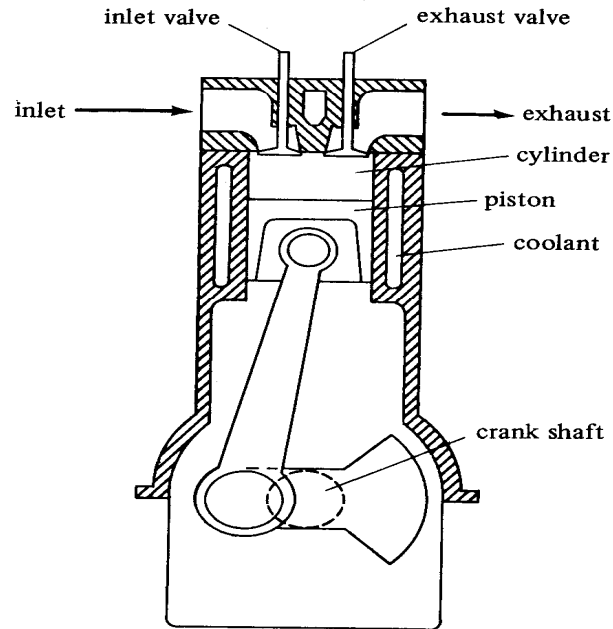


# Compression of a Gas



- The PdV- Work done on or by a gas is

$$W = \int PdV$$

# Quasistatic or Quasiequilibrium Compression

- Quasiequilibrium  
All states through which the system passes may be considered equilibrium states.
- Polytropic process  
Relationship between pressure and volume can be expressed as

$$PV^n = C$$

where  $n$  and  $C$  are constants.

# Quasistatic or Quasiequilibrium Compression

- Rearranging the equation

$$PV^n = C$$

$$\ln P + \ln V^n = \ln C$$

$$\ln P = \ln C - n \ln V$$

- This is an equation of a line

$$y = a + mx$$

$$y = \ln P$$

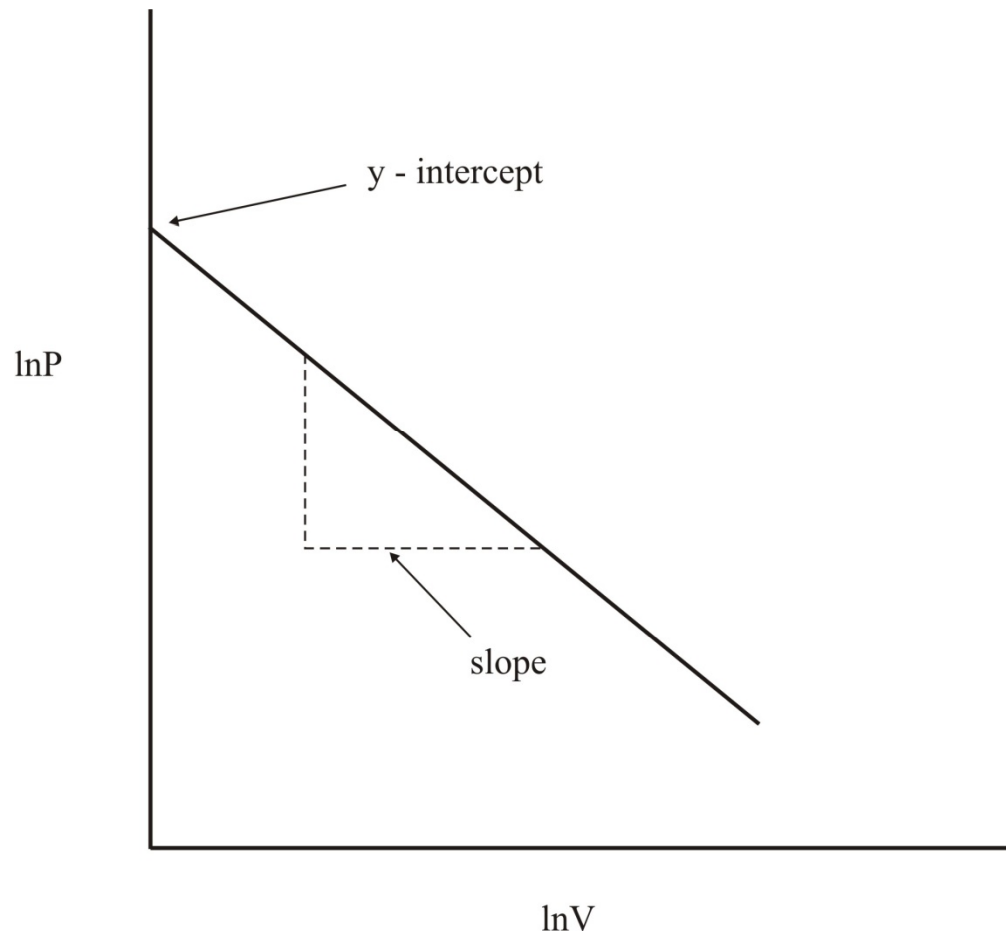
$$b = \ln C \quad (\text{y-intercept})$$

