

Newcomen engine: $T_{\text{cold}} \sim 62^\circ\text{F} \sim 300\text{K}$
 $T_{\text{hot}} \sim 100^\circ\text{C} \sim 400\text{K}$

$$\epsilon = 1 - \frac{T_{\text{cold}}}{T_{\text{hot}}} = 25\%$$



max efficiency! doesn't include factors like friction, steam/heat loss, etc.

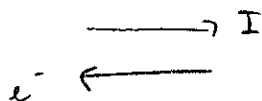
Industrialists realized that they needed a way to break up energy from massive steam engines + distribute it on a large scale.



Electricity!

(see slides)

* current = flow of electrons. "positive current" = e^- flowing in other direction



* Chronologically: battery \rightarrow motor \rightarrow generator

boom in electricity commercialization: late 1800s

* Energy Source Usage:

Coal \rightarrow external combustion to boil water to make steam

\rightarrow coal + water is heavy \Rightarrow not used for transportation

\rightarrow steam turns turbines to generate electricity

* Half of the fuel we used is turned into heat (waste)