of the other plants, as to which no one questions their distribution by the sea. Some coconuts were just beginning to sprout; others had already formed a bunch of leaves and were rooted firmly in the soil. They were here in exceptionally good condition, as the crabs, which often ruin the germinating nuts, were not present on the beach. We thus find on this new island a strong proof of the ability of the coconut, when washed ashore, to establish itself on the beach without human aid.

After a rest of some months, the crater again started into activity in November and the poorly-developed vegetation was covered over by the ejected volcanic material.

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Heavy Hydrogen in Contact with Normal Water

OWING to the impossibility of identifying individual molecules of a gas, very little is known about the possibility of an exchange between molecules of a gas (for example, hydrogen) and the same molecules as constituents of a liquid (for example, water) in contact with the gas. In connexion with work on the disintegration of lithium by ions of the heavy isotope of hydrogen¹, we prepared mixtures of the hydrogen with pure helium and stored these over water in an aspirator. As first prepared, these contained approximately 1 per cent and 7 per cent of the heavy isotope respectively. After the lapse of about six weeks we observed a loss of activity as a disintegrating agent, and measurement of the concentration of the heavy isotope by the method outlined in our paper¹ showed that less than one-twentieth of the original hydrogen was present in each case, but that the total hydrogen content was approximately the same.

Tests extending over six weeks with the apparatus filled with mixtures of ordinary hydrogen and helium showed no change of volume, thus eliminating leakage or solution as the mode by which the heavy hydrogen was lost. It is probable that the molecules of the heavy hydrogen underwent a process of exchange with the molecules of hydrogen in the water, and that the final state of the system would be one in which the concentration of heavy hydrogen was the same in the liquid as in the gas. A similar process of exchange has been reported by Lewis and Macdonald², who showed that there was a rapid equilibrium established between the hydrogen of ammonia and that of heavy water in which it was dissolved. It is evident that the observations suggest the use of the heavy isotope in experiments with hydrogen in much the same way as the radioactive isotopes of heavy elements have been used as 'indicators' for those heavy elements in the past.

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¹ *Proc. Roy. Soc., A.*, **141**, 722; 1933.

² *J. Amer. Chem. Soc.*, **55**, 3502; 1933.

High-Frequency Glow Discharge

It is a well-known fact that it is possible to maintain high-frequency glow discharges at very low voltages. A discharge tube having as internal electrodes two discs at a distance of one or two

centimetres and containing neon at a pressure of a few millimetres of mercury, shows the lowest values of the maintaining potential if the frequency is about 10^6 cycles. Values between 10 and 15 volts (peak-value) are readily obtained. At lower frequencies the minimum maintaining potential increases until at frequencies of the order of 10^6 cycles more normal values are reached, which do not differ much from the values obtained with direct current and low frequencies.

Experiments to be described elsewhere with a modified form of the Langmuir collector method showed that in general there exist in high-frequency discharges considerable space potentials. The existence of such space potentials can be interpreted as a result of the very great difference in inertia between the electrons and the positive ions, both under the influence of an oscillating E.M.F. of high frequency. While the amplitude of the oscillating ions is practically zero, the amplitude of the electrons can exceed by many times the electrode distance, in which case a great part of the electrons will reach the electrodes in each half period, thus being removed

FIG. 1. (a) Direct current discharge through neon; pressure 45 mm., current 8 micro-amp., maintaining potential 256 volt. (b) High frequency discharge in the same tube, maintaining potential about 50 volt, frequency 3×10^6 cycles.

from the discharge. The result is a positive space charge and therefore a potential gradient in certain parts of the discharge.

At the highest frequencies, however the amplitude of the electrons, too, can be smaller than the electrode distance, and so one may expect that at the highest frequencies the space potential will not reach the same high values as in the case of moderate frequencies, for example, between 10^6 and 10^7 cycles.

Experiments have been performed in order to measure the space potential and the maintaining potential at the same time in a glow discharge in the region of the very high frequencies. For that purpose a small collector wire was placed in the middle between the two electrodes. Dimensions of the discharge tube: electrode distance 20 mm.; neon at a pressure of 5 mm. At the frequency of 6×10^7 cycles the following results were obtained: maintaining voltage 13.6 volts, space potential 21 volts positive compared to the electrodes.

A simple calculation shows that the maximum energy which an electron can obtain in the alternating field of 6.8 volts/cm. at the frequency of 6×10^7 cycles is only 1.15 volt, which value is much