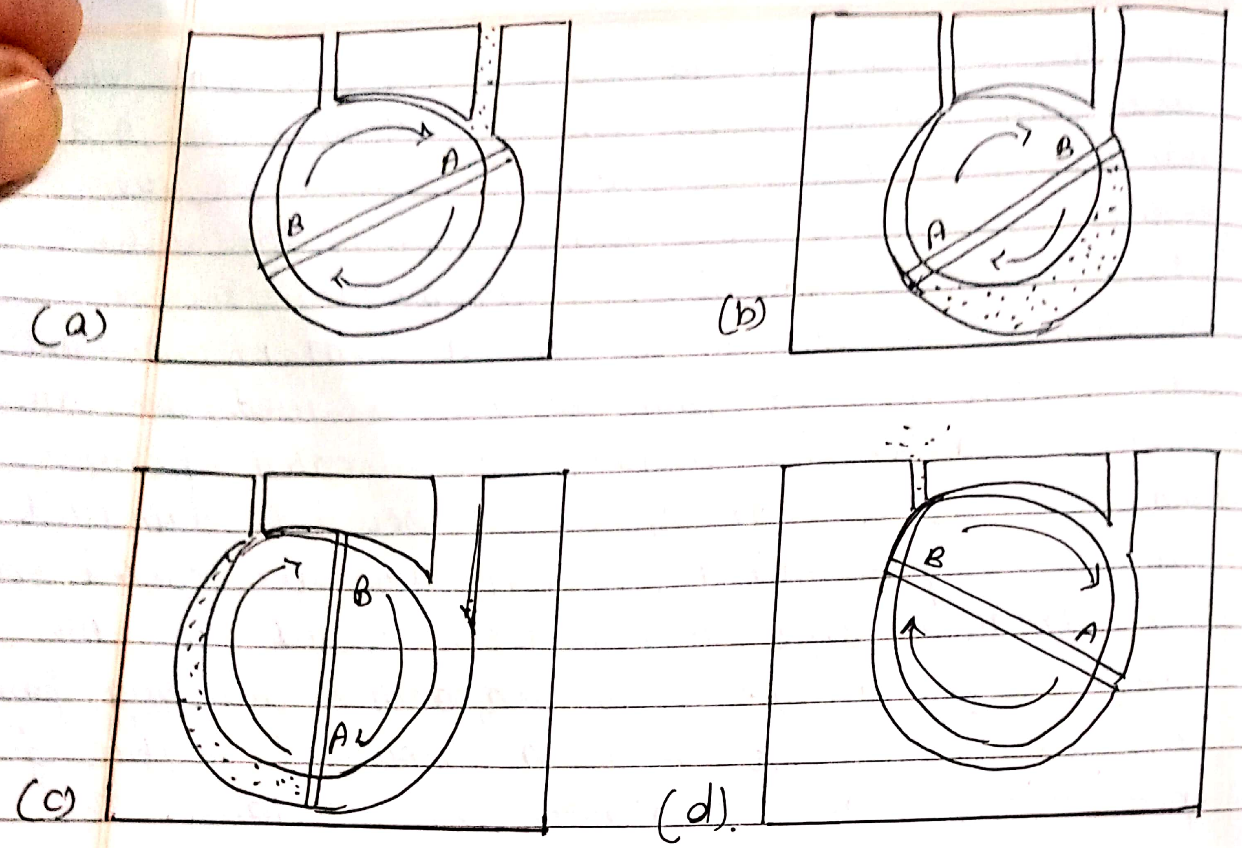


Action of the Rotating Vane Pump.

2. Diffusion Pump:- Diffusion pumps are vapour jet pumps or vapour ejector pumps designed for pumping rarefield gases in the high-vaccum rang ($< 10^{-2}$ Torr). of pressure. These are called "diffusion" pumps because of the fact that the molecules of the pumped gas penetrate the vapour jet In a manner resembling diffusion of one gas into anoth

High vaccum pumping systems ba on diffusion pumps include at least one diffusion pump and one mechanical pump connected in series. Mechanical pumps remove about 99.99 % of the air from the vaccum chamber. The remaining air water vapour, down to any pressure from

