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S.No.	Name of experiment	Date	Sign / Remark
1.	Ultimate Tensile test	13/Aug/19	
2.	Rockwell Hardness test	20/Aug/19.	
3.	Spring Test	27/08/19	
4.	Ultimate shear test	3/09/19	
5.	Vickers's Hardness test.	17/09/19.	
6.	Impact jet	25/09/19	
7.	Plastic mould preparation	10/10/19	
8.	Deflection Test of Bending test.	15/11/19.	

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Experiment

Name of experiment : Ultimate tensile Test.

Objective of experiment : To find out ultimate tensile stress, % elongation & % contraction in cross section area of a given specimen.

Instrument used : Universal testing machine, Test specimen, Vernier Caliper.

Experimental knowledge :

- Function of instruments used
- Design principle of instrument used.
- calibration method of instrument used.
- Detailed hardware of exp. set-up.
- Main element of set up, their function design principle & material use.
- Basic building block of circuit on which exp. set up is based.
- Design of exp.

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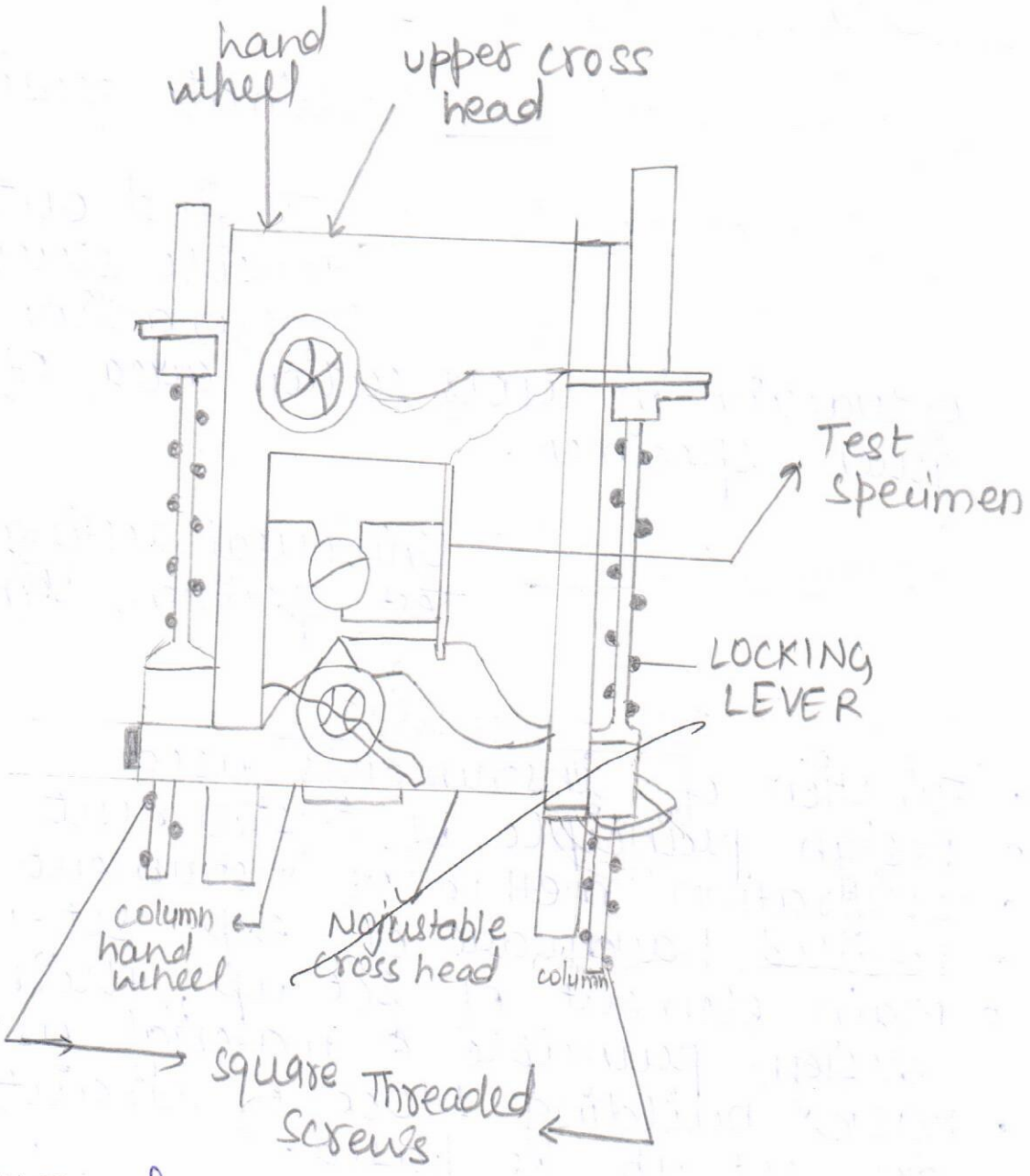

TENSILE TEST PIECE.

