well established facts, while the ideal of stable uniformity under changeless conditions remains a pure speculation.

O. F. Cook

Washington,
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SPECIAL ARTICLES

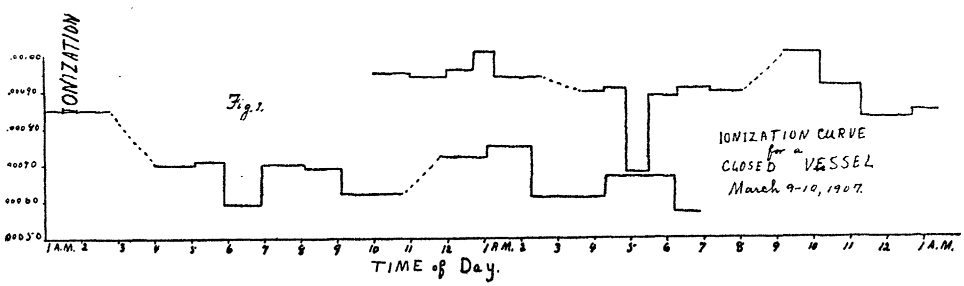
IONIZATION IN CLOSED VESSELS

In connection with some other work on the ionization in closed vessels it was found necessary to examine the daily variation of this ionization, to find what parts of the day it is most constant and to find the best methods to get as constant an ionization as possible. Soon after the work was started the article of Wood and Campbell on the 'Diurnal Periodicity of the Spontaneous Ionization of Air and other Gases in Closed Vessels' appeared.[1] It was thought that it would be of interest to find the periods of maxima and minima in Baltimore.

Dike[2] has also found a similar periodicity in the amount of radio-active emanation in the atmosphere and his periods agree quite well with the periods as found for the ionization in closed vessels. It would thus seem that the variation of the ionization in closed vessels was due to a variation in the penetrating radiation and that by screening this off by the use of thick lead plates one ought to get a much more constant ionization.

The ionization was measured by means of an iron electroscope 10 x 13 x 20 cm. in size. The charged electrode was bent into the arc of a circle and over this arc the gold leaf fell as the charge leaked off. The electrode was charged across a small air gap and so was air-tight. All parts except the charged electrode were earthed. The position of the gold leaf was read by means of a micrometer microscope, the cross hairs moving in the eyepiece. As the microscope was firmly clamped, the same portion of path traversed by the gold leaf would be always used. The air was enclosed some twenty days before readings were taken. The electroscope was not allowed to become entirely discharged at any time.

An electroscope similar to the above but smaller in size was also used. The readings were made in a tower room on the fifth floor of the physics laboratory. The room was not heated artificially, so that the temperature remained fairly constant. All sunlight was screened off.



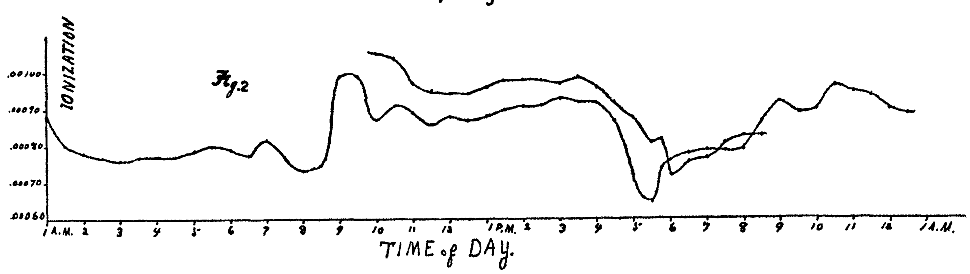


Fig. 1 represents the ionization for March 9–10, 1907. About midnight it began to snow. It will be seen that the value of ioniza-

[1] *Phil. Mag.*, Feb., 1907.

[2] *Terr. Mag.*, Vol. XI., No. 3, p. 128.

tion falls very considerably. It will also be noticed that the relative minimum drop on March 10 is not nearly as large as on March 9. The dotted portions of the curve represent the times when the electroscope was recharged. That all parts of the scale were equally sensitive was shown afterwards when a lead screen was placed around the electroscope. The rate of fall of the gold leaf was then practically constant for the portion of path used. During the day there was a great deal of vibration due to travel on the cobblestone street next the building, so that the error of reading was larger.

Fig. 2 represents the ionization for several days in February and March of the present year. (*a*) is the average of readings for four days and (*b*) for fifteen days. These and other curves show maxima for February and March at about 9 A.M. and 10 P.M., and minima at about 7 A.M. and 6 P.M. Very few observations have as yet been made on the 7 A.M. and 9 A.M. periods. The most conspicuous is the minimum at 6 P.M. This occurs with considerable regularity and is very marked, the ionization often falling thirty or forty per cent. No corresponding change of temperature or barometric pressure was noticed. It will be noticed in the following table, however, that it never drops below the value of the ionization when the penetrating radiation is cut off. It has been found that sudden changes of temperature produce air currents and set the gold leaf in motion, but it hardly seems likely that this minimum is to be explained in this way. Still it seems very remarkable that the penetrating radiation should have such a marked drop and the problem as to whether it is a temperature effect is to be taken up.

The electroscope was then screened with lead plates from 4 to 5 cm. thick. A window was necessary to make the readings, however, so that the radiation was not all screened out. The rate of leak was made much more constant. The marked minimum at 6 P.M. was usually not noticeable.

The following table gives the average ionization for several days. Readings were usually taken from 10 A.M. till 6 P.M. The period of minimum is not included in the column marked average ionization. The ionization during the early part of the afternoon was found fairly constant.

Date	Weather	Average Barometric Pressure	Ionization	Minimum Ionization	Time of Minimum
Feb.					P.M.
16	Clear.		.00113	.00077	5.40–6.00
18	"		.00085	.00064	5.30–7.00
19	Cloudy.		.00100	.00078	5.00–6.00
20	"		.00100	.00092	5.00–7.00
21			.00102	.00069	5.00–5.30
22	Clear.	77.10	.00101	.00058	4.30–5.30
23		77.80	.00093	.00056	5.30–6.00
25	Clear (8″ snow)	76.25	.00090	.00051	5.30–6.00
Mar.					
3		76.50	.00088	.00078	6.00–7.00
4	Clear.	76.50	.00060		
5	"	76.50	.00075		
Apr.					
15	Clear. Lead screen put around telescope.	75.50	.00049	No drop observed.	
16	Cloudy.	75.20	.00051		
17	"	75.70	.00052		
18	Clear.	75.90	.00052		
30	Cloudy.	75.80	.00051		

In conclusion the writer wishes to express his thanks to Professor Ames for his many kindnesses and to Professors Rutherford and Dike for their suggestions.

W. W. STRONG

LABORATORY APPARATUS FOR MEASUREMENT OF THE FORCE ON A CURRENT-CARRYING CONDUCTOR LYING IN A MAGNETIC FIELD

THE method used by Ampère in his investigations of the effect of a magnetic field on a current-carrying conductor was to arrange the conductor so that the forces acting on one part of the circuit just balanced those acting on another part. From observations thus made and without the direct measurement of any forces in force units, Ampère established his propositions with regard to the mutual action of current-carrying conductors.

From these propositions is derived the expression for the force acting on a straight conductor lying in a uniform magnetic field. This is a very special application, but it is