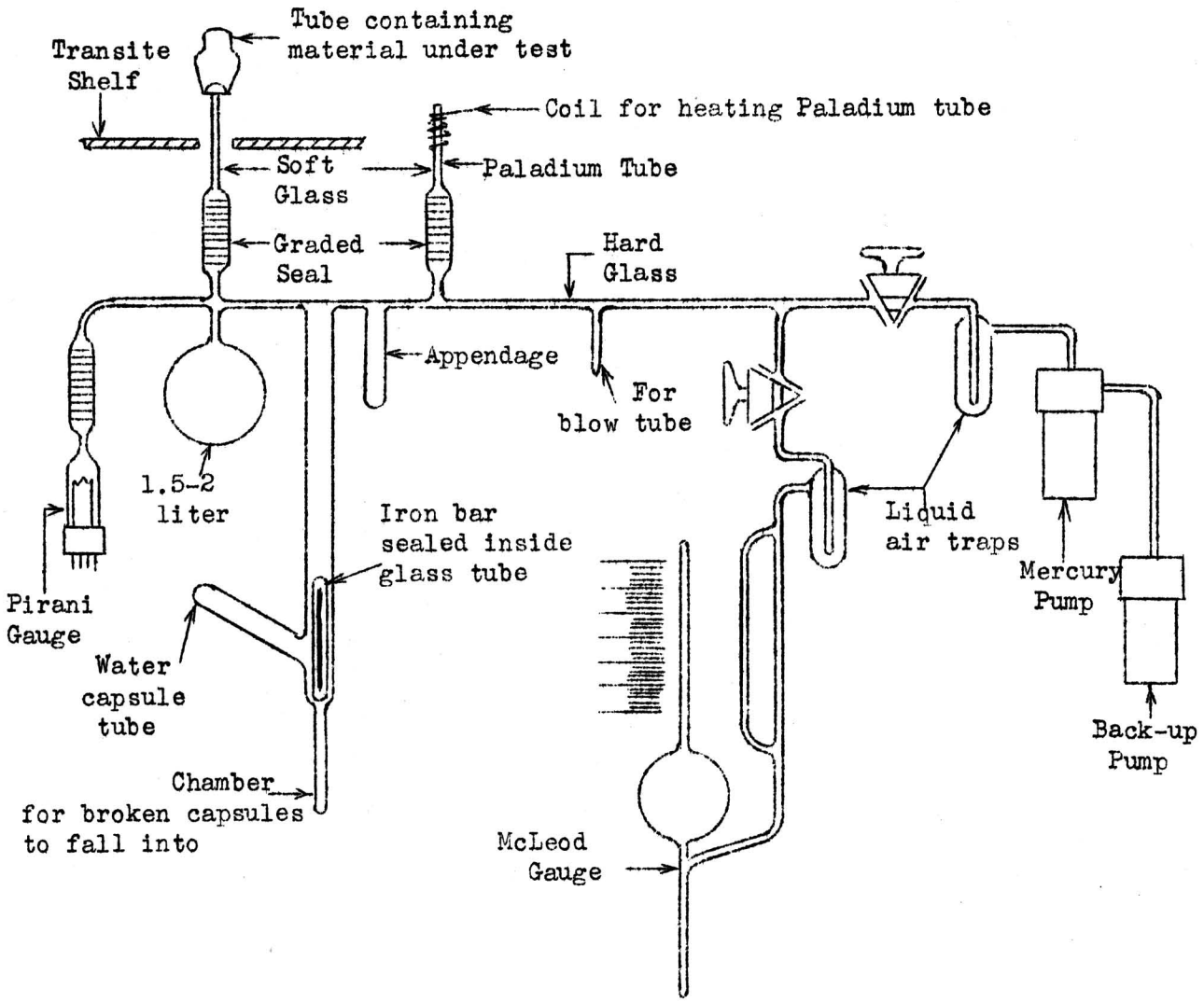
SUBJECT PROCESS OF DETERMINING AMOUNT OF ACTIVATORS DEPOSITED IN BULBS

Supersedes former 34-9-10

A method for determining the amount of activator material, as cesium and rubidium, which has been deposited in a bulb is herein standardized. This device may also be used for obtaining the gas content of tablet getters and also, → with the addition of the voltage supply shown in *34-37-6B for flashing the getter, the gas content of ribbon getters.

