PROFESSOR A. A. BENNETT, of the University of Texas, has been appointed head of the department of mathematics at Lehigh University.

DR. ROBERT CALVERT has been appointed head of the industrial chemistry division at the University of Maryland.

DR. LEROY T. PATTON, associate geologist of the bureau of economic geology and technology of the University of Texas, has been appointed professor and head of the department of geology of Texas Technological College at Lubbock, Texas.

DR. G. G. NAUDAIN, of Iowa, has been appointed professor of chemistry at Kansas State Teacher's College, Pittsburgh, Kansas.

AT George Washington University, Dr. Colin M. Mackall, of St. Johns College, Annapolis, has been appointed professor of chemistry and James R. Randolph, of the U. S. Bureau of Standards, assistant professor of mechanical engineering. Dr. Franklin L. Hunt, of the U. S. Bureau of Standards, will give lectures on physics and Dr. James R. Eckman on chemistry.

PROFESSOR H. TIETZE, of the University of Erlangen, has been appointed to a professorship of mathematics at the University of Munich.

PROFESSOR HANS EPPINGER, of the first medical clinic at the University of Vienna, has been called to the chair of internal medicine at the University of Prague.

DISCUSSION AND CORRESPONDENCE

THE CONSERVATION OF MOMENTUM AND THE WIDTH OF CRITICAL POTENTIALS DETERMINED BY THE METHOD OF ENERGY LOSS

IT is readily deduced from the law of the conservation of momentum that when two bodies of widely different masses collide, either elastically or inelastically, the velocity of the heavier undergoes little change. Hence, if the collision is inelastic, the increase in internal energy of the masses is almost entirely at the expense of the kinetic energy of the smaller. But if the masses are comparable, then the velocity of both is altered and the internal energy is increased at the expense of the kinetic energy of each in an undetermined proportion. The kinetic energy of one mass may even be increased beyond its initial value while that of the other is decreased by a correspondingly greater amount.

These remarks bring to light a possible reason for the failure to detect the excitation of atoms by high speed positive ions, using the method of energy loss, for the success of the method depends entirely on the fact that an electron retains almost the entire excess of energy after an inelastic collision. The apportionment of the excess between ion and atom will lead to a blurring of the critical potential. A further complication results from the fact first pointed out by Franck,[1] that an ion of mass m must possess energy to amount $\frac{m+M}{M}V_R$ in order to excite a stationary atom of mass M and critical potential V_R.

It may be shown that the width of the blurred critical potential is

$$\triangle V' = \frac{4\,m\,M}{(m+M)^2}\sqrt{V\left(V - \frac{m+M}{M}V_R\right)}$$

where V is the energy of m before impact. The center of the band is at

$$V' = \frac{m^2+M^2}{(m+M)^2}V - \frac{M}{m+M}V_R$$

Taking the case of mercury, $V_R = 4.6$v., $M = m$, and $V = 10.2$v (one volt above the minimum): $\triangle V' = 3.2$v., $V' = 2.8$v. The process will therefore result in the formation of low velocity positive ions of no definite energy, rather than in a homogeneous group.

Actually, the method of energy loss is one of great experimental difficulty when applied to positive ions, and has seldom been used. Consequently the failure to detect their action experimentally must be sought elsewhere. It is suggested that their great mass may be a sufficient cause for low probability of inelastic impact.

The inability of this method to detect ionizing potentials follows from similar considerations. In this case the energy in excess of the critical potential must be shared between the ionizing and ionized electron, resulting in a group of electrons whose energy is distributed in an unknown manner between almost zero and almost the entire excess energy. On any reasonable assumption, the distribution will possess a maximum at one half the excess energy. This would account for the presence of some of the pseudo-Maxwellian electron groups of high temperature found in discharge tubes by Langmuir and his coworkers. The very low velocity electrons observed by Eldridge[2] and attributed to the process of ionization are not explained.

CARL ECKART

EDISON LAMP WORKS,
HARRISON, N. J.,
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[1] *Zeit. f. Phys.*, June, 1924.

[2] *Physical Review*, *20*, 456 (1920).