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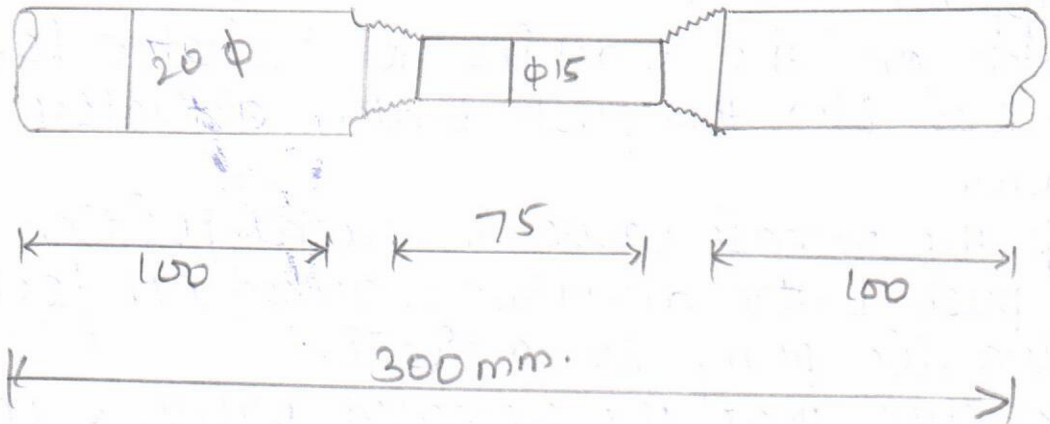
Methodology of experiment :

1. Ensuring that both the ends of the test specimen are secured tight b/w the clamping / gripping jaws.
2. Switch on the machine for indicator lamp provided b/w the push button actuator to glows.
3. Keep the release valve in closed position & press the push button actuator marked ON for hydraulic pump to activate.
4. Make sure that the released valve & control valve are in closed position.
5. Open the control valve slightly.
6. The pendulum dynamometer system gets activated & in turn activates the rack & pinion, thus tensile load is transmitted to test specimen.
7. Both live & dummy pointers on dial mechanism start moving.
8. As the load advances slightly on dial by the movement of pointers, open both the chucks levers of grip.
9. If breaking load of specimen is with in the range selected, the specimen will break at its breaking load. The DUMMY pointer will stay put at load where test specimen breaks & the LIVE pointer will back to zero.



Calculations :

① Ultimate tensile stress = Ultimate load / original area

$$= \frac{9600}{162.77}$$

② % elongation $= \frac{(\text{Final} - \text{ori length})}{\text{original length}} \times 100$

$$= \frac{104.8 - 79.6}{79.6} \times 100 = \underline{31.65\,\%}$$

③ % reduction area $= \frac{\text{ori} - \text{final area}}{\text{original area}} \times 100$

$$= \frac{162.77 - 75.39}{162.77} \times 100$$

$$= \underline{53.68\,\%}$$

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(10) Note down dummy pointer reading.
(11) Switch off motor by pressing push button "OFF" after specimen breaks.

Observation table :

(1) Original diameter d_1 = 14.4 mm
(2) Original cross-section = $\frac{\pi}{4}(d_1)^2$ = 162.77 mm
(3) Original length l = 79.6 mm
(4) Incr. in length (δL) = 104.8 mm
(5) Final dia. (d_2) = 9.8 mm
(6) Final cross-sec area = $\frac{\pi}{4}(d_2)^2$ = 75.39
(7) Ultimate load = 9600 kgf. kgf.

Calculation & graph preparation.

Formula Used.

(1) Ultimate tensile stress = Ultimate load / original area of specimen.
(2) % elongation = (Final - original length) / original length x 100.
(3) % reduction in area = Original area - Final at broken part / original area) x 100

Discussion of Result

(1) Ultimate tensile stress = 59.
(2) % elongation = 31.65 %
(3) % reduction in area = 53.68 %

