

FIG. 1

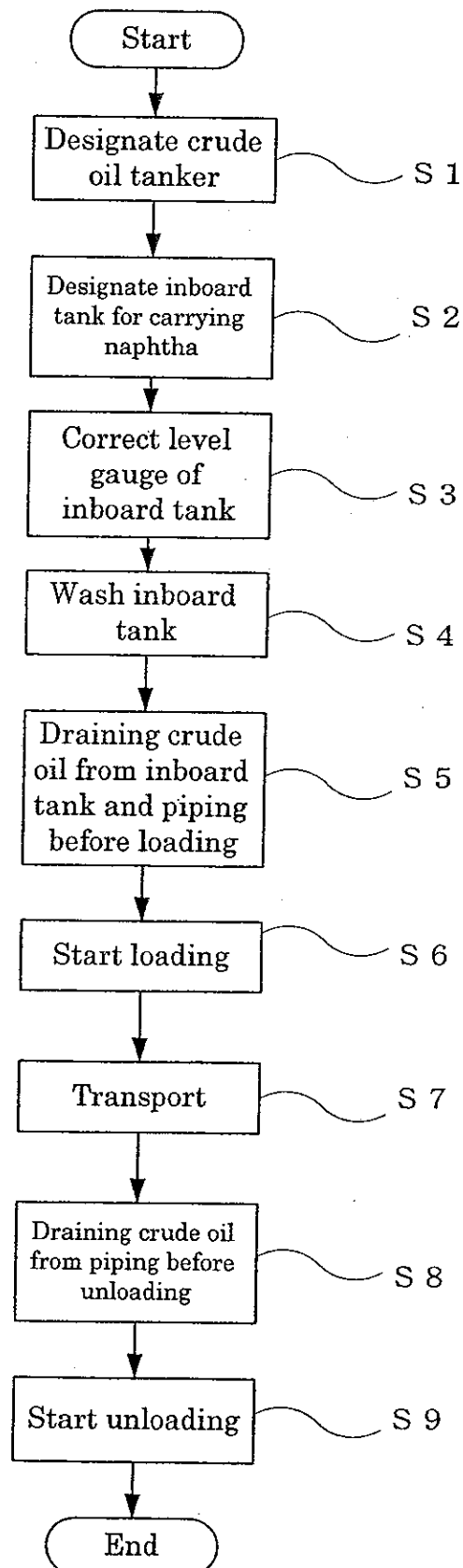


FIG. 2

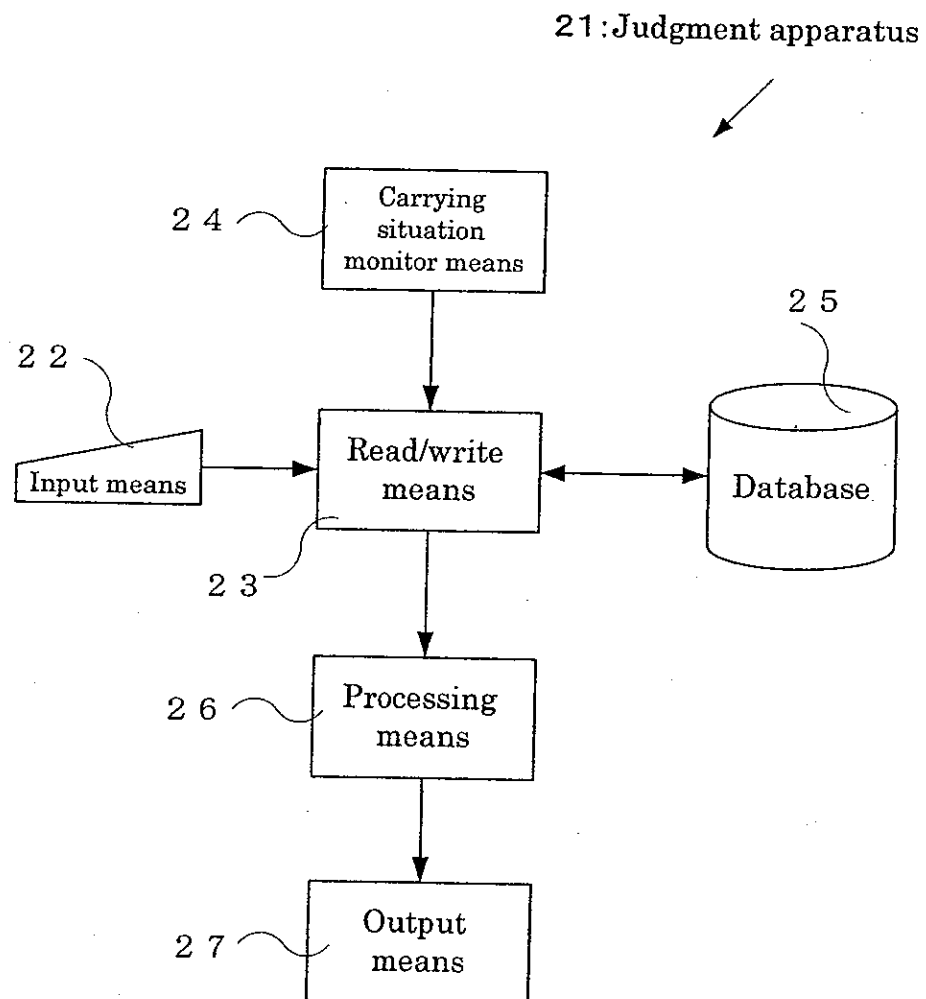


FIG. 3

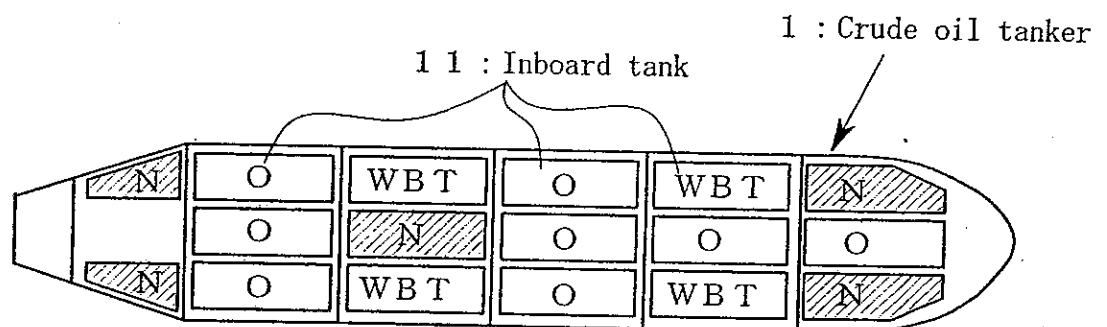


FIG. 4

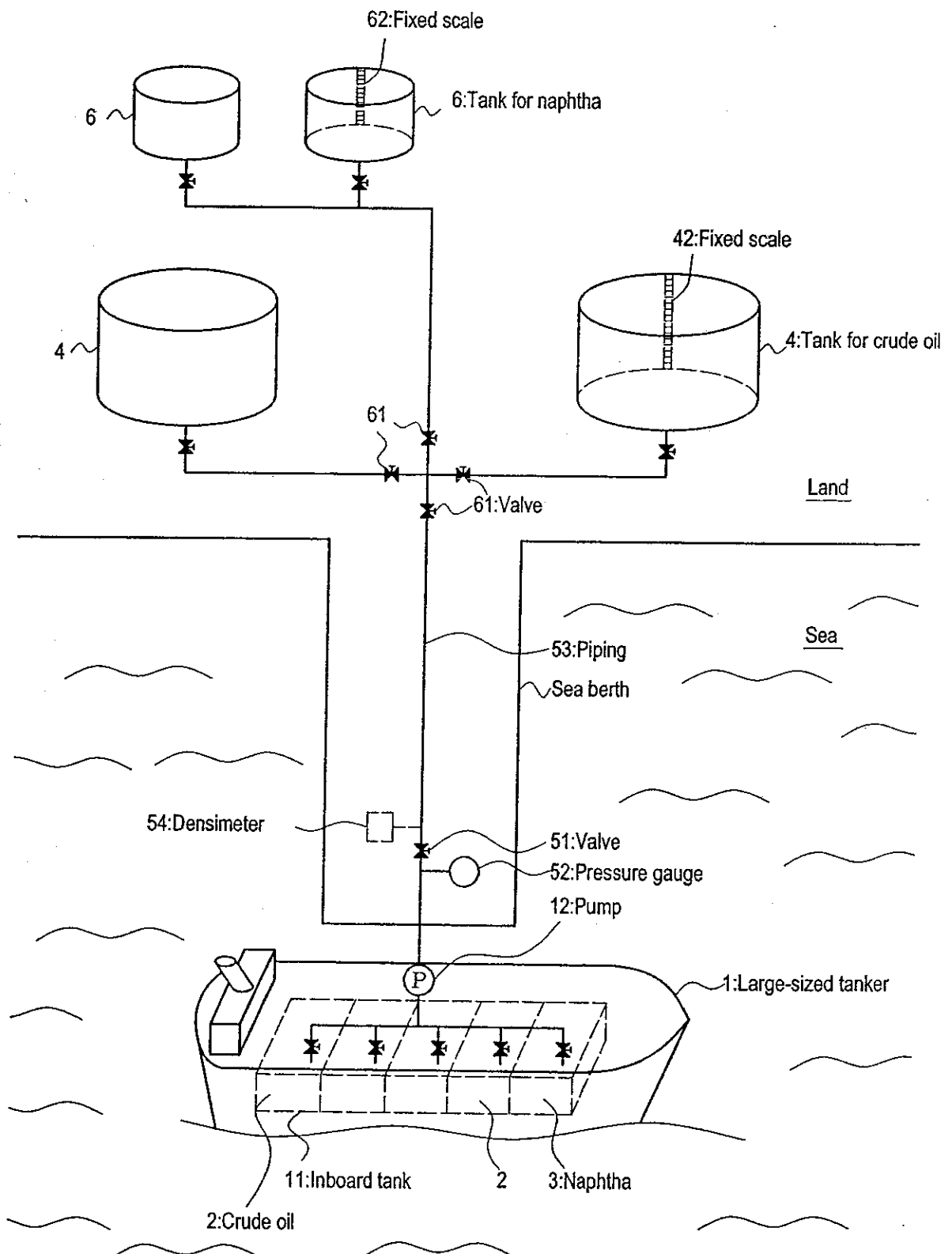


FIG. 5

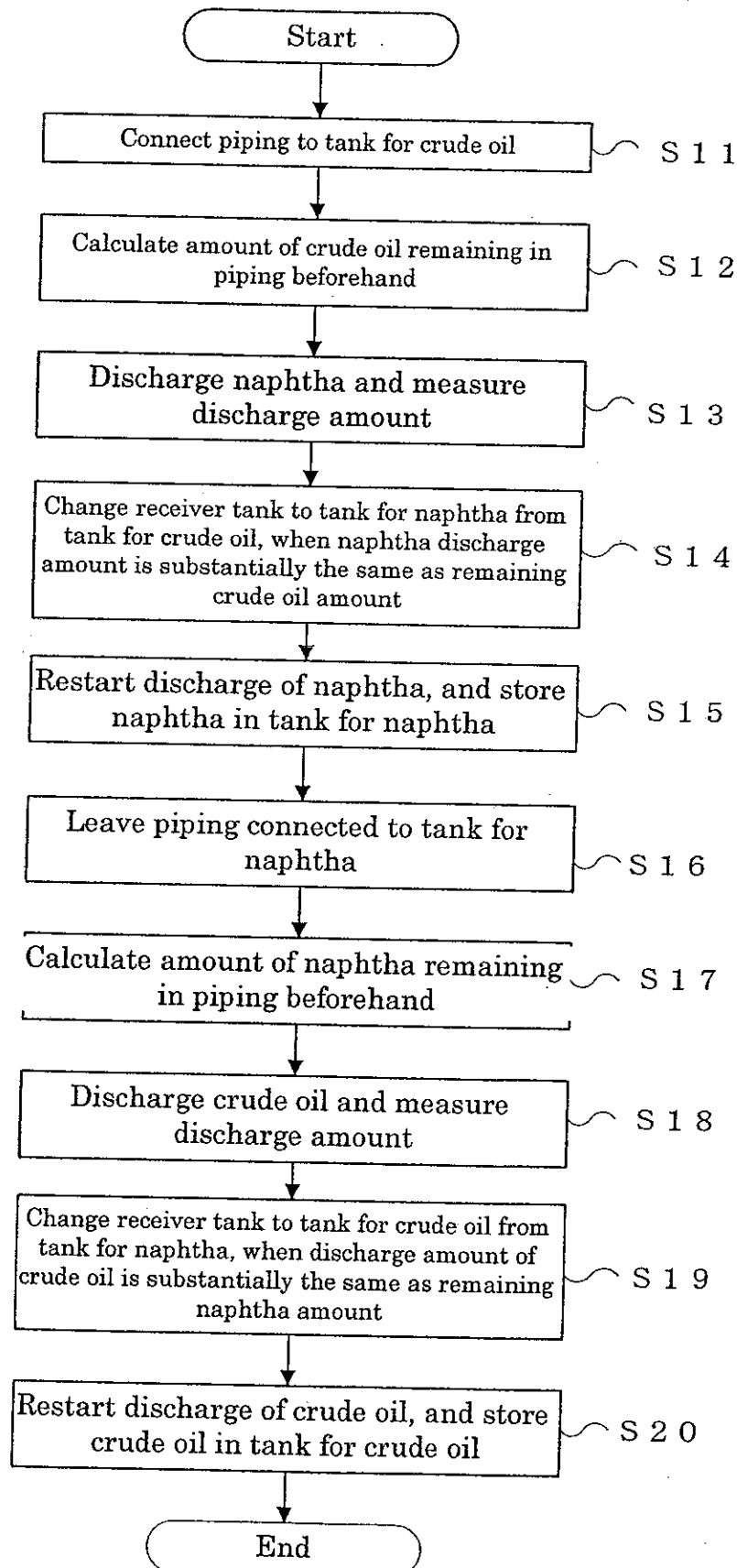


FIG. 6

