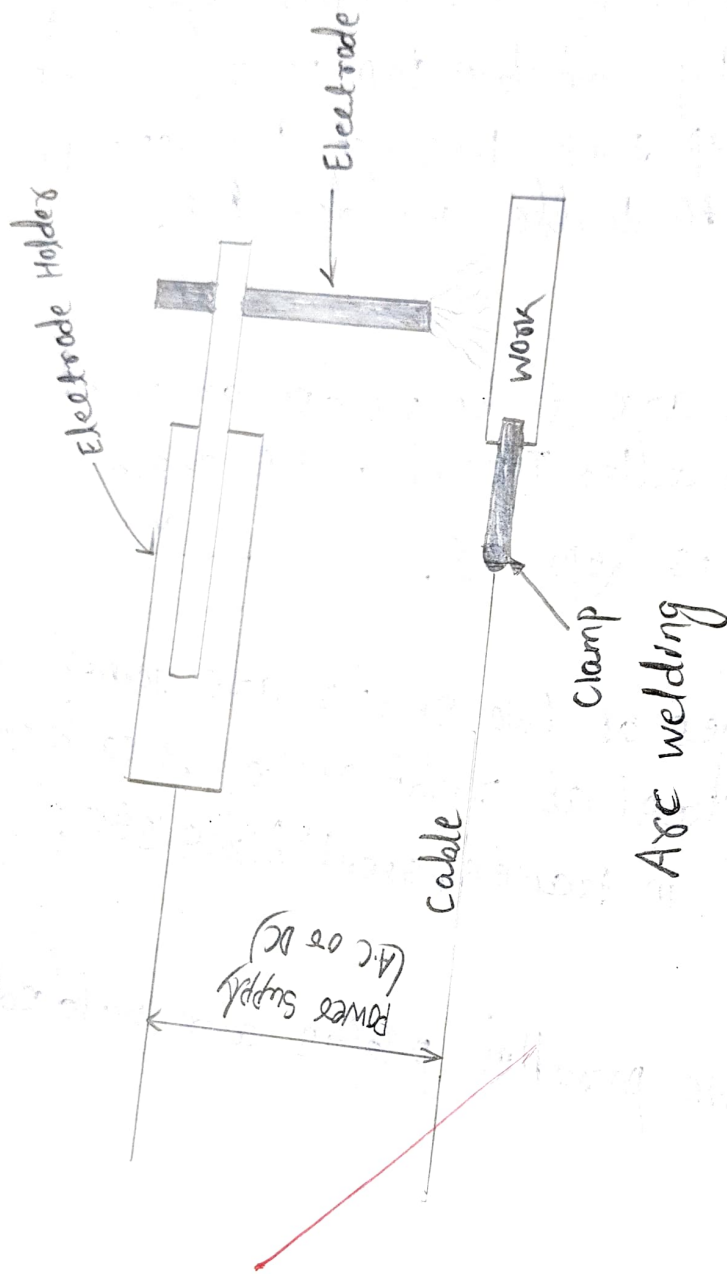
In this joint two parallel plates are welded edge to edge.

Plug joint :-

Plug joint are used in holes instead of rivets & bolts.

Electric power for welding :-

AC current or DC current can be used for arc welding for most purposes DC current is preferred. In DC welding a DC machines are made up to the capacity





range 600 amperes. The voltage in open circuit range is kept around 45 to 95 volts & in closed circuit it is kept 15 to 25 volts. DC current can be given in two ways.

- (i) straight polarity welding.
- (ii) Reverse polarity welding.

In straight polarity welding workpiece is made anode & the electrode is made cathode as shown in the figure. Electrons flow from cathode to anode thus heat is produced at the materials to be welded.

In reverse polarity system the work is made cathode & the electrode is made anode. This welding is done specially for thin section.

AC welding has the advantage of being cheap. Equipment used is simpler than DC welding. A transformer is used to increase the current output at the electrode. An AC welding circuit is shown in the figure. The current vary from 150 to 1000 amperes depending upon the type of work.

