When the amplitude of the wave is very large it is evident that the kinetic energy is due primarily to the vertical component of the liquid velocity inside the domain BDEB'. The corresponding kinetic energy can be computed easily on the assumption that the vertical component of the velocity is constant on each horizontal section of BDEB'. One finds that this part of the kinetic energy is given by

$$T_1 = \frac{a^3\dot{x}^2}{6x(1-x)} \tag{5}$$

For small and moderate amplitudes of the wave, additional terms in the kinetic energy become important. One of them is the kinetic energy due to the horizontal component of the motion of the liquid BDEB'. This term of the kinetic energy is given approximately by

$$T_2 = \frac{ax\dot{x}^2}{6(1-x)} \tag{6}$$

Finally, the kinetic energy due to the motion of the liquid above the line AB' should be estimated. An approximate expression for this term of the kinetic energy yields

$$T_3 = \frac{\pi}{4}\frac{a^2\dot{x}^2}{(1-x)^2} + \frac{\pi}{2}\frac{ax\dot{a}\dot{x}}{1-x} + \frac{\pi}{4}x^2\dot{a}^2 \tag{7}$$

The kinetic energy is the sum of the three terms (5), (6), (7)

$$T = T_1 + T_2 + T_3 \tag{8}$$

As pointed out, the leading term at high amplitude is the first. For low amplitude all the three terms need to be considered.

Using the expressions (4) and (8) for potential and kinetic energy, one can write the Lagrange equations (3). That enables one to express the second time derivatives x and a in terms of x, a, $\dot{x}$, $\dot{a}$. One finds

$$\ddot{x} = \frac{ED-FB}{AD-BC}, \quad \ddot{a} = \frac{AF-EC}{AD-BC} \tag{9}$$

where