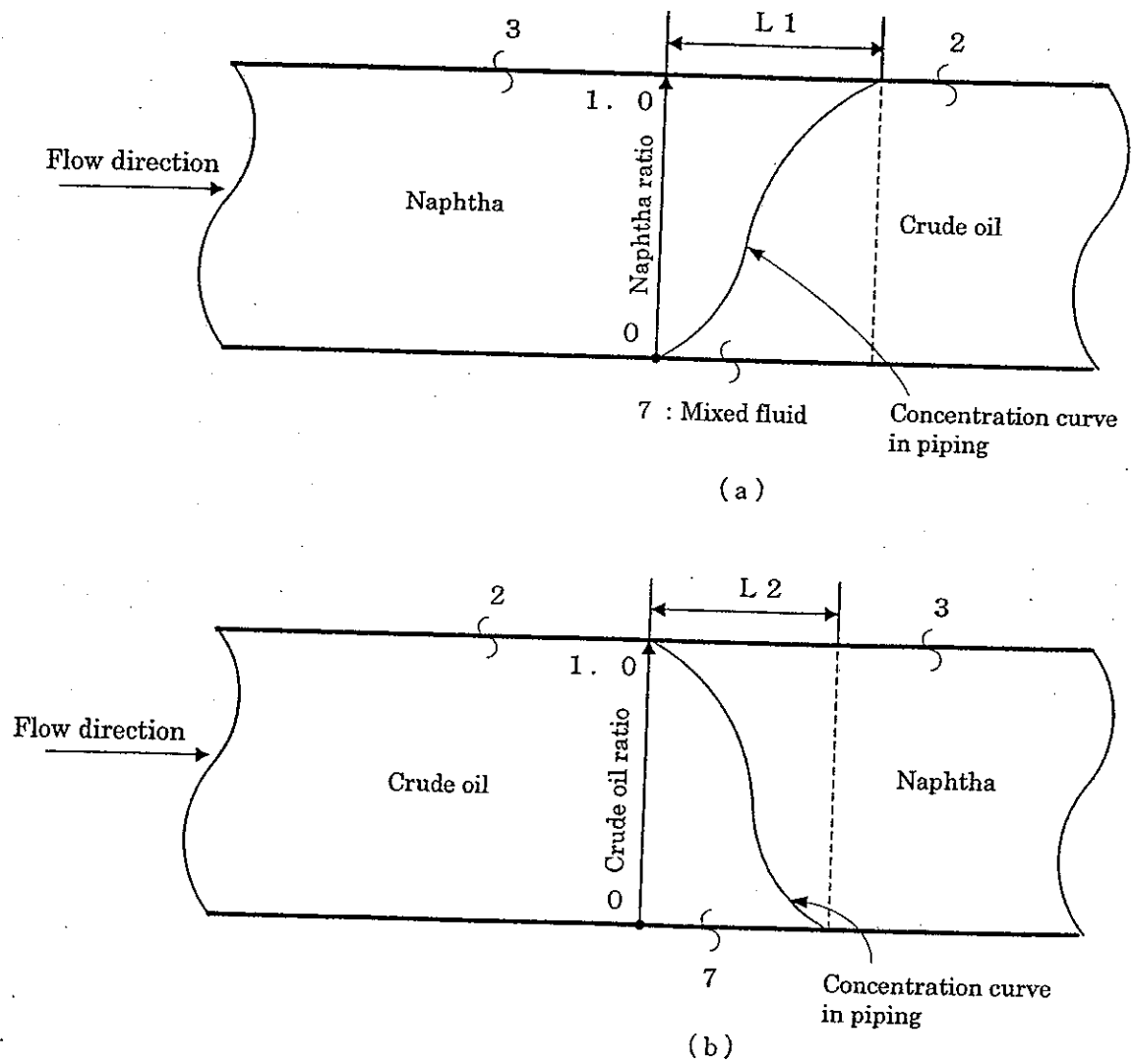


FIG. 7

$\frac{\partial U_i}{\partial x_i} = 0$ $\frac{\partial U_i}{\partial t} + U_j \frac{\partial U_i}{\partial x_j} = -\frac{1}{e} \frac{\partial P}{\partial x_i} + \frac{\partial}{\partial x_j} \left(\nu \frac{\partial U_i}{\partial x_j} - u_i u_j \right) + g_{is}$ $-u_i u_j = \left(\nu \frac{\partial U_i}{\partial x_j} - \frac{\partial U_j}{\partial x_i} \right) - \frac{2}{3} \kappa \delta_{ij}$ $-u_i \phi = \Gamma_i \frac{\partial \phi}{\partial x_i}$ $\frac{\partial C_i}{\partial t} + U_j \frac{\partial C_i}{\partial x_j} = \frac{\partial}{\partial x_i} \left(\lambda \frac{\partial C_i}{\partial x_i} - u_i C_i \right) + S_e$	(1) Continuity equation (2) Momentum equation (3) Turbulence model equation (4) Diffusion equation	U_i: Flow rate component u_i: Speed scholar amount ν: Kinetic viscosity Γ_i: Eddy diffusion coefficient λ: Diffusion coefficient P: Pressure ρ: Density ε: Dissipation ratio k: Turbulent energy β: Buoyancy coefficient C_i: Concentration C_1, C_2, C_3: Empirical coefficient
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$$v_i = C_2 \frac{k^2}{\varepsilon}$$