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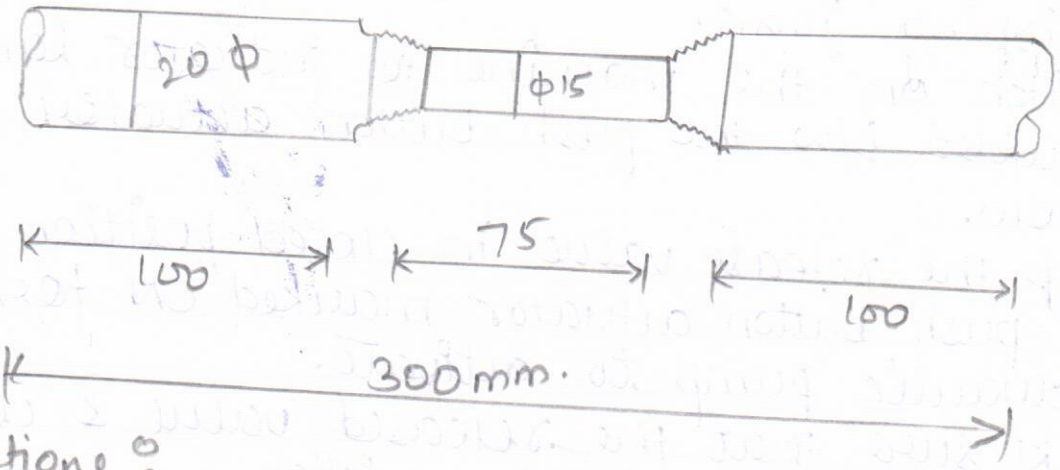

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$$= \underline{53.68\ \%}$$

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(5) Final dia. (d_2) = 9.0 mm
(6) Final cross-sec area = $\frac{\pi}{4}(d_2)^2$ = 75.39
(7) Ultimate load = 9600 kgf. kgf.

Calculation & graph preparation

Formula used.

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(2) % elongation = (Final - original length) / original length x 100.
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Discussion of Result

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Application of experiment result Used.

(1) Generate a stress / strain diagram from experimental data.
(2) Use stress/ strain dig. to determine yield point, ultimate tensile strength, Young Modulus, ductility & toughness.
(3) Application in Design & production.

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Experiment

Name of experiment: Rockwell Hardness Test.

Objective of exp: To determine The Rockwell Hardness No. of a given specimen.

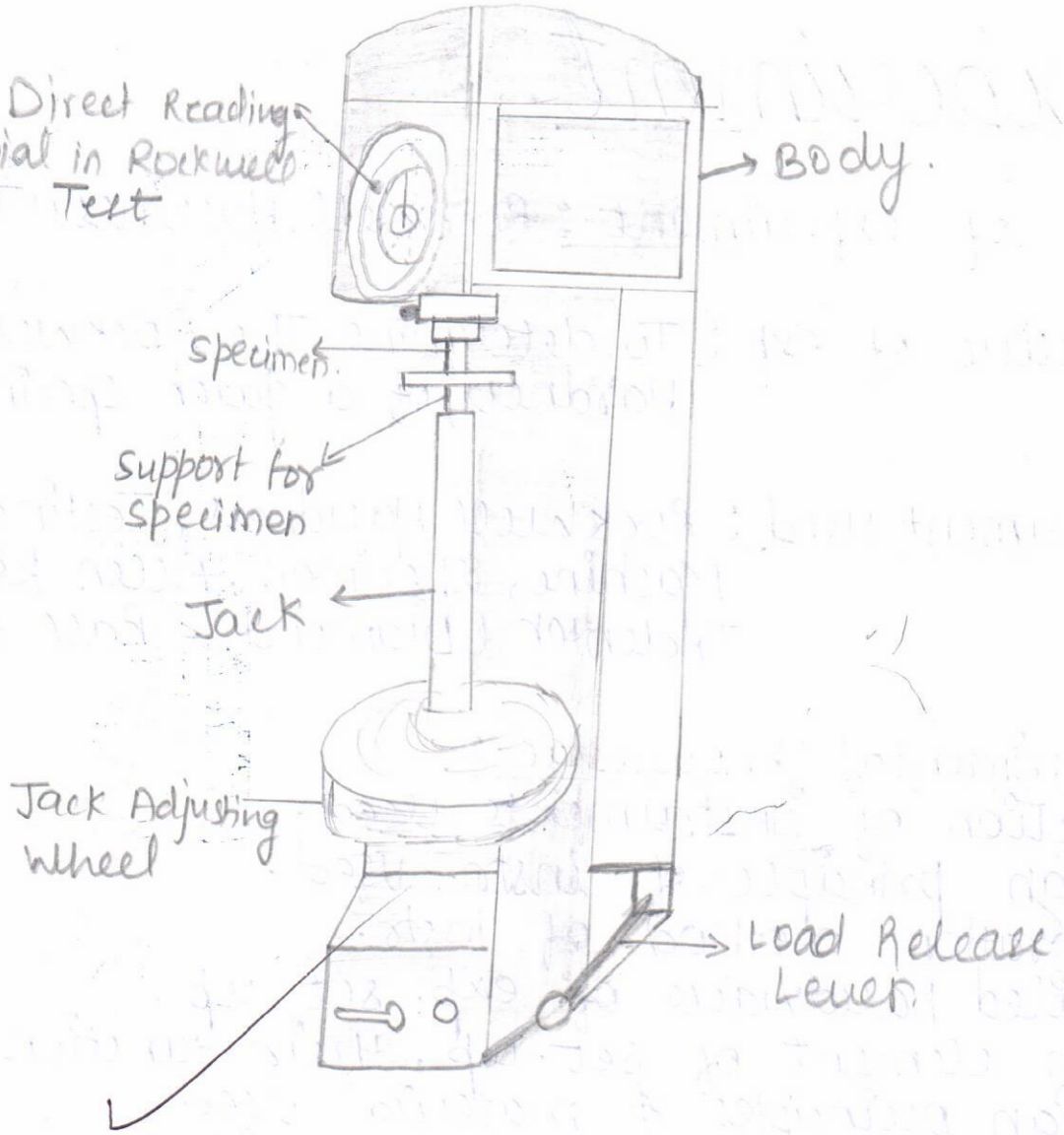
Instrument Used: Rockwell Hardness, Testing Machine, specimen, Allen key, Indenter (Diamond & Ball type).

