Course
Refrigeration & Air-Conditioning

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Lecture 3

The Bell-Coleman or reversed Brayton or reversed Joule Cycle

The Bell-Coleman cycle

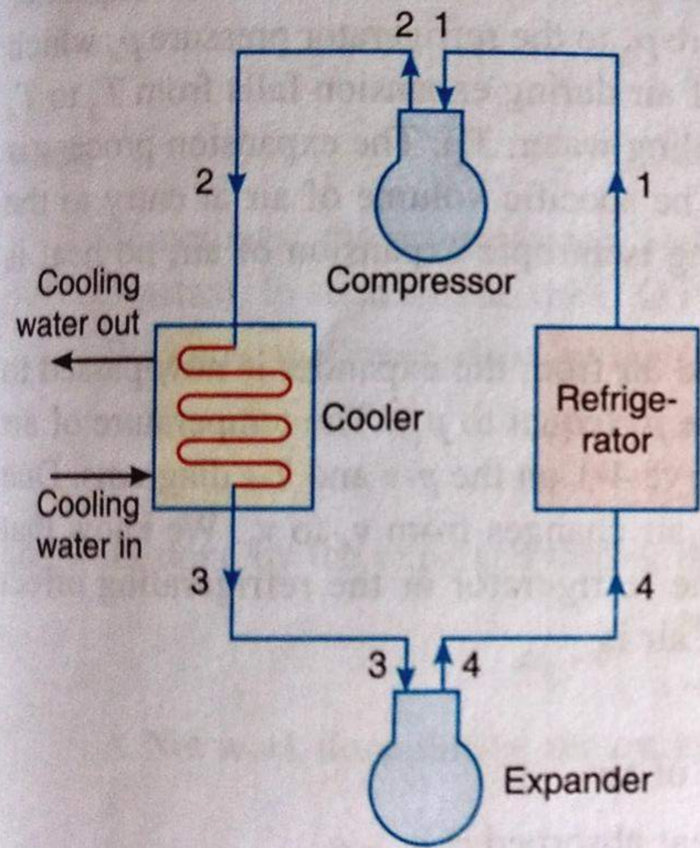


Fig. 2.7. Open cycle air Bell-Coleman Refrigerator.

