

May 27, 1944.

N-1171

To: W. W. Watson.
W. P. Jesse.
From: J. A. Simpson, Jr.

In Re: Proportional Counters and New Problems on
Recent Visit to "X".

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Two complete units of the Model 1C proportional counter have been installed at the Clinton Laboratories. One of these has been placed in the counting room in the 205 area for continuous operation. The other has been placed in Dr. S. G. English's laboratory where resolution tests and general comparison tests, with other counter types of counters, will be made during the week of May 22nd to 29th. Using the paired sample technique, they have verified that the counting loss at 100,000 counts per minute is 0.8%. One-fourth of a gas tank has been used in approximately 160 hours operation. It is planned that the unit will then be sent to the 205 area for continuous operation. One of the units gave evidence of having unsatisfactory components in the power supply and produced an abnormal, spurious background.

The decision has been reached that methane gas will be used in all of the proportional counters instead of regular plant gas. This decision considerably simplifies the high voltage problem and the procurement of materials. It is planned to make 3,000 volts the maximum operating potential for the unit. At present methane gas is being piped throughout the 205 counting room. It was found that the voltage regulation there was entirely unsatisfactory, so new voltage regulators will be installed to carry the greatly increased load.

The Clinton Laboratories' instrument shop is constructing three proportional counters with a number of modifications. It is quite probable that large seals, of the type in use at present here, will be needed for their units. They were supplied with 1/2" Kovar seals, center-wire assembly material and glass bubbler units for the three units.

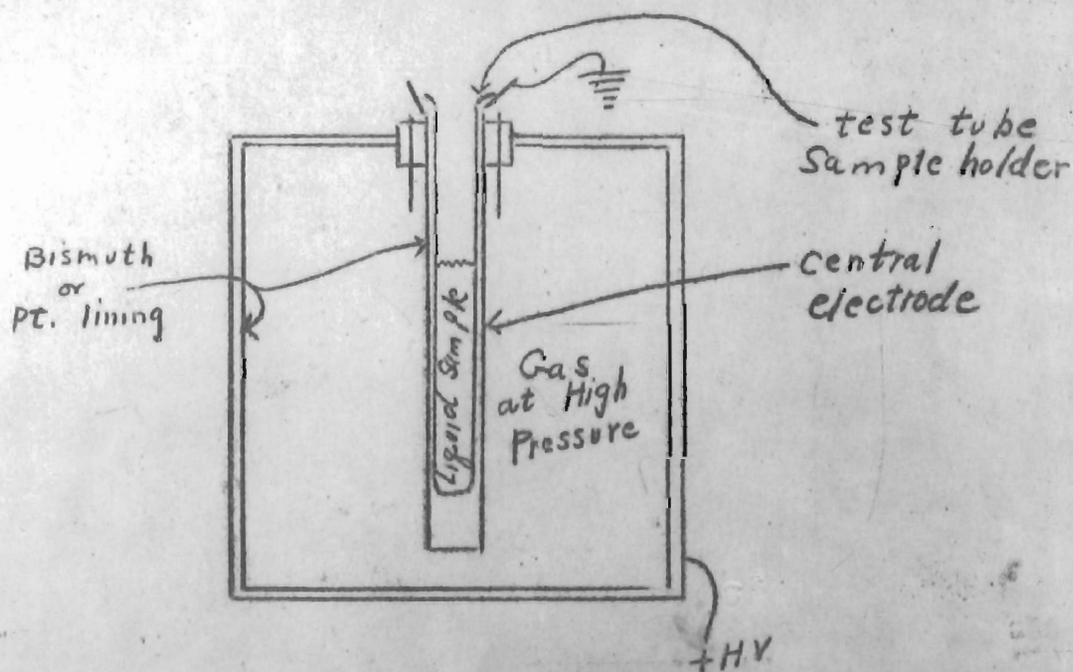
One of the reasons for equipping the 205 area room with the new counters as soon as possible is to enable them to adapt their sample preparation technique to the new units. This work has already been started. Both Don Smith and Mr. Struthers are in agreement that they would like to use the proportional counter exclusively for the counting rooms. A summary of experiments on the counter performed in the 205 area appear in the semi-monthly report of the Analytical Group of Clinton.

Considerable interest was expressed in the design of a low geometry

chamber attachment for use with the counter. This chamber has already been designed and is in our shop.

Several interesting and important problems were found at Clinton. So far as I could determine, the three most important ones which could be solved readily in Dr. Jesse's section are:

1. Research and development of the beta counter to replace the mica-window counter which is in use at present. We are working on this problem. Complete freedom has been given us to develop our own method for sample preparation for the beta and gamma analysis.
2. Measurements of gamma radiation of low intensities. This problem is important to the semi-works group which prepares "W" concentrations of the product, but are limited to only a fraction of the "W" by-product concentration because of radiation hazard. Their work is to try the "W" processes on a small scale. Therefore, it is important. After a decontamination factor of 10^5 , gamma counts are lower than the counter background. Sample concentrations cannot be made because of the potentially lethal dose of alphas present. Also, this problem is important at the "X" and "W" plants since the decontamination factor is 10^7 at "X" and it is 10^5 in the canyon at "W", becoming 10^7 after going to the 224 area. It appears that low gamma counting is a real problem in analysis at both the semi-works and at "X" and "W". By low gamma counting rates is meant the order of 10 counts per minute recorded on a 30% beta ray counter with 1 ml. of solution. Two possible solutions exist.
 - a. Use a pressure ionization chamber lined with a thin layer of bismuth or platinum.



It is possible to insert a liquid sample contained in a test tube inside the inner electrode of concentric cylinder ionization chambers. With this technique, about 50 cc. of sample may be counted with almost 100% geometry. Calculations show conservatively that a 10^{-14} ampere current is obtainable. Dr. Jesse has made calculations and estimates which also indicate that this may be a possible method.

- b. Gamma Counters. Unfortunately, no research of any extent has been done on gamma counters at our laboratory. It is felt that perhaps they should be developed, since the efficiency of a well designed gamma counter would be many times that of counters in present use by the chemistry group. R. D. Evans at M.I.T. has done a great deal of work with them, and at present he is being contacted to obtain information on their characteristics.
3. Determination of alpha intensities by photographic film methods directly from tank solutions. Don Smith was interested in the possibilities of the method and agreed that facilities for trying the method out can be provided at "X".
 - a. Liquid samples can be made available to the Metallurgical Laboratory where they may be useful. It is planned to carry out preliminary experiments on this method very shortly. While at the Clinton Laboratories, data on the concentration of the alpha, beta and gamma disintegrations per ml. have been obtained for tanks 11, 24, 34, 41 and steps D1P, C_p and C_p concentrated.

John A. Simpson, Jr.

JAS/lk

cc: W.P. Jesse
Technical Reading File
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