1. EQUIPMENT REQUIREMENTS Refer to sketch.

a. The vacuum system should be capable of producing a "sticking" vacuum when measured with a McLeod gauge, as may be obtained with a mercury pump backed by a Cenco Hyvac pump.



*Reissued for change in process number.

1. EQUIPMENT REQUIREMENTS (Cont'd)

a. (Cont'd)

To make the determination it is necessary to know the volume, approx. 2 liters, of a portion of the system which can be shut off from the pumps with a ground glass stock cock. Use gas expansion method for obtaining volume. All lines and connections ahead of the mercury pump should be glass, no castor oil treated rubber connections being permitted.

b. An oven to give a temperature of 350°-400°C.

c. Capsules made of No. 12 gauge glass about 1-1/2" long and containing two drops of 33-W-7C double distilled water which is put into the capsule immediately after boiling.

d. Iron bar sealed in glass tube to drop a height to break capsule which is inserted into the side tube. The iron bar is raised by a magnet which is energized preferably by a D.C. circuit rather than a permanent magnet.

e. High frequency heater for flashing tablet getters.

f. Paladium tube having 1/8" O.D., .010" wall, 2" length, one end close and, on open end, a 1/4" length platinum collar of same size as tube. The purpose of the collar is for sealing the tube to soft glass. A coil for heating the Paladium tube to 700°C. The coil in use at present is operated from 22V D.C., is made of .025" dia. nichrome wire and has a length of 1-1/4" and and O.D. of 5/16".

2. PROCEDURE

a. Mount an activator assembly onto the leads of a glass tube stem for an ST12 bulb, so that the activator faces the side of the bulb. Seal the stem into an ST12 bulb.

b. Seal the exhaust tube of the stem to the exhaust system using a glass connection only.

c. Place a water capsule into glass tube and seal end of tube.

d. Start the pumps and after a good vacuum is obtained heat the specimen for one -half hour with the oven at 350°-400°C. Remove oven and allow bulb to cool.

e. Heat activator with high frequency coil so as to drive off the gas, as indicated by the Pirani gauge reading, and then flash activator.

f. After a good vacuum is again obtained close stock cocks to disconnect pumps and McLeod gauge from system.

g. Using magnet lift iron bar, the water capsule should slide down against the wall of the vertical tube, and drop bar to break capsule. The water reacts with the material deposited on the bulb to form a hydroxide.

2. PROCEDURE (Cont'd)

h. After about 30 seconds immerse the appendage in liquid air to freeze excess water. After 3 min. the condensation begins to be rapid as indicated by Pirani gauge reading.

i. While the condensation of water is taking place immerse McLeod gauge trap in liquid air. After there is no further decrease in pressure as indicated by Pirani gauge, open McLeod gauge stop cock. The liquid air trap prevents any condensible gas from getting in the gauge to distort the readings.

j. Take McLeod readings until a minimum pressure is reached and then record that reading.

k. Heat the Paladium tube to about 700°C, as determined by an optical pyrometer, to diffuse the hydrogen in this system. Hydrogen is the gas remaining after the excess water is condensed.

l. Take pressure readings on McLeod gauge until a minimum pressure is reached, and then record that reading. A value of a little less than one micron will usually be reached in approx. 20 min. A small negligible amount of gas remaining is other than hydrogen or a condensible gas.

m. The difference between the two recorded pressures is the pressure in microns (P) of the hydrogen formed by the reaction of the water with the material deposited on the bulb. The quantity of material in mg is therefore

$$\frac{1.008 \text{ (atomic weight of hydrogen)} \times P \times \text{Volume of system in liters}}{\text{atomic weight of material under test}}$$

A curve for a material may be plotted by using mg. of material as ordinates and gas pressure as abscissas. **Minimum limits will be specified in Material Handling Notices.

STANDARDIZING SECTION
ENGINEERING DEPT.