

New Value of Electron

Physics

Hailed by mathematical physicists as ranking in importance with the newly published Einstein paper, Dr. A. S. Eddington, Plumian Professor of Astronomy at Cambridge University, has just announced to the Royal Society here the results of research upon the charge of the electron.

Basing his work both on the theory of relativity and the quantum theory of light, Professor Eddington has found a formula which enables the charge of electricity in the electron, the electrical "atom" and building stone of which atoms are made, to be calculated from two other values. He proves that the value should be a whole number. As a result of these purely theoretical considerations, the famous Nobel prize experiment of Dr. R. A. Millikan, physicist of the California Institute of Technology, in determining this value, may be proved to be slightly in error.

According to the most recent form of the quantum theory, which supposes that light travels as separate bursts of energy rather than as a continuous emission, the electrons are not tiny particles. They either consist of, or are associated with, waves, in some peculiar manner. About this concept has grown the branch of physics known as "wave mechanics".

The two figures that Professor Eddington has used in computing the electric charge of the electron are the

speed of light, which has been determined with extreme precision by Dr. A. A. Michelson of the University of Chicago, and what is known as Planck's quantum constant. The physicist represents it by the letter h . Light and other forms of radiation, like radio waves, differ in frequency, or the number of vibrations per second. The faster the vibration, the more energy there is in a single quantum, or "bunch," of the radiation. This energy is equal to the frequency multiplied by the quantum constant, which is named after Max Planck, the originator of the theory. The numerical value of h is 6.55.

Professor Eddington pointed out that it has long been known that a formula for calculating the electron's charge from the velocity of light and the quantum theory must exist, but this is the first time that it has been found. According to the results of his reasoning, the charge is a whole number, 136. In his famous experimental determination of the same value, Dr. Millikan obtained the value 137.1. Although this is less than one per cent. greater, the difference is too much for scientists to be entirely satisfied.

"I must hope that in this case theory has succeeded in beating experiment," said Professor Eddington in an explanatory statement to Science Service, "and that newer ex-

perimental determinations will confirm my value. If this theoretical value should prove right in the end, that does not, of course, disparage the brilliant experimental work which has given a value at any rate close to the truth."

That his hopes may be justified is indicated by a very recent measurement of the experimental value by Dr. K. M. G. Siegbahn, a famous Swedish physicist, and that is very close to 136. Professor Eddington's work is based largely on what is known as the "exclusion theory", which was developed largely by Dr. P. A. M. Dirac, another English physicist, but which has never been explained in non-mathematical language.

"My result is a suggested mathematical theory, which, if it can be accepted, will form one step in the development of the subject," said Professor Eddington. "Our ideas about the quantum theory will need to become much clearer before physicists generally (including myself), are quite satisfied about it. But that applies to much modern progress in quantum theory. We are working very much in the dark and the most one can say about any suggested step forward, such as this, is that it looks a bit hopeful."

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Inauguration Movies to go "On the Air"

Television

Television experimenters throughout the country will be able to see on the evening of March 4 motion pictures of Mr. Hoover's inauguration. C. Francis Jenkins is now arranging this historic radiovision broadcast. Even long before airplanes carry the films to theaters a re-creation of the inaugural ceremonies will be sent through space via radio waves.

A new radiovision broadcasting station, using a short wave and 5,000 watts power, will be in operation near Washington by March 4, unless unforeseen delays occur. Mr. Jenkins told Science Service. When this is in use, Mr. Jenkins plans to broadcast radiomovies every night, instead of three nights a week as at present. As the new station will have a band a hundred kilocycles wide, it will be possible to broadcast motion pictures in half-tones, in-

stead of only as silhouettes as at present.

The short time available will probably make it impossible to broadcast actual television images from the inauguration itself, Mr. Jenkins explained. Motion pictures of the ceremonies will be made especially for the purpose, and rushed through the finishing laboratory so as to have prints ready a few hours after Mr. Hoover becomes president. These films will then be shown with the radiomovie transmitter at the Jenkins laboratory on Connecticut Avenue, from which they will be transmitted to the station, in a Washington suburb, by telephone line. This telephone connection will be similar to that now used by many sound broadcasting stations.

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"Decibel" Latest Unit

Telephony

When telephone engineers get together in the future to talk about problems of transmission, the word "decibel" will figure largely in their conversation. That is the name that has just been adopted by the engineering staff of the Bell System to designate what has previously been known as the "transmission unit." It refers to the efficiency of telephone circuits. The new name was adopted after a conference between the representatives of the Bell System and the International Advisory Committee on Long Distance Telephony in Europe. The actual unit decided on was the "bel," named after Dr. Alexander Graham Bell, inventor of the telephone. The bel, however, is larger than is needed in practice, so the unit one-tenth as large, and therefore called the decibel, has been adopted by the engineers.

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