

PHYSICS

Atomic Battery Made

Atomic energy is converted directly into electricity by a new battery that uses electrons from strontium 90, a waste product from atomic piles, to bombard a transistor.

► ATOMIC ENERGY has been converted directly into electricity through a revolutionary atomic battery using a waste product of atomic reactors.

The waste product is strontium 90, which emits high-speed electrons that bombard pea-sized transistors. The transistors, which are themselves revolutionary in the field of electronics, in turn emit 200,000 slow-moving electrons for each high-speed electron striking the material from the strontium 90.

The electric current so created is strong enough to produce an audible tone in a telephone receiver.

The Radio Corporation of America battery is thimble-sized and has a life expectancy of 20 years. It is a climax to 40 years of scientific efforts aimed at converting the radiation of the atom's nucleus directly into electricity. Patents on the forerunner of the battery were issued a year and a half ago. (See SNL, June 14, 1952, p. 371.)

Engineers foresee immediate possibilities for the revolutionary battery. Its ruggedness, long life and compactness make it especially attractive for modern electronic equipment using very small parts.

The battery promises to provide the power source in portable pocket-sized radio receivers, hearing aids and signal controls. Eventually, it is believed the battery will be used in portable short-range radio transmitters for radio telegraph and telephone work. It also may go into radio beacons for air and sea navigation.

Other waste products of atomic reactors are expected to produce atomic batteries as good as the strontium 90 battery, which gives an electric output that far exceeds any such attempt made previously.

The development of the atomic battery has been hailed as a "significant development in the utilization of atomic energy for peaceful purposes."

Previous attempts to harness the atom to the nation's electric gadgets have been encumbered because the atom's energy could not be transformed directly into electricity on a large scale.

Networks of piping to carry liquid metals through the hot reactor were needed. The heat picked up in the reactor then was released in water to generate steam that in turn drove electric generators.

The technical details of the battery are reported in a current *Physical Review* by Paul Rappaport of the David Sarnoff Research Center of RCA, Princeton, N. J. The June, 1952, patent was granted to Dr. Ernest G. Linder, Brig. Gen. David Sarnoff, chairman of RCA's board, credited the two physicists with development of the atomic battery.

Germanium and silicon transistors are suitable for the battery. They are bombarded by beta rays from the strontium.

The 200,000 low-speed electrons released by one high-speed electron from the radioactive strontium source flow across the wafer's junction, producing a voltage which can be applied to an electronic circuit and cause a current to flow.

When connected to the transistor circuit, the battery's one-fifth volt potential provides a current of five microamperes, an output of approximately one-millionth of a watt. The best efficiency of energy conversion so far obtained exceeds 1%; that is, the ratio of useful electrical power developed by the battery is at least a thousandth of the energy of the beta particles as they leave the radioactive source.

The greater part of the original energy is lost as heat in the crystal wafer. As present techniques are refined, an efficiency of 10% can be developed, the scientists expect.

Greater power can be achieved by increasing the present 50 millicurie quantity of strontium 90 or by placing a number of such units in a single container.

Although in theory, virtually any radioactive material could be the source of an atomic battery, strontium 90 was chosen to activate the device because of its high energy beta radiation, its relatively long life, its low shielding requirements and its availability from the Atomic Energy Commission.

Strontium 90 is not now obtainable in completely purified form. Since some of the unwanted radioactive materials are emitters of gamma radiation, shielding is necessary in the laboratory device.

However, strontium 90 in purified form, emits only beta particles which, for the quantities that would be used in a small atomic battery, the scientists report, would not raise problems of shielding.

The extent of the effect of beta radiation on the crystal wafer is not yet known, but it is known that the crystal structure of many substances is gradually damaged by bombarding electrons.

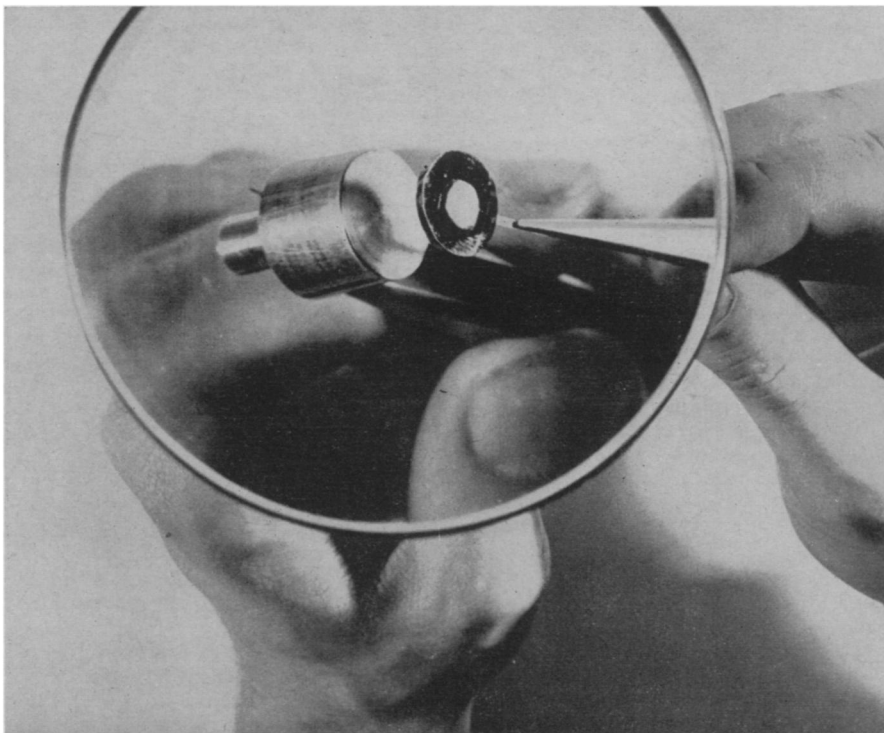
Science News Letter, February 6, 1954

MEDICINE

Polio Vaccine Trial Postponed

► DUE TO delays in the manufacture of the trial polio vaccine, the nation-wide validity tests are expected to get under way in late March or early April, instead of February, it was announced by Basil O'Connor, president of the National Foundation for Infantile Paralysis.

Science News Letter, February 6, 1954



ATOMIC BATTERY—This photograph shows a magnified model of the two basic elements of the experimental battery that convert atomic energy directly into electrical energy, using a radioactive source placed next to the tiny transistor.