

PHYSICS-ENGINEERING

Future Atomic Jobs

The manufacture of special isotopes for future technical developments will be the main use of atomic power plants, Prof. W. G. Pollard declares.

► **JOBS FOR FUTURE** atomic power plants and the conditions for operation of such units were forecast by Prof. W. G. Pollard of Tennessee University's Department of Physics for members of the American Society of Mechanical Engineers meeting in Chattanooga, Tenn.

In addition to atomic energy as a source of power, comparable to any other fuel, the unique products of fission reactions will be a reason for operation of such installations, according to Prof. Pollard. Plants for the production of various isotopes will be required.

"The isotope is as important in a nuclear reaction," says the Tennessee physicist, "as the molecule is in a chemical reaction. A variety of special isotopes will be required for future technical developments and these will require special plants for their production.

"Such plants require unit operations unfamiliar to present engineering practice. They may be based on thermal diffusion columns, gas diffusion through barriers, mass selection of ions in a magnetic field, ultracentrifuges, or special chemical exchange reactions. The engineering of such plants may be expected to be an important new field for oncoming engineers."

In regard to the future of atomic energy, Prof. Pollard discusses two sorts of nuclear reactions. In the first sort both reacting nuclei contain one or more protons. In the second neutrons take part. The first kind of reaction would take place if we could bring together atoms of some of the light elements closely enough to allow their nuclear forces to act.

Hydrogen would react with lithium, under these circumstances, and give out energy of the order of 30 million kilowatt hours per pound of lithium burned, or nitrogen could be reacted with heavy hydrogen to release eleven and a half million kilowatt hours per pound of nitrogen. Neglecting considerations of thermal efficiency, any of these reactions could be used to operate a 50,000 kilowatt power plant on a continuous basis with a fuel consumption of about a pound per week.

"Not only is this perfectly possible," goes on Prof. Pollard, "but a vast number

of power plants of this type are at present in continuous operation throughout the universe. These are the familiar stars, including our own sun."

Enormous central temperatures and enormous pressures in the stars hold together these light nuclei so that the reactions which we observe can take place. Such temperatures and pressures are impossible on earth. In the other sort of reaction, resulting from action of neutrons, which has been made to work here on earth for production of the atomic bomb, the difficulty is that neutrons do not exist as such in nature.

"With the exception of a negligible number in cosmic rays," says Prof. Pollard, "they are all to be found captured in atomic nuclei from which they can be removed only with the expenditure of considerable energy. Thus we are faced with a difficult dilemma. Materials for the first class of reactions are abundant but the conditions to make them go are prohibitive. For the second class the conditions of operation are ideal for a practical atomic power plant, but the essential material for them is non-existent as a natural substance."

"The one reaction capable of maintaining a sustained source of neutrons," says Prof. Pollard, "is the fission reaction. In a light nucleus the repulsion between the protons due to their electric charge, although very strong by molecular standards, is yet only a negligible part of the intense nuclear forces binding the particles together.

"In a heavy nucleus near the top of the periodic table there are, however, so many protons that their repulsion becomes comparable to the nuclear cohesive force. As a result a relatively small disturbance of the nucleus can upset the equilibrium so that the nucleus divides into two pieces which are quickly pushed beyond the range of the nuclear forces.

"Under the great force of repulsion between the large positive charge on each, the two fragments then fly apart with enormous kinetic energies. The heat generated in slowing down and stopping them is the major source of energy in a uranium power plant."

Science News Letter, April 13, 1946



RESISTS ACIDS—From a boiling bath of hot sulfuric acid, a laboratory technician lifts two rods of plastic. One has charred and deteriorated. The other, made of Du Pont's new "Teflon" tetrafluoroethylene resin, is not affected at all by the highly corrosive acid. "Teflon" is not attacked even by aqua regia, which dissolves gold and platinum.

SEISMOLOGY

Tidal Wave Caused by Quake off Unimak Island

► **THE SUBMARINE** earthquake that set the destructive tidal wave in motion across the Pacific on Monday, April 1, had its epicenter about 70 miles south of Unimak island, which is the first and largest of the Aleutians, just off the tip of the Alaskan peninsula. Seismologists of the U. S. Coast and Geodetic Survey, who made the determination after studying data wired and radioed to Science Service from seven observatories, gave the geographical coordinates of the spot as latitude 53.5 degrees north, longitude 164 degrees west.

There were three main shocks, all severe. The first and strongest recorded its time of initiation on the instruments as 7:28.8 a.m., EST, which is the equivalent of 1:58.8 on Unimak island—which happens also to be Hawaiian time. The second shock came five hours later, and the third followed 11 hours after the second.

The sea bottom has a very curious formation at the point where the earthquake occurred, the Coast and Geodetic