Experimental knowledge:

- Function of instruments used.
- Design principle of instr. used.
- Calibration method of instr.
- Detailed hardware of exp. set up.
- Main element of set-up, their functions, design principles & material used.
- Basic building block of circuit.
- Design of exp.

Methodology of exp:

1. Place the required weights on dashpot lever.
2. Place specimen to tested securely on it.
3. Select & fix the indentor diamond or ball depending upon the test scale & load applied.



Rockwell Hardness Test Machine

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(4) Ensuring that needle of dial gauge is at '0' or at '80' bring specimen into contact with the indentor by rotating elevating screw in clock-wise dir^{n} until small needle of dial gauge reaches mark '2'. This also causes the app. of minor 10 kg load.
(5) Turn hand lever away from operator thereby loading specimen for major load.
(6) Watch the pointer till it comes at rest.
(7) Move hand lever back to its original position to ensure that specimen under test is only under initial 10 kg load.
(8) Now Read the "ROCKWELL HARDNESS NUMBER" shown by larger pointer.

Discussion of Result:
Rockwell Hardness of a given sp. = HRB = 85
HRc = 64

Application of exp.
(1) Hardness inspection of cam shaft
(2) " " of Gears
(3) " " of cutting tools.

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Experiment -

Name of exp : Spring Test.

Obj. of exp : To determine the stiffness of spring & modulus of rigidity of the spring wire (compression test) (tensile test).

Instrument Used : Spring testing machine (hand operated or motorized), closely coiled helical springs : tension & compression types, Micrometer Vernier calipers.

Experimental Knowledge :

- Function of instr. used.
- Design principle of instr. used.
- Calibration method of instr. used.
- Detailed hardware of exp. set-up.
- main element of set up, their function, design principles & materials used.
- Basic building block of circuit on which exp. set-up is based.
- Design of exp.

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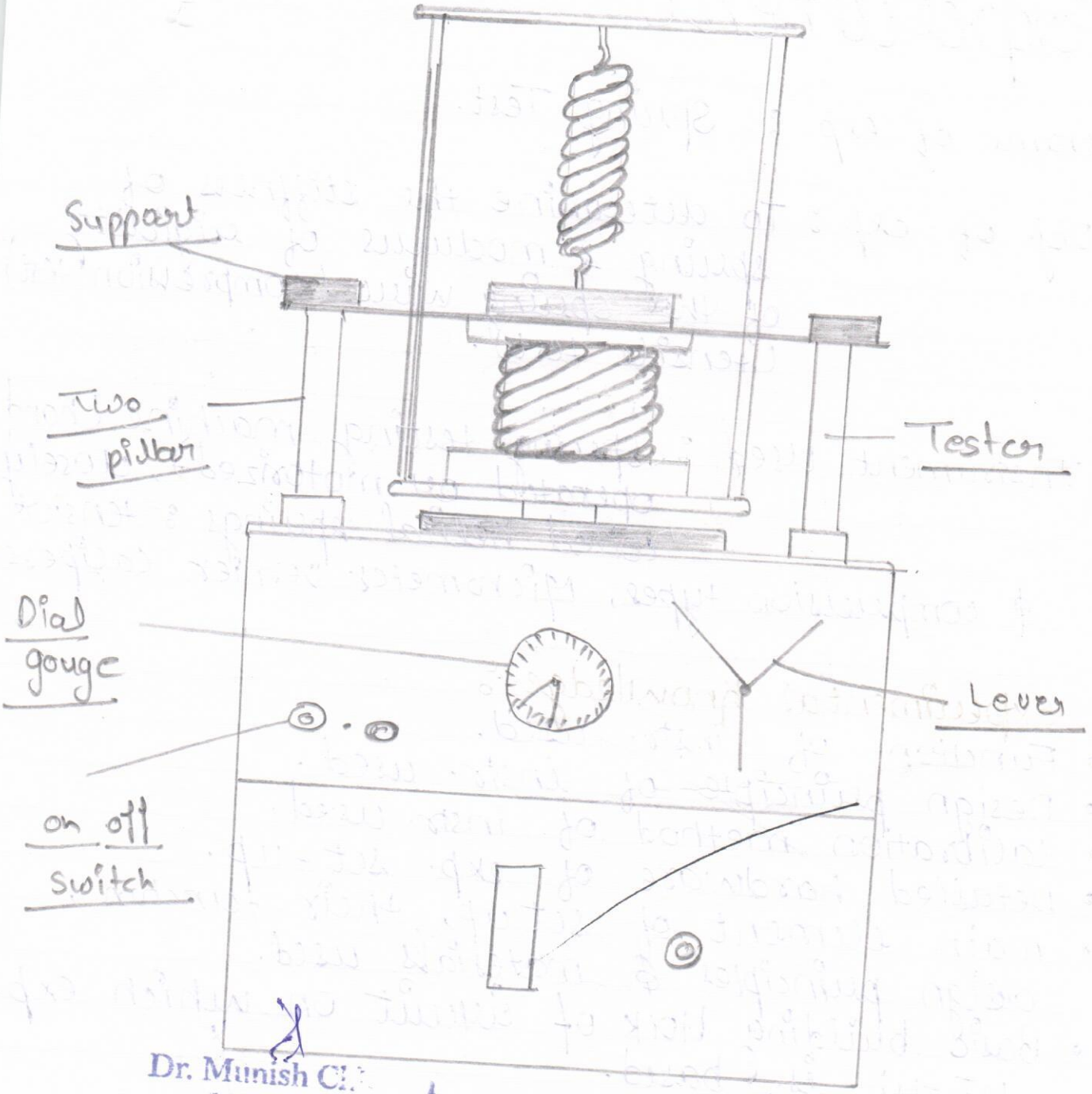

