culate it for the case $t' = 0$. For this special case of (12) the curvature is:

$$R = \frac{\frac{\omega^2}{c^2}\left(1 + 2\Theta^2\left(\frac{\omega r}{c} + \sinh\frac{\omega r}{c}\cosh\frac{\omega r}{c}\right)\left(\frac{\omega r}{c}\sinh\frac{\omega r}{c} - \cosh\frac{\omega r}{c}\right)\left(\frac{\cosh\frac{\omega r}{c}}{\frac{\omega r}{c}}\right)\right)}{\left[1 - \Theta^2\left(\frac{\omega r}{c} + \sinh\frac{\omega r}{c}\cosh\frac{\omega r}{c}\right)^2\right]^2} \quad (13)$$

It appears from the calculations just made that the spacial geometry for the rotating system depends on the time and space coördinates of the point considered, and this is at first sight in contradiction with our ordinary ideas of rotating systems. The explanation of this fact is that for a system rotating with respect to a "stationary" system there is no separation into space and time which stands out as the natural one for the entire rotating system, and consequently for this system spacial geometry is only defined when our coördinates have been selected. Since the equations (9) depend on coördinates so chosen that when $t' = 0$, the points on the radius vector $\Theta^1 = 0$ coincide with those on the radius vector $\Theta = 0$, at $t = 0$ in the stationary system, it is based on coördinates "natural" to these space-time points; in the sense that they are those of a stationary system coinciding with the rotating one at the space-time points considered. It will be noticed that for these points the curvature given by (13) is ω^2/c^2. This shows that the curvature of the spacial cross-section at any space-time point in the coördinates "natural" to this point is constant; it is the square of the angular velocity of rotation in radians per light-second.

THE ENERGY LOSSES ACCOMPANYING IONIZATION AND RESONANCE IN MERCURY VAPOR

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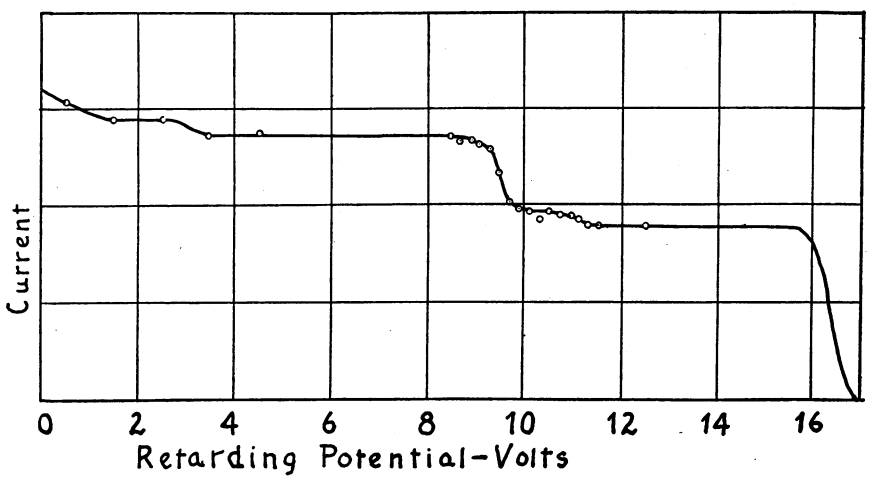
Much light has in recent years been thrown upon the constitution of matter, and upon the validity of the Bohr theory of atomic structure by the study of resonating and ionizing collisions of electrons in vapors and gases. There are, however, still a great many questions of a fundamental nature in regard to such phenomena which cannot be answered by the

experimental methods which have hitherto been employed for the determination of the resonating and ionizing potentials. It seemed desirable to use a new type of tube, with which the actual distribution of velocities of the electrons after their collisions with the vapor molecules could be determined.

Instead of the grid employed in the usual form of tube two diaphragms, placed one behind the other and each pierced with a single small hole, were used. These diaphragms divided the tube into two regions: an upper one in which any desired pressure of mercury vapor could be maintained and in which the collisions to be studied took place; and a lower region from which mercury was removed by liquid air and in which the electron velocities were measured. In the upper region the electrons were emitted from an oxide coated cathode and accelerated by a grid which



was maintained at any desired potential. Passing through the grid, the electrons entered a constant potential region and after a large number of collisions with the mercury vapor, some passed through the two small holes into the lower, mercury free region and to the receiving electrode. To this electrode was applied a variable retarding potential and by measuring the current as a function of this retarding voltage the velocity distribution of the electrons was determined.

In the curve shown the current is plotted against the retarding potential for electrons which had, before collision, velocities ranging between 15.8 and 16.8 volts. We find in the curves drops beginning at 0, 3, 9.1, 10.9 and 15.8 volts, respectively. The drop at 15.8 volts represents those electrons which after collision retained all of their energy. The other drops in the current are due to groups of electrons which have lost respectively all, 13.4 (i.e. 2×6.7), 6.7 and 4.9 volts of energy which they had

before collision. No drop is seen at 5.4 volts which would correspond to the loss of 10.4 volts which is normally assumed to take place at ionization.

From curves of such nature for different velocities of impact, it has been possible to determine more surely than heretofore the energy losses at electron impact. The outstanding results of the investigation are:

1. The discovery by Mohler, Foote and Meggers of a resonance potentiali nvolving an energy loss of 6.7 volts was confirmed. The work from which these investigators were able to deduce the existence of this critical potential seemed subject to some very serious difficulties in interpretation. These difficulties have been cleared up. The 6.7 volt type of collision does not occur for electrons with energies less than 8.5 volts, but at voltages above the ionization point it is the most important type of resonating collision.

2. Indications were also found that a collision involving an energy loss of about 5.7 volts also occurs in mercury. This is in agreement with the fact that absorption lines have been found by previous investigators in the mercury spectrum in a region which through the quantum relation corresponds to this potential.

3. Little has been hitherto known about the nature of the ionizing collision. The present method has cast some light on this matter. The results obtained indicate that at such a collision the impinging electron loses all of its energy, and also that the electron which is the product of the ionization leaves the parent atom with negligible energy. This conclusion is at variance with the usual conception of the ionization process.

THE CRYSTAL STRUCTURE OF BERYLLIUM AND OF BERYLLIUM OXIDE

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The structure of the lighter elements and of their compounds should, on account of their greater simplicity, be of especial value in deciding what rôle the so-called valence electrons play in connecting atoms. Beryllium (Be; atomic number 4) is the lightest metal the crystal structure of which has not hitherto been determined by X-ray methods. Its accepted atomic weight is $w = 9.10$, although a recent determination,[1] apparently of high accuracy, gives $w = 9.018$ which is in much better agreement with the