$$m = -n \quad (\text{slope})$$

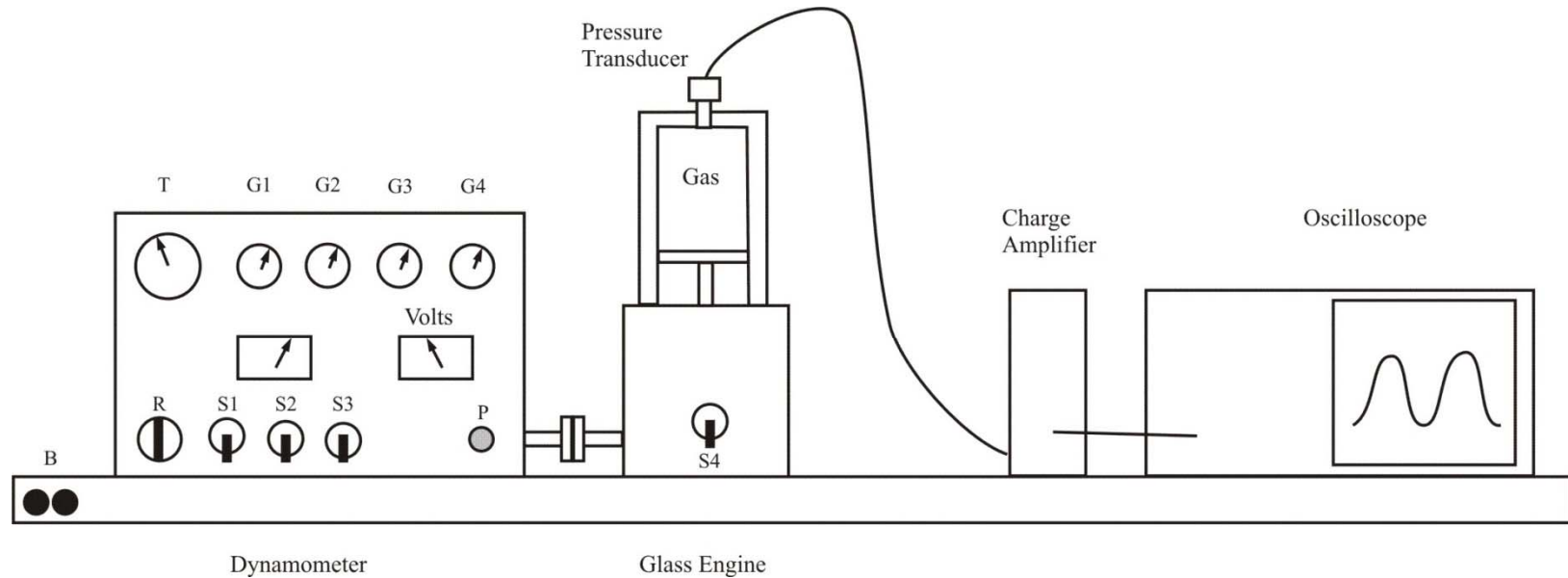
$$x = \ln V$$

# Quasistatic or Quasiequilibrium Compression

- Plot  $\ln P$  versus  $\ln V$

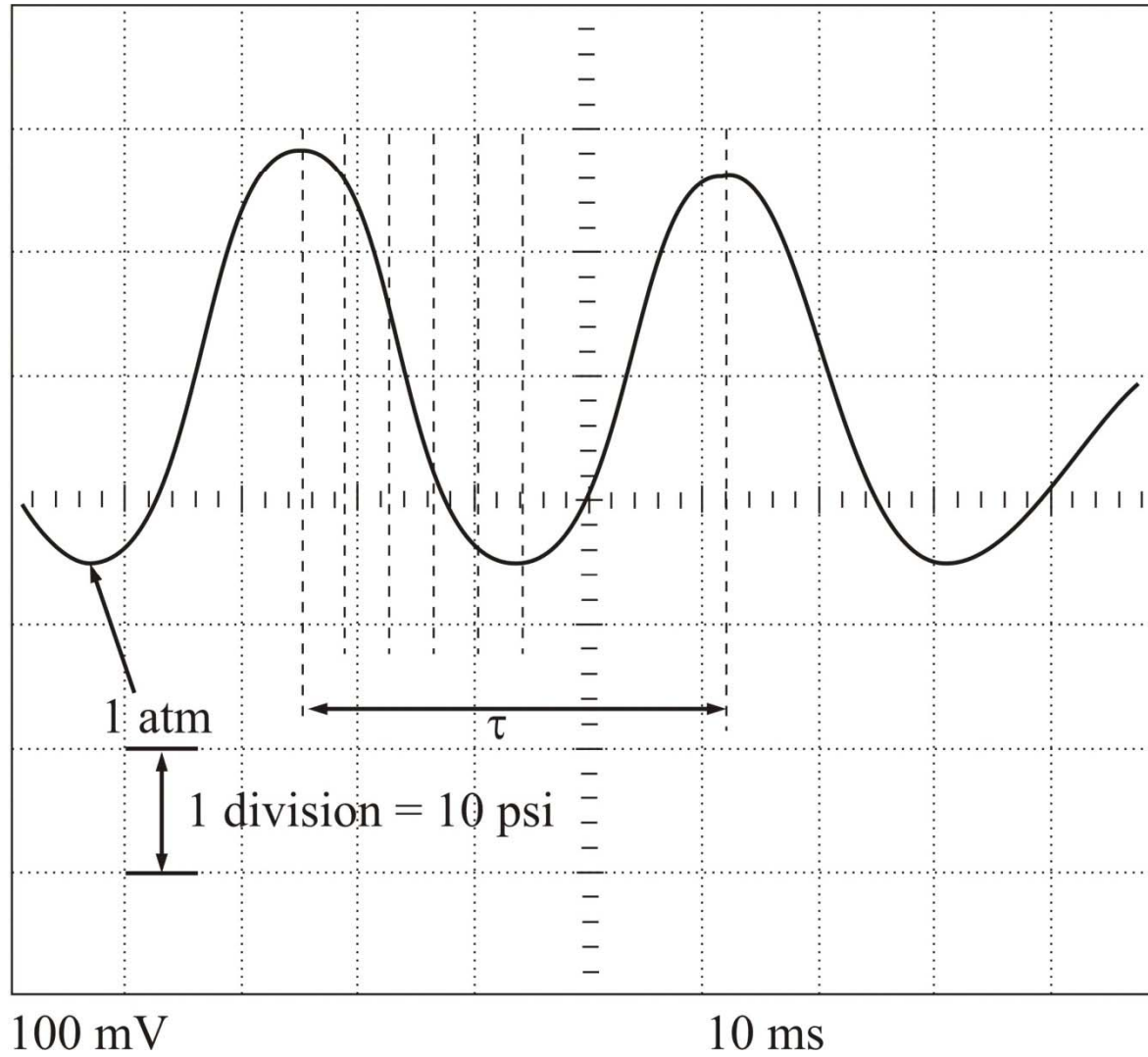


# Experiment Apparatus



- Record pressure-time plot.
- Estimate volume (assume sinusoidal).

# Gas Pressure Trace



# Determination of Polytropic constants

Volume	Pressure
$V_1$	$P_1$
$V_2$	$P_2$
$V_3$	$P_3$
$V_4$	$P_4$

$$PV^n = C$$

$$\ln PV^n = \ln C$$

$$\ln P + \ln V^n = \ln C$$

$$\ln P + n \ln V = \ln C$$

$$\ln P = \ln C - n \ln V$$

$$y = a + mx$$

