XLIX. A CONSTANT-VOLUME APPARATUS FOR GAS ANALYSIS.

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IN the course of investigations on the chemistry of respiration in fruits a constant-volume gas analysis apparatus (Fig. 1) has been developed in this laboratory. A 5 ml. sample of the respired air is taken into the burette (*B*) and is passed into one of the absorption bulbs (*C*, *D*). When one of the components has been completely absorbed it is brought back into the burette and the decrease in pressure noted, the volume being kept constant. This decrease in pressure represents the partial pressure of the component under consideration and is proportional to its concentration in the gaseous mixture. If h is the decrease in pressure and H_0 represents the atmospheric pressure, the percentage content of the constituent, say x , is easily computed: $x = h \times 100/H_0$.

The apparatus (Fig. 1) consists of a manometer (constructed out of 3 mm. bore glass tubing) one limb of which carries a 200 mm. scale etched on it whilst the other is blown into a pipette (*B*), the volume of which between the tap (*G*) and the circular mark (*X*) is exactly 5 ml. Within the water-jacket is also placed a thermo-barometer [Warburg, 1926] which is similar in construction to the manometer just described, with the difference that mercury level adjustments are made by means of the screw (*S*) which presses a rubber reservoir (*R*). One of the limbs of the thermo-barometer carries a 10 mm. scale etched on either side of the zero mark, which corresponds with the mark (*X'*) on the pipette (*B'*). The bulb (*D*) is similar to the "combustion pipette" employed by Haldane [1912] except that the ignition tubes inside the pipette have been removed and a water levelling bulb added. The bulb (*D*) contains stick yellow phosphorus, kept under water, for the absorption of oxygen [Carpenter, 1915]. The KOH bulb (*C*) also resembles the one employed by Haldane [1912], and is filled with a 30 % solution of KOH for CO₂ absorption. A compensation pipette (*H*), based on the same principle as the one devised by Haldane [1912], is added to the KOH bulb.

Sampling is done by the washing method [Carpenter, 1915] by interposing a 3-way tap between the inlet of the pipette (*B*) and the respiration chamber. After the final washing is completed exactly 5 ml. of the sample are taken into the pipette (*B*), the mercury level being adjusted to the mark (*X*) by means of the levelling bulb (*L*). The tap (*G'*) of the thermo-barometer is momentarily opened and is immediately closed after adjusting the mercury to the zero mark on the scale and the circular mark (*X'*) on the pipette (*B'*), the adjustment being made by means of the screw (*S*). The stopcock (*F*) is turned in the position (*Fa*), the tap (*E*) kept in the position shown in Fig. 1, the tap (*K*) opened and the level of KOH adjusted to the circular marks on the compensation pipette and the KOH bulb. The 3-way tap (*F*) is now turned in the position (*Fb*), the tap (*K*) closed and the tap (*G*) turned so that the gas pipette (*B*) communicates with the KOH bulb. The gas is then driven into the KOH bulb and passed backwards and forwards several times. After finally bringing back the gas into the pipette

(B), the potash levels are set and the tap (G) half-turned, so that the gas is confined in the pipette (B). The mercury is again brought to the mark (X) and the lowering of pressure read. The reading of the thermo-barometer is added to or

Fig. 1.

subtracted from that of the manometer in order to eliminate errors due to variations in external conditions. The oxygen is absorbed by a similar process except that the gaseous sample need not be continuously agitated.

The accuracy of the apparatus, as found in practice by a series of analyses of outdoor air, is $\pm 0.1\%$.

REFERENCES.

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