

Centrifugation and the Manhattan Project

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Wood, Glaser, & Kemp, Physics Today, October 2008

**NARA Microfilm set A1218 -- MDH & AEC
Reel 2, Book I, Vol. 4, Chapter 14**

**“Investigation of Miscellaneous Procedures of
Enrichment of Uranium Isotopes”
Sect. 1: The Centrifuge Method
(Oct/1942 – Jan/1944)**



Urey Lawrence Conant Briggs Murphree Compton

Outline

- (1) History to mid-1942**
- (2) Large-scale proposal – October 1942**
- (3) 1943: Diminishing prospects**
- (4) Late 1943 – early 1944
Pilot operations & project abandonment**

(1) History to mid-1942



**Enrico Fermi
(1901-1954)**



**Ross Gunn
(1897-1966)**



**Harold Urey
(1893-1981)**



**Merle Tuve
(1901-1982)**



**Jesse Beams
(1898-1977)**

Summer-fall 1941 MAUD & Compton reports

**22,000 3-foot
machines**

**1 kg/day U-235
\$44M**



Scanned at the American
Institute of Physics

The Planning Board -- January 1942

Westinghouse to develop 11-foot model plus twenty-four 36-inch units for pilot plant.

Engineering studies at SODC.



**Eger Murphree
(1898-1962)**

(2) Large-scale proposal

October 1942

May 23, 1942

Conant decides all methods to be pursued; \$38 of \$80M for 100 gr/day centrifuge plant to come on-line by January 1944. (Never built)

Sept. 17

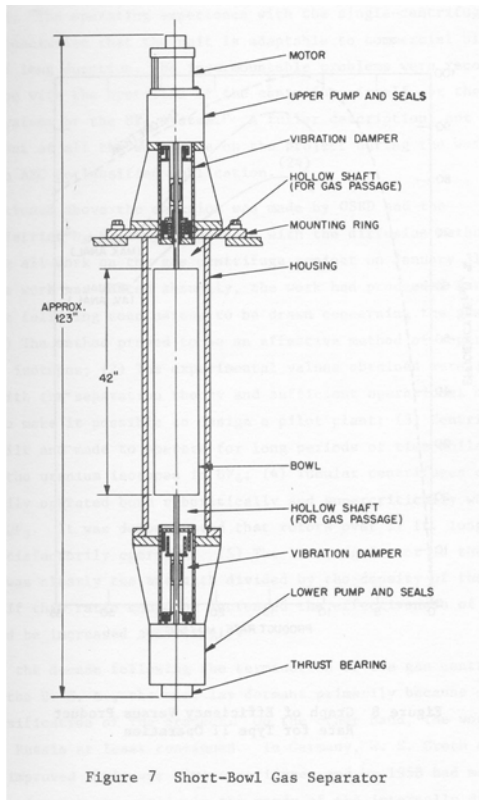
Groves assigned to project.

October 23

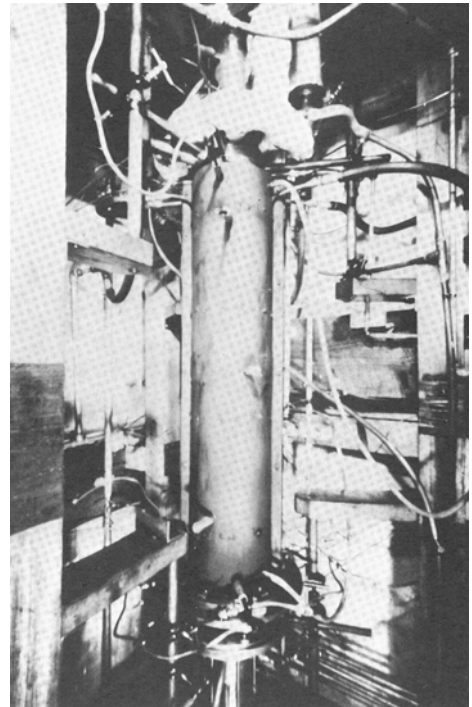
**S-1 committee - Pittsburgh.
Zola Deutsch on 17,000-machine plant**

WW II Machines 1942-1943

Courtesy Dr. Dean Waters
United States Enrichment Corporation



**7.2 in ID / 8.2 in. OD
machine
(Bayway, NJ)**



**Westinghouse 132"
long machine, 7.2" ID**

(3) 1943: Diminishing prospects

Early 1943

K-25 limited to 36.6% enrichment, then to Y-12.

Feb. 24

Centrifuge plant: 36.6% to 90% @ 1 kg/day; 624 11-foot machines in 15 stages.

May 29

36" machine delivered to SODC; Operation commences August. 2nd machine October 9

Sept. 10/11

S-1 Executive adopts "curtailed program."

U K A

Extract of Minutes of Meeting of S-1 Committee Held September 10-11, 1943

After discussion it was voted to permit the Virginia contract to run to its completion date, i.e., not to stop work there at present and at least to have Standard Oil continue to spin the short haul for an aggregate of 4 months, at as small an expense as possible.

... passed

Hestingshouse	\$ 65,000
Standard Oil	125,000
Standard Oil	120,000
Virginia	25,000
	835,000

On a motion to authorize the above complete program, the vote was a tie, and the decision is to be made by Mr. Bush without benefit of any recommendation from the Committee (Lawrence, Compton, and Murphree in favor of the full program; Conant, Briggs, and Urey in favor of the curtailed program previously voted).

... no recommendation

Extracted from Conant to Groves, Dec. 28, 1943

**(4) Project abandonment:
Dec. 6, 1943 – Jan. 19, 1944**



Dec. 6, 22 Pilot operations to cease Dec. 31. Estimates 30,000 machines to produce 0.4 kg/day by Dec/45, 1 kg/day by Sept/46



Dec. 7. “ ...centrifuge plant far ahead of diffusion plant.”



Dec. 18. Requests Conant's views on “ ... feasibility from a scientific standpoint ...”

Jan. 1/44



“ ... I have favored carrying forward the centrifuge ... but now it seems clear to me that the program should be terminated.”

“ ... I should like now to urge that, as Professor Urey has recently indicated, ... K-25 is ... behind the centrifuge development, and ... it should immediately be cut back, if not terminated altogether.”

Jan. 3/44



Centrifugation had come through with definite experiments; no worse than foreseen two years previously; problems with diffusion had increased

Jan. 19, 1944
Conclusion



“... quite clear that under our directive no further extension of the centrifuge project is justified at this time.”