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URANIUM EXTRACTION FROM OIL SHALES

by

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Short Papers on Research

Uranium Extraction from Oil Shales

Previous investigations have shown the Pennsylvanian black shales in eastern Kansas, collected in 11 localities contain nodules having an average composition of 30.2% P_2O_5, 0.017 percent U_3O_8 and 3.2 percent F. As part of a continuing study of these shales the Little Osage was selected to experiment with first removing any oil and then extracting uranium.

The sample of Little Osage Shale selected was obtained from an abandoned quarry north of Fort Scott where the shale is well exposed. The location is the SW NE of Sec. 19, T. 25S., R. 25E in Bourbon County.

Tests for oil on this material indicate the yield is close to 12 gallons per ton. Calculated reserves of oil in this shale are set at 720 million barrels and gas obtainable is estimated to be 2.8 trillion cubic feet. The nodules from one sample of this shale were analyzed with the following results:

P_2O_5	30.88%	SO_3	0.15	FE_2O_3	1.77
U_3O_8	0.029	S	0.63	TiO_2	0.54
F	3.4	SIO_2	6.93	K_2O	0.31
CaO	44.71	Al_2O_3	2.64	Na_2O	0.21
LIO	11.14	MgO	0.32		

The method used for this study consisted of (1) removing the oil from the shale by utilizing a down-draft bench-scale furnace wherein the shale provides the fuel, Figure 1 (21 treat the residue from oil extraction by a standard process for uranium removal.

The bench scale uranium removal technique consisted of the following steps.

(1) Grind oil shale residue from distillation to minus 28 mesh

(2) Add water to make a 50% pulp slurry

(3) Add conc. H_2SO_4 to a pH of 0.7-1.0

(4) Mix 4 hours

(5) Add manganese dioxide at the equivalent rate of 7.5 per ton ore

(6) Mix 6 hours

(7) Add iron filings in the amount of 110 lbs per ton of ore and mix an additonal hour.

(8) Allow mix to settle overnight and syphon off that portion of the suspension above the thick slurry. Repeat syphoning for 5 washings by adding 1000 cc water, mixing and allowing the slurry to settle overnight. Check pH to maintain it at 1.0.

(9) The resulting pulp slurry is given a final filter.

(10) The filtrate is then put through an ion-exchange column for uranium removal using standard techniques. (1) (2)

A sample run using the above technique is as follows:

Sample wt	795 gms.
Water added	800 cc
H_2SO_4 added	82.5 cc
pH	1.0
Mix 4 hours add MnO_2	3 gms
" 6 " " iron	110 gms
" 1 " and allow to stand overnight.	

Add 1000 cc water, mix 1/4 hour and allow to settle over night.

Repeat 5 times.

(1) Amberlite Ton Exchange Resins Laboratory Guide Rohn and Haas Co., Philadelphia, Pennsylvania 19105

(2) Mineral Processing Flowsheets
Denver Equipment Co.
Denver, Colorado

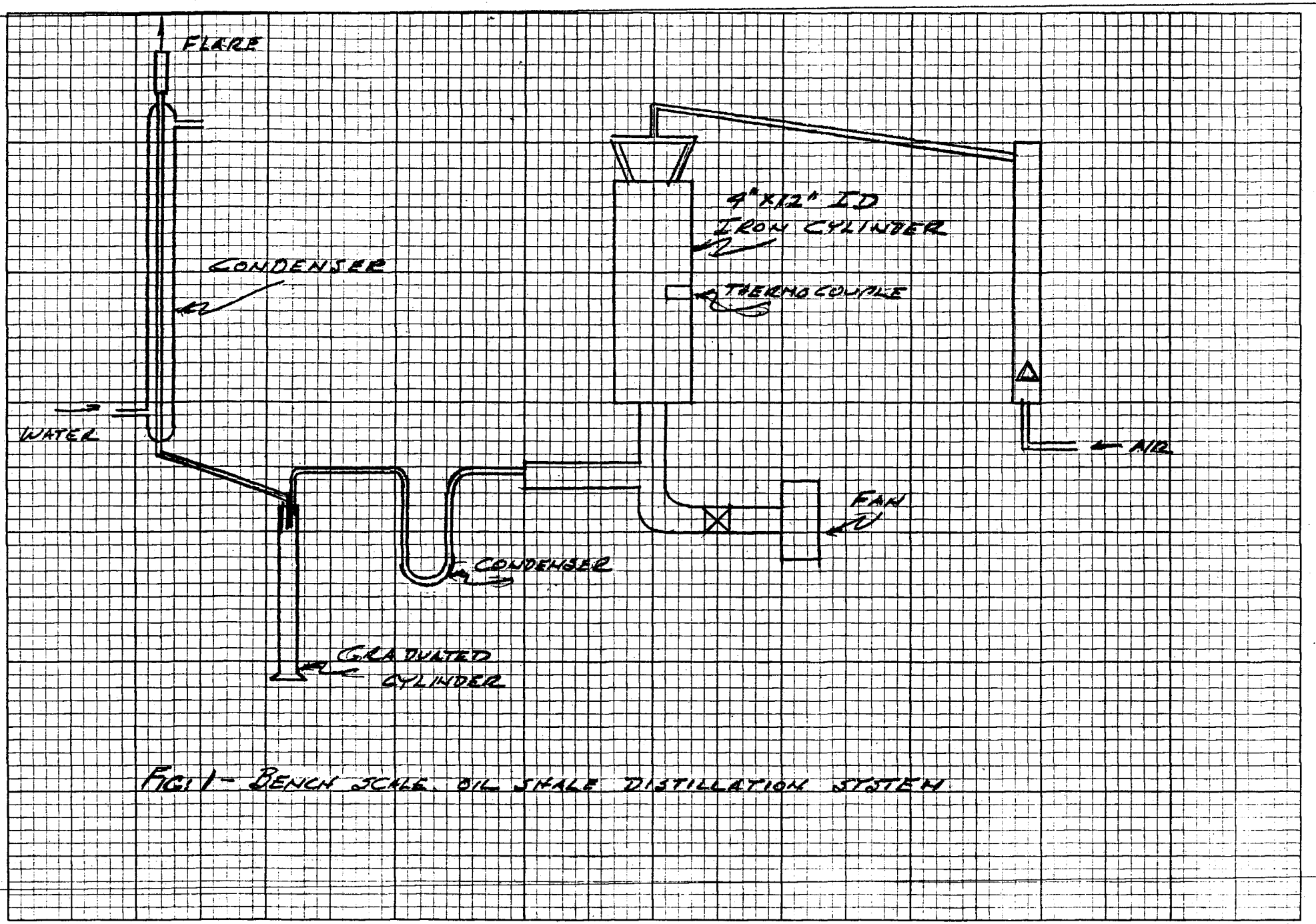

FIG 1 – BENCH SCALE OIL SHALE DISTILLATION SYSTEM