which these principles are formulated, what precisely distinguishes a logical principle from an ordinary contingent proposition is the absence of alternative possibilities, this impossibility of alternatives being explicitly stated in the formulation of the principle itself; so that whoever holds with regard to an assigned proposition that there could be circumstances under which that proposition would fail is holding that the proposition in question is not a logical principle.

THE UNIVERSITY OF WASHINGTON

NOTE ON EINSTEIN'S EQUATION OF AN ORBIT

BY JAMES PIERPONT

In a paper* bearing the above title Morley has given an extremely elegant solution of Einstein's equation

$$(1) \qquad \left(\frac{dx}{d\theta}\right)^2 = 2x^3 - x^2 + 2\lambda x - \lambda^2(1 - e^2),$$

which defines the motion of a single planet about the sun. Here r, θ are the polar coordinates of the planet, a the major semi-axis, e the eccentricity of the orbit, M the mass of the sun, and

$$(2) \qquad x = \frac{M}{r}, \qquad \lambda = \frac{M}{a(1 - e^2)} \cdot$$

In Eddington units, $M = 1.45$. For Mercury, the values are

$$a = 5.8 \cdot 10^{-7}, \qquad e = 0.206, \qquad \lambda = 2.6 \cdot 10^{-8}.$$

The roots of the right side of (1) are thus, to a high degree of approximation,

$$(1 - e)\lambda, \qquad (1 + e)\lambda, \qquad \tfrac{1}{2} - 2\lambda.$$

* American Journal of Mathematics, vol. 43 (1921), p. 29. I notice two obvious typographical errors in this paper. In the last term of (2) α should be α^2; also just below, x_1 should read $x_1 = \frac{1}{2} - 2\alpha$.