face tensions. Another relationship, proposed by Strauss (*37*), is very similar to that shown in Fig. 10.

The value of all such relationships depends on the reliability of the experimental data on which they are based. A critical review of all pertinent data from the literature will be published elsewhere.

The straight line of Fig. 10 for cubic or tetragonal metals is given by the equation

$$\sigma_{mp} = 0.274 \left(\frac{\Delta H_{vap}}{V_{at}}\right)^{0.931}$$

or

$$\log \sigma_{mp} = 0.9309 \log \left(\frac{\Delta H_{vap}}{V_{at}}\right) - 0.5623$$

(the logarithms here and in the equations that follow are to the base 10). The relationship for hexagonal and rhombohedral metals is

$$\sigma_{mp} = 5.740 \left(\frac{\Delta H_{vap}}{V_{at}}\right)^{0.620}$$

or

$$\log \sigma_{mp} = 0.6204 \times \log \left(\frac{\Delta H_{vap}}{V_{at}}\right) + 0.7587$$

(σ_{mp} is in dynes per centimeter, ΔH_{vap} is in calories per gram atom, and V_{at} is in cubic centimeters per gram atom, all for the liquid at the melting point.)

At the critical temperature T_c, the surface tension of any substance is zero. It has been shown (*38*) that, at least in first approximation, σ should be a linear function of temperature. If we know T_c (see Table 3) we can readily calculate the temperature coefficient over the whole liquid range:

$$d\sigma/dT = -\sigma_o/T_c = -\sigma_{mp}/(T_c - T_{mp})$$

or

$$d\sigma/dT = -\sigma_T/(T_c - T)$$

where σ_o is the extrapolated surface tension at 0°K and σ_T is the surface tension at any temperature T (see *38* for a table giving $d\sigma/dT$ for 20 metals and for discussion of this relationship).

Nuclear Rocket Reactor

The obvious way to produce rocket thrust with a high specific impulse is to use atomic energy and operate a nuclear reactor containing the critical mass of fissionable material in the form of a "liquid pipe," as illustrated in Figs. 5 and 6; then to bubble or blow hydrogen gas radially through the liquid metal to heat the gas to as high a temperature as possible and then allow the atomic hydrogen to expand through the rocket nozzle. The thickness, diameter, and length of the "liquid pipe" can be varied to suit the design requirements.

The first step toward realization of this goal should be the study of the chemistry (at as high a temperature as is now experimentally possible) of appropriate metals with various refractory oxides, carbides, nitrides, sulfides, and other substances useful for such a nuclear program (*39*).

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