

ON FILLING BAROMETER TUBES.

[Having been frequently called upon by our correspondents to give information relative to filling barometer tubes, we requested Mr. James Green, of New York, and Mr. W. Wurde-mann, of Washington, to furnish us with an account of the methods employed by them; The following are their answers to our request, with additional information from the Transactions of the Royal Society.

J. H.]

I.—BY JAMES GREEN, OF NEW YORK.

One of the greatest difficulties with the inexperienced is to get the tube itself clean and free of moisture. If the tube is foul, the common way is to clean it with a covered copper wire, wrapped with additional cotton at the end to fit the tube, and moistened with alcohol and whiting at first, afterward with dry cotton. If the tube can be heated and air blown in dry, so much the better.

The mercury and tube should be heated as much as will be allowable to handle them, to keep all the water in a state of vapor. The mercury is filtered into the tube in a long paper funnel, in a fine stream, until within a quarter of an inch of the top. The tube will now be found covered with small air bubbles. Stop the end of the tube with the finger, and run a large air bubble up and down the tube. This will collect the small ones together. Provided the tube be clean and dry, and mercury pure, a pretty good result is obtained.

To boil the mercury in the tube, fill within three inches of the top. Then, with a clear charcoal fire or long spirit lamp, warm the whole tube as much as you can without inconvenience. The tube being held by a cloth, (with woollen gloves on hands is well,) then commence at the top or open end and hold the tube over the fire until the mercury boils, moving the tube a little in all directions all the time to equalize the distribution of the heat from the fire. Continue the boiling downwards until you reach the end, and then return boiling up to the top again. Some begin at the closed end, (for economy of risk and labor,) and boil up only. This may answer the purpose, but not so well as the other, particularly if the tube is not perfectly dry and clean. The part of the tube unoccupied will be well-prepared by the boiling mercury bubbling up; so that to complete the filling, filter hot mercury to the top.

The more perfect methods of boiling are impracticable out of the workshop and hands of the glass-blower.

One of the best tests for the purity of the mercury is, that after once filtering in a long paper funnel to get it clean, in filtering again slowly no lines or marks are left on the paper by the receding surface, and in motion no strings or tails are made, but the mercury will be rounded at its edges.

The best method ordinarily practicable for purifying mercury is to put it in a large bottle with some very dilute nitric acid, and shake it

frequently. It should then be left for some days, and shaken occasionally; then well washed with pure water and dried. I distil first, and then wash with acid, and this will take out the metals likely to be found in it.

II.—BY W. WURDEMAN, OF WASHINGTON.

In compliance with your request, as contained in your note received this day, I will give some notes in regard to my usual method of filling barometers.

First, let me premise that I have so far filled only such as have a straight tube, without bend or contraction, and to such alone the method below explained is applicable; nor ought the tubes to be of a less bore than $\frac{3}{16}$ of an inch.

Besides the requisites stated, those of a clean tube and perfectly pure mercury are equally indispensably necessary with this method as well as any other, where a perfect instrument is desired. The purification of mercury is best accomplished by means of perchloride of iron, with which it is shaken in a diluted state; then carefully washed with pure water, and again freed from moisture by heating. The glass tube must have its open end ground straight and smooth, so that it can be closed air-tight with the finger, or better, with hard caoutchouc, as the former is liable to introduce moisture or grease. Warm well both mercury and glass tube, and fill in through a clean paper funnel with a very small hole (about $\frac{1}{16}$ of an inch) below, to within about one-fourth of an inch of the top. Shut up the end and turn the tube horizontal, when the mercury left will form a bubble that can be made to run from one end to the other by change of inclination, which will gather all the small air bubbles visible that adhered to the inside of the glass tube during filling. Now let that bubble, which has grown somewhat larger, pass to the open end. Fill up this time with mercury entirely, and shut up tightly. Then reverse tube over a basin, when, by slightly relieving the pressure against the end, the weight of the column of mercury will force some out, forming a vacuum above, which ought not to exceed one-half an inch. Closing up again tightly, let this vacuum bubble traverse the length of the tube on the several sides, when it will absorb those minute portions of air, now greatly expanded from removed atmospheric pressure, that were not drawn at the first gathering.

The perfect freedom from air is easily recognized by the sharp concussion with which the column beats against the sealed end, when, with a large vacuum bubble, the horizontally held tube is slightly moved.