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Experiment - 3.

1] Aim :- To study centrifugal pump, pelton turbine and reciprocating compressor.

2] Objectives :-

1) Centrifugal pumps are used to induce flow or raise a liquid from a low level to high level.

2) The main objective of pelton wheel turbine is to measure the power output of a pelton turbine and to compare this to theoretical power output.

3) The main objective of reciprocating compressor is to raise the pressure level of gas being compressed.

3] Introduction :-

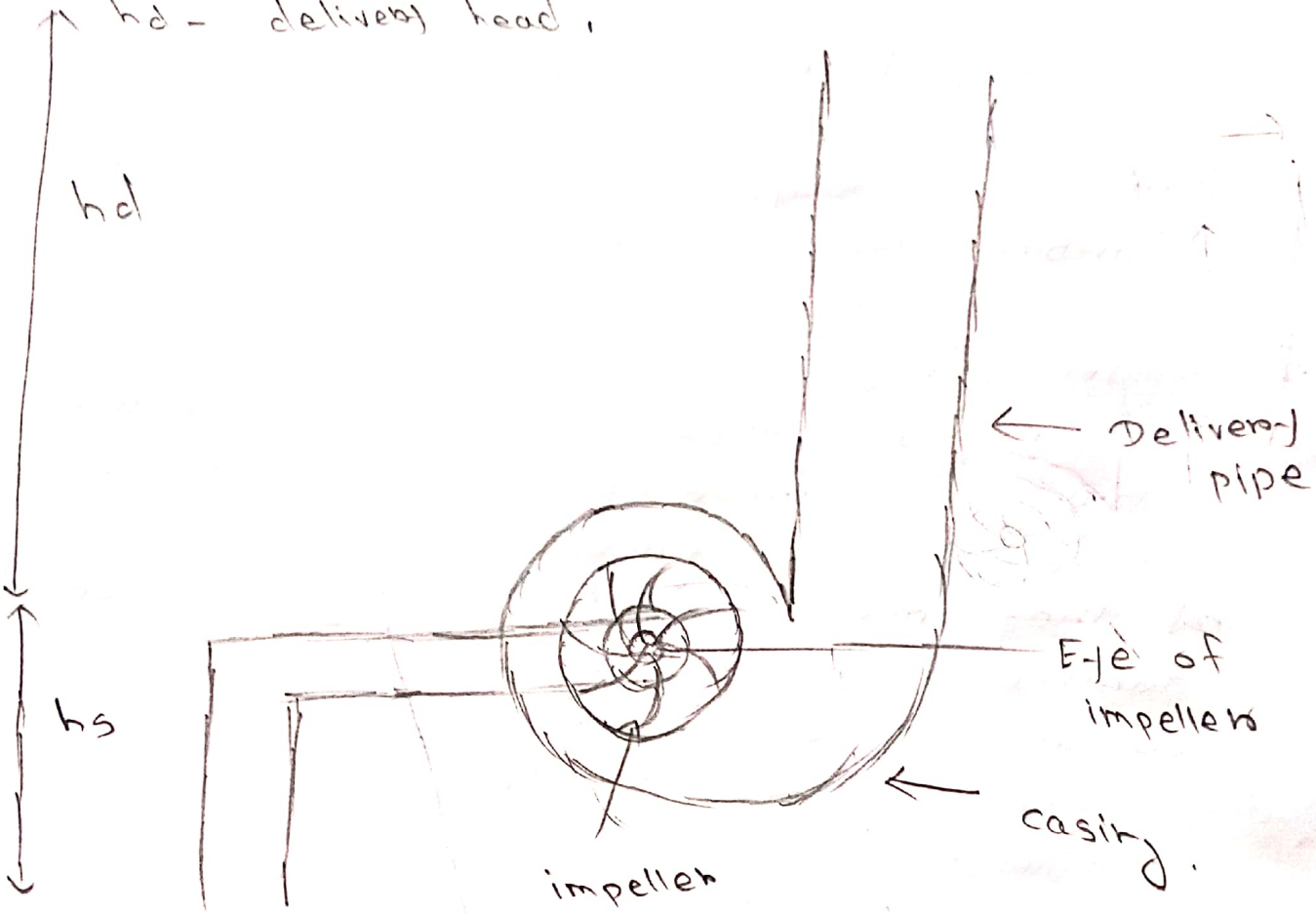
a) Centrifugal pump :- i) A centrifugal pump transfers input power to kinetic energy of the fluid being pumped.

