CHEMISTRY

Uranium Sources

It occurs in various chemical forms in Czechoslovakia, Belgian Congo, Canada, Utah and Colorado. Prewar radium-uranium ore obtained from Congo and Canada.

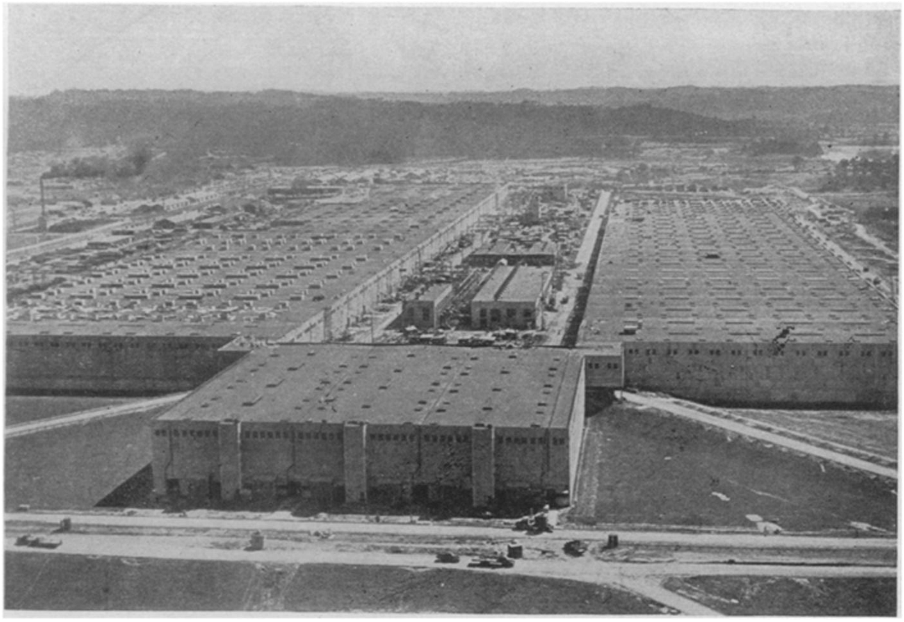
➤ URANIUM, classed by chemists as a minor metal but now perhaps playing a major part in atomic bombs, occurs in various chemical forms in widely scattered countries of the world on at least three continents, North America, Europe and Africa. Pitchblende, a form of uranium oxide, is mined in the Belgian Congo, in Bohemia in Czechoslovakia, and at Great Bear Lake, Northwest Territory, Canada. Carnotite, a uranium and vanadium salt of potassium, is found in Utah and Colorado.

Nearly the entire world output of radium-uranium ore prior to the war was mined at Great Bear Lake and in the Belgian Congo. Mines in both countries were inoperative during 1941, but the Canada company had stockpiles at its refinery at Port Hope, Ontario, and enjoyed its best sales year that year. Mining began again in 1942. The German occupation of Belgium in May, 1940, closed the Belgian refinery at Oolen, near Antwerp, where the African ore was refined, but the Germans captured no stocks there.

The German supply of radium-uranium ore, during the war, was the relatively small amount available from St. Joachimsthal in Czechoslovakia. The Germans did not use the Belgian refinery because there was no ore for it. The stocks at Oolen, including all of the radium and part of the uranium, had been moved to the United States before the invasion.

During the European war, the United Nations were in a favorable position as regards radium and uranium. These countries possessed an estimated two-thirds of the world radium supply and three-fourths of the uranium. Also they controlled approximately 95% of all the known ore reserves.

The carnotite ore mined in western Colorado and eastern Utah yields radium, uranium and vanadium. The production did not meet domestic needs, however, and considerable radium salts, radioactive substitutes, and uranium oxide and salts were imported.



ATOMIC FISSION PLANT—Another view of one of the gigantic production areas at the Clinton Engineer Works at Oak Ridge, Tenn. Shown on the front cover of this SCIENCE NEWS LETTER, is one of the production areas at the Hanford Engineer Works near Pasco, Washington.

The principal uses of uranium (not including its use in atomic bombs) is in ceramics, luminescent paints, tool steels and chemicals. Uranium oxides color pottery glazes and porcelain bodies black, gray, brown or green in a reducing environment, and yellow, orange, or red under oxidizing conditions. Sodium uranate and sodium uranyl carbonate produce the fluorescence typical of uranium glasses.

Uranium salts are incorporated in luminescent paints, either for their own fluorescence, or as activators for such accessory compounds as zinc-cadmium sulfide and beryllium oxide. Uranium imparts desirable properties to steel tools. It is used in the steel as a ferrouranium or in an alloy with nickel. It is used in obtaining a stainless silverware, and as a catalyst in a number of organic chemical reactions.

Science News Letter, August 18, 1945

PHYSICS

Atoms Are Like Miniature Solar Systems

➤ THE ATOM is the one fundamental unit of matter in the universe. Everything is made of atoms. The only difference between the coal in your furnace, the phosphorus in the match that lights it and the oxygen in the air that makes them burn is that their atoms are made of slightly different arrangements of the same electrical forces. It is these electrical forces that disintegrate the atom and give out atomic power.