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Methodology of experiment:

1. By using the micrometer measure the diameter of wire of spring.
2. By using the vernier calipers measure the diameter of spring coil.
3. Count the no. of turns.
4. Insert the spring in spring testing machine & load spring by suitable weight & note the axial deff. in tension or compression.
5. Incr. the load & take corr. axial deff. reading.
6. Plot the curve b/w load & deff. The shape of curve gives stiffness of spring.

Observation Table:

Least count of microscope = 0.2 mm
Dia. of spring of wire, d = 11.7 mm
Least count of vernier caliper = 1.6mm
Dia. of spring coil, D =
Mean coil dia., Dm = D-d = 11.7-1.6 = 10.1
No. of turns, n = 7

Calculation:

1. Spring stiffness $k = w/\delta$
2. $\delta = \frac{8wDm^3n}{cd^4}$
3. Spring index = Dm.

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Calculations

(i) For compressive Test

$K = 10.3$

$\delta = 7.1$

$W = 200$

$$7.1 = \frac{8 \times 200 \times (10.1)^3 \times 7}{cd^4}$$

$$cd^4 = \frac{8 \times 200 \times (10.1)^3 \times 7}{7.1}$$

$$\boxed{cd = 58.28}$$

(ii) For Tensile Test

$W = 100$

$\delta = 8$

$K = 12.5$

$$8 = \frac{8 \times 100 \times (4.7)^3 \times 27}{cd^4}$$

$$cd^4 = \frac{8}{100} (4.7)^3 \times 27$$

$$\boxed{cd = 23.00}$$

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S.NO.	Load W(N)	Deflection δ(mm) compressive test		Stiffness K=W/δ Tensile test	
		Def.	Stiffness	Def.	Stiff.
1	0	4.6	0	6.1	0
2	100	6.1	16.39	8	12.5
3	200	7.1	20.16	10.3	19.41
4	300	8.1	37.03	12.7	23.62

Discussion of result :

① spring stiffness K = 10.3, for tensile = 12.5

② Modulus of rigidity of spring wire = 58.20
tensile = 23.00

Application of exp. result used :

① Shock absorber

② Spring Balance.

27/8/15

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Experiment-2

Name of exp: Ultimate shear test.

Obj. of exp: To find out ultimate shear stress of a given test piece.

Instrument used Universal testing Machine, test specimen, Bushes, Test Block, Vernier calipers.

Experimental knowledge:

- Function of inst. used.
- Design principle of inst. used.
- Calibration method
- Detailed hardware of exp. set up
- Main element of set up, their fun, design principle & materials used.
- Basic building block of circuit on which exp. set up is based.
- Design of exp.