ii) This energy, though the specifics of the pump design, is converted to pressure energy that causes the

Centrifugal pump.

h_s - suction head

h_d - delivery head.



fluid to flow.

iii) In this type of pump, fluid enteres the pump at the centre of rotating impeller

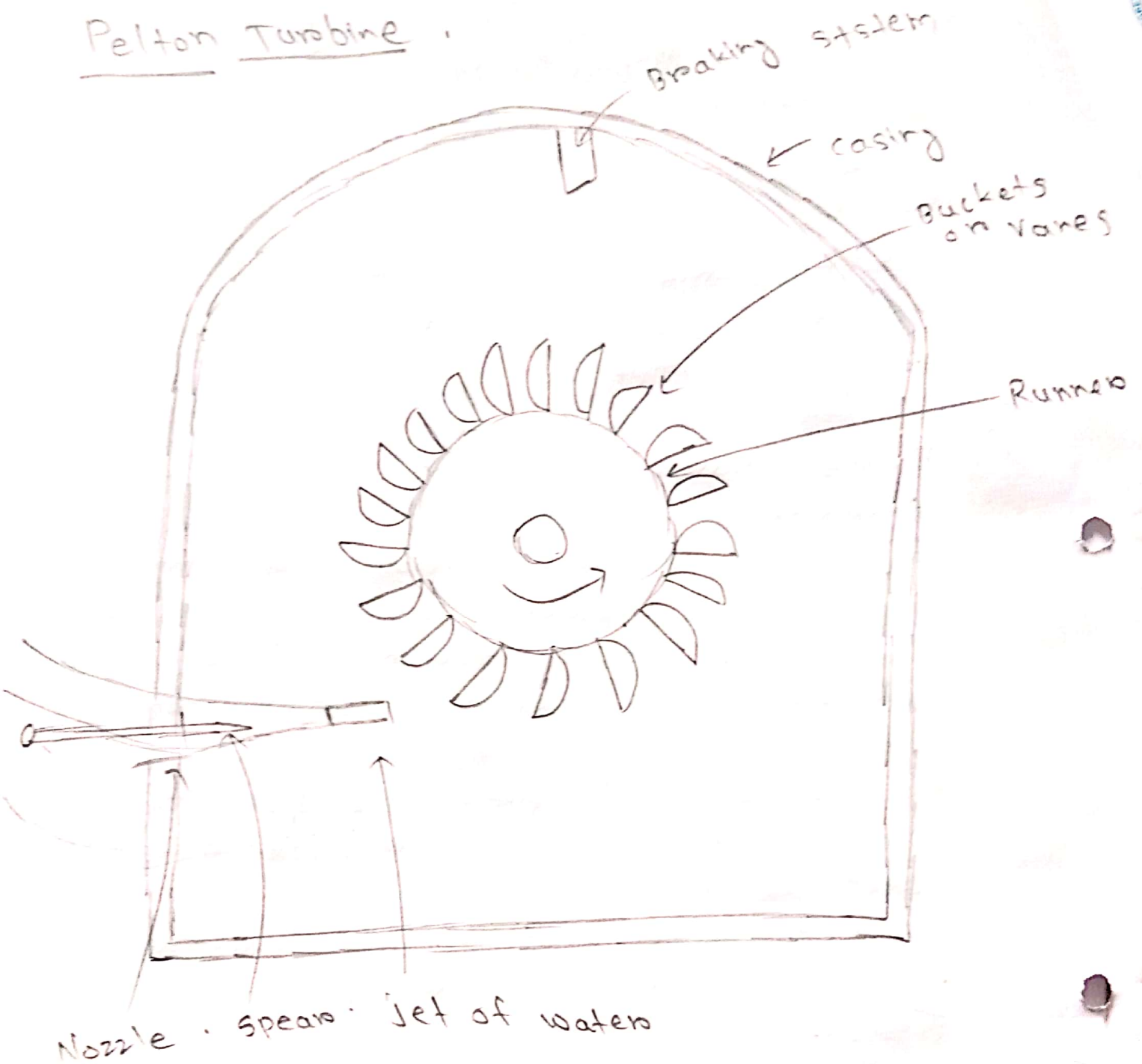
b) Pelton turbine :- i) The pelton wheel turbine was invented in 1870's to extract energy from the impulse of moving water, as opposed to water's dead weight like the traditional overshot water wheel.

