A CONVENIENT FORM OF GAS ANALYSIS APPARATUS.

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In a recent publication[1] I described a gas analysis apparatus suitable for rapid and accurate laboratory work. This apparatus is, however, somewhat cumbrous, and cannot easily be conveyed from place to place, as is very often required in investigations relating to questions of hygiene. It also occupies a good deal of working space in a laboratory, as it cannot be moved from its place without a good deal of trouble. On the other hand the already existing forms of portable gas analysis apparatus for technical work are too inaccurate for many of the requirements of work in hygiene and physiology. I have therefore designed an apparatus with a view to meeting these defects as far as possible[2].

The apparatus is shown in the accompanying illustration (Plate I). It is contained in a wooden case of which the internal measurements are 20 by 12 by $2\frac{1}{2}$ inches. This can easily be shut up and transported from place to place without disturbing the absorbent solutions etc., so that the apparatus is always ready for use. The front, top, and one side are hinged.

As the principle adopted is the same as that of the larger apparatus a detailed description is unnecessary. The only points of difference, apart from the arrangement in a case, are as follows: (1) The capacity of the burette is 10 c.c. instead of 20 c.c., the absorption and combustion pipettes and mercury reservoir being correspondingly reduced in size, and the weight of mercury thus diminished to within more easily manageable proportions. (2) The graduated portion of the burette contains only 3 c.c. instead of 6 c.c., and is thus half the length. (3) The arrangement of

[1] *The Investigation of Mine Air*, edited by Le Neve Foster and Haldane, 1904, p. 100.

[2] The apparatus can be obtained from Messrs F. P. Rittershaus and Co., 53A Huntly Street, Tottenham Court Road, London, W.C.

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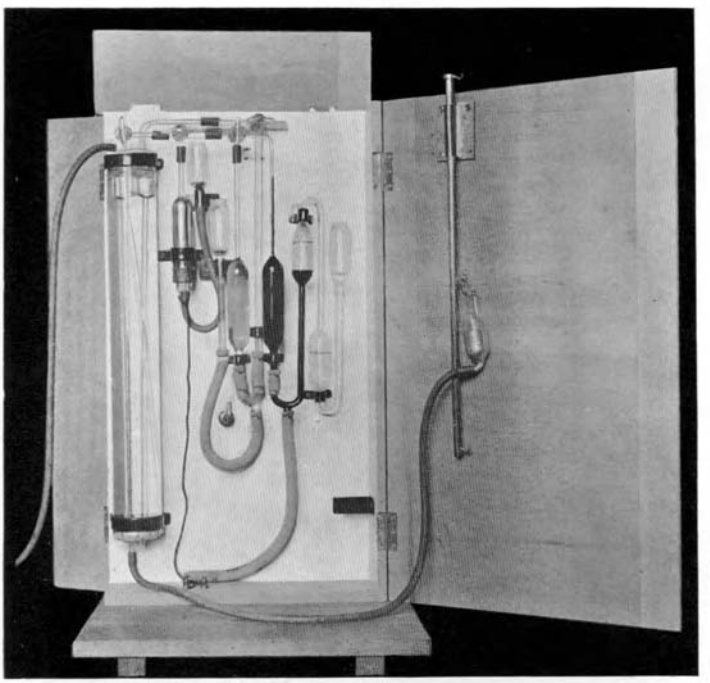

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the combustion and absorption tubes is slightly different, as shown in the illustration. (4) In place of the levelling tube there is a mercury reservoir. When not in use this is held by the spring clamp close to the bottom of the case. During use it is placed on one or other of the three hooks shown on the sliding brass rod fixed on the door of the case. By raising or lowering the brass rod with a rotatory motion the level can be very exactly adjusted. A rack and pinion arrangement, similar to that shown in Fig. 38 of *The Investigation of Mine Air*, can if preferred be obtained from the maker.

The mode of using and testing the apparatus, and of collecting and transferring to the burette samples of air or gas is sufficiently described on pp. 98–120 of *The Investigation of Mine Air*. The following additional details may be mentioned. For removing the glass stopper from a sample bottle which has been placed in position in the mercury trough an iron fork of suitable shape, recently devised by Staff-Surgeon Oswald Rees, R.N., is very useful, and may be obtained from the maker of the apparatus. If a sampling tube is employed, and this is only provided with ordinary two-way taps, the glass tubing beyond the tap should be filled with mercury from a capillary pipette before making the connection with the burette. Any air in the connecting tube can then be expelled by pinching the rubber junction in such a way as to allow the air to escape when it is put under pressure by raising the mercury reservoir of the apparatus. In the same way any air in the connections at the lower end of the sampling tube may be expelled.

If the apparatus has been taken to any place where it is required to analyse the air a sample may be taken into the burette directly, as in the case of the portable apparatus for estimating small percentages of CO_2 in air, described in this *Journal*, vol. I. p. 109[1].

With proper care in using the apparatus the limit of error is about ·01 %—somewhat greater than with the larger apparatus, but sufficiently low for most purposes. The following examples will afford an idea of the results obtainable.

[1] A more convenient form is described very fully in the *First Report of the Committee on Factory Ventilation*, Parliamentary Paper, Cd. 1302, p. 117, 1902.

1. *Three consecutive analyses of outside air.*

	CO_2	O_2
(*a*)	0·04	21·04
(*b*)	0·02	21·03
(*c*)	0·03	21·04
Mean	0·03	21·04

As atmospheric air contains only 20·93 % of oxygen there was a slight error in the graduation of the burette employed, and a deduction of one part in 200 in the resulting percentage requires to be made in analyses with this burette.

2. *Determination of coal-gas in the air of a room where coal-gas was escaping.*

(A) Partial analysis of the undiluted coal-gas.

Volume of air (freed from CO_2) taken = 8·540.

The whole of this was passed into the potash pipette. About 1 c.c. of undiluted coal-gas, as measured by the rough graduation on the wide part of the burette, was then taken in, and the measured volume of air returned to the burette.

Volume of air + coal-gas = 9·486.

$\therefore$ volume of coal-gas = 9·486 − 8·540 = 0·946.

This mixture was then burnt in the combustion pipette by means of the electrically heated platinum spiral.

Volume after combustion = 8·020.

$\therefore$ contraction = 9·486 − 8·020 = 1·466.

$\therefore$ ratio of gas present to contraction on combustion = $\frac{\cdot 946}{1\cdot 466}$.

(B) Partial analysis of the air vitiated by coal-gas.

Volume taken = 9·996

After combustion = 9·822

$\therefore$ contraction = 0·174 = 1·74 %

$\therefore$ coal-gas present = $1\cdot 74 \times \frac{\cdot 946}{1\cdot 466} = 1\cdot 12$ %.

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