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.

Science News Letter, February 7, 1948

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.

Science News Letter, February 7, 1948

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.

of the Aeronautical Sciences was told by Jackson R. Stalder and David Jukoff of the National Advisory Committee for Aeronautics. The reason is atmospheric friction.

At 75 miles altitude, they said, the heat of the sun has little effect as contrasted with its potency at customary flight levels. At altitudes of 150 miles, solar radiation is the predominating factor that determines the temperature of a body in flight. Within the earth's atmosphere friction alone melts meteorites that wander into it.

"At the extreme altitude encountered during flight of sounding rockets or missiles," they stated, "the atmosphere can no longer be considered as a continuous medium, and account must be taken of the motions of the molecules comprising the atmosphere." They submitted calculations of the temperatures of bodies travelling at altitudes from 75 to 150 miles, at speeds up to 13,000 miles per hour.

Wing Design for Speed

Power for supersonic flights has forced designers to consider relatively unconventional wings, most of them very thin, with a short span relative to their size, and a high degree of backward or forward sweep, the meeting was told by Victor I. Stevens, Jr., of the same government aviation laboratories.

The exhaustive study of wing shapes became urgent, he said, with the development of power plants capable of driving aircraft at supersonic speeds. Heretofore the primary limit on airplane speed was the available power. A wide range of wing designs were shown on charts, and their expected performance as determined by wind tunnel and other tests was indicated.

Science News Letter, February 7, 1948

VETERINARY MEDICINE

Vaccine Protects Poultry From Newcastle Disease

➤ A NEW vaccine to protect poultry against Newcastle disease, one of the most destructive of poultry maladies, has been developed by scientists at the Massachusetts Agricultural Experiment Station. It is prepared from a low-potency virus, and inoculated by the thrust of a small needle into the wing-web—the so-called "stick method."

Success with some 12,000 chicks is reported. Immunity was tested with a potent virus from one to three months after vaccination, and all the young chickens survived.

It has been found possible to combine this vaccine with another, against fowl pox, and thus give the birds double protection with a single vaccination.

Science News Letter, February 7, 1948

TECHNOLOGY

New Type of Bed Proposed

➤ CONCRETE blocks will replace metal beds in hospitals of the future, if a French architect has his way. But the bed would feel no harder to the patient.

Jean Walter, a French hospital designer, explains his novel concrete bed in a report on hospital building in the journal, *Lancet,* (Jan. 3).

Patients would sleep on the usual mattress and springs. Instead of the metal frame support, the bed would be on a hollow concrete block covered with earthenware.

"This would save considerable trouble in cleaning," M. Walter points out.

Each block would have drawers for the patient's property and medical equipment, and the concrete bed could be wired for diagnostic instruments.

The new type of bed is only one of several suggestions the French architect has for modern hospitals. Hospitals, he believes, should be designed like industrial plants to prevent waste effort. And many hospitals use too much space.

The New York Hospital, built in 1930, has 576 cubic meters of space for each bed. M. Walter has designed hospitals with as little as 90 cubic meters per bed.

"I have discarded the dogma that all wards should face south," he declares.

Acute surgical patients average only 12 days in the hospital, while medical patients average 20. He argues that sunshine is not of great importance in this short time and that modern heating makes the sunlight unnecessary for warmth.

M. Walter's basic design for a large hospital consists of a central core, five to eight stories tall, with several wings extending out from the center. Through the central tower run elevators for patients, staff and visitors and other communication lines.

The wings on succeeding stories are graduated so that each floor has a balcony. This permits recuperating patients to get outside without using the elevator or leaving the building.

Top floor of the Frenchman's hospitals always is for the kitchen, so that the smell of cooking will not spread through the building.

And where is the architect's ideal medical center? M. Walter answers:

"It will be found that each center has something to offer: Munich has a model linen-room, Budapest the perfect kitchen, Alexandria (Egypt) the best infectious diseases department, and Chicago an excellent sound-proofing system."

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