

NUCLEAR PHYSICS

New Steps in Electricity

Germanium metal bombardment with a cyclotron has produced new types of electrical "semiconductors" which may be useful for radio, radar and microwave.

► BY knocking holes of positive electricity in the unusual metal germanium with an atom-smasher, Purdue University physicists have created a new kind of substance that promises to be useful in rectifying electricity and converting light into electrical effects.

Dr. K. Lark-Horovitz, head of Purdue's department of physics, told the American Physical Society meeting in New York that with the Purdue cyclotron new types of electrical "semiconductors" have been produced which promise to have varied applications in the field of radio, radar and microwave.

Very pure germanium metal was bombarded with the hearts of heavy hydrogen atoms, deuterons, accelerated to 10,000,000 volts. Although the attack was for only a few seconds, lasting changes were produced in the metal, and the resistance of the metal was increased ten-fold.

"Holes" which behave like electrons that are positive electricity instead of the usual sort of negative electricity are created by the bombardment and this leads to new phenomena which allow the use of the bombarded material as rectifiers, photosensitive devices, and for other possible uses.

The bombardment dislocates permanently atoms from their regular positions in the metal, Dr. Lark-Horovitz explained, and when these atoms are dislocated they are able to take up electrons from the internal structure of the metal and produce in this way some holes that for all practical purposes behave like positive electrons.

Half of a piece of the metal can be bombarded and made to conduct electricity by means of the positive holes and the other half can be left alone, conducting in the ordinary manner. This makes a rectifier that can yield direct current from alternating current. The sharp boundary between the positively and negatively conducting regions is extremely photosensitive and can be used to convert light into electricity, particularly in the invisible infrared regions of the spectrum.

Other nuclear particles are being tried in a similar way for their effects on

germanium and other substances. The hearts of helium atoms, called alpha particles, have already been found to produce strong effects, Dr. Lark-Horovitz reported. Drs. E. Bleuler, R. Davis, and D. Tendam were in the Purdue cyclotron group making the experiments.

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AERONAUTICS

Largest Ram-Jet Engine Ever Flown Passes Test

► THE largest ram-jet engine ever flown was successfully tested in Inyokern, Calif., the U. S. Navy revealed. Its speed was far in excess of the speed of sound. The "flying stovepipe" shot through the air like a rocket; it was not in a plane.

The ram-jet is not a primary source of power for an airplane, but a secondary power to give sudden spurts of speed to a plane already travelling at a fast clip. A speed of from some 300 to 400 miles an hour is required before the ram-jet scoops up enough air to cause combustion and set it into operation.

Something similar to the ram-jet is already in use in a few planes as an "afterburner" behind the jet engine to complete combustion of unconsumed combustibles in the jet exhaust.

The ram-jet engine was developed by the Applied Physics Laboratory of the Johns Hopkins University at Silver Spring, Md., during the war, and was designed especially as the propulsion unit for guided missiles which acquired initial speed by means of a rocket or a combination of rockets.

This type of engine has no moving parts. It is a metal tube open at both ends which scoops up air at high speed to cause the combustion of a fuel within, giving a high-speed discharge of gases at the rear, thus causing propulsion in the same manner as the ordinary jet engine. However, it is a powerful device. Pound for pound of engine weight, the large ram-jet just tested delivers about 25 times the power available from the best aircraft reciprocating engine.

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AERONAUTICS

Plane and Missile Bodies Must Be Slim and Pointed

► AIRCRAFT bodies, both of planes and missiles, must be slender with long pointed noses, and with all body angles as small as possible, if they are to be used at extremely high altitudes, the Institute



SUCCESSFUL FLIGHT TRIAL—This shows the largest supersonic ram-jet engine ever flown leaving the launching rack. The ram-jet must first be boosted to high speed by a rocket, which then drops off, leaving it to continue under its own power.