

Attack on the Atom

Latest Research Work

THE annual exhibition of the British Institute of Radiology was opened in London on December 3 by Lord Rutherford, who not only gave one of his extraordinarily simple and yet illuminating expositions of the history of atomic physics, but added an announcement of the results of his latest researches.

At the Cavendish Laboratory a co-ordinated attack has been made on the problem of the structure of the nucleus of the atom. The nature of the nucleus may be deduced from the rays it emits when it disintegrates, but the rays are so complicated that progress has been slow in the study of how they are produced. Lord Rutherford is now fairly certain that the penetrating rays from radium, which resemble X-rays, but surpass them in power of penetration, are due to the vibration of the nuclei of helium atoms within the nucleus of the radium atom. They appear not to be due to the vibrations of the ultimate particles, the protons and the electrons, but to groups of these bound together as in the nucleus of the helium atom, and the mechanism is of the type suggested by the young Russian physicist, Gamow.

Lord Rutherford recalled his early days in the Cavendish Laboratory after the X-rays had just been discovered in Germany. The application of them made the discovery of radio-activity and of the electron much simpler. Indeed the discovery of the X-rays by Rontgen in 1895 really marks the division between the old physics and the new.

What is Radiation?

DURING the exhibition, Sir James Jeans, one of England's most noted scientists, delivered a lecture on "What is Radiation?"

The chief characteristics of radiation are that it travels and carries energy. According to our idea of familiar things, such as stones and water, energy is carried by them as by particles and waves. When energy is carried by stones or particles it is assumed that they fly through empty space. When the energy is carried by waves just the contrary happens, for one cannot conceive waves as travelling through emptiness.

Newton first tried to explain light by particles, but the explanation broke down. Then the idea of light as waves was developed, and was so successful that in the nineteenth century physicists, except one or two profound ones like Maxwell, were quite certain light was wave-like, and that a substance existed to transmit it, the ether. But as the knowledge of light became deeper it was found to have unexpected particle-like properties. The particle-like properties were more evident in light of short wavelength, such as X-rays.

By 1905, Einstein had developed a theory which conceived of light as bundles of entities called photons. These have weight, but no electric charge. They can be conceived as a form of a fundamental structural unit of nature which has two alternative forms, the electron and the proton. As a rule protons and electrons move much less quickly than light, because they have to carry charges of electricity about with them. All of the three fun-

damental units are a combination, as it were, of wave and particle characteristics, sometimes showing one property and sometimes another. Photons have very little weight; in fact, the electric light companies have to supply so little to light our houses that they can charge us £17,000,000 an ounce for photons. This expense of photons explains in the last analysis why the transmutation of metals into gold would be uneconomical if we could do it. The cost per ounce would be of that order.

Useful Hints

WHEN reaction seems much too strong and it is inconvenient to take off turns from the reaction winding, and adjustable condenser of about .0002 mfd. placed between the anode and filament of the detector valve to act as a by-pass may be of assistance.

FOR very fine adjustments of tuning of reaction it is always an advantage to turn the dial by its outer rim.

AN easy method of removing the layer of scale on a neglected soldering iron is to heat the iron until it

is almost red-hot and plunge it swiftly into cold water, when the deposit will flake off.

TERMINALS should never be filed over a panel where variable condensers are mounted, or the dust may get on to the vanes of the variable condensers and cause endless trouble.

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LARGE dials give much finer adjustments than small when held in this way, and it is often advantageous to fit a large "tuning" dial to a reaction condenser which normally has a small dial.

ONE disadvantage of dirty surfaces and poor heat from the soldering

iron is that you are liable to melt adjoining ebonite, etc., through failure to get a quick joint.

IF your soldering iron is not properly heated when soldering to terminals on a transformer or similar component, you may melt the connections inside the instrument and find it extremely hard to renew them.

IF the flux from a newly-soldered joint is wiped while it is hot it comes away cleanly, but if left until cool it becomes sticky, and it is impossible to remove it from the underside of wires, etc.

ONE of the greatest disadvantages of soldering flux left behind around a joint is that dust will settle upon this in time, and so make a conductive path which may destroy the advantages of correct insulation.

ELECTRIC soldering irons are very convenient, but as they are not quite so robust as ordinary ones, should be handled carefully and not banged against anything or the heating element may be injured.

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