true deviation, we have from the above constants $\Delta = D + D' \times \frac{100}{144-t}$.

In the table given by Mr. Casamajor the quantities which t was equal to was given, so that by a simple calculation it became readily possible to determine the value of the true deviation. The table was based on the much larger one of Clergets.

The fourth paper of the evening was by Mr. A. H. Elliot and it consisted of a description of "A New Form of Apparatus for the Analyses of Gases." It was very severely criticised by Dr. Endeman as being decidedly inferior to the more complicated forms devised by Professor Hempel. M. B.

THE SUCCESSFUL ADMINISTRATION OF NITROUS OXIDE AS AN ANÆSTHETIC FOR DENTAL AND SURGICAL OPERATIONS.*

DR. E. P. HOWLAND, Washington, D. C.

The successful administration of nitrous oxide consists in administering it to patients in such a manner that during operations they will not suffer pain, and that they will be in such a condition that the dentist and surgeon can successfully perform the operation and afterwards that the patients are found not to be injured by its administration. The first requisite for success is that the nitrous oxide should not have more than one per cent of pure oxygen or three per cent of atmospheric air, and that it should be perfectly free from all other gases or vapors. Nitrous oxide with two per cent or more of pure oxygen or five per cent or more of atmospheric air, will not produce perfect anæsthesia and the patient will feel the pain of the operation and pronounce the gas a failure. The adding of one per cent of pure oxygen to nitrous oxide has the benefit of partially oxygenating the blood and in a measure preventing the spasmodic action of the muscles and at the same time produce satisfactory anæsthesia. According to experiments made in France by P. Bert, ten per cent of oxygen or fifty per cent of atmospheric air can be added to nitrous oxide to oxygenate the blood, and at the same time produce perfect anæsthesia if it is breathed in a chamber under a pressure of two atmospheres. A certain amount of nitrous oxide taken into the lungs is necessary to produce insensibility, and it can be diluted with any innocuous gas and still produce anæsthesia, provided this amount is inhaled in the given time. Under pressure in a chamber more gas is breathed in a given time, as the nitrous oxide is condensed the same as the air in the chamber and under a pressure of two atmospheres, two volumes of nitrous oxide would be condensed into one volume, so that the nitrous oxide could be diluted with equal measures of atmospheric air and still the quantity of nitrous oxide inhaled would be the same as if breathed ordinarily and the quantity of oxygen breathed sufficient to arterialize the blood. Rapid breathing of nitrous oxide produces quick anæsthesia, but nothing is gained by it in practice. It is very difficult to produce anæsthesia with nitrous oxide at high elevations above the ocean, because the low pressure of the atmosphere allows the gas to expand so that a less quantity is taken into the lungs in a given time than is required to produce insensibility. Valve inhalers have generally proved a failure, because they admit atmospheric air with the gas in sufficient quantity to to prevent perfect anæsthesia. As near as I can ascertain, more than one-half of all the dentists of the United States who have used nitrous oxide have abandoned its use on account of want of success in producing satisfactory insensibility and thereby injuring instead of benefiting their practice. One cause of failure is the unskillful administration of the gas in allowing air to be inhaled with it, by not having the lips closed tight around the inhaler, and other causes; not using the nose as a valve for expiration exactly at the right time; not stopping the administration at the point of greatest anæsthesia and not having sufficient self-possession under all circumstances and emergencies to know just what to do and when to do it. But the greatest cause is the failure of producing perfect anæsthesia from the mixture of atmospheric air in the nitrous oxide that has been kept in a gasometer over water for a few days. The gas becomes mixed with air through the medium of the water and defective gasometers and cocks. The trouble and cost of making fresh gas every few days has caused the great abandonment of its use. Skillful administrators, who have a large practice and make fresh gas before deteriorated by air, are making nitrous oxide a success. Other dentists can make gas a success by obtaining it condensed in cylinders, when the gas will keep unadulterated and unchanged for years. The only drawback to a paying success is the present great cost of the condensed gas, which in the small cylinders amounts to about thirty-five cents for each administration, when the gas can be made in the dentists' laboratory for about three and a half cents for each administration. An apparatus can now be obtained that enables each dentist to make and condense his own gas and keep it for any length of time. Physicians and surgeons do not use nitrous oxide on account of the trouble and cost of making and keeping it, and the greater amount of practice and skill required in its successful administration than with the more dangerous ether and chloroform. Nitrous oxide requires a costly apparatus to manufacture it, and bulky receptacles to hold and administer it from, and the gas is for sale in but two places in the United States, while ether and chloroform can be carried in a bottle in the pocket and purchased at every drug store in the land. Nitrous oxide can be administered with almost absolute safety, while ether and chloroform can point to their victims in every city and hospital. Money, labor and skill can make nitrous oxide successful with both dentist and surgeon, and taking into account the value of human life, nitrous oxide should stand at the head of all anæsthetics, and its practical use be encouraged instead of ether and chloroform.

I have administered nitrous oxide in over thirty thousand cases for dental and surgical operations, and have had uniform success. I have never had a case of injury from lung or heart disease, but in many cases of throat and lung diseases a marked and permanent improvement. I have kept a large number of patients perfectly anæsthetic for surgical operations from five to thirty-five minutes, and the pulse during these operations has been nearly uniform and full. The success of prolonged operations consists in first producing perfect anæsthesia and then breathing air to arterialize the blood and before consciousness returns again breathing nitrous oxide, the necessary intervals varying in different patients from one-fourth to one-half minute. The average length of time occupied in dental operations from the first commencement of breathing the gas till return of consciousness has been two minutes. To encourage and make nitrous oxide a greater success in the future, the dental and medical colleges should employ successful operators to lecture and instruct graduates so that the particular knowledge and skill acquired by them in practice can be learned by others.

* Read before the A. A. A. S., Cincinnati, 1881.

ON October 17 next, fifty years will have elapsed since Prof. Bunsen, the eminent chemist, received his doctor's diploma from Göttingen University. He, however, intends to absent himself from Heidelberg on the day in question, in order to avoid all congratulations and speech-making.

MR. W. H. M. CHRISTIE, F. R. S., First Assistant at Greenwich Observatory, has been appointed Astronomer Royal, in succession to Sir George Airy, who retires after holding the office for nearly half-a-century.