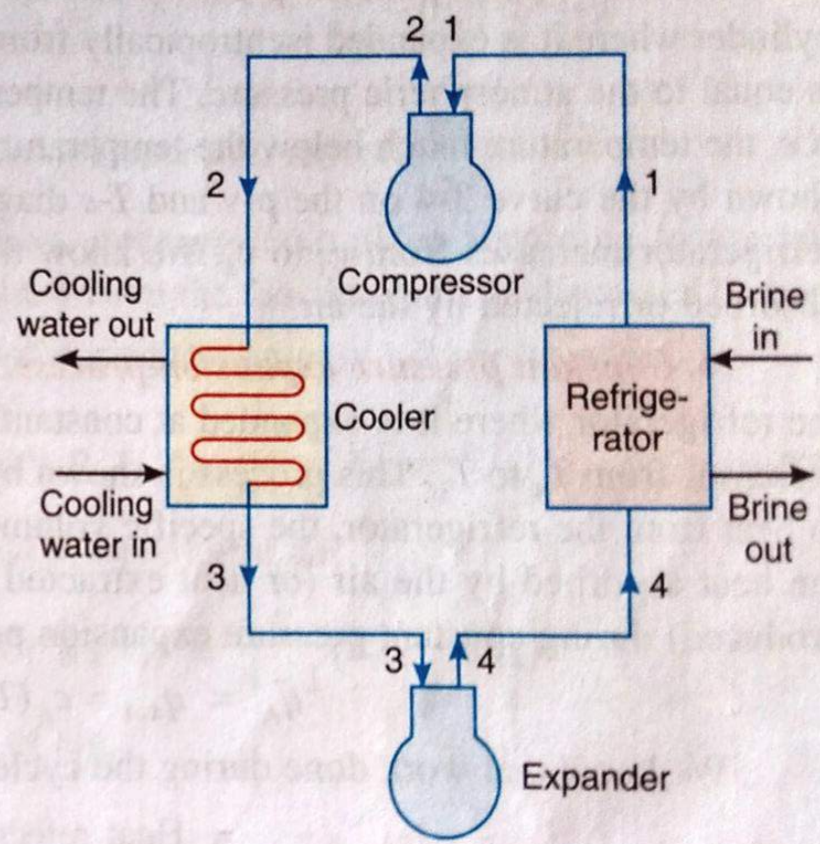
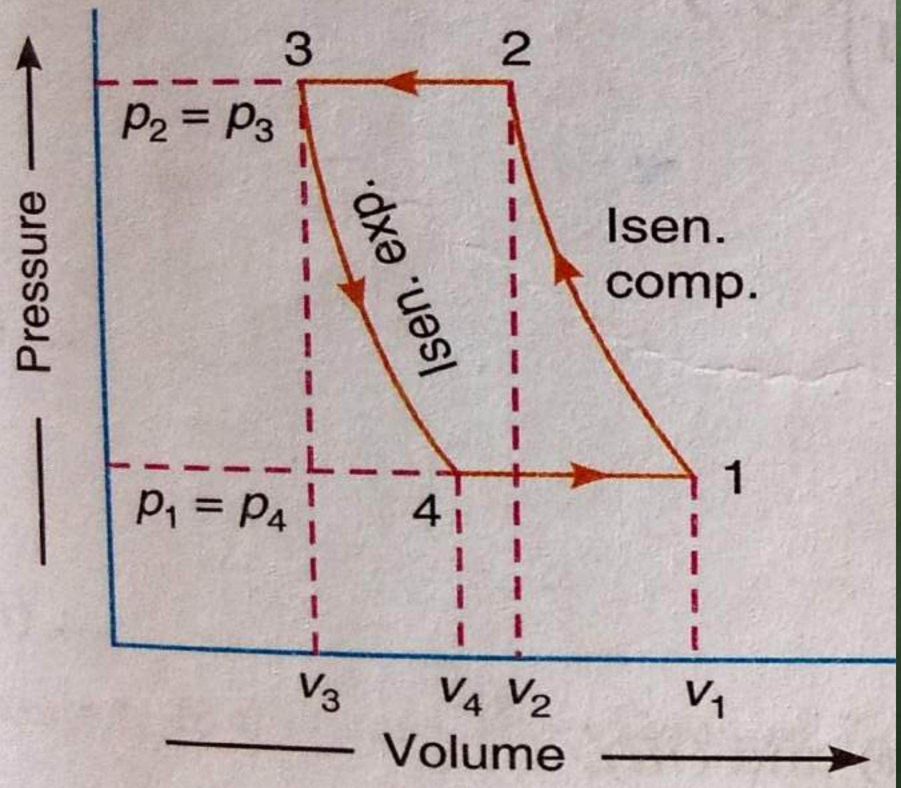
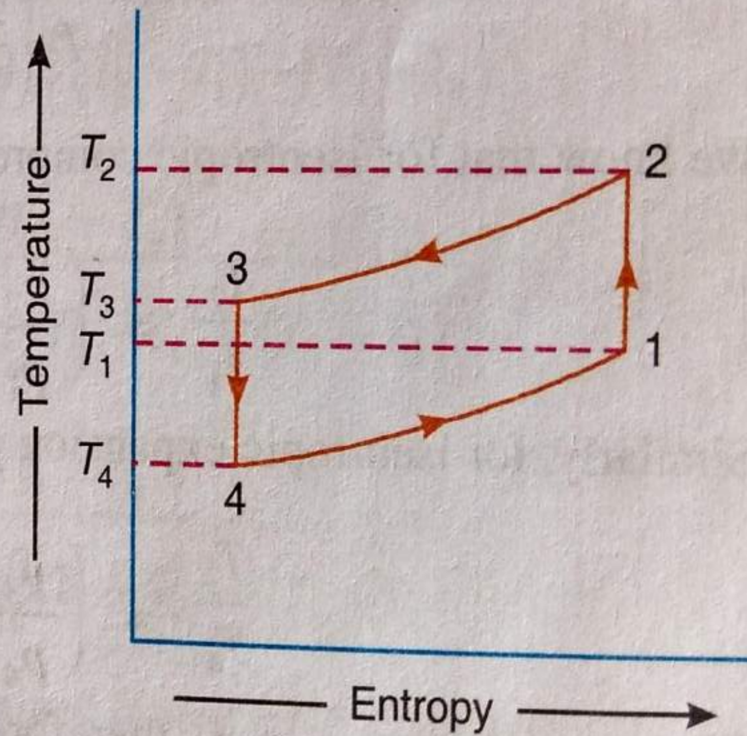


Fig. 2.8. Closed cycle or dense air Bell-Coleman Refrigerator.

P-V and *T-S* Diagram



(*a*) *p-v* diagram.



(*b*) *T-s* diagram.

The Bell-Coleman cycle

- Isentropic Compression process (1-2)

$$\frac{T_2}{T_1} = \left(\frac{P_2}{P_1}\right)^{\frac{\gamma-1}{\gamma}}$$

- Constant Pressure Cooling process (2-3)

$$Q_{2-3} = C_p(T_2 - T_3)$$

- Isentropic Expansion process (3-4)

$$\frac{T_3}{T_4} = \left(\frac{P_3}{P_4}\right)^{\frac{\gamma-1}{\gamma}}$$

- Constant Pressure Expansion process (4-1)

$$Q_{4-1} = C_p(T_1 - T_4)$$

COP of Bell-Coleman Cycle

$$C.O.P. = \frac{T_4}{T_3 - T_4}$$

$$C.O.P. = \frac{1}{\left(\frac{P_3}{P_4}\right)^{\frac{\gamma-1}{\gamma}} - 1}$$

$$C.O.P. = \frac{1}{\left(r_p\right)^{\frac{\gamma-1}{\gamma}} - 1}$$

- Thank You….