LXI. Remarks on certain properties of barytes in its combination with mineral acids; and on two new salts never before described

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This experiment was repeated and varied, at the expence of several thermometer bulbs; and it appeared that water may be cooled down in such circumstances, not only to 21° , but to 5 or 6° , without freezing, and that the law of expansion above mentioned obtains in every part of the scale from $42\frac{1}{2}^{\circ}$ to 10° or below; so that the density of water at 10° is equal to the density at 75° .

LXI. *Remarks on certain Properties of Barytes in its Combination with Mineral Acids; and on two new Salts never before described.* By J. HUME, Esq.*

FROM a number of experiments I have occasionally made on *barytes*, but chiefly on it when combined with mineral acids, I have been led to draw some conclusions and observe phenomena, which, I believe, have hitherto been either totally unknown, or so very imperfectly detailed, as, no doubt, to have frequently been a source of error. This earth, for I am not yet disposed to class it with alkalies, certainly possesses peculiar habitudes, or rather, when compared with those of other earths and alkalies, and its own combinations compared with each other, some singular anomalies, which I have never yet seen pointed out by chemical writers. Amongst many others, the following appear the most prominent, and therefore demand first to be noticed.

1. That sulphate of barytes is completely *soluble* in sulphuric acid; forming a saline *fluid* or acidulous sulphate, analogous, in some of its characters, to phosphate of lime and many other salts; with capacity for excess of acid; decomposable by water alone, which returns it to simple sulphate; and this salt never has been enumerated by any author.

2. That carbonate of barytes is also totally decomposed by, and soluble in, sulphuric acid, forming, of course, the same *acidulous* sulphate. Respecting any figure this new salt may put on, I have not yet been able fully to determine; but I strongly suspect it may, under particular circumstances, be made to crystallize.

3. That nitrate of barytes, not in crystals only, but even a saturated aqueous solution, is perfectly *insoluble* in nitrous acid of the usual specific gravity.

4. That carbonate of barytes may entirely be changed into nitrate by nitrous acid in its *concentrated* state. The converse of this has hitherto been maintained.

* Communicated by the Author.

5. That muriate of barytes is virtually *insoluble* in muriatic acid.

6. That carbonate of barytes may be rendered into muriate by *concentrated muriatic acid*.

7. This may not appear to be, with propriety, placed after the others; it ought nevertheless to be named, since no author has given any account of it. It is, that sulphate of strontian has also a capacity for super-saturation; forming, like No. 1, an acidulous sulphate in *solution*, and decomposable by water.

In several chemical works, written by very eminent men, I have frequently observed some of the above results very nearly accomplished; and have been amazed to find such palpable truths had escaped their notice: yet, on a careful examination of the context, I confess, I could never find a single proof that any one of these peculiarities of barytes has been known to the full extent as above detailed. In respect to No. 1, there is no mention of an *acidulous* sulphate nor of *fluidity*, in an essay, where I expected to find it, written in 1790 by C. Fourcroy *. It may also be remarked, that in a more modern work by the same very excellent chemist, speaking of sulphate of barytes, he expresses himself thus: "Il paraît cependant dissoluble par des *moyens* que la nature nous *cache* encore, puisqu'il est visiblement cristallisé par l'eau. On ne peut pas le faire cristalliser artificiellement †." The same author had affirmed the perfect insolubility of carbonate of barytes in nitrous (or nitric, for it is not yet decided) acid: "L'acide nitrique le plus concentré n'a absolument aucune action sur le carbonate de barite natif en morceau, ce sel y reste intact absolument comme dans l'eau ‡." This is quite contrary to the result of my experiments, even with little more heat being employed than the common atmospheric temperature. Indeed, regarding the effect of mineral acids upon the native carbonate of witherite, for it would be unfair, in this place, to speak of *artificial* carbonate, the same author sums up his opinion in one sentence: "Que les acides ne l'attaquent point en masse, et lorsqu'ils sont concentrés §." Since no part of this analysis has yet been re-

* Analyse de Carbonate de Baryte natif, &c. § 3.

† Système des Conn. Chimique.—"It, however, appears to be soluble by *means* which nature still *conceals* from us, since it is evidently crystallized by water. It cannot be made to crystallize artificially."

‡ Ibid.. "The most highly concentrated nitric acid has absolutely no action on native carbonate of barytes in bits. This salt remains in it absolutely unattacked, as in water."

§ Analyse, &c. § 4.—"That the acids do not attack it in a mass, and when they are concentrated."

tracted,

tracted, but, on the contrary, if possible, more completely confirmed by the author's writings since that period, I have been less scrupulous in applying these quotations to my purpose. Though another author has, in one solitary sentence, apparently flatly contradicted C. Fourcroy, yet, on a closer inspection of the work, (2de édition *considérablement augmentée*), which I should call a *third* edition, it does not appear that any one of these habitudes or anomalies has been clearly demonstrated to exist. The sentence is, to say no more of it, evidently conditional, and no mention made either of *concentration* or *dilution*: "Tous les acides minéraux décomposent ce sel," (meaning carbonate de barite*.) But my doubts were completely removed, at least respecting what I have stated at Nos. 3 and 4, when I read a whole page†, where we find detailed a most circuitous process for purifying nitrous acid by litharge and nitrate of silver.

I purposely forbear to mention any method I pursued to accomplish each combination; as it appears to me to be within the limits of the meanest capacity, and obvious to every chemist to obtain the same results.

No. 108, Long Acre,

January 24, 1803.

LXII. *On the Utility of Prussiate of Copper as a Pigment*
By CHARLES HATCHETT, Esq. F.R.S.†

THE accidental discovery made by Diezbach of the pigment called Berlin or Prussian blue, about the year 1710, and which afterwards was published by Woodward in the Philosophical Transactions for 1724, was soon adopted by artists and manufacturers, so that in a short time the great utility of this colour was completely established: it is therefore remarkable, that but little attention has been subsequently paid to the colorific properties of the other metallic prussiates.

The experiments made by Mr. Brown with the prussic lixivium on various metallic solutions do not merit particular attention, as the results evidently show that a very large portion of the alkali remained unsaturated with prussic acid, and thus the effects appeared different when the lixivium was prepared with blood or with muscle§.

Bergman has, however, more accurately examined the pro-

* Analytic, &c. §— "All the mineral acids decompose this salt."

† Manuel d'un Cours de Chimie, *La Gange*.

‡ From Journals of the Royal Institution of Great Britain.

§ Philosophical Transactions 1724, p. 17.