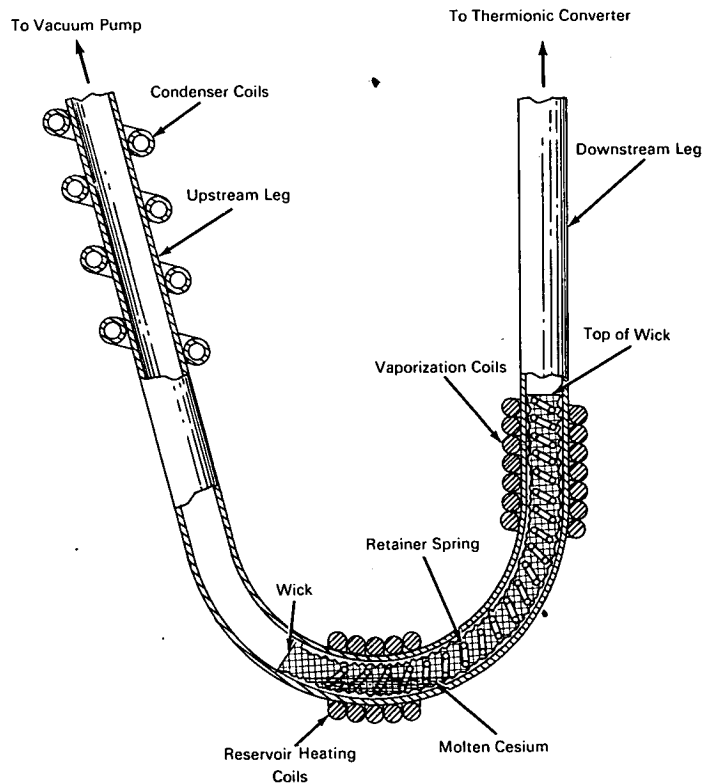


# NASA TECH BRIEF



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## Distillation Device Supplies Cesium Vapor at Constant Pressure



### The problem:

To devise a compact distillation apparatus that will supply small amounts of pure cesium vapor at constant pressure to a thermionic converter. At the pressure required for operation of the converter, the temperature of the distilled cesium vapor must be maintained at 310°C.

### The solution:

A distillation apparatus in the form of a U-tube.

### How it's done:

The upstream leg of the U-tube is connected to a vacuum pump for withdrawal of noncondensable impurities. Surrounding this leg are condenser coils for circulation of a coolant. The bottom portion of the U, which serves as a reservoir for the liquid cesium, is surrounded by heating coils that maintain the cesium in the molten state. Extending from the bottom portion into the downstream leg of the U is a wick (capillary) made, for example, from fine mesh stainless steel screen arranged in a tubular configuration

(continued overleaf)

to match the inner surface of the U. The wick is held in contact with the inner walls of the U tube by a retainer spring. The wick carries the molten cesium up into the top of the downstream leg of the U by capillary action. Heating coils around the downstream leg are used to vaporize (at 310°C) the molten cesium that has risen to the top of the wick. The heating coils surrounding the reservoir at the bottom of the tube are set to a temperature sufficiently below that of the vaporization heating coils to maintain a desired pressure differential in the system. Since the thermionic converter is operated at a temperature higher than that of the top of the wick, an equilibrium occurs in which the molten cesium is evaporated from the wick. Any vaporized metal which does not pass into the converter is condensed by the condenser coils and returned to the molten cesium reservoir. The wick is continually refilled by the molten cesium, which is carried to the top of the wick where vaporization occurs, resulting in a constant pressure of cesium vapor in the converter. The magnitude of the cesium vapor pressure is determined by the evaporation rate of the liquid cesium, the temperature, and the diffusion rate of the liquid cesium from the reservoir to the top of the wick.

**Notes:**

1. This compact, lightweight, inexpensive apparatus has the disadvantage of effecting distillations at a low speed compared to conventional stills. It would have application for purification of various liquids including molten metals used in closed loops and heat pipes.
2. A series of these tubes can be connected to form a fractional distillation apparatus.
3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
NASA Pasadena Office  
4800 Oak Grove Drive  
Pasadena, California 91103  
Reference: B68-10020

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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NASA Pasadena Office  
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