Effect of Arc length:

Arc length is the distance from the top of the



electrode to the bottom of the arc. It should vary from 3 to 4 mm. In short arc length the time of contact will be shorter. And will make a wide & shallow bead. The penetration is low as compared to long arc lengths.

Equipment used for Arc welding:

Various equipments used for arc welding are as under.

1. DC welding Equipment :-

- (a) AC motor - Generator set
- (b) Diesel Engine - Generator set
- (c) Transformer - Rectifier set

2. AC Equipment

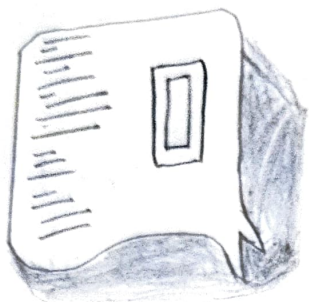
- (a) welding transformer set

3. Equipment accessories:-

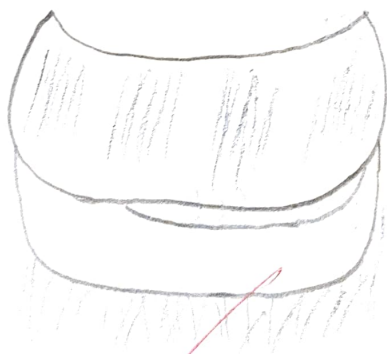
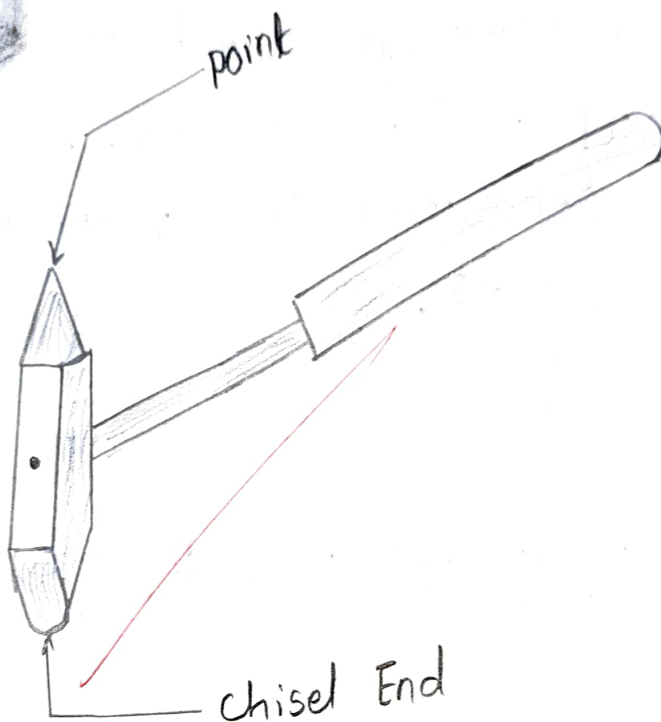
- (a) Leads
- (b) Holder
- (c) connectors
- (d) Ground clamps

4. operator's tool:-

- (a) chipping hammer
- (b) wire brush
- (c) Arc shield
- (d) closed shoe



Face shield



Wire bough



SAFETY POINTS

SAFETY FRECAUTIONS :

- Safety rule improves the work efficiency.
- When some work is down follow the safety precaution to prevent any accident while doing job.

PARSONAL SAFETY RULES :

- A ways wears apron, shoes, gloves.
- While doing any job in shaper machine in running condition don't touch the cutting tool.
- Always maintain the discipline in work shop.

WORK SHOP SAFETY RULES :

- Never workshop floors dry it should be proper dry & clean.
- If any electrical disupt in work shop do not solve by it self report immidiately to the instructor.

