Newcomen engine: 
\[ T_{\text{old}} \sim 62^\circ F \sim 300 \text{K} \]
\[ T_{\text{old}} \sim 100^\circ C \sim 400 \text{K} \]
\[ e = 1 - \frac{T_{\text{old}}}{T_{\text{hot}}} = 25\% \]

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 and distribute it on a large scale.

Electricity!

(see slides)

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

... I

... e⁻

Chronologically: battery → motor → generator

Boom in electricity commercialization: late 1800s

* Energy Source Usage:

Coal → external combustion to boil water to make steam

... coal + water is heavy → not used for transportation

... steam turns turbines to generate electricity

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