A further simplification of $W_4$ is obtained by subtracting the hydrostatic value

$$W_4^H(\beta) = \frac{GM}{R}\beta^2 \cdot \frac{8}{35}\left[\left(\frac{3}{2}e^2 - 4\kappa_H\right)D - 3eS + \frac{3}{2}P_H + \frac{4}{3}Q_H\right] \equiv 0 \quad , \qquad (6\text{–}26)$$

noting that $D$ and $S$ are equal in both cases. Thus we get

$$W_4(\beta) = \frac{GM}{R}\beta^2 \cdot \frac{32}{105}\left[-3(\kappa - \kappa_H)D + \frac{9}{8}(P - P_H) + (Q - Q_H)\right] \quad , \qquad (6\text{–}27)$$

where, by (4–56),

$$\frac{9}{8}(P - P_H) = \beta^{-7}\int_0^\beta \delta \frac{d}{d\beta}\left[(\kappa - \kappa_H)\beta^7\right] d\beta \quad , \qquad (6\text{–}28)$$

$$Q - Q_H = \beta^2 \int_\beta^1 \delta \frac{d}{d\beta}\left[(\kappa - \kappa_H)\beta^{-2}\right] d\beta \quad . \qquad (6\text{–}29)$$

## 6.3 Equipotential Surfaces and Surfaces of Constant Density

Denote a surface of constant density, $\rho = \rho_1$, by $S_1$ and a corresponding surface of constant potential, $W = W_1$, by $S_2$. Let the surface $S_1$ be characterized by a value $\beta_1$ such that

$$\rho(\beta_1) = \rho_1 \quad ; \qquad (6\text{–}30)$$

then the constant $W_1$ will be determined by

$$W_0(\beta_1) = W_1 \quad , \qquad (6\text{–}31)$$

the function $W_0(\beta)$ being expressed by (6–24). Thus a surface $S_2$ is made to correspond to each surface $S_1$ (Fig. 6.1).

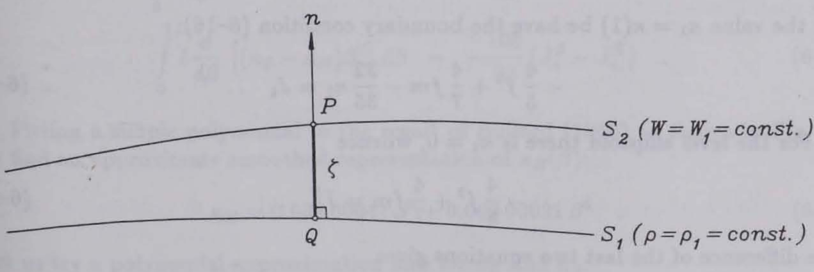


**FIGURE 6.1**: A surface of constant density, $S_1$, and the corresponding surface of constant potential, $S_2$