HAND TOOL'S SAFETY RULES :

- Hand tool should inspect regularly to make sure that they are in good condition.
- Always use the right tool with care fully.
- Hand's tool used only for specific work of performances.

**# MACHINE SAFETY RULES :**

- Always check machine before starting.
- Never leave machines unattended without still moving.
- While start a machine you should be know about the machine Rule & precaution property.

JOB SAFETY RULES :

- Job should be properly care.
- Job should be properly cover to avoid resting.

6. CONCLUSION : By successfully performing. The above me attended Job, we know working of splined shaft by using shaper machine.

NAME OF THE STUDENT Jagan SahuBRANCH AutomobileSEMESTAR 3rdREGD. NO. F22110005008

GROUP _____

Juehasti
2/11/23

SIGNATURE OF THE (WORKSHOP) LECTURER / ASST. LECTURER

GOVERNMENT POLYTECHNIC, BALANGIR



LARKIPALI, BALANGIR

State Council Regd. No. F22110005008
Name. Jagan Sahu
Roll No. 08 Semester. 3rd Session. 2023-2024
Branch. Automobile Group
Subject. Mechanical Engg. Lab-I



INDEX PAPER

Sl. No.	NAME OF THE EXPERIMENT	DATE	SHEET USED	REMARKS
01	Determine end reactions in a simply supported beam using parallel force apparatus.	2.09.2023	01-04	Juehast 2/09/2023
02	Determination of salient points (Young's modulus yield point fracture point) from stress-strain curve using universal testing machine.	14.10.2023	05-07	Juehast 14/10/23
03	Determination of the torsional rigidity of shaft using sexle's apparatus.	28.10.2023	08-12	Juehast 28/10/23
04	Determination of the torsional rigidity of shaft using torsion testing machine (TTM).	11.11.2023	13-15	Juehast 11/11/23
05	Determination of hardness numbers by Rockwell & Vickers hardness testing machine.	18.11.2023	16-17	Juehast 18/11/23
06	Determination of toughness by using Impact testing machine (IZOD & CHARPY)	09.12.2023	18-20	Juehast 9/12/23



AIM OF THE EXPERIMENT:-

Determine end reactions in a simply supported beam using parallel force apparatus.

