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Latent Heat of Vaporization

Joseph William Richards

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Dr. JOSEPH W. RICHARDS, of Lehigh University, presented a paper on "the latent heat of vaporization." The metals, as far as they have been tested, pass into monatomic vapors, such as Na, K, Hg, Zn, and Cd, in which each atom represents a molecule. Trouton's rule, which is approximately correct for this case, states that the latent heat of vaporization of atomic weight is proportional to the absolute temperatures of the boiling point at atmospheric pressure, and is numerically equal to about 23 times that temperature, if the external work performed in overcoming the atmospheric pressure is included, or 21 times the absolute temperature of the boiling point if the external work is not included. From this rule we can estimate the amount of heat necessary to vaporize any metal the boiling point of which under atmospheric pressure is known.

Metallurgists, however, are often interested in the total heat

contained in the vapor when escaping under atmospheric pressure. This is 33 times the absolute temperature of the boiling point; it is the total heat required to raise the substance to the boiling point and boil it. This follows from the following approximate rules, which are often useful: If T is the temperature of the melting point and T^1 the temperature of the boiling point under atmospheric pressure, then the heat required to heat one molecule of the substance up to the melting point is 8T, the latent heat of melting is 2T, the heat raising the temperature from melting to boiling point is approximately 10 $(T^1 - T)$, the latent heat of boiling $23T^1$, hence total, by addition, $33T^1$; meaning in every case kilogram-calories per kilogram-molecule.