$$\left. \begin{aligned} \frac{\partial k}{\partial t} + U_j \frac{\partial k}{\partial x_j} &= -\frac{\partial}{\partial x_i} \left[u_i \left(\frac{u_i u_j}{2} + \frac{P}{\rho} \right) \right] - u_i u_j \frac{\partial U_i}{\partial x_j} - \beta g u_i \phi - \nu \frac{\partial u_i}{\partial x_j} \frac{\partial u_i}{\partial x_j} \\ \frac{\partial \varepsilon}{\partial t} + U_j \frac{\partial \varepsilon}{\partial x_j} &= \frac{\partial}{\partial x_i} \left(\nu_i \frac{\partial \varepsilon}{\partial x_i} \right) + C_1 \frac{\varepsilon}{k} (P + C_3 G) - C_2 \frac{\varepsilon^2}{k} \end{aligned} \right\} \text{Standard k-}\varepsilon \text{ model}$$

FIG. 8

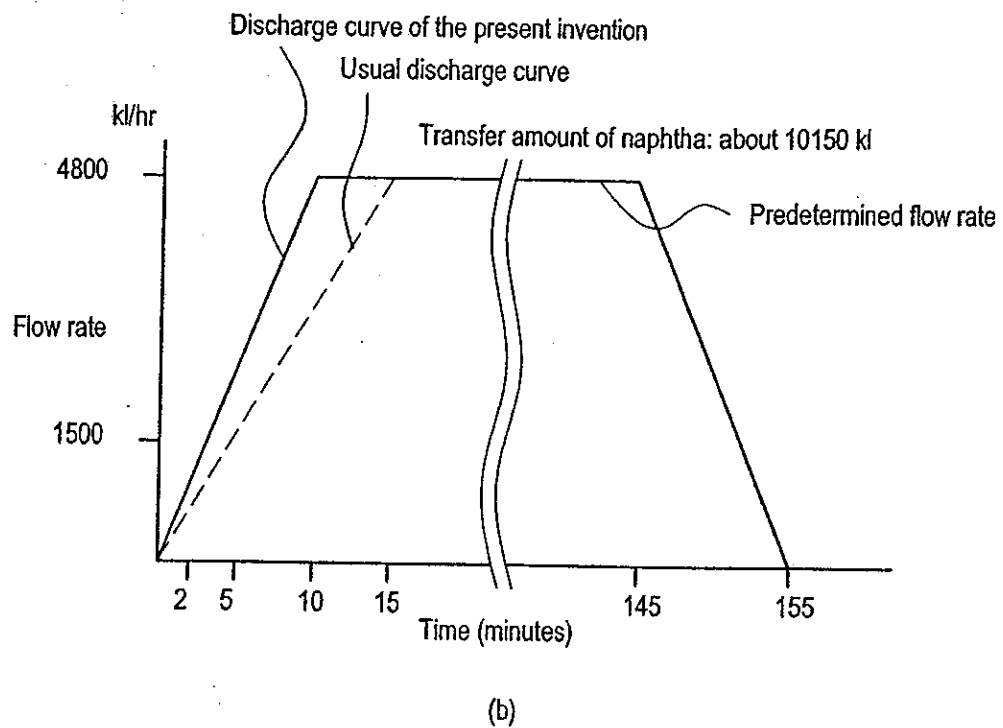
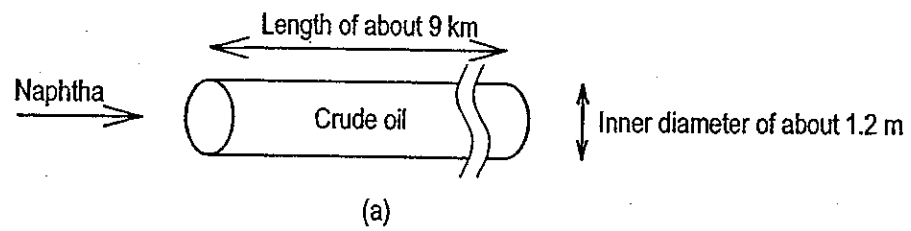