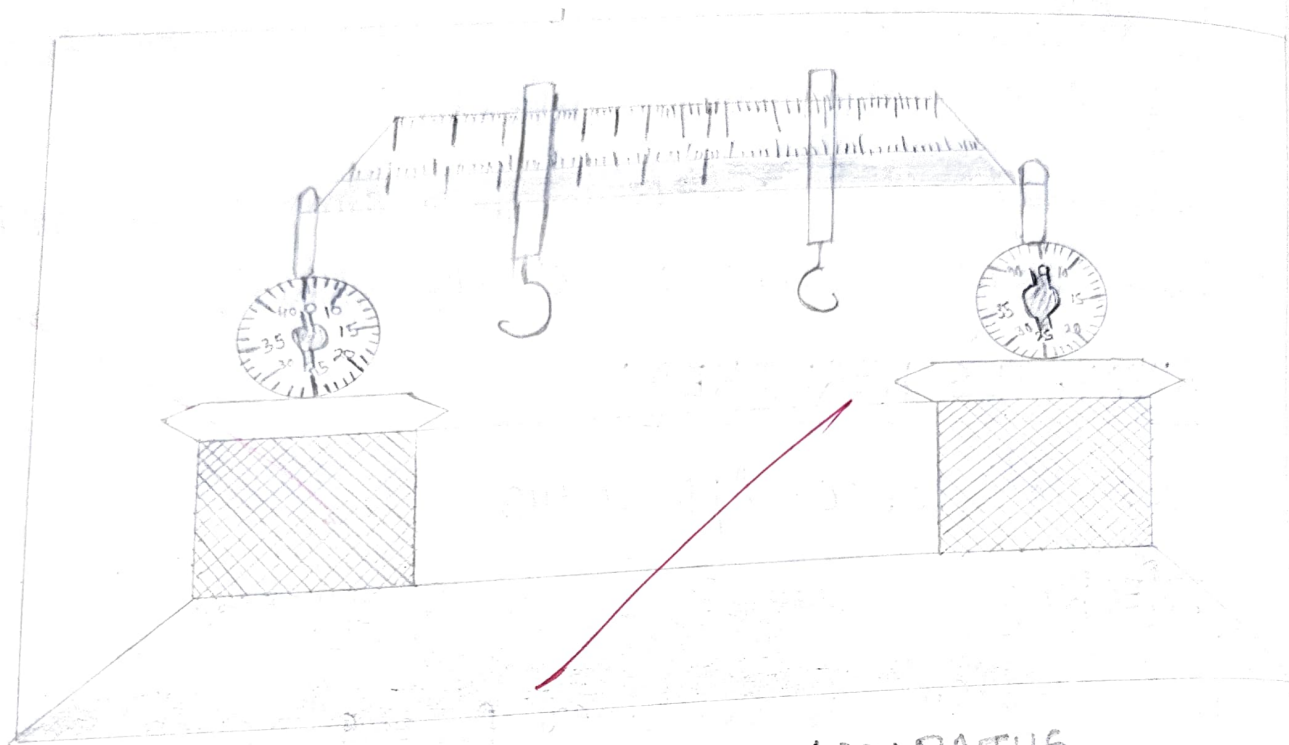
APPARATUS REQUIRED:-

Parallel force Apparatus.

THEORY:-

If a system of coplanar forces acting on a rigid body keep it in equilibrium then the algebraic sum of their moments about any point in their plane is zero.

Reactions in a simply supported beam are determined by using the principle of moments. According to this principle, algebraic sum of the moments of all the forces about a point is zero, for equilibrium condition. Varignon's principle of moments states: "If a number of coplanar forces are acting simultaneously on a particle, the algebraic sum of the moments of all the forces about any point is equal to the moment of their resultant force about the same point."



