LVI.—*Modified Form of Apparatus for Collecting the Gases Dissolved in Water.*

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IN making a series of nitrogen determinations in the Buxton thermal water, I was led to devise a form of apparatus which proved to be convenient for use, and to give very uniform results.

The following figure will illustrate at once the construction and mode of using the apparatus:—

400 THRESH: APPARATUS FOR COLLECTING GAS, ETC.

a is the flask containing the water to be examined; *b* and *b*₁ two pieces of thermometer tubing connected by a short length of caoutchouc tubing carrying a pinchcock; *c*, a cylindrical glass tube drawn out at its lower extremity, and by aid of a long piece of stout caoutchouc tube joined to the similar but much wider vessel, *e*, both being attached by clamps to upright supports; *d* joined to *d*₁ by rubber tubing, and carrying a pinchcock, serves to transfer gas from *c* to the absorption-tube, *g*. *c* is closed by a firm rubber cork with two perforations, one traversed by *b*₁, which terminates about middle of *c*, and the other by *d*, which barely passes through the stopper.

When a determination is to be made, the flask, after filling at the well with the usual precautions, is closed by a stopper of rubber perforated at the centre, the lower end of the opening being securely plugged by a short piece of glass rod. *e* is lowered, filled with mercury, then raised until *c* also is filled, when the stopper *k* with its fitted tubes is firmly inserted. On raising *e* still higher and opening the two pinchcocks, the tubes *b* and *b*₁, *d* and *d*₁, are completely filled with mercury, a little manipulation being sometimes necessary to drive all the air from the parts where the tubes are connected. The pinchcocks being closed, *e* is now lowered as far as possible and left in this position for some time, when, if no air-bubbles have made their appearance, the experiment can be proceeded with. The free end of *b* is now inserted into the orifice in the stopper of the flask containing the water (care having been taken previously to replace any air or water in the cavity by mercury, and to see that the tube *b* is quite full of that metal), and gently pushed down so as to force the plug into the bottle, and until the end of the tube can just be seen below the stopper.

On now releasing the clamp upon *b* *b*₁, and applying heat to the flask, the heat and diminished pressure cause the gas to be readily given off, and ultimately the water will boil at a temperature below 100°, depending of course upon the difference between the levels of the mercury in *c* and *e*. The expansion of the water causes a portion to pass into *c*, above which the evolved gas collects, and when the latter nearly half fills the tube, *e* is raised after opening the pinchcock on *d* *d*₁, and most of the gas thus forced into the absorption-tube. This process can be repeated as often as necessary, care being taken not to force any mercury into the water flask, or any water into the tube *d* *d*₁, and to keep the end of the tube *b*₁ always under the surface of the fluid in *c*. Finally, by keeping *e* raised until the water is nearly at 100°, and then lowering, the water in *c* may be made to boil and give up almost the last trace of gas. On again raising *e*, &c., the whole of the evolved gas is collected in *g*, saturated with moisture, but, due precaution having been taken, without any trace of water on the surface of the mercury.

The capacity of *c* may vary according to the richness of the water gaseous constituents, but will chiefly depend upon the quantity of water used, as when much gas is present it can readily be transferred from time to time into *g*. For flasks of from $\frac{1}{2}$ to 1 litre capacity, *c* should be capable of holding at least 100 c.c.