FIG. 9

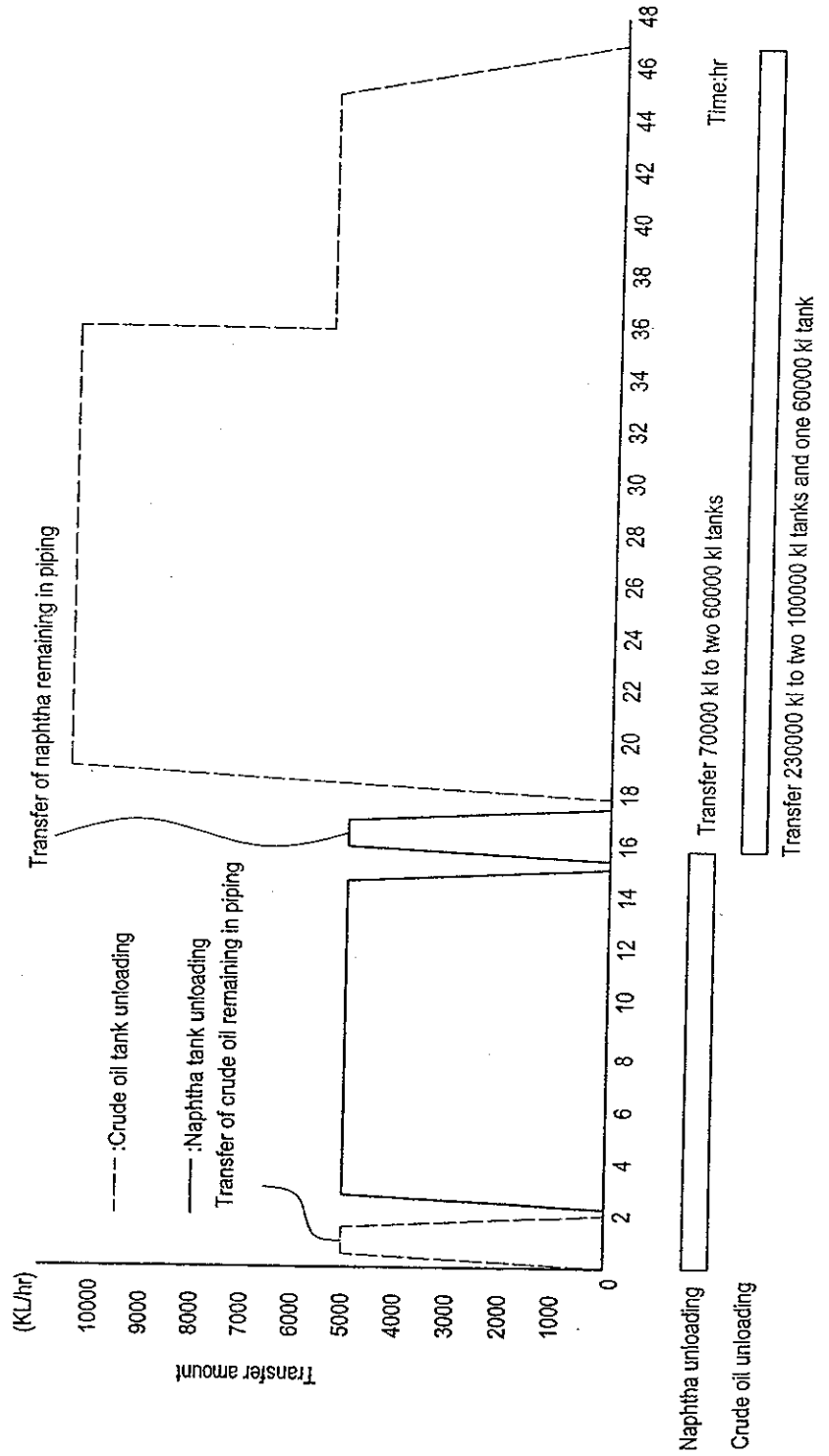


FIG. 10