PARALLEL FORCES APPARATUS

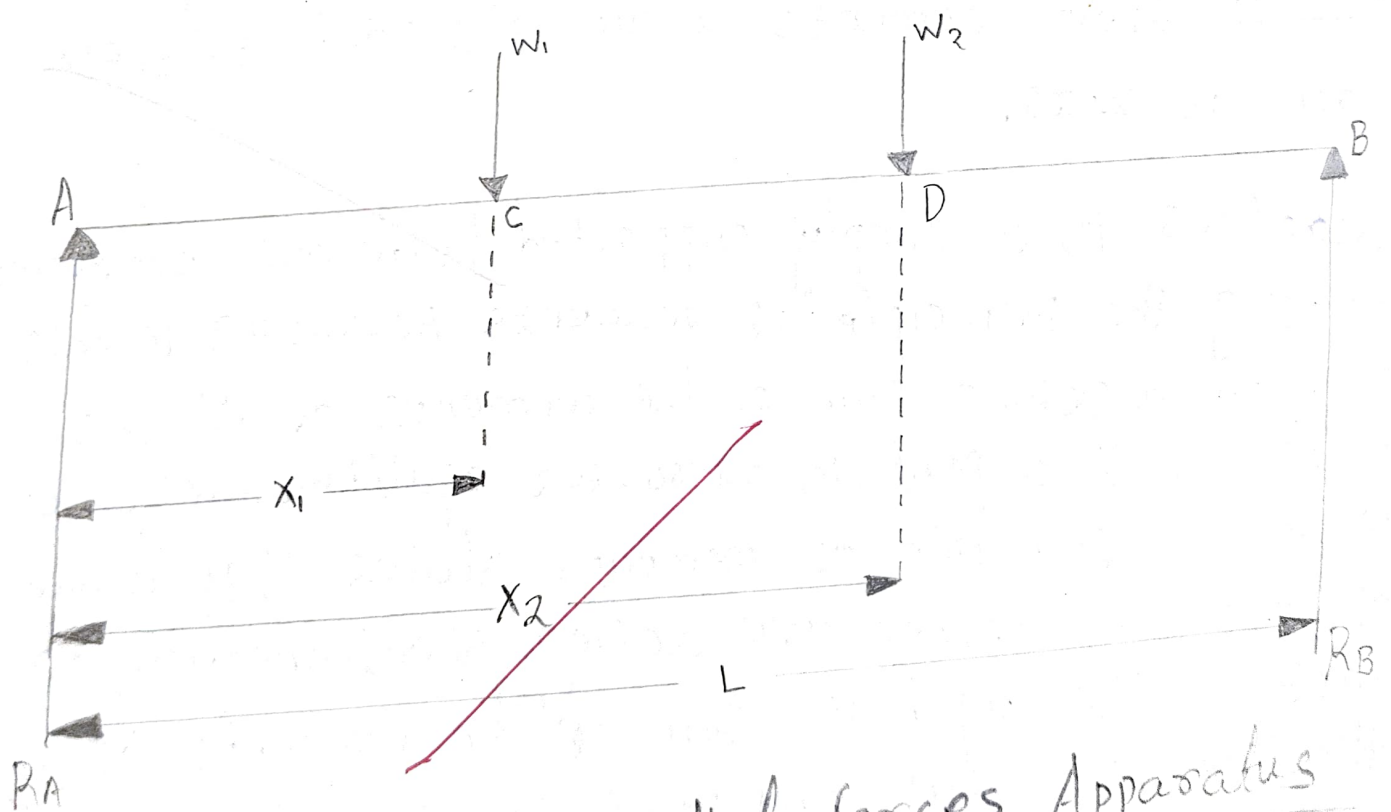


Fig. Parallel forces Apparatus



In the figure AB is a simply supported beam supported at A and B. When two loads w_1 and w_2 are applied at points C and D situated at distance x_1 and x_2 respectively from end A. From Newton's third law reactions R_A and R_B are developed at A and B supports. Applying condition of equilibrium we have

$$(A) \quad \sum V = 0,$$

$$\therefore R_A + R_B = w_1 + w_2 \quad \text{--- (1)}$$

$$(B) \quad \sum V = 0,$$

Taking moments about A, we have

$$R_B L + w_2 x_2 + w_1 x_1 = 0$$

$$R_B L = w_1 x_1 + w_2 x_2$$

$$R_B = \frac{w_1 x_1 + w_2 x_2}{L} \quad \text{--- (2)}$$



SUGGESTED EXPERIMENTAL WORK:

- (*) Measure the distance L .
- (*) Note the zero errors in the compression balances, when the beam is supported at its ends A and B let them be R_A and R_B .
- (*) Suspend two weights w_1 and w_2 at distance x_1 and x_2 from A.
- (*) Note the reaction on the beam given by the readings of compression balances (R_A and R_B) and takes in to account the zero errors from each reading. Readings thus obtained are R_A and R_B .
- (*) Calculate R_A calculated and R_B calculated the equation (2) and (3)
- (*) Repeat the experiment by taking different positions of w_1 and w_2 .

Sl. No	Weight on beam and their distance from point A				Reaction observed		Reaction from calculation		% Error in R_A & R_B	
	W_1	W_2	x_1	x_2	R_A	R_B	R_A'	R_B'	R_A	R_B
1	200	500	0.20	0.80	155	390	260	440	0.67	0.11
2	500	200	0.25	0.50	100	230	475	225	3.75	0.02
3	200	500	0.25	0.50	145	250	400	300	1.75	0.02
4	1kg	700	0.50	0.75	185	520	675	1025	2.64	0.02

Calculation:

$$R_A (\text{mean}) = \frac{0.67 + 3.75 + 1.75 + 2.64}{4}$$

$$= 2.2025\%$$

$$R_B (\text{mean}) = \frac{0.12 + 0.02 + 0.2 + 0.97}{4}$$

$$= 0.3275\%$$

Conclusion:

