conducted away from one element must go into another, the total energy change by conduction is zero. The work done by the motion of the walls does not vanish exactly. However, the displacement of the walls is proportional to the electron density differences; since the pressure differences are also infinitesimal, the actual work performed is quadratically small. Thus the energy change introduced by changing the charge distribution remains, to the first order, $2\varepsilon E_{pot}$. We also observe that the entropy change due to heat conduction described above is infinitesimal to second order, since both the amount of heat conducted and the temperature differences are infinitesimals of the first order.

In order to arrive at the same configuration reached by the similarity transformation, the volume must now be readjusted. This is done by a volume increase $(1+\rho)^3$. In this process, the entropy will be kept constant. At the same time, however, the energy of the system will decrease by an amount equal to the pressure multiplied by the volume change, i.e., by $p(3\rho v)$. Thus the total energy change is $2\varepsilon E_{pot} - 3\rho Pv$. Equating this with η times the original total energy we obtain

$$2\varepsilon E_{pot} - 3\rho Pv = \eta\,(E_{pot} + E_{kin})$$

Using Eq. (30) and (31) to express η and ρ in terms of ε we finally have

$$2\varepsilon E_{pot} + 6\varepsilon Pv = 4\varepsilon(E_{pot} + E_{kin})$$

or

$$E_{pot} + 2E_{kin} = 3\,Pv \tag{29}$$

The reasoning which has just been described can be applied equally to calculations with and without exchange effects. The reason is that the exchange energy, as all other potential energies, is proportional to e^2/r.