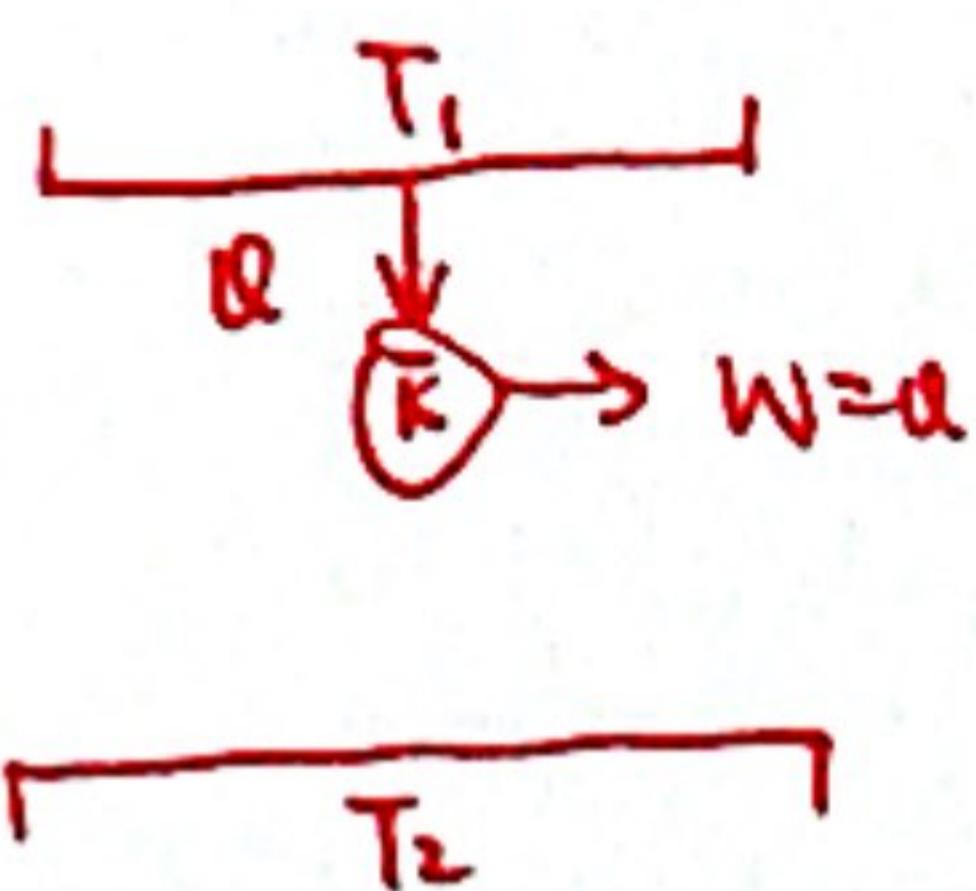


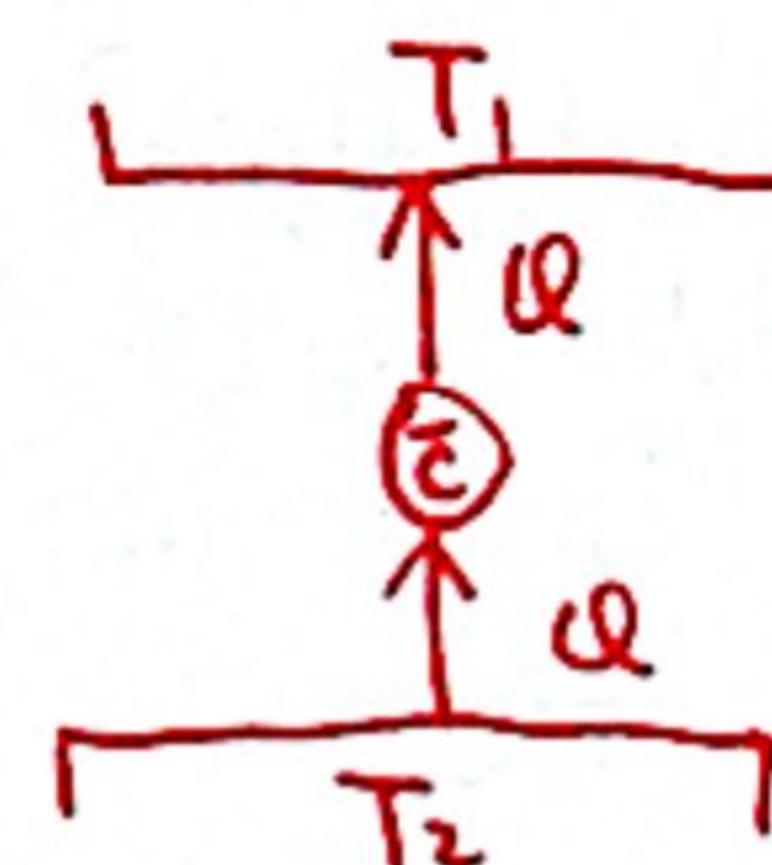
## Equivalence of Clausius and Kelvin statements

Clausius: No process is possible whose sole effect is the transfer of heat from a colder to a hotter body.

Kelvin: No process is possible whose sole effect is to extract heat from a single reservoir and convert it into an equivalent amount of work.

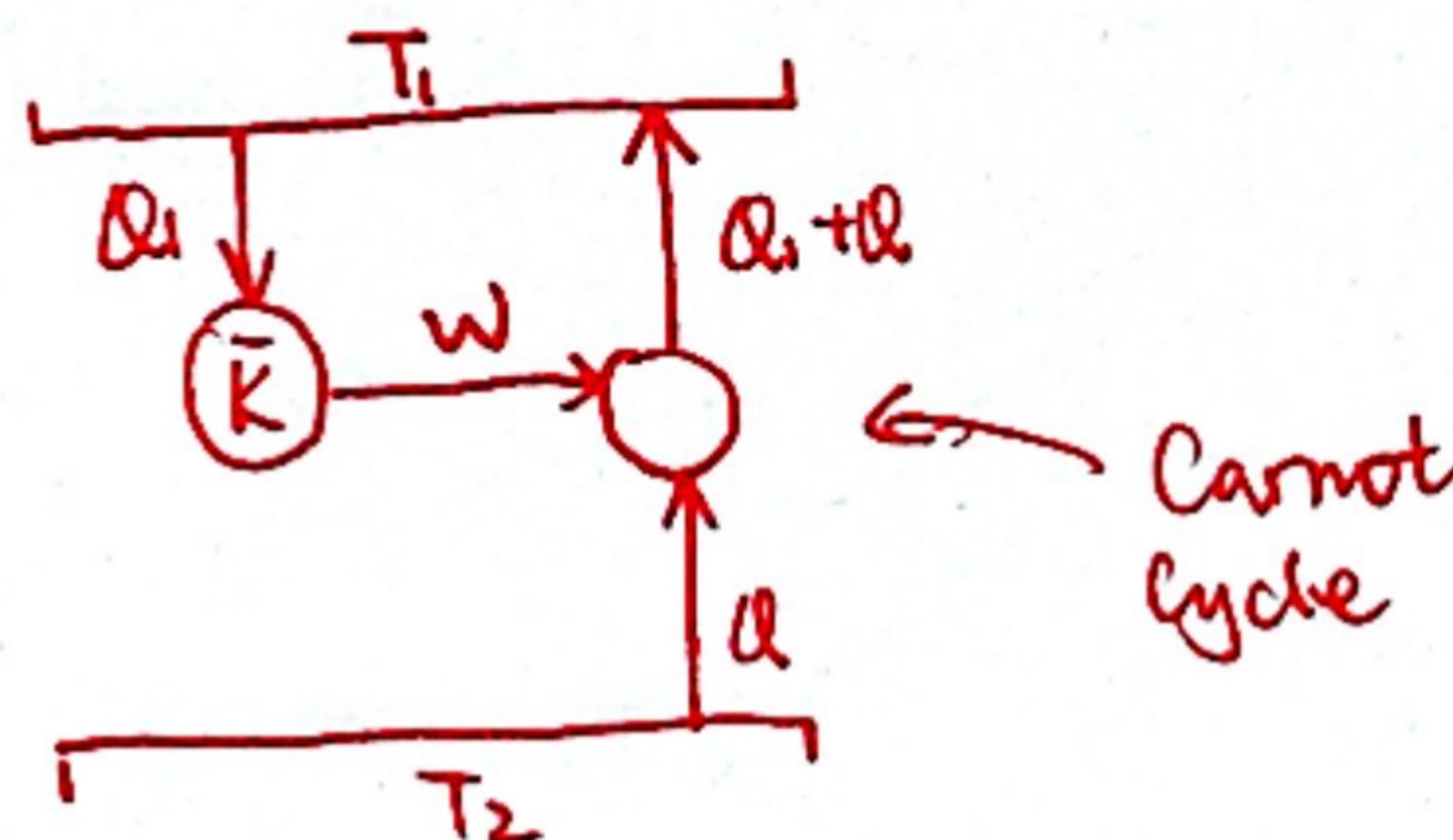


Forbidden by Kelvin statement



Forbidden by Clausius statement.