The simply supported beam by using parallel force apparatus of the end reactions are $R_A^* = 260, R_B^* = 440$, $R_A^* = 475, R_B^* = 225$, $R_A^* = 400, R_B^* = 300$, $R_A^* = 675, R_B^* = 1025$

Signature
21/9/23

Submitted by
Name - Jagan Sahu
Regd. No. - F22110005008
Branch - Automobile
Sem - 3rd



Case-1

$$W = 200 + 500 = 700$$

$$\Rightarrow R_{B \times 1} = (0.20 \times 200) + (500 \times 0.80)$$

$$\Rightarrow R_B' = 440$$

$$R_A' = 700 - 440 \\ = 260$$

Case-2

$$W = \overset{500+200}{200+500} = 700$$

$$\Rightarrow R_{B \times 1} = (0.25 \times 500) + (0.50 \times 200)$$

$$R_B' = 225$$

$$R_A' = 700 - 225 \\ = 475$$

Case-3

$$W = 200 + 500 = 700$$

$$\Rightarrow R_{B \times 1} = (0.25 \times 200) + (0.50 \times 500)$$

$$R_B' = 300$$

$$R_A' = 700 - 300 \\ = 400$$

case - 4

$$W = 1000 + 700 \\ = 1700$$

$$\Rightarrow R_B \times 1 = (0.50 \times 1000) + (0.75 \times 700)$$

$$R_B = 1025$$

$$R_A = 1700 - 1025$$

$$= 675$$



AIM OF THE EXPERIMENT:

Determination of salient points (young's modulus, yield point, fracture point) from stress-strain curve using universal testing machine.

REQUIREMENT OF EXPERIMENT:

- (*) universal testing machine (UTM)
- (*) Mild steel specimens
- (*) vernier caliper
- (*) steel Rule
- (*) Extension meter

Before going to determine the young's modulus wants to know about some important term like elasticity stress, strain, etc.

(*) STRESS:-

It is defined as the resisting force per unit area. It is denoted by (σ).

(*) STRAIN:-

It is defined as the change in length to the original length & it is denoted by (ϵ).

(*) ELASTICITY:-

It is the property of material to return back to



their original position after removing the external force is known as Elasticity.

YOUNG'S MODULUS OF ELASTICITY:

It is the ratio of stress to linear strain within elastic limit is known as young's modulus elasticity. It is denoted by E .

