ART. XXXIII.—*On a New Method for Standardizing the Coronas of Cloudy Condensation; by C. BARUS.*

ASSUMING that for ions produced within the fog chamber the rate of decay in the lapse of time t is as the square of the number, or that $1/n - 1/n' = b(t - t')$ where b is constant, a few incidental attempts were made to compute b , when the number, n , of nuclei (ions) is expressed in thousands per cubic centimeter. The table gives an example of such results, obtained by exhausting the fog chamber at a stated time t , after the removal of radium. If the drop in pressure is *below* the coronal fog limit of air, precipitation takes place on ions, only.

TABLE.—Decay curve. Nucleation observed and computed. $b = .0024$ relative to $n \times 10^{-3}$. Radium suddenly removed from top of fog chamber (glass) and exhaustion made t sec. thereafter. $\phi p = 23^{\text{cm}}$ (below the coronal fog limit of dust free air). $s/30$ (nearly) angular diameter of coronas.

t sec.	s cm.	(Computed for	
		(observed) $n \times 10^{-3}$.	$b = .0024$) $n \times 10^{-3}$.
0	5.9	67	67
5	5.0	41	37
10	4.6	32	26
15	4.0	21	20
20	3.5	15	16
30	3.3	12	12
50	2.9	7	7
120	1.7	2	3
∞	1.0	1	--

For the first five seconds $b = .0019$; for the first fifteen seconds $b = .0022$; etc., values obtained ranging from .002 to .003. This is larger than the corresponding electrical datum, say .0014, when n is given in thousands. Decay is more rapid than the equation warrants. Initial coronas are too large, final coronas too small, in spite of the presence of air nuclei, the number of which should be deducted, at least in part. Other experiments show similar coefficients. Naturally the present method for b is much inferior to the electrical method, even if the two coefficients are identical; and the b here is obtained under possible complications with the larger gradations of the colloidal nuclei of dust free air, though these are probably inefficient.

If the values of $1/n$ be inserted the curves should be linear since $1/n = 1/n_0 + bt$ where t is the time dated since the occurrence of n_0 . The line passing through the observations at 5, 30, 50 seconds is best adapted to represent the results, and

from it $b = .0024$ (n in thousands of nuclei per cubic centimeter) may be roughly assumed. These computed values of n are given in the table. Shown in a chart, they are too low initially and too high finally, even if the air value is quite ignored; but the constant probably reproduces the true conditions better than the observation, remembering that the initial corona ($t = 0$) is not quite invariable.

A very important consequence may be deduced from these results. The equations specified may be written $n_0 = (n_0/n - 1)bt$. Hence if the ratio of nucleations or of ions is known (for instance by my method of geometric sequences), n_0/n is given, and the absolute value of n_0 may be computed if b is known. Now if b for the case of ions may be taken as identical with the value found in electrical experiments, where $b = .0014$ roughly and relative to ionization in thousands,

$$bn_0 = .0014n_0'$$

where n_0' is the true nucleation. Thus in the table $b = .0024$, $n_0 = 67.5$; therefore $n_0' = (.0024/.0014)n_0$ or 115,000 nuclei per cubic centimeter, instead of 67,500 for the initial corona. Quite generally if n_0/n and b are determined from purely coronal measurements

$$b / .0014$$

is the reduction factor for all the relative nucleations to absolute value.

Another important consequence may be drawn: If the coefficient is known from direct experiments, it will then be possible to standardize the residual curve (depressed asymptote) leading to the terminal corona, corresponding to groups of nuclei of different sizes occurring together.

Moreover, in any such curve, let the ordinates denote the computed number of ions, the abscissas denote the observed number of *efficient* nuclei, being the colloidal nuclei and ions occurring together in the course of a stated time. Then the curve gives an indication of the distribution of the precipitated water on the two groups of nuclei different in size and present in different proportions, for the given supersaturation. Experiments of this kind are of the highest importance and the present cursory treatment is admitted provisionally in view of a restandardization of the coronas of cloudy condensation which the variety of results since obtained has made necessary.

Brown University, Providence, R. I.