

England, and in concurrence with the view of Mr. Justice Romer, who tried the case in the ower Court. But, however the rights of this may be, these are the points that I have ascertained in the bromo-cyanide process:—

“(1.) That when strong solutions of potassic cyanide are bromodized they act with even greater rapidity on gold than potassic cyanide does upon gold that is polarised;

“(2.) That, in the good working-solution of the cyanide, bromodizing has but very little accelerating effect, if, indeed, it has any at all—certainly far less than ferri-cyanide of potassium has;

“(3.) That a well-prepared solution of this agent has but an extremely slight effect on cupreous sulphides;

“(4.) That gold, even when sulphurised, is speedily attacked and dissolved by this bromodized-cyanide solution.

“These results show that the bromo-cyanide process, also variations of it with other haloids, seems especially applicable in those cases where the gold to be extracted is coarse or is admixed with metallic sulphides—cases where the ordinary cyanide process either completely fails or is not at all satisfactory.”

“ON THE POSITION THAT CYANOGEN HOLDS IN RELATION TO THE SIMPLE RADICALS, AND ITS INABILITY TO COMBINE DIRECTLY WITH SILVER OR GOLD. (By WILLIAM SKEY, Analyst to the Mines Department.)

“ [Read before the Wellington Philosophical Society, 26th August, 1896].

“ *Abstract.*

“In this communication I refer to the fact that in 1874 I gave a paper to this Society entitled ‘On the Analogy of Cyanogen to Oxygen,’* in which I endeavoured to show that this compound radical should not, for certain reasons that I stated, be classed, as it now is, with the haloid elements chlorine, bromine, and iodine, but rather with oxygen; that, in fact, it is only when it is united with sulphur that we have a radical at all comparing with the elements here named. This theory when circulated in England did not meet with any favour—not that the facts I adduced in support of it were at all questioned, but that others were put forward which, as was stated, conflicted with them. Not then having any further facts to adduce I let the subject drop; but just recently, owing to the question assuming considerable importance, I took it up again, and I have, as a result, discovered further evidence, which, as I believe, is greatly in favour of my theory, and which I adduce. I therefore state this evidence, which is to the effect that cyanogen does not, as it is at present supposed, dissolve either silver or gold when administered to it as an aqueous solution, whether these are dilute or concentrated—that, indeed, as far as I have at present investigated the matter, cyanogen does not even attack either of these metals at all.

“The exhibits 1 and 2 on the table here show a little silver- and gold-leaf that have been in a strong solution (aqueous) of this gas for five days, and, for comparison, pieces of silver- and gold-leaf, from the same sheets respectively, that have not been in the solution. I do not think any one can discern any difference in the appearance of these—that is, any loss of either the gold- or silver-leaf that has been in the cyanogen; and I think that you will allow that this is a very severe test in the case of gold, when you consider that its thickness is not more than $\frac{1}{170000}$ in. To get a still more crucial test I have coupled gold-leaf with chalcopyrites in the solution of cyanogen (as you may see in the exhibit No. 3), so as to have the benefit, the stimulating effect, that we get by allowing any electricity produced by chemical action to become current electricity. Still, you may see the result is the same; the gold remains, as far as we can see, *absolutely unaffected*.

“In all these experiments I feebly acidulate the cyanogen solution to counteract the decomposing effect produced by atmospheric ammonia or the alkali of the vessels that I use. Thus I completely avoid the production of gold-dissolvers—that is, the alkaline cyanides, which otherwise would interfere with the accuracy of investigations of this nature.

“Light does not appear to act on these solutions of cyanogen, at least so as to produce any solvent for gold, such as ammonium-cyanide.

I then assert that cyanogen gas, like oxygen, is far more soluble in water than in saline solutions generally that have no chemical effect on it, but that, as it now appears to me that this is a general character of gases, I do not count upon this fact to aid me in my contention. I then go on to state, in regard to the position of this compound radical among the elementary radicals, that wherever this is, it cannot be with the group of chlorine radicals, owing to the non-acidity of its hydride in water, the composition of its acidic compounds with oxygen, and, lastly, as here shown, its refusal to unite directly with certain metals.

“I then, in conclusion, state the position I would take in the controversy that I started, and it is this: that, while not disputing the correctness of the general opinion that cyanogen stands in close relation to the radical carboxyl, in which case it is monoatomic, and so comparing with the chlorous radicals, I still maintain that it is on certain occasions diatomic, and so comparable with oxygen. It has, in fact, as I believe, a varying atomicity or quantivalence, according to the nature of its environment.

“As you are aware, this compound can assume allotropic states—that is, like oxygen, it can combine with itself—and an intercombination such as this might, I think, give us cyanogen in the form of a ‘dyad’; but this is a matter that requires further consideration.

“It is only right that I should inform you that Professor Black, of the Otago University, has proved by a series of experiments which are practically contemporaneous with mine that if cyanogen does dissolve gold it is only at a very slow rate as compared with the action of potassic cyanide on this metal. However, as it appears that a very suggestive query that I proposed bearing on this matter started these experiments, I feel sure that this gentleman will, with his accustomed magnan-

* Trans. N.Z. Inst., Vol. vii., p. 379.