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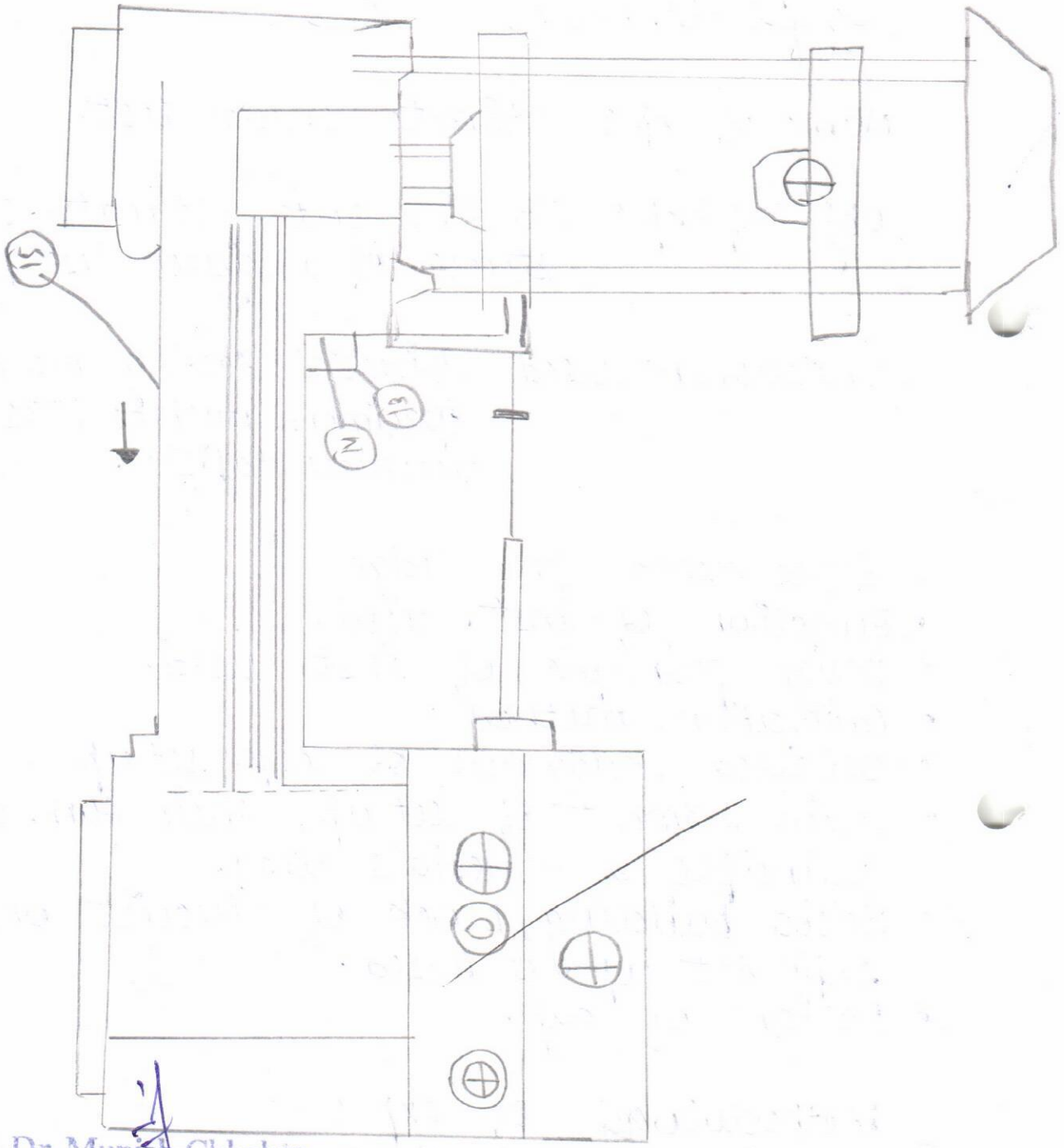
Methodology of exp:

① Let us presume that 12mm dia. test specim is being tested for its double shear strength determination. First all the 3 pieces of 12mm



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set bush of 3 piece. 2 pieces have collars around them.

(2) All these 3 pieces shall have their center a 12mm hole duly punched.

(3) Fix the plain circular piece in hole provided in sliding plate of double shear block flush.

(4) Slide the plate through top slot of double shear block such that block coincide with hole. Test specimen protrudes at least 2" on either side of double shear test.

(5) Place the double shear block holding specimen bottom cross head of loading unit & keeping release closed position, after necessary adjustment of middle cross head to required height.

(6) Switch on machine & open control valve to allow ram to rise & come in contact with jutting portion slide plate of double shear block.

(7) Record the reading shown by dummy pointer for double shear breaking load.

