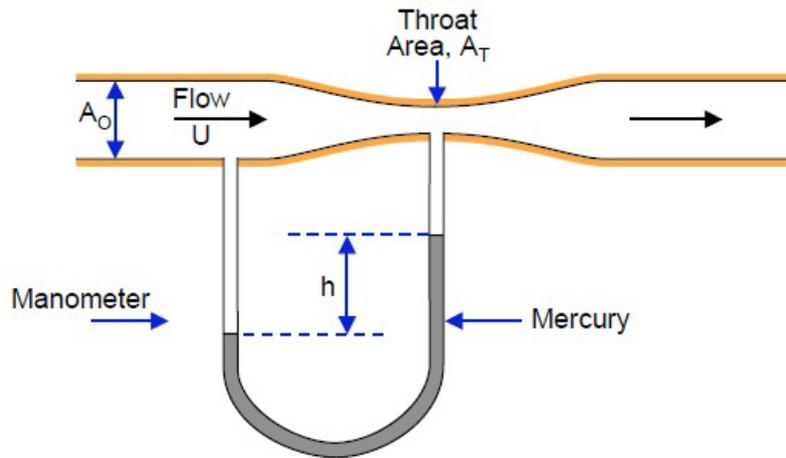


Problem 220K

The following device, known as a Venturi meter, is used to measure the flow rate of water in a pipe of cross-sectional area A_0 . A convergent/divergent nozzle with a throat area A_T is installed in the pipe:



Pressure taps are located upstream of the nozzle and at the throat; these are connected to a water/mercury manometer as shown. When the water is flowing through the device, the manometer levels differ by an elevation, h . Neglecting viscous effects, find the formula which should be used to determine the flow rate, $Q = UA_0$, from the measured value of h . Denote the densities of water and mercury by ρ_W and ρ_M and gravity by g .