A Convenient Form of Burette for Exact Gas Analysis.

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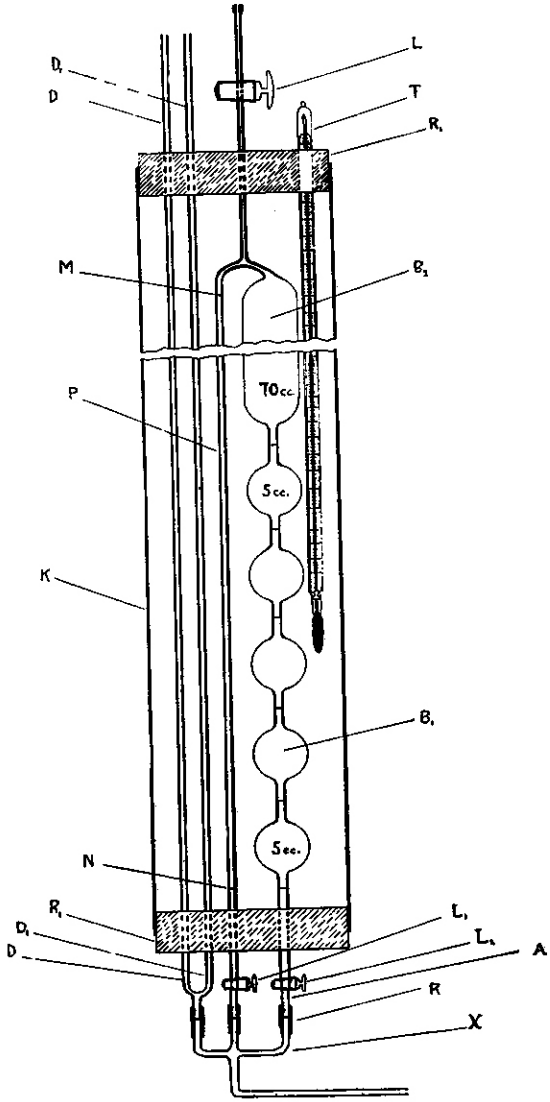
A large number of gas burettes for various kinds of analysis is described in the chemical literature and in the catalogues of chemical apparatus. With most of these burettes, which have a volume of 100 or 150 cc. and are graduated to read to 0.1 or 0.2 cc., it is not possible to measure differences in volume with an accuracy of more than 0.1 or 0.2 per cent., an accuracy sufficient for many purposes. Since in some kinds of work a greater accuracy is highly desirable, the writer proposes to describe a type of burette which has he designed and had specially made for determining differences in gaseous volumes with a accuracy of about 0.02 per cent.

This burette (Figure I) consists of a measuring tube, P, and a reservoir-tube, A, joined together at the top by a capillary tube to which is connected a stop-cock, L, and closed at the bottom ends by the stop-cocks, L1 and L2. The tube A is made up of five small bulbs, B1, each holding 5.00 cc. between the marks on the constricted portions on either side of the bulb, and a large bulb, B2. The volume of the bulb B2 and the capillary tube between the stop-cock L amd the mark M on the upper portion of the tube P is 70 cc. The arm P, consisting of a thick-walled tube with an internal diameter of three millimeters, has a volume of 5.00 cc. getween the marks M and N. This portion of P is graduated throughout its entire length and each division reads 0.01 cc.

As small variations in temperature during analysis produce changes in the volume of gas amounting to several hundredths of a cubic centimeters, the burette is enclosed in a water-jacket, K, along with a thermometer, T, reading to tenths of a tenth of a degree. The water-jacket has a diameter of 85, cm., and is closed at the ends by the rubber stoppers R1. There are also enclosed in the water-jacket two leveling tubes, D1 and D2, which have approximately the same diameter as the small arm, P, of the burette. These two tubes are joined together at the bottom outside the water-jacket. Each of the rubber stoppers, R1, has a small opening (not shown in the Figure)

FIG. 1.



through which the water-jacket be filled or emptied, or through which water at a constant temperature can be circulated.

The lower end of D1, and D2, and the lower ends of thr small and large arms of the burette are joind by heavy rubbee tubing to the three-arm tube X, the horizontal portion of which is joined by two meters of rubber pressure tubing to a reservoir containing mercury.

The absorption pipettes are connected to the upper end of the burette in the usual way. The rubber connections are, however, enclosed in mercury to prevent leaks. It is also advisable to employ for L a stop-cock with a mercury seal.

In order to measure a given volume of gas enclosed in the burette, the stop-cock L1 is closed, the stop-cock L2 opened and the reservoir containing the confining liquid raised or lowered, until the level of mercury the in the larger arm of the burette is brought to one of the marks between two of the bulbs B1. If the volume of gas is between 95 and 100cc., the first small bulb is filled with mercury; if the volume is between 90 and 95 cc. the first two small bulbs are filled with mercury and so on. The stop-cock L2 is then closed and the stop-cock L1 opened, and the fraction of 5cc contained in P measured by bringing the mercury in P, D1 and D2 to the same level. This is readily accomplished by getting the mercury meniscus in each of the three tubes in a line, one behind the other When this is done, the stop cock L1 is closed and the volume of gas read. It is necessary, of course, to make corrections for changes temperature and pressure which occur during analysis.

With this particular burette it is only possible to measure gas. volumes which are more than 70 cc. and not more than 100 cc.

The writer has used this burette to determine the carbon-dioxide, oxygen and carbonmonoxide in more than one hundred samples of air, in laboratories and large industrial plants. In a number of instances where small quantities (0.02 to 0.04 per cent.) of carbonmonoxide were found present in the air, subsequent investigation showed its presence to be due to small leaks in the illuminating gas lines and connections.

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