Observation table :

(1) Original dia. of specimen (d) = 9.2mm

(2) Original cross-sec. area of speci. $= \frac{\pi}{4} d^2$

$= 66.44 mm$

Calculate :

$$VSS = \frac{P}{2A}$$

$$= \frac{5800}{2 \times 66.44} = 132.08$$

$$= 43.64 \text{ N/m}^2.$$

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(iii) Ultimate shear load = 5000 kgf

(7) Calculation & graph preparation :
Formula used
Ultimate shear stress = $\frac{P}{2A}$

(8) Discussion of result.
(1) Ultimate shear stress = 43.648 N/m^2.

(9) Application of exp. result used :.
(1) Design of Rivited & Bolted joint.
(2) Punching
(3) Design of knuckle joint
(4) Design of shaft under tousion.

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Experiment - 5

Name of the experiment : Vickers Hardness test

Objective of exp : To determine the vickers hardness no (VHN) or diamond pyramid hardness no. (DPN) of a given specimen.

Instrument used : computerized Vicker's Hardness Tester, indentor, specimen.

Experimental knowledge :

→ Function of the instrument used.
→ Design principle of ~~instr.~~ used.
→ Calibration method of instr.
→ Detailed hardware of exp. set up.
→ Main element of setup, their function, design principle & material used.
→ Basic building block of circuit.
→ Design of exp.

Methodology of exp :

① Select the weight acc. to expected hardness of specimen to be tested by turning the "weight selection knob".
② Place specimen securely on testing table.

(3) Turn the hand wheel clockwise slowly so that specimen will get focused on monitor sharply. At this stage a gap of about 0.2 to 0.25 mm expected b/w tip of diamond indentor & top face of specimen.

(4) Press start button The loading cycle start gradually thro a gear motor provided with a drive cam. The loading is fully automatic

(5) Index indentor head to next position so that obj. of optical system will exactly over indentation

(6) Make the machine is in Enable auto mode by clicking the mouse. 1st hardness reading will autom. display on screen.

(7) To have next ~~test~~ change the position of specimen where hardness to be checked. Verify from monitor there is no earlier indentation near about expected new indentation Index the head to original position & bring back Indentor on specimen. Repeat operation.

Result : Vickers Hardness No. of Specimen = 250

Applications :

(1) Hardness inspection of Cam shaft
(2) " " of Gear
(3) " " of Cutting Tools.

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Experiment No.

1- Name of the Experiment :- Impact Test

2- Objective of the Experiment :- To determine the fracture Energy required to fracture a standard notched specimen by an Impact testing machine (IZONE)

3- Instrument used :- Impact Testing Machine Allen key, Spanner, Izod Striker.

4- Experimental Knowledge.

- Function of the instruments used.
- Design principle of the instruments used.
- Calibration method of instruments used.
- Detailed hardware of the Experimental
- Main element of Setup, their function design principles and material used.
- Basic building block of Circuit on which Experiment Setup is based.
- Design of Experiment.

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5. Discussion of result - fracture energy required to fracture the given specimen (by Izode Test)
= 221.35 Joule

6- Application of Experiment result used.

(i) Pressure Vessel design
(ii) Design of motor Vehicles

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* Experiment No :- ?

1. Name of the Experiment :- Plastic mould Preparation

2. Objective of the Experiment :- To prepare plastic mould for small metallic specimen.

3. Instruments Used :- A specimen mounting press bakelite powder as the raw material and one pair of asbest as hand gloves to hold the hot specimen.

4. Experimental Knowledge :-

- Fuction of the instruments used.
- Design principle of the instruments used.
- Caliberation method of the instruments used.
- Detailed hardware of the experimental set-up
- Main element of set up, their functions, design principles and materials used
- Design of experiments.