c) Reciprocating Compressor :- i) Reciprocating air compressor is a positive displacement air compressor in which air is sucked in a chamber and compressed with the help of a reciprocating piston.

ii) It is called as positive displacement compressor because air is first sucked in a chamber and then compression is achieved by decreasing area of the chamber.

4] i) Pumps are classified as centrifugal pump, and reciprocating compressor pump.

Pelton Turbine.



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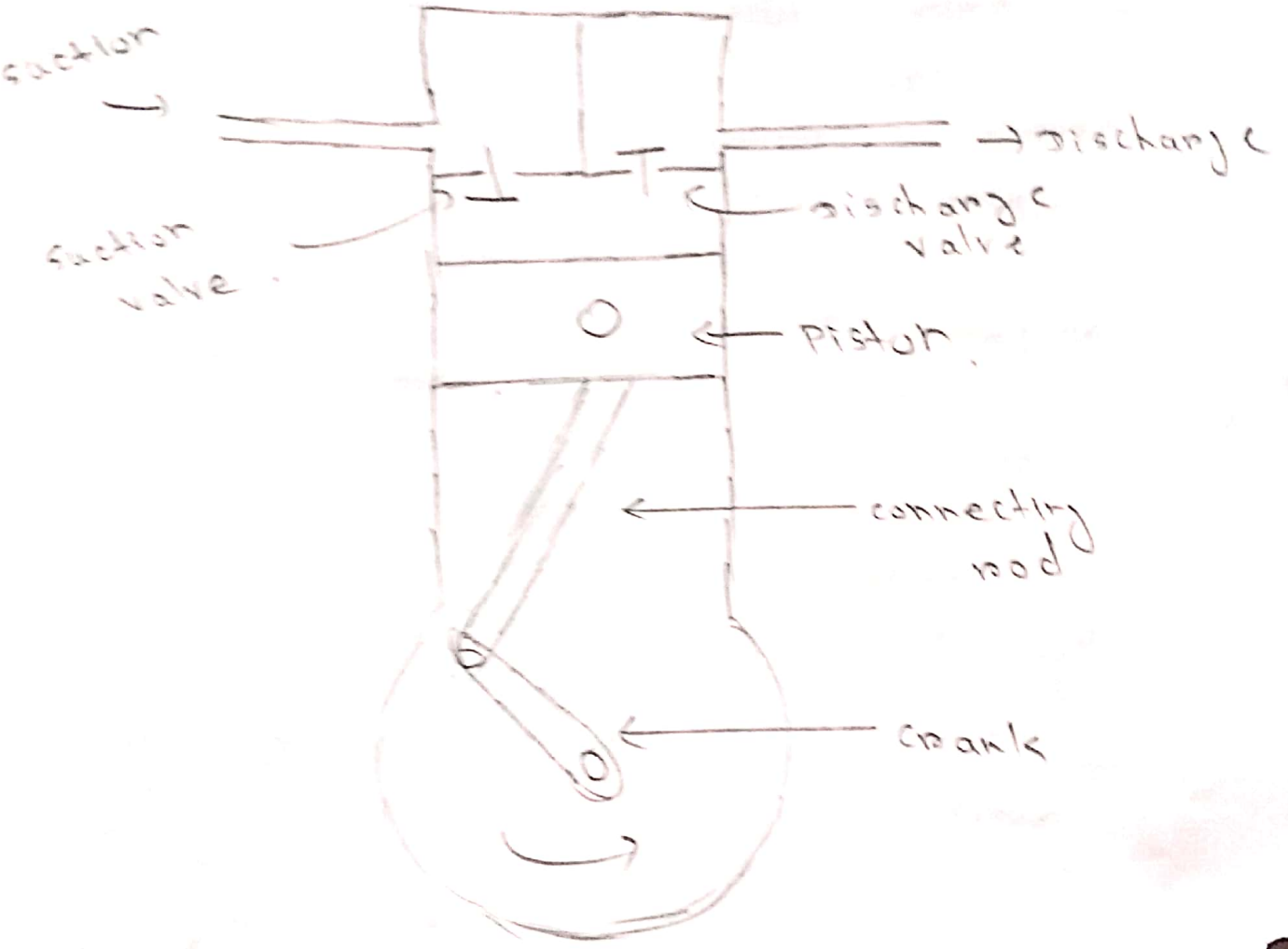
i) Centrifugal / roto dynamic pump produce a head and a flow by increasing the velocity of the liquid through the machine with the help of rotating vane impeller. Centrifugal pumps include radial, axial and mixed flow units.

