A Method for the Determination of Size Distribution in Soils

By

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Within recent years considerable effort has been expended in devising methods for better describing the texture of soils. A number of investigators have worked on the problem of measuring certain constants, such as moisture equivalent, heat of wetting, wilting coefficient, and hygroscopicity. Another group have not given up the attempt to describe the texture of a soil in terms of the percentage of different sized particles expressed as a Maxwellian distribution curve.

Among the many who have worked on this problem Oden, Wiegener, Ostwalt and Hahn, Kelley, and Robinson, may be mentioned as having done work along lines related to the work reported in this paper. All methods devised by the above named investigators, attempt to solve the problem by obtaining the data for the rate of sedimentation from suspensions. These data are plotted, using the percentage of total weight of material which has settled out as the ordinate and time as the abscissa. The resulting curve is usually called a "Fall curve".

On such a curve (Fig. 1), if "p" represents the percentage of material which has settled out in time "t", a tangent may be drawn to the curve at the point t,p. This tangent will intercept the ordinate at a point "b". The equation for any such tangent to the fall curve must be:

\[ p = mt + b \]

In this equation "p" is the percentage of the total amount of material originally in suspension, which has settled out in time "t". "m" is the slope of the tangent and "b" is the point on the ordinate where the tangent intercepts. But "m" can also be designated as the derivative of the equation of the fall curve. The equation for the tangent then becomes:

\[ p = \frac{dp}{dt} t + b \]

It is quite evident that \( \frac{dp}{dt} \) is the rate of sedimentation at time "t". But the particles falling at this time are those that are smaller than those which would fall the whole length of the column of suspension in time "t", because the particles which are