The initial point is P and the arrow indicates the direction of increasing time. As time increases q becomes positive infinite and r converges to the value 3/5. One can now find without trouble the following asymptotic expressions

$$x \longrightarrow \left.\begin{array}{l} \frac{1}{2}\frac{8}{7} g \frac{\rho - \sigma}{\rho} t^2 \\ y \sim t^{1/2} \end{array}\right\} . \tag{12}$$

The first of these equations indicates that the heavy fluid moves into the light fluid with uniformly accelerated motion, as was found to be the case when $\sigma = 0$. The acceleration is $8/7\ g\ (\rho - \sigma)/\rho$. Presumably the factor $8/7$ in front of the expression should not be there in a more correct theory because the same factor was obtained also when $\sigma = 0$, in which case one would expect a free fall with acceleration g. We may, therefore, conclude tentatively that the heavy liquid should penetrate the light liquid with an acceleration

$$g \frac{\rho - \sigma}{\rho} . \tag{13}$$

Again we find that a bubble of the light liquid rises much more slowly into the heavy liquid. The fact that the height of this bubble is proportional to $\sqrt{t}$ and not to t is presumably due to the inaccuracy of the model.

Conclusions

The present discussion makes it appear likely that the features of the Taylor instability at the interface between two liquids of different density are similar to those corresponding to the case of the boundary between a liquid and a vacuum. The main difference is that according to formula (13) the acceleration describing the fall of the heavy into the light liquid is reduced by the factor $(\rho - \sigma)/\rho$. There is, of course, another phenomenon that has been here