LITERATURE CITED

1. Colburn, A. P., and T. B. Drew, *Trans. Am. Inst. Chem. Engrs.*, **33**, 197 (1937).
2. Colburn, A. P., and O. A. Hougen, *Ind. Eng. Chem.*, **26**, 1178 (1934).
3. Drew, T. B., E. C. Koo, and W. H. McAdams, *Trans. Am. Inst. Chem. Engrs.*, **28**, 56 (1932).
4. Eckert, E. R. G., and V. Lieblein, *Forschung*, **16**, 33 (1949).
5. Emmert, R. E., and R. L. Pigford, *Chem. Eng. Progr.*, **50**, 87 (1954).
6. Gilliland, E. R., *Ind. Eng. Chem.*, **26**, 681 (1934).
7. Kamei, Saburo, and J. Oishi, *Chem. Eng. (Japan)*, **18**, 421 (1954).
8. Kent, E. R., Ph.D. thesis, Univ. Delaware, Newark (1953).
9. Lewis, J. G., and R. R. White, *Ind. Eng. Chem.*, **45**, 486 (1953).
10. Mickley, H. S., *Chem. Eng. Progr.*, **45**, 739 (1949).

10a. ———, R. C. Ross, A. L. Squyers, and W. E. Stewart, *Nat. Advisory Comm. Aeronaut., Tech. Note* 3208 (July, 1954).

11. Mizushina, Takuro, and T. Kotoo, *Chem. Eng. (Japan)*, **13**, 75 (1949).
12. Nusselt, Wilhelm, *Z. Ver. Deut. Ing.*, **60**, 541, 569 (1916).
13. Sherwood, T. K., and R. L. Pigford, "Absorption and Extraction," 2 ed., McGraw-Hill Book Company, Inc., New York (1952).

APPENDIX

Partial Condensation for Gas- and Liquid-film Resistances

In the derivation of Equation (14) it was shown that

$$\left[\frac{w}{k_G}\right]_{avg} \doteq \frac{H_G}{h}\ln\left[\frac{V_1}{V_2}\right] \quad (1A)$$

Similarly,

$$\left[\frac{w}{k_L}\right]_{avg} \doteq \frac{H_L}{h}\ln\left[\frac{L_1}{L_2}\right] \quad (2A)$$

Since by definition $h/H_G = N_G$ and $h/H_L = N_L$, Equations (1A) and (2A) may be written as

$$\frac{w}{k_G} = \ln\left[\left(\frac{V_1}{V_2}\right)^{N_G^{-1}}\right] \quad (3A)$$

and

$$\frac{w}{k_L} = \ln\left[\left(\frac{L_1}{L_2}\right)^{N_L^{-1}}\right] \quad (4A)$$

Let

$$G = e^{w/k_G} = (V_1/V_2)^{N_G^{-1}} \quad (5A)$$

and let

$$\pounds = e^{w/k_L} = (L_1/L_2)^{N_L^{-1}} \quad (6A)$$

Solving the Colburn-Drew equation—Equation (3)—for z in terms of both the liquid and vapor phase gives

$$z = \frac{\pounds x_i - x}{\pounds - 1} = \frac{Gy - y_i}{G - 1} \quad (7A)$$

and replacing y_i by mx_i results in

$$x_i = \frac{G(\pounds - 1)y + (G-1)x}{\pounds(G-1) + m(\pounds - 1)} \quad (8A)$$

and

$$x_i - x \quad (9A)$$

$$= (\pounds - 1)\frac{Gy - (G - 1 + m)x}{\pounds(G-1) + m(\pounds - 1)}$$

or

$$\frac{x_i - x}{x^* - x}$$

$$= \frac{[Gy - (G - 1 + m)x](\pounds - 1)}{[\pounds(G-1) + m(\pounds - 1)](y/m - x)}$$

$$= \frac{m(\pounds - 1)}{\pounds(G-1) + m(\pounds - 1)}$$

$$\cdot\frac{G(y - x) - (m-1)x}{(y - mx)} \quad (10A)$$

From Equation (7A)

$$z - x = \frac{\pounds}{\pounds - 1}(x_i - x)$$

or

$$\frac{dx}{z - x} = \frac{\pounds - 1}{\pounds}\frac{dx}{x_i - x} \quad (11A)$$

but $dx/(z - x) = dL/L$; therefore, according to Equation (11A)

