

## PHYSICS

# New Transforming Device

An "electrical sandwich" of titanium dioxide used as rectifier is expected to relieve the demands on selenium which is now in short supply.

► THE SHORT-SUPPLY pinch of strategic selenium is forcing scientists to seek new materials that can be used in radio, television, and radar sets to convert alternating current to the direct current required to operate vacuum tubes.

Currently under development at the National Bureau of Standards is an "electrical sandwich" made of titanium dioxide that may help solve the selenium shortage. It permits current to flow easily in one direction, yet offers considerable resistance when the current tries to go the other way.

Such rectification now is being done by vacuum tubes and metallic "sandwiches" using copper oxide selenium, or magnesium-copper sulfide. Of these, the selenium rectifier is one of the most practical, commercially speaking.

Dr. R. G. Breckenridge and W. R. Hosler, the NBS scientists working on the titanium-dioxide rectifier, say their project seems to hold great promise. Although titanium is still rather high priced, more quantities of it are becoming available and its cost is dropping. Titanium-dioxide rectifiers soon should compare favorably in price to selenium rectifiers.

Military engineers who constantly are

scouting for things that work at high temperatures have shown interest in the titanium-dioxide rectifier. It works well even at temperatures of 300 degrees Fahrenheit.

Generally speaking, half-inch squares of commercial titanium sheet metal only two-hundredths of an inch thick are used to make the rectifiers. The squares are heated in an atmosphere of steam at about 1,100 degrees Fahrenheit for about three hours while a semi-conducting layer of titanium oxide forms over the metal. Then silver is deposited on the squares, sandwiching in the oxide.

Wires are connected to each plate. When alternating current is impressed on the rectifier, the current moves much more freely in one direction than in the reverse.

Each "sandwich" can stand 20 volts across it. For a commercial unit, the titanium rectifier cells would be stacked together to form a sort of "Dagwood" sandwich until the battery of cells could handle the working voltage.

Although titanium-dioxide rectifiers still are in early developmental stages, Dr. Breckenridge said at least two companies are working on them in their own laboratories. The National Bureau of Standards will con-

tinue its research, he said, until "industry gets going on them" in the not-too-distant future.

Science News Letter, October 25, 1952

## GEOPHYSICS

## Clue Found to Earth's Electrical Conductivity

► STUDYING THE optical properties of the mineral olivine under high pressure is giving a British scientist visiting at the University of California at Los Angeles some idea of what the electrical conductivity at the center of the earth is like.

This investigation, which is important in the study of the earth's magnetic fields, is being made by Dr. Keith Runcorn, assistant research director of Cambridge University's department of geodesy and geophysics, in U.C.L.A.'s Institute of Geophysics.

The rigid mantle of the earth is thought to consist largely of olivine, an insulator under normal conditions. At the high temperatures within the earth, its properties change enough for it to become a conductor. The electrical conductivity of the earth's mantle plays an important role in many geophysical phenomena, Dr. Runcorn points out.

For instance, it provides an electromagnetic coupling between the earth's mantle and liquid core. The activity of the coupling device may explain the small, irregular fluctuation occurring periodically in the earth's rate of rotation.

Science News Letter, October 25, 1952

## TECHNOLOGY

## Thin Seams Cut by Coal Mining Machine

► UNDER FAVORABLE conditions a new type of German coal planer machine can mine eight tons of soft coal in four minutes, and can feel its way along narrow seams that otherwise might be by-passed, the U. S. Bureau of Mines reports.

Tests conducted in a West Virginia coal mine revealed that the machine could chip out 83.3% of the coal contained in an 11-acre block. By conventional mining methods, only 78.1% of the coal would have been removed.

The high efficiency of the machine points to a "sharp increase" in the amount of fuel that can be mined from thin beds, and to increased reserves of high-grade coking coal. It also means that coal from seams as thin as 24 inches, previously left unmined, now can be recovered.

Traveling 75 feet a minute, the coal planer is dragged back and forth over a solid face of coal by an endless chain. Its steel teeth dig into the coal, which then is pushed on a conveyor.

Although the machine has proved to be satisfactory in mining Pocahontas No. 4 coal, further tests are needed to determine whether it will work well in beds of hard coal, Bureau engineers add.

Science News Letter, October 25, 1952



**SETS RECORD**—Col. Fred J. Ascani just received the USAF Mackay Trophy for setting a world speed record of 635.6 miles an hour in the 100-kilometer closed course competition at the National Air Races in Detroit.