ii) Centrifugal pumps are classified as-
a] end suction pumps.
b] In - line pumps.
c] double suction pumps.
d] self - priming pumps.

iii) Reciprocating pump operates by alternating filling cavity and then displacing a given volume of liquid. A positive displacement pump delivers a constant volume of liquid for each cycle independent of discharge pressure or head.

They are classified as-
- Reciprocating pumps - piston, plunger.
- Power pumps.
- Steam pumps
- Rotary pumps - gears, lobe.

Reciprocating Compressor :-



II] Centrifugal pump - 1) Centrifugal pumps are used to transport fluids by the conversion of rotational kinetic energy to the hydrodynamic energy of the fluid flow.

2) The rotational energy typically comes from an engine or electric motor. They are a sub-class of dynamic axis symmetric work-absorbing turbo machinery.

3) Centrifugal pumps are used to induce flow or raise a liquid from low level to high level. These pumps work on simple mechanism.

4) In the impeller, kinetic energy of water is converted into pressure energy. The centrifugal pumps provide a continuous discharge of fluid.

5) Centrifugal pumps can be used to pump fluids with high viscosity.

5] Pelton turbine :-

1) The pelton turbine extracts energy from the impulse of moving water, as opposed to water's dead weight

like the traditional overshot water wheel.

ii) Earlier variations of impulse turbi existed but they were less efficien than pelton's design.

iii) Pelton's paddle geometry was designed so that when the rotating ran at half the speed of the water jet, the water left the wheel with very little speed, thus this design extracted almost all of the water's impulse energy which allowed for a very efficient turbine.

iv) Pelton wheels are the preferred turbine for hydro-power where the available water source has relatively high hydraulic head at low flow rates. Pelton wheels are made in all sizes.

6) Reciprocating compressor :-

i) A reciprocating compressor is a positive displacement machine that uses a piston to compress a gas and delivers it at high pressure.

ii) Reciprocating compressors are typically used where high compression ratios

(ratio of discharge to suction pressures) are required per stage without high flow rates, and the process fluid is dry.

3) In reciprocating air compressor, the piston moves towards the BDC, the air is sucked into the cylinder from the atmosphere and when it moves towards the TDC, the compression of the air starts and keeps on going and pressure increases.

4) When the pressure increases upto its design limit it pushes the discharge valve to open and the compressed air is delivered to storage tank.

5) As the power is on, the electric motor starts rotating and also rotates the crankshaft attached to it. The piston starts doing to and fro motion inside the cylinder.

6) As the piston moves downward (towards BDC) the air from the atmosphere enters into the chamber of cylinder.

7) Now the piston after reaching at BDC, starts moving upward (Towards

TDC), the compression of air starts and its pressure begins to increase
6) When the pressure inside the cylinder increases above the pressure of discharge valve, the discharge valve opens and the compressed air is delivered to a air storage tank from where it is utilized for the work.

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