maintained. This term represents the kinetic energy of the vertical motions in the two channels of length $x + y$ through which the heavy fluid of density ρ moves downwards and the light fluid of density σ moves upwards. The expression of this kinetic energy is given by two terms similar to expression (5) of the previous memorandum, rewritten with new notations. The expression of the kinetic energy is

$$T = \frac{\lambda}{6}\left(\rho + \sigma \frac{y}{x}\right) y \dot{x}^2 + \frac{\lambda}{6}\left(\sigma + \rho \frac{x}{y}\right) x \dot{y}^2 + \frac{\lambda}{6}(\rho x + \sigma y)\, \dot{x}\, \dot{y}. \tag{1}$$

The potential energy U is given by

$$U = -\frac{\lambda(\rho - \sigma)}{2} g\, x\, y. \tag{2}$$

The Lagrangean equations corresponding to (1) and (2) can be written immediately. One of them is

$$\left(2\rho y + 2\sigma \frac{y^2}{x}\right) \ddot{x} + (\rho x + \sigma y)\, \ddot{y} - \sigma \frac{y^2}{x^2}\, \dot{x}^2 + \left(2\rho + 4\frac{\sigma y}{x}\right) \dot{y}\, \dot{x} - 2\rho \frac{x}{y}\, \dot{y}^2 -$$

$$- 3\, g(\rho - \sigma)\, y = 0. \tag{3}$$

The other Lagrangean equation is obtained by interchanging in (3) x and y and also ρ and σ in all terms except the last. Instead of using the two Lagrangean equations, we may, however, use equation (3) and the energy equation

$$T + U = 0. \tag{4}$$

The total energy is taken to be zero because we assume that the system starts with zero velocity and with a flat horizontal interface. By a suitable change of the scales of x, y, and t, it is possible to write the equations (3) and (4) in a form in which ρ, σ and g do not appear. This is done by the following transformations