



# On the determination of carbonic acid in saline compounds

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method of scalars and vectors) enables us, as we have seen, to pass, by a very short and simple symbolical transition, from either to the other of these two great and known properties of the cone of the second degree.

[To be continued.]

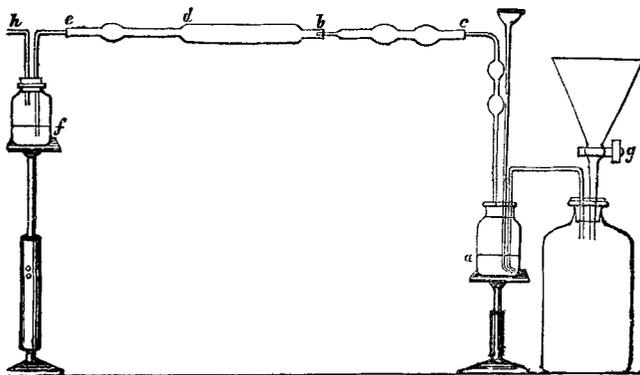
*L. Intelligence and Miscellaneous Articles.*

ON THE DETERMINATION OF CARBONIC ACID IN SALINE COMPOUNDS. BY C. BRUNNER, SEN.

THE estimation of carbonic acid in its combinations is generally effected by ignition, when the compound is one of those which part with the whole of the acid at a red heat. When water is disengaged at the same time, its quantity must either be determined by a separate experiment, and subtracted from the loss experienced on ignition, or collected in a suitable apparatus during the calcination, and so calculated. With those compounds where this method cannot be applied, it is customary to expel the carbonic acid by a stronger acid, for instance sulphuric acid, and to determine its amount from the loss, taking care in this case to retain the water accidentally carried over with it by some suitable substance. Apparatus for this mode of determination have been described by Rose, and recently by Fresenius.

It is readily seen that, according to these methods, the result is always obtained in a negative manner, that is to say, by a loss in weight. As we should certainly endeavour to exchange all such negative methods for positive, I will here communicate one which appears to me applicable in most cases. The substance to be examined is placed in the little flask *a*, and a suitable quantity, for instance an ounce, of water poured over it; upon which the flask is closed with a tight-fitting cork provided with three tubes, and when necessary coated with cement. The straight tube terminates above in a small funnel, through which the sulphuric acid is poured; the second, provided with two bulbs, is connected by its rectangular bend with a tube *bc*, from a third to half an inch wide; and, in order to gain space, likewise furnished with two expansions containing asbestos moistened with sulphuric acid; the third is bent

new, yet it is impossible for him, in mentioning here the name of Chasles, to abstain from acknowledging the deep intellectual obligations under which he feels himself to be, for the information, and still more for the impulse given to his mind by the perusal of that very interesting and excellent History of Geometrical Science, which is so widely known by its own modest title of *Aperçu Historique* (Brussels, 1837). He has also endeavoured to profit by a study of the Memoirs by M. Chasles, on Spherical Conics and Cones of the Second Degree, which have been translated, with Notes and an Appendix, by the Rev. Charles Graves (Dublin, 1841); and desires to take this opportunity of adding, that he conceives himself to have derived assistance, as well as encouragement, in his geometrical researches generally, from the frequent and familiar intercourse which he has enjoyed with the last-named gentleman.



twice, and terminates in the large empty flask. To adapt it more easily, it may be cut anywhere in the middle, and the two parts connected by caoutchouc. The two tubes dipping in the liquid *a* are drawn out at their lower ends into fine, somewhat laterally curved points; the tube *be* contains, in the expanded portion *bd*, which is from three-quarters to an inch in width, well-burnt lime, which may be readily moistened with water, from *d* to *e*, asbestos, or fragments of pumice-stone, drenched with sulphuric acid, and separated from the lime by a light stopper of asbestos; the small Woulf's flask contains lime-water.

