A Simple Derivation of General Equations of Energy and Entropy of Gases.—Recently the author,[1] by employing the characteristics of exact differentials, deduced general equations of energy and entropy of gases whose generalized equation of state is

$$p = T\Psi(v) - \Phi(v) - F(v,T) \tag{1}$$

While this method of derivation[2] is exact, it is rather time consuming. The author has now found that these equations can be directly and very easily deduced by using the following two thermodynamic formulas

$$\left(\frac{\partial s}{\partial v}\right)_T = \left(\frac{\partial p}{\partial T}\right)_v \tag{2}$$

$$\left(\frac{\partial u}{\partial v}\right)_T = T\left(\frac{\partial p}{\partial T}\right)_v - p \tag{3}$$

For, from Equation 1, we have by differentiation at constant volume

$$\frac{\partial p}{\partial T} = \Psi(v) - \frac{\partial F}{\partial T} \tag{4}$$

Substituting Equation 4 into Equation 2 and integrating, we get

$$S = \int \Psi(v)\mathrm{d}v - \int \frac{\partial F}{\partial T}\,\mathrm{d}v + \beta(T) \tag{5}$$

which is the general equation of entropy. Substituting Equations 1 and 4 into Equation 3 and integrating, we get

$$u = \int \Phi(v)\mathrm{d}v + \int \left[F - T\frac{\partial F}{\partial T}\right]\mathrm{d}v + \alpha(T) \tag{6}$$

which is the general equation of energy. The general applicability of Equations 5 and 6 has already been shown.[1]

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[1] Huang, *Phys. Rev.*, **37**, 1171 (1931).

[2] For the detail of derivation by the method of exact differentials see "Science Reports of National Tsinghua University," First Series, Vol. I, No. 3 (in press).