Page 119, equations (3.200)+(3.201)

Combining (3.111) and (3.198) we get:

$$\dot{f} = \dot{u} - s\dot{T} - T\dot{s} = -s\dot{T} - P\dot{v}. \tag{1}$$

From (1) the second equation (3.200) follows immediately. The definition (3.199) gives $\dot{v} = -(1/\rho^2)\dot{\rho}$ and upon combining with (1) the first equation (3.200) follows.

The definitions (3.202) and (3.199) together with (3.194) give:

$$g = \rho\frac{\partial \hat{f}}{\partial \rho} + f = \rho(P/\rho^2) + f = vP + f. \tag{2}$$

Taking time derivative of (2) and substituting from (3.198) we have:

$$\dot{g} = v\dot{P} + P\dot{v} + \dot{f} = v\dot{P} + P\dot{v} - s\dot{T} - P\dot{v} = -s\dot{T} + v\dot{P}$$

which is (3.201).