

ETHYL GASOLINE CORPORATION

CHEMICAL RESEARCH LABORATORY

1600 ~~W. 8th~~ WEST EIGHT MILE ROAD

DETROIT, MICHIGAN

December 14, 1940

Dr. Robert A. Kehoe
College of Medicine
University of Cincinnati
Cincinnati, Ohio

Dear Bob

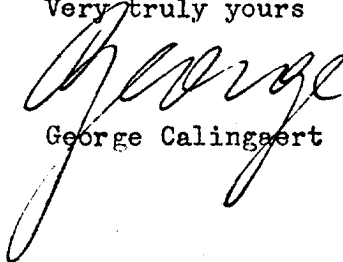
Please find herewith a copy of Dr. Beatty's memorandum dated December 13 covering the operation of the army gasoline stove. The two significant observations to date are:

- (a) One-third of the lead input goes off with the combustion products, some of it settling on the bottom of the heated kettle.
- (2) The trouble with gum in the heated tube, encountered by the Army, has not yet been observed.

This coming week we shall experiment with the triple filter, and we are also expecting to hear from the Army about the gumming up.

We shall be very glad, if you wish, to send Mr. Neal to Cincinnati to help your men familiarize themselves with the operation and idiosyncrasies of the equipment.

Very truly yours



George Calingaert

GC:JH
Encl.

CC: Dr. Edgar
Mr. Gay

December 13, 1940

MEMORANDUM

Test of U.S. Army Gasoline Stove

A complete fire unit of a U.S. Army gasoline Field Range, together with spare filters and cleaning tools, was received through Mr. E. Gay, and has been installed in an outside shed at the Chemical Laboratory. A series of five runs has been made by Mr. H. R. Neal on three different fuels: Red Crown Base, the S.O.N.J. Fuel B (69% olefine), and a 100% Michigan cracked (3 years old, very high gum), each containing 3 cc. lead per gallon in 70-45 Fluid.

From the viewpoint of lead removal and deposits, the principal feature of the operation is that, after the flame has been started and maintained by hand for a time, it then heats a "generator" in which the fuel is fed under pressure, completely vaporized, partially cracked, and passed through a filter to remove the lead; from this generator, the fuel vapor goes to the "flame valve" where its rate of flow is controlled and it is mixed with air and fed to the burner proper. The operating instructions call for replacement of the filter every four hours, and cleaning the connecting tube, flame valve, and burner surface with scraping tools and (if required) a gum solvent every 12 hours.

Our tests were planned to determine:

- (1) The percentage of the lead input retained by the filter disc.
- (2) The location and amount of lead deposits elsewhere, and of gum.
- (3) The performance of the unit as a whole:
 - (a) when cleaned as per instructions, and
 - (b) when allowed to operate without cleaning (except for change of filter each 4 hrs.), until faulty operation occurred at some point.

The results obtained may be summarized as follows:

- (1) Lead retained by filter. - About 70% of the lead input is retained by the stove, practically all in the filter and its case. The data are: Run 2, 6.75 hrs., 1 filter used, about 68% of the lead recovered, 5% in the filter case, 25% in the outlet half side of the filter, and 37% in the inlet half side; Run 3, 12 hrs., 3 filters⁶⁰ used, 66% of the lead recovered; Run 4, 15 hrs., 4 filters used, 77% of the lead recovered; Run 5, analysis in progress.

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(2) Other lead deposits. - In the flame valve jet, about 10 or 20 mg. lead is deposited every 4 hrs., and this is sufficient to require cleaning the valve about every 12 hrs. On the tubing and burner surfaces, the lead deposited is small, readily removed, and not troublesome. On the bottom of a kettle, containing warm water, which was placed directly over the burner flame, lead was deposited at the rate of 50 mg. every 4 hrs. (2 Runs, which checked).

Gum Deposits. - Very little gum, about 10 mg. every 4 hrs., was deposited in the connecting tubing using the Red Crown or S.O.N.J. fuels; the Michigan fuel will show large deposits in tubes and flame valve (data not yet available).

(3) When the filters are changed every 4 hrs. and the various parts are cleaned every 12 hrs. following the specified procedures, there are no troubles resulting from lead or gum deposits, except that, first: the flame valve may require cleaning before 12 hrs., especially with a high-gum fuel, and second: the openings into the filter case may not be adequately cleaned by the specified procedure (an ammonium acetate extraction of the case following the routine cleaning dissolved 546 mg. lead).

Numerous mechanical difficulties were encountered which could not be directly ascribed to the deposits: the most frequent were leaks at the filter case and the valves.

Summary. - The operation is reasonably satisfactory, except that only 70% of the lead is retained; the change of filters and cleaning operations are not unduly difficult and give satisfactory results, but cannot be neglected without running into trouble.

It is planned to make a new case to hold 3 filters together, and test the lead removal.

H. A. Beatty
12-13-40

HAB:JH

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