

PHYSICS

Reproduce Star's Heat

Scientists at the Naval Research Laboratory have reproduced star-like temperatures through the use of equipment that may contribute to controlled fusion reactions.

➤ STAR-LIKE temperatures in excess of a million degrees, which could in the future lead to successful control of thermonuclear reactions for peaceful power, have been reached in the Naval Research Laboratory.

Dr. A. C. Kolb reported his experiments in momentarily reproducing stellar atmospheres to the Optical Society of America meeting in Washington.

Although his work is aimed at developing reliable methods for measuring the temperatures and pressures of gases at very high temperatures, the equipment used has

all the necessary "ingredients" for controlling fusion reactions, Dr. Kolb told SCIENCE SERVICE.

The possibility of producing power from the virtually unlimited supply of heavy hydrogen in the world's oceans has stimulated high-temperature research in many countries.

The method used to produce the high temperatures at NRL is to accelerate ionized gases to velocities approaching 500,000 miles an hour in a shock tube by electromagnetic forces.

These temperatures can be inferred from the measured speed of the shock wave.

The problem is that complicated processes can affect the accuracy of temperatures inferred in this way. By analyzing the light produced by shock waves, more accurate temperature measurements are in prospect.

At the Naval Research Laboratory the hot gases are kept away from the cold walls of the shock tube by a method that reverses the so-called pinch effect. At NRL, the shock tube containing the gas is surrounded with coils that carry high currents, and these currents produce a magnetic field that pushes the gas into the tube's center.

In a pinch tube, currents are passed along a tube and the resultant magnetic fields encircle the pinched gas.

The currents for the coils are produced by discharge of a large condenser bank that is rated at 20,000 volts. When discharged into a short circuit, 15,000,000 amperes are possible, a peak power of nearly 100 billion watts.

Certain technical problems associated with switching high currents have been solved, in collaboration with L. J. Melhart and T. H. DeRieux, and have made possible the practical use of condenser discharges involving tens of millions of amperes at relatively low cost for the switch gear and electrical connections.

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ENGINEERING

Thermo-Electron Engine Holds Great Promise

➤ THE PROMISE of directly changing atomic energy into electricity is seen a step closer with the development of thermo-electron engine.

The device operates without any moving mechanical parts. It is based on the principle that when there is a temperature difference between two metal plates, electrons flow from the hot to the cold one. These electrons form a stream of electricity that can be tapped.

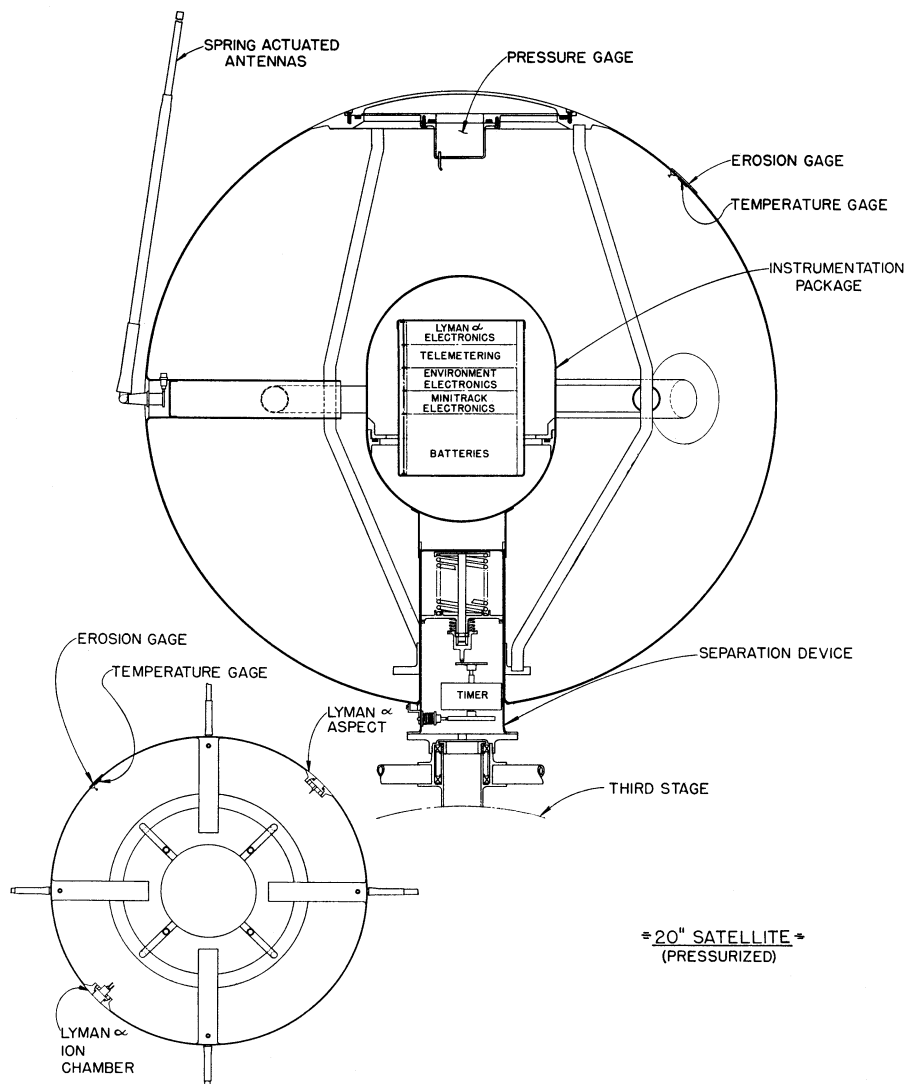
So far, the process has been conducted only inside a large vacuum tube, but the inventors believe it will eventually become practical for many uses.

The thermo-electron engine was developed during the last five years by Drs. George N. Hatsopoulos and Joseph Kaye of Massachusetts Institute of Technology, Cambridge, Mass. The model has produced electric power with thermal efficiencies of about 12%.

Advantages of the thermo-electron engine over the old-fashioned steam engine, a modern steam turbine or an atomic engine in which heat is converted into electricity by means of a steam turbine include:

1. Because it uses no moving machinery to convert heat to electricity, maintenance problems should be virtually eliminated.
2. Where size and weight are at a premium, as they are in missiles and satellites, it will have significant advantages over conventional systems.
3. On the basis of efficiency alone, it should be more than competitive in the small power plant field.

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INSTRUMENTATION FOR IGY SATELLITE—The 21.5 pound, 20-inch round earth satellite that will be launched as part of the United States' scientific program for the International Geophysical Year may contain solar cell mercury batteries, ion chambers, thermistors, erosion gauges, a Minitrack transmitter, meteorite collision memory devices, telemetry coding systems, and Lyman alpha storage units.

