

Problem 312A

Consider the steady frictionless flow of a perfect gas through a pipe of constant, uniform cross-sectional area. Heat is added to this flow through the pipe walls so that the total temperature, T_0 , of the gas increases by an amount dT_0 over a small length of the pipe. Find a relation for the correspondingly small change in the Mach number (denoted by dM) in terms of dT_0 , the Mach number, M , and the temperature, T , of the flow. The expression also contains the ratio of the specific heats, γ . [The total temperature, T_0 , is defined as the total enthalpy divided by C_P .]