

X.—*On the Valuation of Nitre.*

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IN accordance with a promise made by the authors at the conclusion of a former paper upon this subject,\* they beg to lay before the society the results of the application of their modification of the method of Gay-Lussac, for determining the value of specimens of the commercial salt.

It will be remembered that the modification alluded to, consisted in the substitution of resin for charcoal in the conversion of the nitre into carbonate of potassa, and in the subsequent treatment of the fused mass with chlorate of potassa in order to oxidise the cyanate of potassa, and to obviate the error arising from the reduction of the sulphates.

The following results were obtained in 53 consecutive experiments conducted in this manner.

Mean of 53 experiments upon pure nitre ; 99·7 per cent.

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Of these results, 25 exhibited a slight deficiency in the amount of nitre indicated by the standard acid ;

Mean of these 25 experiments . . . 98·7 per cent.

Mean of the remainder . . . . 100·7 „

Moreover, a difference, amounting to 0·3 or 0·5 per cent. was observed in the results, according as the strength of the acid employed had been determined by means of pure nitre, or of its equivalent of carbonate of soda, proving that the process was not yet theoretically correct, or the results would have coincided in the two cases.

The alteration of the quantity of resin and of the temperature employed to effect the deflagration, was not found to improve the results.

On examining the mass obtained by the deflagration, the carbon was usually found collected into large flocks, and, therefore, unequally disseminated ; and on examining the residues in such cases, traces of undecomposed nitre were frequently detected.

In the course of subsequent experiments, it was noticed that the decomposition of the nitre appeared to be more complete when the carbon was added in the form of the pure, ignited, finely divided graphite prepared by the recently patented process of Mr. Brodie.

Attention may be called to the circumstance that no cyanate of potassa was to be found in the deflagrated mass when the graphite had been used, while it may be remembered that considerable quantities of this salt were formed when other varieties of carbonaceous matter, which contained hydrogen, were employed, rendering it probable that the ammonia which was always evolved in such cases, is the proximate cause of the formation of cyanogen. The use of chlorate of potassa, however, is still necessary in the examination of samples of nitre containing sulphates.

Twenty grains of pure nitre were mixed with 5 grains of ignited graphite and 80 grains of salt ; after deflagration, the amount of carbonate of potassa formed was determined as usual.

Considerable influence was exerted upon the success of the process, by the degree of heat employed in conducting the deflagration ; if the platinum crucible be heated to moderate redness in a muffle, from 8 to 10 minutes will suffice to complete the decomposition of the nitre, a result which may also be attained, when a gauze burner is used, by prolonging the application of heat for 20 minutes, and covering the crucible with a jacket. If too high a temperature be applied in the muffle, the results always exhibit

a deficiency; the heat should not be sufficient to volatilise the common salt to any considerable extent.

Six experiments made with the above proportions gave, as a mean result, 99·98 per cent. of nitre.

Eleven experiments upon a mixture containing 95 nitre, 2·5 common salt, and 2·5 sulphate of potassa, gave a mean of 94·88 per cent. of nitre.

In treating the fused mass with chlorate of potassa, the crucible was removed from the muffle, the chlorate sprinkled over the surface, and heat applied by means of an argand burner as long as any effervescence was observed. The fused mass was then thrown upon a filter (having been loosened by pouring a little water into the crucible), and washed with hot water till the washings were no longer alkaline.

In the course of the experiments upon pure nitre, a fresh sample of graphite happened to be employed, and the results then fell somewhat short of the theoretical numbers; on enquiry, this was found to be due to the presence of sulphide of iron in the specimen of graphite; after this had been removed by treatment with hydrochloric acid, correct results were again obtained.

The subjoined table exhibits the results of a number of determinations of the value of commercial saltpetre by the graphite process, the amount of nitre thus indicated being compared with that indirectly obtained by determining the various impurities in the sample. The greater number of these analyses were performed by Messrs. Dent and Brown.

Saltpetre employed for each determination 20 grains.

No.	Nitre obtained		No.	Nitre obtained	
	Directly.	Indirectly.		Directly.	Indirectly.
1	94·85	94·81	14	98·45	98·33
2	98·25	98·31	15	98·65	98·60
3	98·45	98·10	16	96·05	96·00
4	95·85	95·79	17	94·00	93·91
5	98·10	97·96	18	98·75	98·43
6	96·70	96·88	19	99·50	99·72
7	96·90	96·73	20	99·35	99·49
8	95·25	95·03	21	94·85	94·66
9	95·05	95·24	22	95·35	95·27
10	97·10	97·41	23	96·05	96·18
11	99·15	99·21	24	95·00	95·05
12	93·80	94·09	25	97·10	97·32
13	95·35	95·43	26	97·10	96·90