Ad. 10th June '08

WONDERFUL RADIUM.

THE LATEST EXPERIMENTS.

A CHAT WITH MR. KLEEMAN.

The recent researches by Professor Bragg and Mr. R. D. Kleeman, of the Adelaide University staff, into the properties of radium, have aroused the keenest interest of the scientific world, and the experiments now being continued by those gentlemen are producing results of great value to physical knowledge. On Friday Mr. Kleeman was asked by an Advertiser representative if he had any fresh information on the subject, to supplement that contained in The Advertiser of that day. The instructor of the physics class at the University said that the experiments were being continued, and he was kind enough to give a progress report.

"Professor Bragg had an idea," said Mr. Kleeman, "that an atom consisted of electrons not near one another, which could pass through any other atom without suffering a deflection as a whole."

Will you kindly explain what an electron is?

"An electron is about the thousandth part of a hydrogen atom, and has a negative charge of electricity. An atom is supposed to consist of a crowd of electrons, and different atoms only differ from one another in the number and arrangement of the electrons. These electrons, experiments have proved, are not close together, but are separated so as to resemble a shower of meteors. In the space between them we suppose there is a positive charge of electricity equal to the sum of the negatives of the electrons. Before proceeding further I may explain the changes of radium. Rays shoot off in alpha particles (which consist of a crowd of electrons) at a velocity of 8,000 miles per second. These are a small part only of the radium atom, and there is left behind what is known as an emanation, which behaves like a gas of heavy molecular weight. That emanation shoots off in alpha particles again, and a still further remainder is left, which breaks again, and is known as emanation X, or the first change. What is left after this undergoes a change without shooting off rays, and when that has taken place another alpha particle is shot off, besides electrons and rays known as gamma rays. Following this are two more changes, which take place so slowly, however, that they are of no importance here.

"Since an alpha particle consists of a number of electrons, when it passes through the air (and consequently through the air molecules) they are not deflected as a whole, but tear one or more of the electrons of the air molecules out, which, of course, leaves those air molecules positively charged. Therefore the torn-out electrons are attached to the remaining part of the molecule as attracted to a negatively charged body.

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"This furnished our means of investigating these phenomena," continued Mr. Kleeman, "and we, that is, Professor Bragg and I, have found that the alpha particle is not deflected in its path, and that it comprises four streams which differ from one another in initial velocity, and also that it spends its energy in ionisation (that is to say, tearing out electrons in the air). These four streams, in our experiments, went four different distances in the air, and then stopped dead, their energy being expended. The alpha particle sent off by the radium goes about three centimetres in the air before it stops. The alpha particle shot off from the emanation goes about 3.5 centimetres; that by emanation X (or the first change) 4.5 centimetres, and tne third change 7 centimetres.

"In the course of our experiments we shot the alpha particles through thin sheets of different metals, amongst which were gold, silver, copper, and platinum films, and we found that a thin film of any of the metals tried would diminish the distance that these streams were shot into the air by the same amount, but would not deflect the alpha particles from their straight line course. The density of the metal, multiplied by its thickness, and divided by the product (consisting of the diminished length of a stream), and multiplied again by the density of the air, gave us the stopping power of the metal as compared with air. And it was found that this was not proportionate to the density of the substance, but proportionate to the square root of the atomic weight. And in the case of gases, we found that the stopping power was proportionate to the sum of the square roots of the atoms composing the molecule of the gas."

Would you mind, Mr. Kleeman, explaining this in less technical language?

"Certainly. I will put it into popular language. The physical interpretation which can be placed on this is that an atom consists of circular discs, and electrons on the circumference of the discs are only capable of being knocked out by the alpha particle. For the circumference is proportional to the square root of the area of disc—that is, proportional to the mass of the atom, and when we have a molecule consisting of several atoms electrons can only be knocked off the circumference of each constituent atom. I should like to add," continued Mr. Kleeman, "that we have found that all along the path of the alpha particle we have electrons knocked out of the air molecules, and the latter are left with a positive charge. These are gathered up in our laboratory by means of an instrument known as an ionisation chamber, consisting of a plate, kept positively charged, and parallel to a gauge, some distance away, negatively charged. This chamber gathers together the debris between the gauge and plate, and by having the arrangements at various distances from the radium we set the debris in the path of the alpha particles."

In conclusion, Mr. Kleeman spoke confidently of the success of the experiments now in progress.

BELGIAN SCIENCE CONGRESS.

Melbourne, June 9.

The Prime Minister, in replying to an invitation from the Belgian Government, has stated that the Commonwealth Government do not see their way to be represented at the International Congress on radiology and ionisation, to be held at Liege in September next.