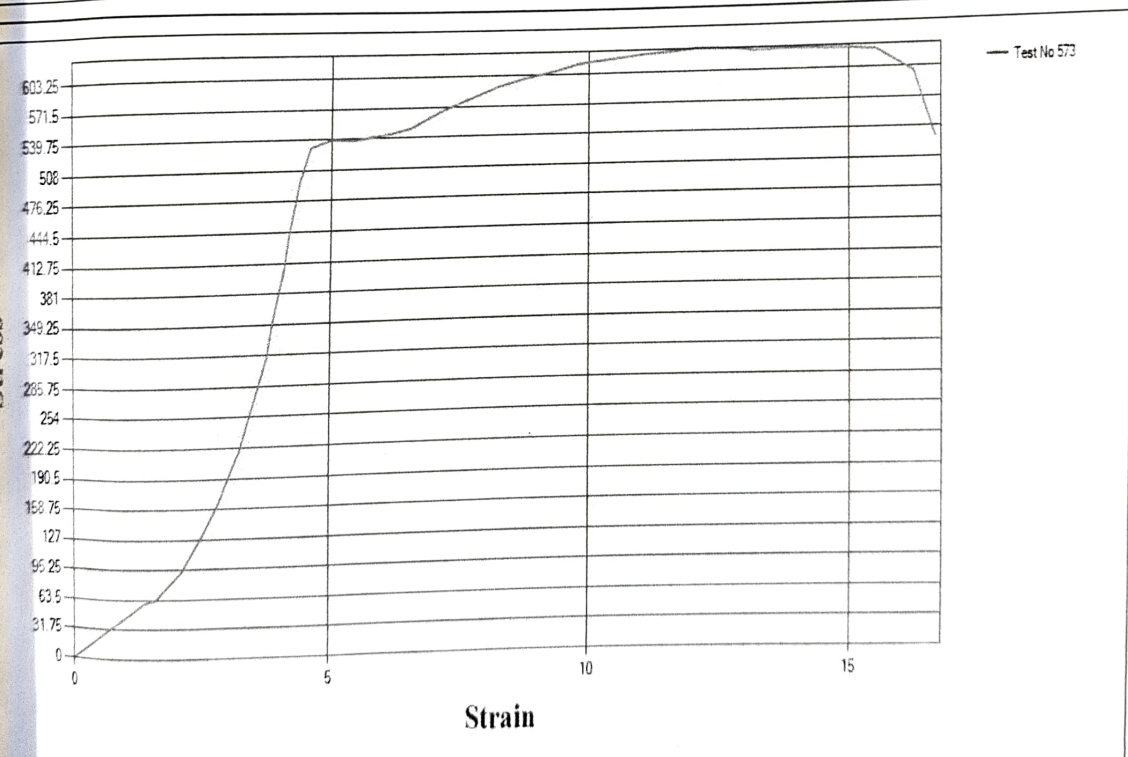
PROCEDURE:

- (*) First of all we fill the specimen in UTM & the enter ^{dimension} in the software & will be attached with.
- (*) Then the specimen details & necessary data are enter in the software & the same time the hydrolic valve closed.
- (*) The pannel board is set-up & pump will be switched on' Automatically.
- (*) Forced will be increased & it will extend the specimen of upto a certain limit & after some time the speelment will break.
- (*) Immidietly after broaking of speelment the running of software to be stopped in the computer screen & then switched 'off' the pump.
- (*) The broken piece is remove & the load value is opes to release the load.

Universal Testing Machine

TEST REPORT

Input Parameters		Final Calculated Values	
Date	13/10/2023		
Number	573	Ultimate Load (kN)	126.30
Type	TENSILE	Breaking Load (kN)	106.50
Material Type	M19	Yield Load (kN)	108.20
Name	AUTOMOBILE 2ND YEAR	Ultimate Strength (N/mm Sq)	628.05
Temperature Dec C	25.00	Breaking Strength (N/mm Sq)	529.59
ID / Code	16D	Yield Strength (N/mm Sq)	538.00
Machine Name	SHYAM 500D	Disp.@Peak Load (mm)	11.10
Machine Type	ROD	Disp@Brk Load (kN)	15.60
Weight (gms)	1539.00	Elongation (Total) %	4.36
Length (mm)	987.00	Elongation G/L %	-50.00
Diameter (mm)	16.00	Reduction in Area %	60.90
Area (mm sq.)	201.10	Avg Test Speed (kN/Sec)	3.50
Gage Length (mm)	100.00	Start / Stop Time (sec)	12:18:11 // 12:18:53
Length	1030.00	Test Duration (sec)	36.00
Gage Length (mm)	50.00		
Diameter (mm)	10.00		



Tested By *[Signature]* 13/10/23

Checked By

Verified By



- (*) Then we will take the graph from computer.
- (*) one should be remove the extensio meter after the yield point has been reached in order to avoid any kind of damage to extensio meters.
- (*) From the graph we will take the stress value of corresponding strain value which will be within elastic limit.
- (*) From this data we will can found at the young's modulus, all over like a yield point, ultimate point, fracture point etc.

CONCLUSION:

From this experiment we get the young's modulus of elasticity & all over the point to the graph.

Jelhaen
14/10/23

Name - Jagan Sahu
Roll No. - 5008
SEMESTER - 3rd
BRANCH - Automobile