TECHNOLOGY

Make Energy Converter

A device called a thermionic converter has been developed that is capable of converting heat energy directly into electrical energy without the use of thermocouples.

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➤ AN ELECTRONIC device that converts heat energy directly into electrical energy has been developed by the General Electric Company, Dr. Guy Suits, vice president and director of research, has reported.

The device, a thermionic converter, "boils" electrons out of a hot metal surface to produce an electrical current. Experimental converters have changed more than eight percent of the applied heat energy into electrical power.

The photograph on the cover of this week's SCIENCE NEWS LETTER shows Dr. Volney C. Wilson of the company's research laboratory, Schenectady, N.Y., inventor of the new thermionic converters. There are many versions of these experimental devices.

The converter represents a unique combination of several principles long known to scientists.

In explaining his invention, Dr. Wilson compared the boiling of electrons out of a metal surface with lifting water to the top of a hill.

"If we let the water flow down the hill, it can do work—run a water wheel for instance—but only if we can provide a smooth, uninterrupted path down the hill. The thermionic converter essentially smooths the path of the electrons from a hot electrode to a cooler one and removes barriers which in the past have absorbed the energy before it could do useful work in an electric circuit."

Most methods of converting heat into electricity involve moving machinery, such as steam plant electrical generation or the heat of gasoline combustion expanding gases, to operate a gasoline engine generator.

Most previous methods of converting heat directly into electricity without intervening rotating machinery have been based on thermocouples. In such devices a junction between two different metals is heated and small electrical currents are produced. However, thermocouple efficiency is normally well below one percent.

General Electric officials emphasized that thermionic converters are "experimental laboratory devices only" and are not ready for production.

"Dr. Wilson's new thermionic converter is an extremely important scientific contribution," Dr. Suits said, "but neither he nor we want to imply that solar-powered space ships or inexpensive atomic power plants are just around the corner because of this invention."

The research director added: "It is only natural to try to relate every new basic scientific discovery to some futuristic gadget. However, real research just doesn't ordinarily work that way."

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AERONAUTICS

Space Ship Described

➤ THE FIRST SPACE ship to Mars will be driven by electricity, not chemical rockets, one of the top guided missile experts in the country has predicted.

Dr. Ernst Stuhlinger, director of the research projects office in the Army Ballistic Missile Agency, Huntsville, Ala., has found that an electrically propelled space ship would be much lighter than a ship using chemicals for power. It would start on its Martian journey from an earth-circling space platform.

The ship's primary power source, he reports in the *Scientific Monthly* (Dec.) would be a nuclear reactor containing about 12 tons of uranium. For protection from its deadly radiation, the reactor would be at least 250 feet from the space ship crew's living quarters. It would drive a turbo-generator.

Dr. Stuhlinger's proposed design shows a giant wheel at one end of a long shaft, with the reactor at the other end. Living quarters are in the giant wheel. As soon as the turbine and generator start to turn, the entire ship revolves slowly in the opposite direction, thus giving the crew a little "gravity" as simulated by the centrifugal force.

The flight path between the earth and Mars would be far different in an electrically powered ship than in a rocket driven one.

The Martian trip would have to be made in six stages: from earth to the space platform from which the interplanetary ship would be launched; the long path from there to an orbit circling Mars; a descent in a winged landing craft to the planet's surface, and these three steps in reverse for the return trip.

Crew members would be gone two and a half to three years, Dr. Stuhlinger calculates. They would reach the space station some 1,000 miles above the earth's surface in large, three-stage rockets. The winged nose section of these rockets, really a fourth stage, would be used for the return trip to earth.

The interplanetary ship would leave the space station very slowly, since its acceleration is quite low. After two hours it would not be more than 20 miles away.

The electric propelling system would work for the entire trip, which would take 402 days, accelerating the ship about half the time and decelerating it during the other half.

This continuous operation, Dr. Stuhlinger's studies show, make guidance of the space ship easy. During the spiraling departure from the space station and approach to an orbit around Mars, the ship's power can be cut out if a time delay is needed. If the ship should be late in meeting Mars, the crew can gain time during the spiraling phase by opening the throttle a little more.

The ship's position will be automatically measured and computed by star tracking, so that any necessary corrective measures can be taken immediately.

Dr. Stuhlinger estimates the chance of a crew member being hit by a meteor is very low, about the same as that of a man's losing his life on earth in an accident.

Crew members will have more comfort and more space in which to move around than persons on today's submarines. However, to take care of any possible interplanetary mishap, Dr. Stuhlinger recommends sending about ten ships traveling together on one expedition.

He does not estimate the cost of such a venture but points out that the earth to space station part of the journey would be the most expensive. For every pound of pay load taken into the space station orbit, 160 pounds of take-off weight must be invested in the commuter rockets.

His design data for one ship call for a total initial mass of 730 tons.

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SELENIUM GLASS — A glass-like material that transmits infrared radiation to 25 microns has been developed by the Eastman Kodak Company, Rochester, N. Y. It is said to be useful in missile guidance, fire control and other infrared optical systems.