1. Power (Shown): Gas on left expands, absorbing heat isothermally at $T_h$

2. Transfer: Gas pushed into cold side, constant volume, gradually cooled by heat exchanger

3. Compression: Gas on right compresses isothermally at $T_c$

4. Transfer to hot: Gas pushed to hot side, gradual heating

Gradual Heating & Cooling $\rightarrow$ No temp. difference $\rightarrow$ No entropy creation

$\rightarrow$ Cannot efficiency!
Boiling Water:

Pressure stays constant $\Rightarrow$ Gibbs $G(P,T)$
Temperature stays constant
Volume goes up big time.

At constant pressure, Gibbs free energy is minimized. $P_{atm} \Rightarrow T_c = 212^\circ F = 100^\circ C$.

At coexistence, $G_w(P_{atm}, T_c) = G_s(P_{atm}, T_c)$.

\[
G = E - TS + PV = F + PV
\]

\[
\left( \frac{\partial G}{\partial V} \right)_T = \frac{\partial E}{\partial V} + \frac{\partial P}{\partial V} V + P = \frac{\partial P}{\partial V} V
\]

$\Rightarrow$ Maxwell Equal Area

- $P$ (Wednesday)

Phase Boundaries

Adding Heat

Isotherm (Changing $P$)
Steam Tables:

Look up enthalpy \((E+PV = H)\) at point 1
(Coexistence curve: saturated water–steam) \(H_0(T_1)\)

Incompressible water: \(H_2 = H_1\) (No need for water table)

Look up \(H_3(P_3, T_3)\)

Lookup \(S_3(P_3, T_3)\) - set equal to \(S_4\), find mixture
\(\lambda S_w(T_4) + (1-\lambda) S_{steam}(T_4) = S_3(P_3, T_3)\), \(H_4 = \lambda H_w(T_4) + (1-\lambda) H_{steam(T_4)}\)