# NOTES FROM THE LABORATORY, GENERAL ELECTRIC COMPANY.*

## THE IONIZATION GAGE.

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[ABSTRACT.]

I. *Construction and Calibration.*—The design used by the writers consists of two concentric tungsten filaments inside a coaxially situated cylinder. The inner filament is used as a source of electrons with the outer one as anode, while the cylinder is used as positive ion collector. The gage was calibrated by a "flow" method (based on Knudson's formula for the flow of gases through capillaries) for extremely low pressure, and it was found that the electron emission is proportional to the pressure over a range which extends from over 10 bars to $10^{-3}$ bars, and it is, therefore, probably certain that this same relation holds at the lowest attainable pressures.

II. *Relation between Ionization Current at Constant Pressure and Number of Electrons per Molecule of Gas.*—Calibration of the gage with different gases led to the interesting relation that the number of positive ions formed at constant electron emission and constant pressure is proportional to the number of electrons per molecule of the gas ionized. It is possible, therefore, by this method to determine *molar numbers* for different gases. By molar number is meant the sum of the products, atomic number times number of atoms taken for each atom in the molecule. Thus the molar number of iodine is $2 \times 53 = 106$; and for $HgI_2$ it is $80 + 2 \times 53 = 186$. Vapor pressure determinations of both these substances gave results agreeing with the above values for the molar numbers. If it be assumed that ionization is due to collisions between thermions and electrons in the atoms, it is possible to calculate the mean free path of an electron in any gas at a given pressure, and also the effective diameter of the electron. For argon at 1 bar pressure and room temperature, the mean free path is about 150 cm., and the diameter of the electron is calculated on this basis as about $4.4 \times 10^{-9}$ cm.

* Communicated by the Director.