CCXX.—*Notes on Intensive Drying of Gaseous Media.*

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I DESIRE to submit the following supplementary notes regarding my own experiences on the intensive drying of gaseous media in endorsement of what my colleague, Professor H. B. Baker, has said in his paper (preceding communication).

When I was initiated into the art of drying gases by Professor H. B. Dixon nearly forty years ago, he chiefly insisted upon the necessity of (i) always using phosphoric anhydride which had been redistilled in a current of oxygen over red-hot platinised asbestos, and (ii) avoiding altogether the use of organic lubricants for stop-cocks by substituting metaphosphoric acid therefor. And ever since, I have always observed these two precautions, although we now use a better and more convenient method of redistilling the phosphoric anhydride in oxygen devised by Finch (J., 1922, **121**, 692; 1926, 117).

In 1905, before commencing experiments (with Mr. G. W.

Andrews) on the influence of intensive drying upon the slow combination of equimolecular mixtures of ethylene and oxygen, and of acetylene and oxygen, which showed that such drying had no appreciable influence, I had no difficulty whatever in repeating and confirming Professor Baker's well-known results with rigidly dried electrolytic gas, carefully observing all the precautions which he had found necessary. Our experimental tubes (length 70 cm., internal diameter 15 mm., and capacity 150 c.c.) were of Jena borosilicate (No. 59''') or Jena " hard combustion glass " both of which were found to be admirably adapted for the purpose. They were cleaned and dried out beforehand according to Baker's procedure, and the electrolytic gas was prepared by electrolysing a solution of recrystallised barium hydroxide in accordance with his directions. A detailed description of the experiments was published by the Society in 1906 (J., **89**, 652), to which the reader is referred.

In the experiments upon the combustion of rigidly dried carbon monoxide and oxygen mixtures, which have been carried out in my laboratories at the Imperial College during recent years, in addition to following out faithfully in every detail Baker's directions in regard to the cleaning and preliminary drying of the explosion vessels, we have added a few special precautions of our own in regard to the preliminary glowing-out electrically of the electrodes, the sealing up of the vessels, and other particulars. Our explosion vessels have been made of Jena ' red-line resistance glass,' and the elaborate ritual involved in the preliminary cleaning and drying of them has been fully described in our papers, to which the reader is referred (*Proc. Roy. Soc.*, 1926, *A*, **110**, 624—628; 1929, *A*, **123**, 285—291).

Our drying periods with the purified and redistilled phosphoric anhydride have in some cases been as long as 1000 days, although the results have shown that, in vessels of the size employed by us, the possible limits of such drying are reached in about 250 days. Once a fortnight during this drying period the explosion vessels were externally heated (except in the part containing the phosphoric anhydride, which was kept cool) to between 150° and 200° in order to disperse any moisture absorbed by or adhering to the interior glass surfaces; and throughout the drying period we were particularly careful to observe that the phosphoric anhydride retained its pristine, dry, powdery condition without any sign of caking. Also, by tapping the tube where it is located, we frequently exposed a new surface of it to the gaseous medium. Moreover, in sealing up the explosion vessels a blow-pipe flame of carbon monoxide and air (both calcium chloride-dried) was always employed so as to avoid all risk of the glass absorbing steam during the sealing process.

By such procedure we have been able so to dry $2CO + O_2$ mixtures that condenser discharges of 0·5 microfarad at 1000 volts could be repeatedly passed through them without the slightest appreciable combustion occurring, although a similar discharge of twice that capacity caused the medium to ignite; and after the resulting flame had passed through it, the combustion was between 80 and 90% complete.

To be successful in such "intensive drying" experiments requires the most scrupulous care at every point in regard to every detail of the apparatus and procedure, and failure may result from disregard of any one of them. There is no mystery at all about the matter, for provided that proper care is exercised there should be no difficulty in obtaining correct results.

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