phere passing over those lakes since the 20th of December, 1901, and the warm temperature has caused unusually great evaporation so that the water in those lakes is only about four feet higher at this date—February 9, 1902—than usual at this time of the year. There is also but slight increase of volcanic activity, indicated by an increased flow of gases and vapor from volcanic peaks. Only seven earthquakes in Western Nicaragua have occurred since November 15, each slight, from II. to IV. of the Rossi-Forel scale.

There are no indications of higher water in the Lakes this year. J. CRAWFORDES.

MANAGUA, NICARAGUA,
February 9, 1902.

UNIO CONDONI IN THE JOHN DAY BEDS.

PROFESSOR J. C. MERRIAM informs me that he 'found great quantities of that species at the original locality.' As this form was not among the material sent to me for determination, I erroneously inferred that it had not been detected. The original locality, as stated by Dr. White, is the North Fork of John Day River, Oregon, at the angle of the big bend, longitude 119° 40′, latitude 44° 50′. My paper in SCIENCE January 24 last, pages 153–154, is hereby corrected in this particular.

ROBT. E. C. STEARNS.

NOTES ON INORGANIC CHEMISTRY.

THE NEW SULFURIC ACID MANUFACTURE.

ATTENTION has often been called within the last few years to the new process of making sulfuric acid from the pyrites-burner gases without the intervention of lead chambers, but the first authoritative description of the process, with the history of its development, was given in a lecture last fall by Dr. R. Knietsch before the German Chemical Society. This lecture has now been published in the *Berichte* of the Society and deserves notice, not only on account of the intrinsic importance of the subject, but also as being a conspicuous example of how the persistent investigations of trained chemists have succeeded in overcoming what seemed to be insuperable obstacles.

The catalytic action of platinum upon mixtures of gases was discovered by Sir Humphrey Davy in 1817, and in 1831 Peregrine Phillips, of Bristol, England, took out a patent for the manufacture of sulfuric acid by the action of finely divided platinum upon a mixture of sulfur dioxid and oxygen. This process, though exploited from time to time, and worked at by many chemists, came to nothing. In 1875 Clemens Winkler took up the study of this reaction, finding that the most favorable condition for this reaction is when the gases are present in the proportion of two volumes of sulfur dioxid to one of oxygen, and that the presence of other gases or even of an excess of either of those involved in the reaction is detrimental. Since, by decomposition, ordinary sulfuric acid yields a mixture of sulfur dioxid, oxygen and water, it was possible to utilize these gases in the manufacture of sulfur trioxid or of fuming sulfuric acid, by drying them to remove the water, and then leading them over platinum sponge. This was put into practical application with some success. This can, however, hardly be considered more than a very slight step toward the manufacture of ordinary oil of vitriol from the pyrites-burner gases.

The rapidly increasing development of the color-industry of Germany has occasioned a demand for enormous quantities of both concentrated and fuming sulfuric acid, and for the past decade the energies of the chemists of the great color corporations have been directed toward the problem of the manufacture of these acids without the intervention of the lead chambers and the platinum concentration stills. In these investigations Dr. Knietsch, of the Badische Anilin- und Soda-Fabrik, was a most important factor, and to him belongs a great share of the credit of having rendered the new process a commercial success.

The gases from the pyrites-burners consist of sulfur dioxid, nitrogen and an excess of oxygen from the air. When these gases were thoroughly purified and carried to the laboratory it was found that on passing over a 'contact mass' containing finely divided platinum, the sulfur dioxid was completely oxidized to the trioxid, or to sulfuric acid if water was present. When, however, an attempt was

made to carry out the operation on a large scale, the contact mass quickly became inert. This was the case even when the gases had been purified by passing through long pipes, repeated washing with sulfuric acid, and further passage through coke and asbestos filters. In following up the cause of the difficulty, it was found that extraordinarily small quantities of arsenic were capable of inhibiting the action of the platinum in the contact mass. The same is true of a few other substances such as mercury and perhaps phosphorus. These substances seem to have what may be considered a poisonous action upon the platinum. Investigation showed that the arsenic was contained in the fine white fume which is formed in all cases where sulfur is burned. This fume consists of finely divided sulfuric acid, and its complete condensation has been one of the unsolvable problems of technical industry, especially in connection with smelting plants. Eventually the problem was solved by the thorough washing and wet filtration of the slowly cooled gases, with water or dilute sulfuric acid.

After this purification from every trace of mechanical impurity, as was shown optically, it was found that the contact mass still lost its activity after a time, and here again patient investigation revealed the fact of arsenic poisoning. This was finally shown to be due to the action of the condensed sulfuric acid from the burners upon the iron condensers, whereby traces of arseniuretted hydrogen (arsin) were generated. This difficulty was easily overcome, but when the process was attempted on a large scale, it was still unsuccessful. When the pyrites burners were used to their full capacity, there was formed a fume which resisted every attempt at condensation. This was unconsumed sulfur, which, of itself harmless, contained minute quantities of arsenic, thus again poisoning the contact mass. The formation of this fume was prevented by the injection of steam into the burners, which has other advantages, in preventing the action of the condensed acid on the iron pipes, and in hindering the formation of hard dust scales in the cooling pipes and chambers. Other difficulties appeared in the cooling of the contact mass and in connection with the absorption of the sulfur trioxid, which is attended by a great development of heat, but they were slight in comparison with those which had attended the purification of the gases. At last the process was established on a commercial basis, as is shown by the fact that in the year 1900 the production of sulfur trioxid reached the amount of 116,000 tons.

The first interest of the process is of course for the manufacture of the concentrated and fuming acids, used largely in the color industry, but when it is considered that it is the concentrated acids which are most economically made in this manner, it is not difficult to foresee that in the near future the chamber process must be superseded for all acids which would require concentration in platinum stills. It is quite possible that the chamber process will continue to be used for many years to come, for the more dilute acids which require no concentration, but even so, the perfection of the contact process can be looked upon as little short of a revolution in this most important of the chemical industries.

J. L. H.

RELIEF SHIP FOR THE BRITISH ANTARCTIC EXPEDITION.

Sir Clements Markham, president of the Royal Geographical Society, has issued the following appeal to the Society's fellows:

It is with some reluctance that I appeal again to the fellows of the Society on behalf of the relief ship, which must leave England not later than July next to obtain news of, and render what assistance may be necessary to, the expedition on board the *Discovery*. I make this further appeal in the belief that the fellows as a body do not realize the situation, and entertain an erroneous impression as to how much is expected of each individually. I am assured that many, if not most, of the fellows of the Society feel that, unless they can each contribute a very considerable sum, it would be useless to do anything.

I am particularly anxious to disabuse the fellows of this impression; I assure them that we shall be glad to receive any contribution,