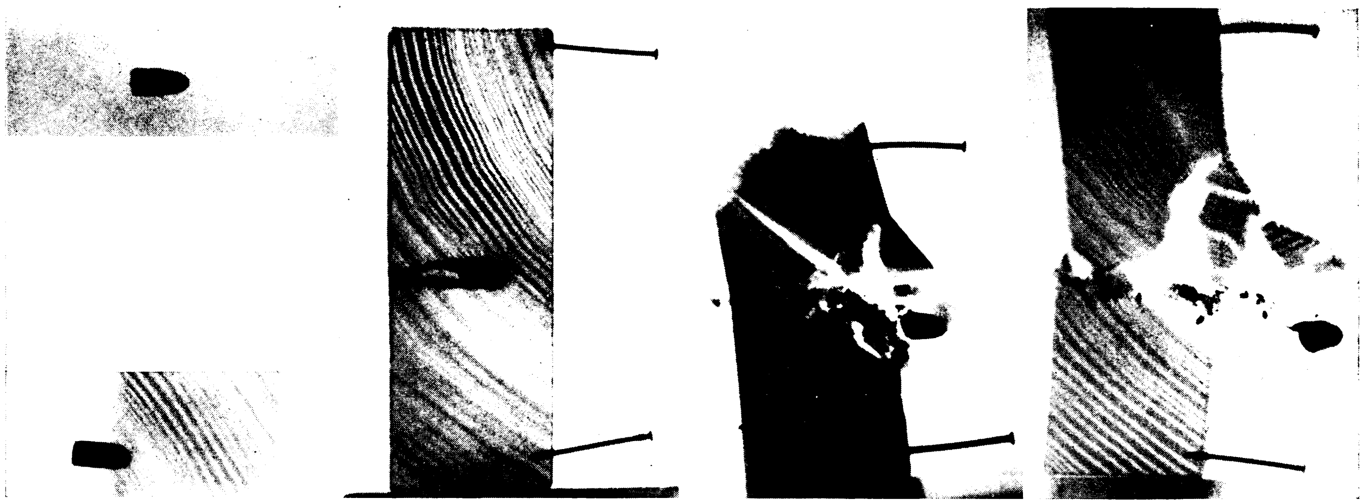

SPEED X-RAYS

These photographs, taken at a millionth of a second permit the scientist to look through a block of wood and see the damage done by the bullet on its way through. The two pictures at left show the bullet in the air and entering the wood. The others shows how the wood "seals" itself after the bullet has entered and show the shattering action of the bullet as it makes its way out.

and discharging it through the X-ray tube. The voltage is about 100,000, somewhat less than that often used in ordinary tubes. But the current is far greater. The ordinary tube takes about half an ampere, this new tube uses about 2,000 amperes.

In use, the bullet, golf ball, or other object being studied, is made to break a fine tungsten wire. This is connected to a timing circuit, which releases the energy stored in the condensers.

Possible practical applications of high-speed X-rays are in studying internal strains in rapidly moving machine parts, detection of slight deflections in a bullet passing through a gun barrel, or finding out what happens to the bones in a football player's foot as he kicks the ball.

Science News Letter, June 29, 1940

• RADIO

Recent experiments on dental caries will be described by Dr. J. R. Blayney, director of the Walter G. Zaler Dental Clinic of the University of Chicago, speaking as guest scientist on "Adventures in Science" with Watson Davis, director of Science Service, over the coast to coast network of the Columbia Broadcasting System, Thursday, July 4, 4:00 p.m., EDST, 3:00 EST, 2:00 CST, 1:00 MST, 12:00 PST.

Listen in on your local station. Listen in each Thursday.

PHYSICS

Water Softening Method May Separate Uranium 235

Patent Is Issued for Running Potassium Chloride Through Zeolite and Then Salt, Increasing Isotope

POSSIBILITY that a method esentially similar to that now widely used for softening water may provide a new means for separating the uranium isotope of weight 235, hailed as a source of practicable atomic power, is foreseen in a patent just granted. The patent, number 2,204,072, has been given to Dr. John G. Dean, director of the laboratory of the research division of the Permutit Company at Birmingham, N. J.

Dr. Dean's method makes use of interesting substances called zeolites. These are chemical compounds containing aluminum, calcium and sodium in combination with silicon. The material looks like sand, except that it is green in color, so it is sometimes called "greensand." Hard water contains calcium and magnesium salts. When this is passed through a zeolite, calcium or magnesium is taken out and sodium put in. Thus, if the water has calcium sulphate in solution before it passes through the zeolite, it has sodium sulphate when it comes out.

When the zeolite has given up all of the sodium, it is no longer effective, but it can be regenerated. This is done by passing through it a strong solution of ordinary salt, which is sodium chloride. Then the reverse of the softening process takes place. The solution is changed to one of calcium chloride, and sodium is put back into the zeolite.

Dr. Dean's patent applies this to the separation of isotopes, which are elements very similar chemically and physically, but with atoms of different weights. Ordinary potassium, for instance, contains three isotopes, of atomic weight 39, 40 and 41; 40 is in extremely small amounts. Of the others, number 39 is a little more than 14 times as abundant as 41.

He passed a 2% to 3% solution of potassium chloride through a 35-inch column of zeolite. In the solution which emerged, the 39 isotope was even more plentiful than normally. But when a salt solution was passed through to regenerate the zeolite, it yielded a potassium chloride solution in which the percentage of the rarer isotope was increased about 5%. By further passages, the percentage could probably be enlarged still more.

