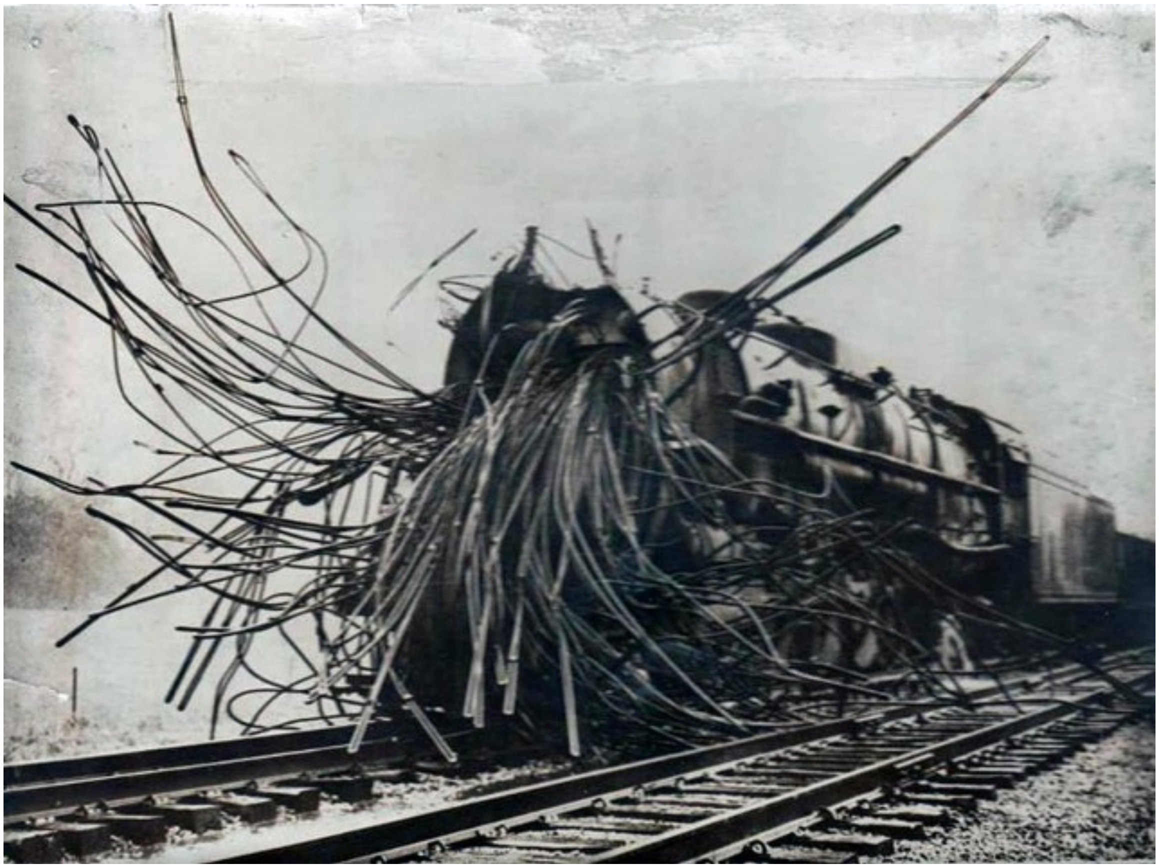

Entropy change for an incompressible substance

(Mythbusters hot water heater "rocket":
https://www.youtube.com/watch?v=jbreKn4PoAc)

From the *T-ds* relations

$$Tds = du + pdv$$

For an incompressible substance

$dv = 0$ and $du = c(T)dT$

For the incompressible substance model

- Liquids and solids are often approximated as being incompressible.
- v = constant
- $c(T)$, $u = u(T)$, $h = h(T, p)$, $s = s(T)$
- $u(T_2) - u(T_1) = \int_{T_1}^{T_2} c(T)dT$
- $h(T_2, p_2) - h(T_1, p_1) = u(T_2) - u(T_1) + (p_2 - p_1)v$
- $s(T_2) - s(T_1) = \int_{T_1}^{T_2} c(T)\frac{dT}{T}$

If the temperature range isn't too large, then it's reasonable to assume $c \approx$ constant,

- $u(T_2) - u(T_1) \approx c(T_2 - T_1)$
- $h(T_2, p_2) - h(T_1, p_1) \approx c(T_2 - T_1) + (p_2 - p_1)v$
- $s(T_2) - s(T_1) \approx cln\left(\frac{T_2}{T_1}\right)$