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Attempts to link Quanta & Atoms before the Bohr Atom model

A. VENKATESAN, Northeastern University, Boston, MA-02115, M. LIEBER, University of Arkansas, Fayetteville, AR-72701 — Attempts to quantize atomic phenomena before Bohr are hardly ever mentioned in elementary textbooks. This presentation will elucidate the contributions of A. Haas around 1910. Haas tried to quantize the Thomson atom model as an optical resonator made of positive and negative charges. The inherent ambiguity of charge distribution in the model made him choose a positive spherical distribution around which the electrons were distributed. He obtained expressions for the Rydberg constant and what is known today as the Bohr radius by balancing centrifugal energy with Coulomb energy and quantizing it with Planck's relation $E = h\nu$. We point out that Haas would have arrived at better estimates of these constants had he used the virial theorem apart from the fact that the fundamental constants were not well known. The crux of Haas's physical picture was to derive Planck's constant h from charge quantum e , mass of electron m and atomic radius. Haas faced severe criticism for applying thermodynamic concepts like Planck distribution to microscopic phenomena. We will try to give a flavor for how quantum phenomena were viewed at that time. It is of interest to note that the driving force behind Haas's work was to present a paper that would secure him a position as a Privatdozent in History of Physics. We end with comments by Bohr and Sommerfeld on Haas's work and with some brief biographical remarks.

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