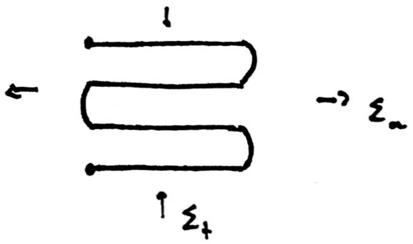
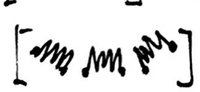
- Most commonly used is advance or constantan w/ $S_a \sim 2.1$
  - → 45% Ni, 55% Cu is nice because of linear for elastic $\varepsilon$ and even into plastic
  - → High "$\rho$" and insensitive to $\Delta T$
- Gage Construction
  - → needs to be relatively long (~ 0.1 m) but we want $\varepsilon$ at a specific location
  - → Put onto grid pattern




- ·1930's Ruge / Simmons : wire on paper
- ·1950's Sanders & Roe : photo etched on metallic foil
  normally bonded to plastic for durability & insulation

  - → need special appreciation for bonding to ~~specimine~~ specimin
  - → $L_{gage} \in [200\,\mu m,\ 100\,mm]$
- Arrays
  - → Linear Array :  for capturing a line of $\varepsilon$
  - → Rosettes
    - + 90° Rosette :  if we know principal strain
    - + 45° Rosette :  & 60° 
- Gage Sensitivity and Gage Factor
  - → using a grid adds transverse component "$\varepsilon_t$" which we don't want to measure
  - → $S_A = \dfrac{dR/R}{\varepsilon} \approx \dfrac{\Delta R/R}{\varepsilon}$ must be transformed for biaxial strain
  - → $\Delta R/R = \underbrace{S_a\varepsilon_a}_{\text{Axial Sensitivity}} + \underbrace{S_t\varepsilon_t}_{\text{Transverse Sensitivity}} + \underbrace{\cancel{S_s\gamma_{at}}^{0}}_{\text{Shear sensitivity}} = S_a(\varepsilon_a + K_t\varepsilon_t)$ ; $\varepsilon_t = -\nu\varepsilon_a$

    "$K_t = S_t/S_a$" or transverse sensitivity factor
  - → $S_g$ = Gage factor

$$\Delta R/R = S_g\varepsilon_a = S_a\varepsilon_a(1-\nu K_t) \;;\; S_g = S_a(1-\nu K_t) \quad \text{w/ } [S_g, S_a, K_t] \in \begin{bmatrix} 1.96 \to 2.13, \\ 1.93 \to 2.14 \\ -4.2 \to +1.8 \end{bmatrix}$$

- Error comes from only considering axial strain, knowing there is some transverse strain

$$\Delta R/R = \frac{S_g \varepsilon_a}{1-\nu K_t}\left(1 + K_t \frac{\varepsilon_t}{\varepsilon_a}\right) \rightarrow \varepsilon_a = \frac{\Delta R/R}{S_g}\,\frac{1-\nu K_t}{1+K_t(\varepsilon_t/\varepsilon_a)}$$ is true axial strain

apparent $$\varepsilon_a' = \frac{\Delta R/R}{S_g} \rightarrow \varepsilon_a = \varepsilon_a' \,\frac{1-\nu K_t}{1+K_t\,(\varepsilon_t/\varepsilon_a)}$$

so that % error from neglecting transverse component

$$\mathcal{E} = \frac{\varepsilon_a - \varepsilon_a'}{\varepsilon_a}(100) = \frac{K_t\,(\varepsilon_t/\varepsilon_a + \nu)}{1-\nu K_t}$$ ?

$\varepsilon_t/\varepsilon_a$ is a prescribed value from problem; independent of $\nu$