THE METHOD OF MOMENT DISTRIBUTION FOR THE ANALYSIS OF CONTINUOUS STRUCTURES

BY LOUIS BRAND

1. *Introduction.* If ab is any member of constant cross-section forming part of a continuous structure, the moments at its ends, M_{ab} and M_{ba}, are given in terms of the angle-changes θ_a, θ_b at its ends and the lateral deflection per unit of length R by the slope-deflection equations*

$$M_{ab} = 2EK_{ab}(2\theta_a + \theta_b - 3R) \mp C_{ab},$$
$$M_{ba} = 2EK_{ba}(2\theta_b + \theta_a - 3R) \pm C_{ba}.$$

Here $K_{ab} = K_{ba}$ denotes the sectional moment of inertia of ab divided by its length (I/l) and C_{ab}, C_{ba} are the *numerical* values of the fixed-end moments due to the loading on ab. For the derivation of these equations and the sign conventions employed, reference may be made to the Bulletin just cited.

When there is no lateral deflection, or when this is neglected, $R=0$, and we write the slope-deflection equations

(1) $$M_{ab} = 2EK_{ab}(2\theta_a + \theta_b) + M_{ab}^{(0)},$$

(2) $$M_{ba} = 2EK_{ba}(2\theta_b + \theta_a) + M_{ba}^{(0)},$$

in which $M_{ab}^{(0)}$, $M_{ba}^{(0)}$ denote the fixed-end moments *inclusive of sign.* Suppose also that at all joints of the structure, other than certain fixed ends, there is no external momental load. At any such joint a, we must have

(3) $$\sum M_{ai} = 0,$$

the summation ranging over all members that meet at a. At a fixed end c, θ_c is given. Owing to the continuity of the structure, all members meeting at a joint a rotate through the same angle θ_a. At each such joint we have an equation of type (3). Thus we have precisely as many equations (3) as we have unknown angles, so that in general these equations determine the angles

* Bulletin No. 108, Engineering Experiment Station, University of Illinois, p. 20.