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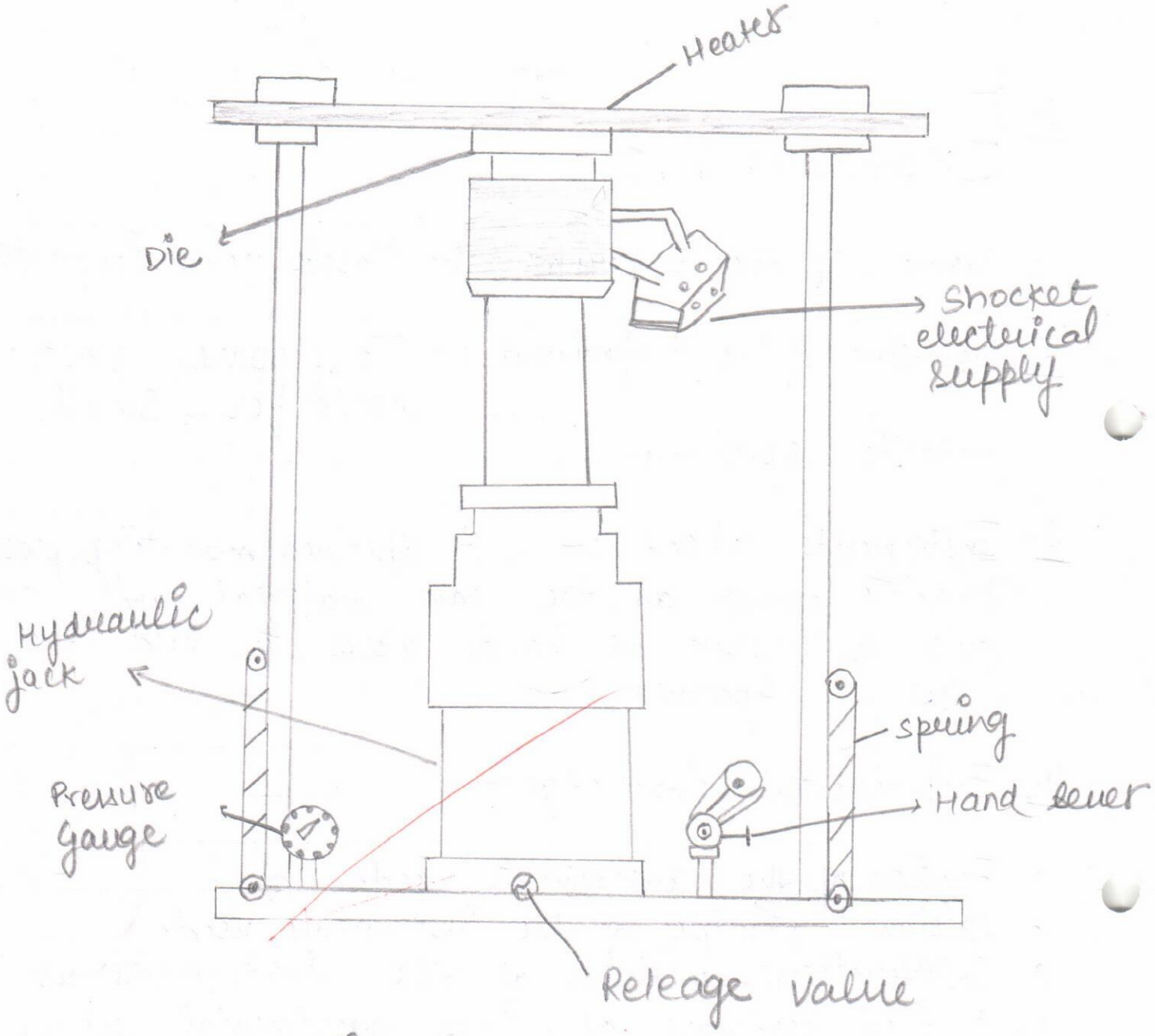

Mounting pens

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5. Methodology of Experiment:-

(i) First we will lift the ram with the help of hydraulic pressure.
(ii) Then put the specimen on the ram.
(iii) Now release the hydraulic pressure to come back the ram to its original position.
(iv) Near about one & half spoon bakellite powder will be poured in the die.
(v) Then the small cylindrical piece will be put on the bakellite powder in the die and die assembly will be closed now.
(vi) Then maintain the temp. of near about 75°C to 80°C for one minute & during this operation we will also apply the hydraulic pressure (2000 lbs/sq inch).
(vii) After some time, the specimen will fix in the bakellite powder & take it out with help of high pressure.

6. Discussion of Result:-

7. Applications of Experiment Result used.

(i) Material Testing.
(ii) Micro Structure Examination.

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Experiment

1) Name of exp : Deflection Test or Bending test.

2) Obj. of exp : To conduct the deflection test on mild steel beam
   (1) stress of end of proportionality.
   (2) Bending stress at ultimate load of ultimate stress.
   (3) modulus of elasticity.

3) Instrument used : UTM, scale
   (1) function of instr. used.
   (2) Design principle of instr. used.
   (3) calibration method of instr. used
   (4) Detailed hardware of exp. used
   (5) Basic building block of circuit
   (6) Design of exp.

4) Methodology : To begin with the dimension of specimen are measured. to know the maxi load carrying capacity of beam.

$M/I = Fb/y = E/R$

M = maxi bending moment

I = moment of inertia

F_b = bending stress.

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a bending stress at limit of proportionality and ultimate load are calculated

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6) Observation Table:

1) Length of the Specimen = 180 mm

2) Eff. length = 100 mm

7.)

S. No.	load 'W'	Deflections
1	2400	12.5
2	4400	13.5
3	5680	15.1

8. Calculation: when material is subjected to loading deformation.
This test is carried out for deformation

9. Discussion of Result:

1) Stress at limit of proportionality σ_{by} = 87 N/mm
2) Ultimate bending stress σ_{bu} = 92 N/m
3) modulus of elasticity (E) = 93 N/m

10. Application of Experiment Result used:

1) Shaft.
2) Beam.

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