Clausius to Kelvin

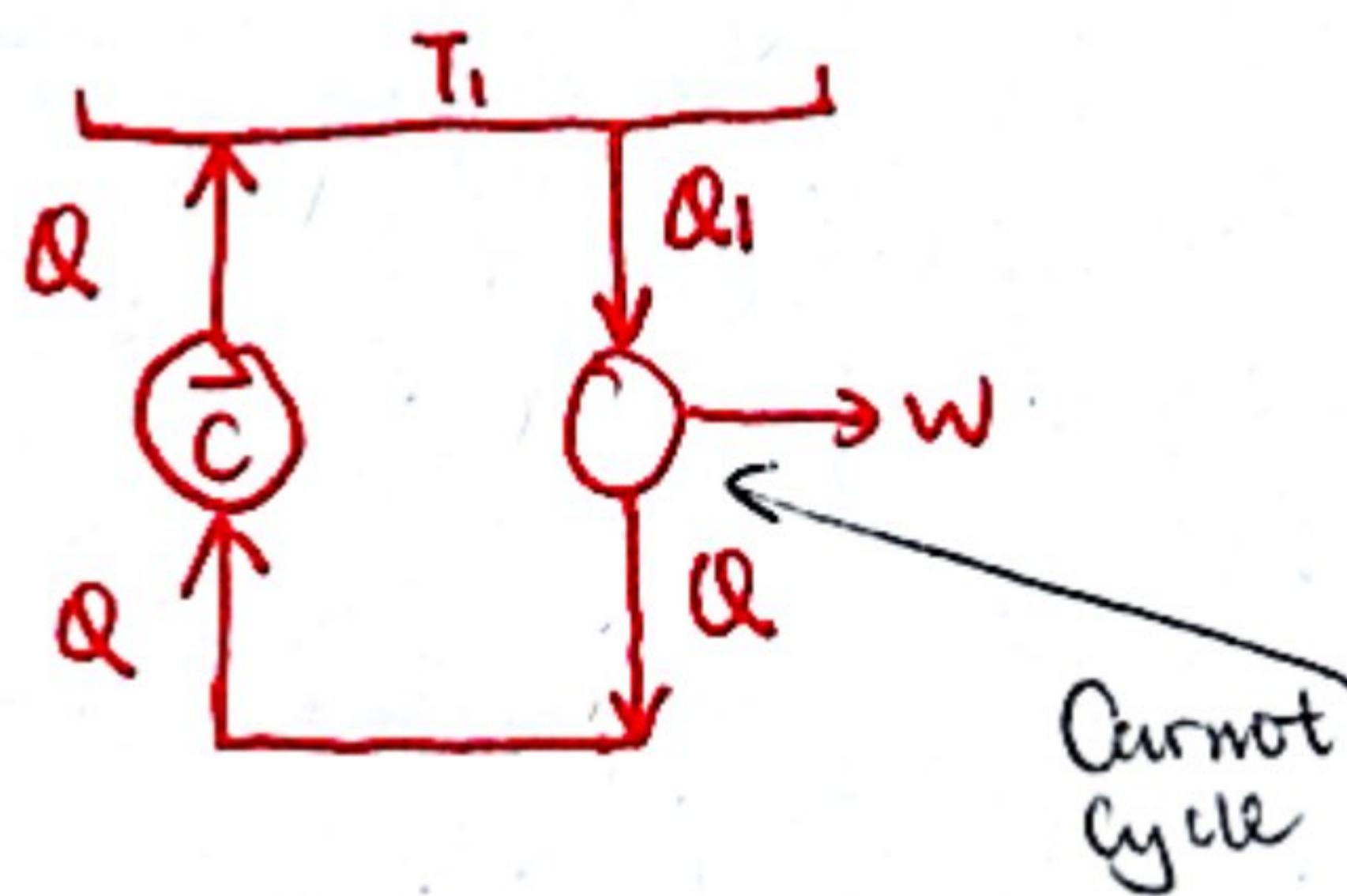


- Clausius states the net result is impossible. [ $Q_2 : T_2 \rightarrow T_1$ ].

- Carnot cycle is possible.

- Engine  $\bar{K}$  must be impossible.

Kelvin to Clausius



- Kelvin states that the net result is impossible [ $Q_1 = w$ ].

- Carnot cycle is possible

- Engine  $\bar{C}$  must be impossible.