

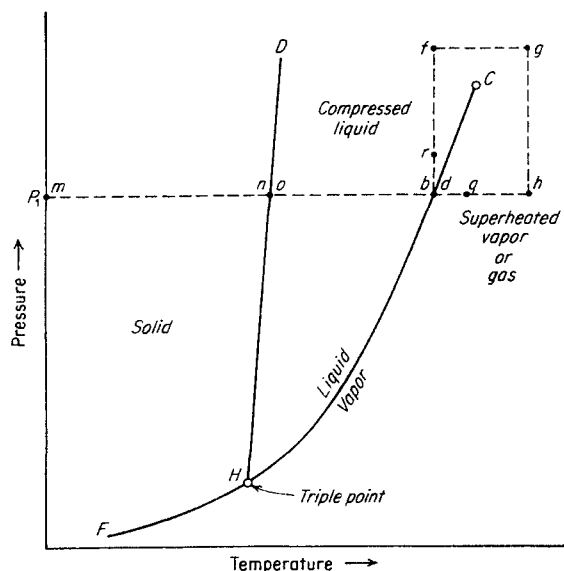


Fig. 3-2. Pressure-temperature diagram.

The conditions at which vapor and liquid may coexist are represented in Fig. 3-1 as the area $HbCdI$. The surface is "ruled"; that is, the lines generating the surface are all parallel to the base of the figure. The projection of CbH or CdI on a pressure-temperature plane becomes a single curve (HC of Fig. 3-2) known as the vapor-pressure curve. The two-phase surface $BDHG$ for solid and liquid is ruled likewise, and projects as curve HD in Fig. 3-2. The solid-vapor surface projects as HF . Consider methane in the solid state at m , and increase its temperature at constant pressure P_1 . At n , liquid begins to form and, upon the addition of heat at constant temperature and pressure, the methane will become all liquid at o . Further temperature rise is accompanied by the formation of a less dense fluid phase at b , called vapor. Vaporization takes place at constant temperature until at d it is completed. Temperature rise beyond d to g simply causes the volume to increase without any phase change.

At the triple point H all three phases coexist; only at this single temperature and pressure can one have three phases together at equilibrium for a pure compound.

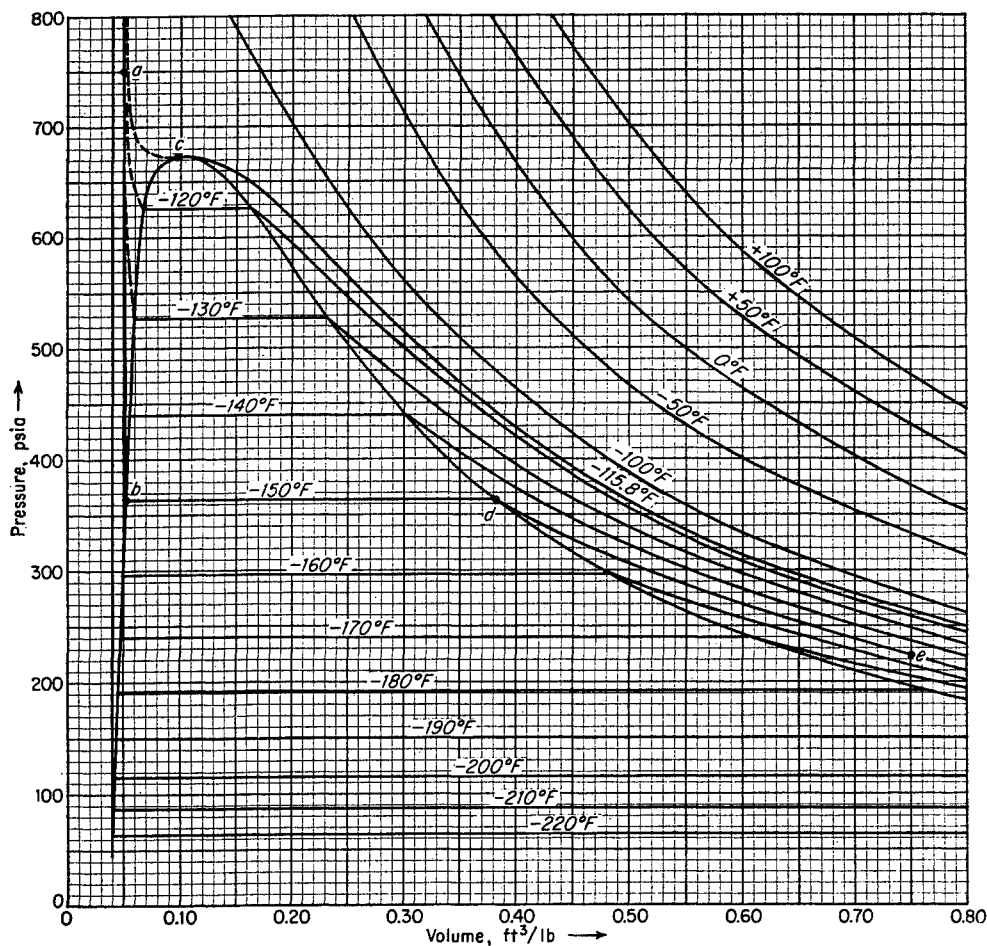


Fig. 3-3. Pressure-volume diagram for methane. (Data from Matthews and Hurd, 3-42.)