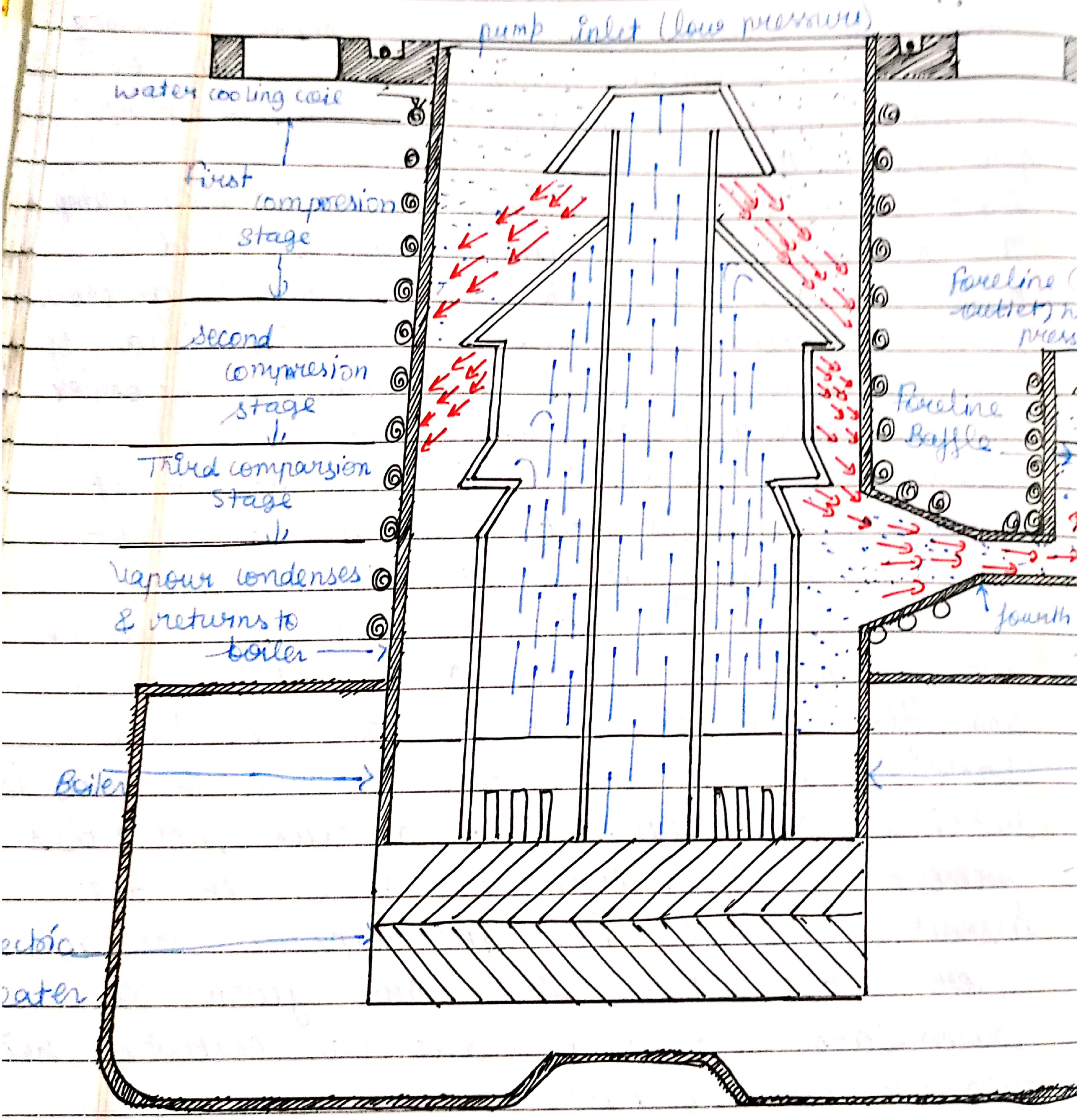
10^{-3} to 10^{-2} Torr is removed by the diffusion pump discharging into the mechanical pump.

Diffusion pumps are used when constant high speeds for all gases are desired for long periods of time without attention. Diffusion pumps cannot discharge directly into the atmosphere. A mechanical pump is required to reduce the pressure in vaccum system to the correct operating range. The mechanical pump is then used to maintaine proper discharge pressure conditions for the diffusion pump.

Fig 1 illustrates the action of a diffusion pump. The arrows represent the pumping fluid molecules and the black dotes represents gaseous molecules being pumped. A pumping fluid of low vapour pressure is boiled in the boiler. The oil vapour flows up through the jet chimneys, reverse its directions at the jet caps and emerges out (downwards) from the jet nozzles at supersonic velocity.

The oil moleculus condense on the pump wall which are water cooled and flow in the form of an oil film, back down to the boiler where the oil is reboiled and evaporated; gaseous molecules present in the chamber above the jet assembly diffuse into the vapour stream (or jet) where they are given a downward momentum due to collisions with heavier oil molecules.

Thus, the gas molecules are forced by the jet into the region of higher pressure in the lower section of the diffusion pump. The pressure here is high enough for the backing rotary pump to have a finite pumping speed so that accumulated gas molecules are drawn off through the fore vacuum line.



Pumps of this type operate only at quite low pressure. The backing pressure usually required is 10^{-1} to 10^{-2} Torr. The ultimate vaccum attainable depend upon the vapour pressure of the pump liquid at the temperature of the condensing surfaces. However, by providing a cold trap between the vapour pressure of the pump liquid may be achieved.

3. **Pirani Gauge**:- In its simplest form, the Pirani Gauge is made up of a glass or meta tube enclosing a wire stretched along the tube's axis. This wire is heated by sending current through it. This heat energy is lost primarily by three distinct process:-

(i) a part of it is spent in heating the enclose gas molecule

(ii) a part of it is lost in rotation &

(iii) there are also losses due to conduction through the wire leads.

ision

At low pressures the energy balance may be expressed as:-

$$I^2R(1+\alpha\Delta T) = cP_x\Delta T + \sigma(T^4 - T_a^4) + b\Delta T \quad -(\ldots$$

pump fluid

where ΔT is the difference in the filament temperature (T) and the ambient temperature within the enclosu (T_a), P_x is the pressure within the enclosure, c, σ and b are proportionality constant, I is the current through the filament, R is resistance of filament at room temperature and α is the temperature coefficient of the resistance for the filament material.