$$\frac{dx}{x_i - x} = \frac{\pounds}{\pounds - 1}d\ln L \quad (12A)$$

For the over-all resistance

$$\frac{dx}{x - x^*} = \frac{x_i - x}{x^* - x}\cdot\frac{dx}{x - x_i}$$

which upon substitution by Equations (10A) and (12A) gives

$$dN_{OL} = \frac{dx}{x - x^*} = \left[\frac{1}{\frac{G-1}{m} + \frac{\pounds - 1}{\pounds}}\right][-d\ln L]$$

$$= \frac{-d\ln L}{\frac{1}{m}[(V_1/V_2)^{N_G^{-1}} - 1] + [1 - (L_1/L_2)^{-N_L^{-1}}]}$$

Upon integration this becomes Equation (16) in the text, i.e.

$$N_{OL} \equiv \int_{x_1}^{x_2}\frac{dx}{x - x^*} = \frac{\ln(V_1/V_2)}{m^{-1}[(V_1/V_2)^{(H_G/h)} - 1] + [1 - (V_2/V_1)^{(H_L/h)}]}$$

Presented at A.I.Ch.E. Louisville meeting

ERRATA

Below is the list of references cited in John W. Delaplaine's paper "Forces Acting in Flowing Beds of Solids," which appeared in the March, 1956, issue of the *Journal* on page 127. The list was omitted from the published paper.

LITERATURE CITED

1. Adams, B. F., M.S. thesis, Univ. Delaware (1951).
2. Bowden, F. P., and D. Tabor, "The Friction and Lubrication of Solids," Clarenden Press, Oxford (1948).
3. Brinn, M. S., S. J. Friedman, F. A. Gluckert, and R. L. Pigford, *Ind. Eng. Chem.*, **40**, 1052 (1948).
4. Caquot, A., and J. Karisel, "Traité de Mécanique des Sols," Gautier Villars, Paris (1949).
5. Jaky, J., "Proc. Second Intl. Conf. on Soil Mechanics and Foundation Engineering," Rotterdam (1948).
6. Janssen, H. A., *Z. Ver. Deut. Ing.*, 1045 (1895).
7. Ketchum, M. S., "The Design of Walls, Bins, and Grain Elevators," McGraw-Hill Book Company, Inc., New York (1919).
8. Kirk, R. E., and D. F. Othmer, ed., "Encyclopedia of Chemical Technology," vol. 6, pp. 614—656, The Interscience Encyclopedia, Inc., New York (1951).
9. Pleissner, J., *Z. Ver. Deut. Ing.*, 976 (1906).
10. Rausch, J. M., Ph.D. thesis, Princeton Univ. (1948).
11. Schwartz, C. E., and J. M. Smith, *Ind. Eng. Chem.*, **45**, 1209 (1953).
12. Sechler, E. E., "Elasticity in Engineering," John Wiley and Sons, New York (1952).
13. Shaffer, M. R., M.S. thesis, Purdue Univ. (1953).
14. Shaxby, J. H., and J. C. Evans, *Trans. Faraday Soc.*, **19**, 60 (1923).
15. Taylor, D., "Fundamentals of Soil Mechanics," John Wiley and Sons, New York (1948).
16. Tschebotarioff, G., "Soil Mechanics, Foundations, and Earth Structures," McGraw-Hill Book Company, Inc., New York (1951).
17. Westergaard, H. M., "Theory of Elasticity and Plasticity," John Wiley and Sons, New York (1952).
18. Zhavoronkov, N. M., et al., *Zhur. Fiz. Khim.*, **23**, 342 (1949).

In the paper "Entrainment Removal by a Wire-mesh Separator" by C. LeRoy Carpenter and Donald F. Othmer, which appeared in the December, 1955, issue of the *Journal*, on page 554 the equation

$$k = \frac{36{,}856\times9.4167\times10^{-4/3}}{3.2739} = 10.601$$

should be

$$k = \frac{36{,}856\times9.4167\times10^{-4}}{3.2739} = 10.601$$

and Equation (8) on page 556, which appeared as $E_s = 1 - (1 - (E_M/c))^N$, should be $E'_s = 1 - [1 - (E_M/c)]^N$.