Reversible heat exchange

Consider a rigid, insulating box with two compartments of volumes $V_1$ and $V_2$ separated by an internal wall. Each compartment contains $N$ atoms of a monatomic classical ideal gas $[pV = Nk_B T, C_V = \frac{3}{2} N k_B]$ in equilibrium at the same pressure.

(a) Find the maximum work, $\Delta W(T_1, T_2, N)$, that can be extracted from this system by any means that keep the box rigid and insulating.

(b) Design a reversible process that employs the internal wall, which is movable by an external agent in a controlled manner and which can be switched between heat-conducting and insulating modes.

Solution: