

Sección Inglesa.

RADIUM.

It is a peculiarity of Radium, as everybody who has taken even a passing interest in the subject must have noted, that it is impossible to deal with either the theoretical or the experimental phase of this wonderful and mysterious new metal without adopting a lecture hall manner. Nor must this idiosyncrasy be misinterpreted as betraying an unwarrantable arrogance on the part of the writer—it is the natural and inevitable attitude, not only of those who are in a position to throw new light upon a dark subject, but also of those who affect only to collate and arrange the facts that have been revealed by scientists. When all that has so far been disclosed about Radium has been read and digested, the sum total of our knowledge is comparatively insignificant. M. and Mme. Curie, the gifted discoverers of the substance, protest that they are almost ignorant as to its effects and uses. The scientific, practical, and medical values of Radium are not yet removed from the region of possibilities, but the scientific mind of Europe and America is concentrated on the subject, and experimentalists are daily adding to our knowledge and assisting to harness this new or intra-atomic energy to the chariot of physical science.

My object in this letter is to set down the facts that have been revealed about Radium to date—its properties and its potentialities—and to begin at the beginning, let me answer briefly the natural inquiry, "What is Radium?" Radium is the name given to a new elementary substance, the existence of which was first demonstrated by M. Henri Becquerel, who, in the course of his studies of the phosphorescent substance, uranium, affected the discovery of "radio-activity." This was in 1896, and Madame Curie took up the subject and made quantitative measurements of the radio-activity of a great number of minerals. In the course of innumerable experiments, she found that the residue of pitch-blende, an oxide of uranium, when chemically isolated by the extraction of the uranium, was four and a half times as active as that mineral. These residues by repeated processes of solution and crystallisation, each of which gave a result five times stronger than the last, ultimately produced a substance though in very small quantities, which was a million times more active than uranium. In its purest form for scientific purposes, the metal exists as radium bromide, and although the German chemist Griesel is now able to obtain four grains of the substance from one one of pitch-blende or uranium residues, Mme. Curie was, at first, only able to segregate a tenth of a grain of Radium from two tons of material.

Radium is a whitish substance which does not change in appearance as it increases in intensity, but keeps the form of small crystals which may be crushed into a white powder. It is preserved in small glass tubes, not much larger than a thick match, which are sealed at both ends and partly covered with a fold of lead for the protection of those that handle it. The world supply of this precious metal at present available could be contained in a lady's thimble. In two years M. and Madame Curie—M. Curie did not join his wife in her investigations until she had proved the existence of the metal—treated eight tons of pitch-blende for a total yield of fifteen English grains, or the 466th part of a pound of Radium. M. Curie

calculates that in all the world there is not available more than four grammes, or about one and one-third ounces. Of this, about one gramme is held in France, one gramme in Germany, something less than a gramme in America, and another gramme in England and elsewhere.

The price of Radium is, of course, a very uncertain quantity. To say that it is "hundreds of times dearer than gold" is not to be particularly definite, and even the Curies' estimate of its worth at three thousand times its weight in pure gold has been disputed. M. Curie recently computed the value of a kilogramme (two and one-fifth pounds) of Radium at ten million francs (£400,000), but Sir Robert Ball, in the course of a lecture delivered in Nottingham last January, estimated the worth of a pound of Radium at £1,000,000. In seven thousand tons of pitch-blende there might be two pounds of Radium.

But Radium, besides being the most expensive metal in the world, is the most powerful of discovered substances. Let me append here a list of the properties that it has been proved to possess. Radium is electricity in the making; it is the phenomena of radio-activity, and has the power of emitting material substances (without any external excitement) which are capable of discharging electricity at a distance. It is "not only the most radio-active of discovered bodies," but it has also the greatest atomic weight, and therefore, on the electrical theory of matter, the most complicated arrangement of electrons to form its atom.

A century ago the atomic theory was established which regarded the atom as indivisible, and therefore the smallest particle in matter. It was accepted that these "ultimate" particles would not be found to be made up of still more infinitesimal particles. But Professors Larmor and Thomson proved that these atoms—three hundred millions of which can lie in a row side by side in an inch—are composed of electrons which are a thousand million times smaller in bulk than atoms are. The atoms of Radium are constantly giving off innumerable sparks, which move at the incredible speed of 180,000 miles a second—five hundred times faster than the speediest bullet from a rifle—and which break away in such numbers that the mind could not grasp the figure of a second's output. This disintegration of the atoms of Radium, in addition to throwing off a gaseous emanation called helium, and emitting three kinds of rays, gives out light and heat without any waste or diminution of substance that can be detected of the most delicate scientific instruments.

To be continued.

CRONICA INTERNACIONAL

LAS GRANDES POTENCIAS NO HACEN LA GUERRA A LAS PEQUEÑAS

Mientras las grandes potencias se ven obligadas a gastar millones cada año para buscar el medio de imponer respeto a las naciones rivales, hay numerosos países pequeños y débiles, que sin que les cueste un céntimo gozan de este mismo respeto y de una paz envidiable. Su propia debilidad es su salvaguardia, y los celos de las naciones poderosas bastan para que ninguna de éstas se atreva a invadirlos ni a declararles la guerra.

Suiza es uno de estos países. Sin puertos, con un ejército reducido y rodeada de Italia, Francia, Ale-