March 18, 1850.

J. T. COOPER, Esq., V.P. in the Chair.

Charles Shearman, Esq., John Cameron, Esq., and George Ewbanks, Esq., were elected Fellows of the Society.

The "Quarterly Journal of the Geological Society" was laid on the table, as a donation from the Society.

The following Papers were read :

"On the relations between Chemical Composition, Boiling Point, and Specific Volume," by Professor Hermann Kopp, (to be published in the next number).

X.—*On the Precipitation of the Colouring Matter of Sugar by a Metallic Oxide.* By HENRY WARBURTON, F.R.S. F.G.S., &c.

(*In a letter to* PROFESSOR GRAHAM).

Allow me to put upon paper what I said to you the other day, respecting the experiments I made many years ago (the year of Mr. Howard's death) with the view of precipitating the colouring matter of brown sugar in combination with a metallic oxide.

My assistant was a gentleman related, by marriage, to Mr. Howard, and his operator in all the experiments on sugar-refining and filtering connected with Mr. Howard's patents. He gave me the information I was in want of, as to the strength of the syrups at which it would be requisite to effect the precipitation of the colouring matter, in order to render any process of that kind available to the sugar refiner. He prepared for me a small apparatus for filtering the syrups at a boiling heat, and pronounced judgment on the results obtained.

The metals I used were iron, lead, zinc, and *tin*. Iron, I at once abandoned. Lead, I was afraid of; though, with the sub-acetate, followed by a little sulphuric acid, and that followed by a little hydrate of lime, I obtained very colourless results.

With the sulphate of zinc, the results were very good. A solution of this salt was first mixed with the syrups, and then hydrate of lime was added, equivalent to the sulphuric acid in the salt. One experiment of this kind was made on the great scale at the boiling-house of a firm with whom Mr. Howard was connected in business, and was regarded by them as highly promising. However, Dr. Wollaston found a trace of zinc in some of the syrups which had been thus treated, and I was afraid of zinc also.

The best results of all were obtained with sulphate of tin ; and one experiment, on the large scale, was made with this salt at the boiling-house of the firm referred to. I am sorry that I cannot lay my hand on my cotemporary memoranda of the details of all my experiments with this salt ; and you must be content, therefore, with the outline of them, which I now give from memory.

The salt was prepared by precipitating the copper of blue vitriol with grain tin, the latter being finely granulated by crushing it while hot by a wooden pestle ; and to prevent the copper from coating the tin as it precipitated, clean copper plates were immersed in the liquid with the tin. Perhaps the best way would be to make the precipitation in a clean copper vessel. To hasten the precipitation, I sometimes added an excess of sulphuric acid ; and I kept the vessels cool by immersing them in water. I could not obtain a strong solution of tin in sulphuric acid by the direct action of sulphuric acid on tin : a quantity of subsulphate, or insoluble oxide, in this case, was always found.

After adding a solution of the sulphate of tin to the syrup, a quantity of hydrate of lime, rather more than equivalent to the sulphuric acid, was superadded, and then the syrup was boiled by steam and filtered hot, in a vessel surrounded by steam. I also used, with great success, as a precipitant of the sulphuric acid, freshly precipitated hydrated oxide of lead. But this was only in experiments on the small scale.

Astonishingly perfect results are obtained with the sulphate of tin, when you operate with *dilute syrups*. The difficulty consists in effecting a complete precipitation of the colouring matter in *the syrups of the strength usually employed by the refiner*. Dr. Wollaston did not find any oxide of tin in the syrups treated with tin.

My friend, Dr. Wollaston's relative, always advised the final employment of a small quantity of animal charcoal, as it gave a *fluidity* to strong syrups, that could be obtained in no other way. In our small experiments, we added a *souppçon* of animal charcoal, after the tin and lime had done their work.

As I made these experiments only for my own amusement, and to serve Mr. Howard's family, if his relatives or the firm thought fit to persevere in them, I left the matter in their hands. But this was the critical period for them, when the refiners were just beginning to take out licenses to boil sugar under Mr. Howard's patents ; and their opinion, which appeared to me a well-founded one, was, that any new improvements, suggested at that period, would tend to

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unsettle the minds of the refiners, and rather deter them from making up their minds to apply at once for a license.

I conclude that all the tin employed may be recovered, without difficulty, from the precipitate, which will be a mixture of gypsum and vegetable matter combined with oxide of tin. It would be a saleable article to metallurgists; so also will the precipitated copper be.

I shall be curious to know whether any experiments you may make with the sulphate of tin prove satisfactory. Of course, any other soluble salt of tin will answer, when the dissolving acid is neutralized by lime or an alkali, subject to the condition, that the new compound thus found is not soluble in the syrup.