In the case of lithium solutions, he increased the relative abundance of the rarer isotope about 9%. With nitrogen compounds, the increase was about 10%.

Uranium of atomic weight 235 makes up about one one-hundred-fortieth of ordinary uranium, the rest being an isotope of weight 238. The former is the one believed to be a possible source of atomic power, if it can be separated in sufficiently large quantities. One method already used to separate it, however, the mass spectrometer, is exceedingly slow, so it is estimated that 75,000 years would be needed to secure a pound of the stuff. Another method, that of thermal diffusion, may speed this up about 11,000 times, but even this would be too slow to be of value.

Dr. Dean stated to Science Service that he saw no reason why his method could not be applied as successfully to uranium as to lithium, potassium and nitrogen. He said that he does not have the facilities for making these tests, but that material has been supplied to Dr. H. C. Pollock, of the General Electric Company's research laboratory at Schenectady, N. Y., where the method will be tried.

Science News Letter, June 29, 1940

AERONAUTICS

Airplane Engine Production To Pass 25,000 By December

Huge New Plant Additions Will Enable "Big Three" Producers to Speed Up Their Output Substantially

AMERICA'S capacity to build all-important aircraft engines is rising at phenomenal rate. At the end of last year it stood at 16,000 a year. By December it will pass 25,000.

The Wright Aeronautical Corporation marked still another milestone in aviation progress as it strives to bring into full production at Paterson, N. J., the fourth major motor plant addition since the start of the war.

Oldest and largest of the "big three" engine producers, its new plant adds 540,000 square feet to the company's facilities, bringing to 2,300,000 square feet the area it is devoting to building engines. This is more than double the space available one year ago. Still another plant is already in preparation. A nearby dyeing building (Paterson is a noted textile center) has been taken over.

Besides Wright, both of the other "big three" producers have also increased capacity substantially.

Allison, builders of the new streamlined, liquid-cooled engine, completed a second factory in Indianapolis scarcely was its initial one completed.

Pratt and Whitney, of East Hartford, Conn., has tripled its facilities in the last 18 months. One plant addition went into service early this spring and another has already been started. Pratt and Whitney's capital investment has climbed from $7,000,000 to $27,000,000 during that period. The major part of expenditures for the new plant has been paid for by the Allies. Wright's new plant number two is one such Allied-subsidized addition.

Exact figures on production are not being given out these days but known constants of production engineering enable one to guess that Wright alone should be able to build close to one thousand per month by the end of the year. So should Pratt and Whitney. Allison's output will be smaller for some time. This firm only recently began production and as was to be expected with any new power plant, it has been having its difficulties. However, these are now reported to be largely solved.

Wright takes important steps toward rationalized engine building in its new factory, which is entirely devoted to manufacturing parts. All assembly work is done in the original plant, where 150 test stands, two-thirds of which are generally in use, provide an ear-splitting background. Plant number two is laid out in twelve double lines broken by three cross aisles. The whole lends itself to easier flow of the thousands of parts necessary for an airplane.

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ASTRONOMY

Layer of Lava on Moon Would Explain Cooling

IF THE surface of the moon were covered with a layer of lava about an inch thick, its rate of cooling at a lunar eclipse would be explained. Reporting on observations made from the Mt. Wilson Observatory on October 27, 1939, when the moon entered the earth's shadow, Dr. Edison Pettit, of the Observatory staff, draws this conclusion.

The measurements were made by a thermocouple, which changes the heat radiation from the moon into electricity. It was attached to a 20-inch reflecting telescope. These showed that at the beginning of the eclipse the temperature of a point on the lunar surface where the sun was directly overhead was 208 degrees F., just below the boiling point of water on earth. While the moon was entering the shadow, the temperature dropped rapidly, so that when the eclipse was total, the temperature was 98 degrees below zero, F. While the moon was in the shadow, the temperature continued to drop, rapidly at first, then more slowly, until just at the end of the total eclipse, it had reached 144 degrees below zero, F. As the moon left the shadow, the temperature returned to normal.

From these data, Dr. Pettit was able to calculate the ratio between the radiation that the moon receives, from the sun, and that which it sends out again into space. He found that the two were nearly proportional, showing that the moon's surface is able to hold its heat for a very brief period. This is characteristic of materials like volcanic lava, of which the moon's surface is supposed to be made. Knowing how lava does "hold its heat," he found that a layer 2.6 centimeters (about one inch) thick would respond the way the moon's surface did on this occasion. These results are similar to observations which he made of a lunar eclipse in 1927.

Dr. Pettit's report appears in the *Astrophysical Journal.*

Science News Letter, June 29, 1940

PHYSICS

Northern Lights Copied by Current Through Nitrogen

WHAT they described as "the most faithful reproduction of the auroral spectrum so far achieved" has been obtained by passing electrical discharges through long tubes filled with nitrogen at low pressures, Dr. Joseph Kaplan, of the University of California at Los Angeles, and Dr. Sidney M. Rubens, of the University of Southern California, announced to the meeting of the American Physical Society.

In order to get the maximum effect, the tubes were viewed from the end, so that the light came from a great thickness of gas. The pressure was about one-fiftieth to one seventy-fifth of that of the atmosphere.

The light was analyzed through the prisms of a spectroscope. They found that after the current was disconnected, there remained an after-glow in the tube, similar to the actual aurora, or northern lights. Even though the glow faded as time passed, at first the band in the spectrum corresponding to wave length 3467 increased in brilliance. They interpret these effects as due to changes in the nitrogen molecules.

Science News Letter, June 29, 1940