The analysis is now performed in the following manner:—A small quantity of sulphuric acid is poured into the flask *a* through the funnel-tube, the stopcock *g* being closed; as this will not descend of itself, it is made to do so by drawing gently with the mouth at *h*. The evolution of gas, which is rendered perceptible by the ascending bubbles, and by the air passing through the lime-water in *f*, is now waited for; another portion of acid is then added, and this continued until it may be assumed that a tolerable excess of acid has been introduced. This being done, some water containing a little caustic potash in solution is allowed to flow into the flask by opening the stopcock *g*, whereby a current of air is passed through the vessel *a*, which carries the carbonic acid, contained partly in the liquid partly in the upper space of the vessel, into the tube *be*; but since this would never be completely effected without the application of heat, the vessel *a* towards the end of the experiment is immersed in a small dish filled with water, which is kept warm over a small lamp as long as is found requisite.

It is best to regulate the current of air so that about 2 bubbles of gas pass through the lime-water in a second. It will however never be found to become in the least turbid. It is scarcely necessary to observe that the object of the sulphuric acid in *b* *c* is to retain the moisture carried by the gas from *a*; also that the potash added to the water which flows into the large flask is to absorb the carbonic acid of the atmospheric air; and, lastly, that, the increase in weight of *be* yields the result sought for.

Several analyses made according to this method yielded highly satisfactory results. 1·771 grm. of recently ignited carbonate of potash, which was allowed to cool in a closed platinum crucible, gave 0·564 carbonic acid. Taking the atom of potash at 590, that of the carbonic acid at 275, 0·563 ought to have been obtained.

1·705 grm. of very pure magnesite gave 0·870 carbonic acid = 51·026 per cent.—Poggendorff's *Annalen*, No. vi. 1846.

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ON THE ACTION OF NITRIC ACID UPON CHOLIC ACID.

BY A. SCHLIEPER.

The interesting connexion which has recently been shown to exist between the products of decomposition of cholesterine and choloidic acid by Prof. Redtenbacher\*, led to the supposition that it might also extend to the other products of the bile if they were submitted to a similar treatment. With this view I have been induced to examine the action of nitric acid on Demareay's cholic acid.

The cholic acid was prepared according to the process described by Theyer and Schlosser; bile, freed from mucus, fat and colouring substance, was retained for several days at a boiling temperature with a tolerably strong solution of potash, and then concentrated until a soapy mass, which became hard on cooling, separated from the liquid. After complete separation, it was dissolved in water, filtered, and treated with acetic acid, which separates the impure cholic acid in thick white flakes, which unite, forming resinous masses. If the eliminated resin be heated with water to boiling, it assumes all at once a granular crystalline structure, and is then easily reduced to powder; the latter was dried, and washed on a funnel with æther until it appeared white, and then pure white cholic acid obtained from it by dissolving and crystallizing it from alcohol. Cholic and nitric acids do not act on one another in the cold, however concentrated the latter may be; but if a mixture of the two be heated in a retort, a very violent reaction soon ensues, the mass ascends, frothing considerably, while large quantities of nitrous acid escape. When the first action is over, the retort contains a dark yellow liquid, on which float some drops of oil, which on cooling solidify, and are nothing more than unaltered cholic acid. As the nitric acid which distilled over possessed a peculiar odour, it was nearly saturated with an alkali and again distilled; but although the aqueous distillate still retained the peculiar smell, none of the volatile products which Redtenbacher discovered in submitting cholesterine and choloidic acid to a similar treatment, could be detected in it. The yellowish liquid which remained in the retort was evaporated on the water-bath to expel the excess of nitric acid, when it dried to a yellowish transparent gum, which exhibited in its external properties the greatest resemblance to the cholesteric acid recently described by Redtenbacher. To separate this body from some still undecomposed cholic acid, it was repeatedly dissolved in water, filtered, and again evaporated until the residue dis-

\* Chem. Gaz., vol. iv., p. 269.