Atoms are like miniature solar systems, whose suns are spots of positive electricity and whose planets are electrons. The atoms of the various chemical elements are built of different numbers of electrons. The atoms of uranium are the largest known. Scientists believe they are too large to hold together and that this accounts for the fact that this heavy metal is constantly breaking down into lighter elements, thorium, radium and lead, giving off the strange gas, radon, which is heavier than lead, and showing loss of energy by glowing in the dark.

For nearly half a century the fact of atomic disintegration has been known. But no one knew how to make use of the energy given off by the exploding atoms. Here and there a few electrons would break away from their tiny orbits, throwing the system into confusion, liberating energy as heat and light. Compared to the size of the atom, the quantities of energy liberated are enormous. But no one could predict just when the atoms would explode, or make them do it where the released energy could be made to do useful work. This was the situation at the beginning of the war. Our scientists were almost on the verge of this discovery. But so were the Germans. The race for solving the problem of using the energy locked up in the quiet atoms has been won by our side, and just in time.

Science News Letter, August 18, 1945

PHYSICS

Rapid Assembling

Atomic bomb parts are made to assemble themselves just before detonation. One method would be shooting one part from a gun against a target which is the second part.

➤ TO PREVENT the atomic bomb which wrecked Japanese cities from going off prematurely in a harmless fizzle, the bomb was constructed in such a way that its various parts would assemble themselves at the moment when the explosion was desired. This is revealed in a technical report by Dr. H. D. Smyth, of Princeton University, recently released by the War Department.

This rapid assembling can be done by shooting one part as a projectile from a gun against a target which is the second part of the bomb.

Weight of the projectile, its speed and the caliber of the gun need not be far from the range of standard ordnance practice. But new problems were introduced by the fact that it was necessary to have sudden and perfect contact between projectile and target and by the fact that gun, projectile and target all had to be "portable."

The reason why assembly could not be done until the very last minute is because of what is known as the "chain reaction." When you light a fire, Dr. Smyth explains, you set in motion such a chain reaction. The match releases enough energy to ignite some fuel which releases more heat to set fire to more fuel and so on.

If atomic energy is to be practical for large-scale use, such chain reactions must be set up. This is not always easy. It all depends on whether more neutrons are produced by the splitting of the atoms than are lost through escape, through capture without atom-smashing by the uranium atoms, or by capture without smashing by impurities. Neutrons released by atom splitting of uranium-235 have very high speeds. To prevent the escape, they must be slowed down.

In a bomb, while it is necessary to have this chain reaction, the chain must not be started too soon. With all the conditions made purposely favorable for a chain reaction, precautions must be taken to prevent its being set off accidentally. Cosmic rays with which we are constantly being bombarded from outside space could set it off. So could the spontaneous splitting of an atom, or reactions in impurities.

It is for this reason that all the parts of the bomb must not be assembled until the moment when it is ready for explosion.

As used in combat, the bomb is detonated at such a height above the ground that the blast effect against structures will be at a maximum and the radioactive products will be spread in a cloud and carried upward in an ascending column of hot air and dispersed harmlessly over a wide area.

Science News Letter, August 18, 1945

PHYSICS

Idea for Plutonium Bomb Credited to Dr. Lawrence

➤ IDEA for the atomic bomb using the new element plutonium is credited to Dr. E. O. Lawrence, of the University of California, in the official report written by Dr. H. D. Smyth, of Princeton University, and released by the War Department.

In a memorandum submitted to a committee of the National Academy of Sciences in May, 1941, seven months before Pearl Harbor, Dr. Lawrence included what the report terms "an important idea not specifically emphasized by others, namely, the production of large quantities of plutonium for use in a bomb." Dr. Lawrence is quoted as saying:

"If a chain reaction with unseparated isotopes is achieved, it may be allowed to proceed violently for a period of time for the express purpose of manufacturing element 94 in substantial amounts . . .

"If large amounts of element 94 were available it is likely that a chain reaction with fast neutrons could be produced. In such a reaction the energy would be released at an explosive rate which might be described as a 'super bomb.' "

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BEGINNING—Prof. E. O. Lawrence, of the University of California, holds in his hands the small beginning of the cyclotron.

PUBLIC HEALTH

Polio Cases Increase Slightly Over Nation

➤ INFANTILE paralysis cases increased slightly throughout the nation for the week ending Aug. 4 but the total number, 476, was only just over half the total for the corresponding week last year when cases mounted to 932.

The week's increase of 22 cases over the previous week was much less than the increase of 175 cases in the corresponding week last year.

Cases will probably continue to increase for another three or four weeks before beginning to decline. The peak of the rise during the epidemic last year was reached the week ending Sept. 2.

States reporting biggest increases for the week ending Aug. 4 were New Jersey, Pennsylvania, Illinois and New York. Decreases were reported from Virginia, Tennessee and Texas.

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