to say here that the following considerations are of fundamental importance:

1. Abolish all distinction between field and office force.

2. Leave all examinations or other tests of qualifications for appointment into the Survey wholly with the Civil Service Commission. If the Commission cannot propound suitable questions, let it consult the faculties of our leading universities. But let them never appeal to the bureau interested, save as to the general scope of the examination or other tests. If the bureau can dictate to the Commission, there is grave danger that it will override the latter and frame requirements suited to some person in whom it is interested. Again, ridiculously specific or technical questions do not well test a man's capacity nor his ability for doing work.

3. So far as possible, let the individuals do that kind of work for which they are best fitted because of their education, ability and natural liking.

4. Then base promotions in salary upon the quality and quantity of work done, unless it works obvious injustice to known abilities not well brought out by the assigned work.

5. The same rule should generally be applied in the selection of chiefs of divisions and of field parties. In doubtful cases favor the older candidates.

6. Let no set of employees have the ear of the superintendent while the other employees are seldom or never consulted.

7. Grant the greatest possible freedom in the pursuit of the work. Favor, and do not discourage, free consultation between all members of the Survey.

The preceding remarks show that much depends upon the selection of a superintendent. They show how important it is that he should be a scholarly man capable of properly judging the merits of the persons employed, also that he should encourage scientific activity as generally as possible throughout the bureau.

OBSERVER.

NOTES ON INORGANIC CHEMISTRY.

AN interesting paper by J. C. A. Simon Thomas, on the liquid carbon dioxid of commerce, has recently appeared in the *Zeitschrift für angewandte Chemie.* The author was incited to his investigation by the widely varying prices for the liquefied gas as supplied in steel cylinders for use in the ice machines on Dutch men-of-war. The gases examined were obtained from combustion of coke (Ozouf's method), from magnesite, from carbonaceous rock, 'prepared artificially' (no further data obtainable), and from the natural carbonic acid gas from certain volcanic regions. Gas from brewery fermentation was not obtained. The gases were all found to be of fairly good quality. No sulfurous acid gas nor hydrogen sulfid was found in any case. The natural gas contained considerable water, but this was probably introduced accidentally into the cylinder. The other gases left little, if any, residue. The natural gas was almost perfectly pure, containing only a trace (0.8 per cent.) of air. The Ozouf gas and that from carbonaceous rock contained respectively 2 per cent. and 5.7 per cent. of air. That from magnesite and that artificially prepared contained 4 per cent. and 3.4 per cent. of carbon monoxid. This was doubtless due to the presence of the reducing materials used in the decomposition. This impurity should not be present when the gas is used in ice machines in confined spaces, as on men-of-war, as the machines are liable to leak when first set to work. These quantities of impurities are found in the first portions of the gas drawn from the cylinders, and after half the gas has been drawn off, the amount of gas unabsorbed by caustic potash is inappreciable. The result of this investigation is to show that the quality of liquid carbon dioxid furnished by the European manufacturers leaves little to be desired.

SINCE the investigation of the metallic carbids by Moissan, the electric furnace has been applied to the preparation of many compounds of a similar nature, and some of these, like calcium carbid and carborundum, have already found important industrial applications. A paper was read before the Chemical Section at the Bradford meeting of the British Association by C. S. Bradley, on a series of silicids discovered by Charles B. Jacobs of New York, which may prove to be of commercial value. They are silicids of calcium, strontium and barium, with the formulæ $CaSi_2$, $SrSi_2$ and $BaSi_2$, thus

corresponding to the carbids. They are formed in the electric furnace from mixtures of the carbonates with sand, and sufficient carbon to effect a reduction, or silicates of the alkaline earths and carbon may be used. When treated with water, hydrogen is evolved; with dilute acids the calcium compound evolves silicon acetylene, Si_2H_2. They are powerful reducing agents, and may find use in the dye-stuff industries. They have also been found to be effective in removing phosphorus and sulfur from molten steel.

A RECENT issue of the *Chemical News* gives a description of the electrolytic refining plant of Boston and Montana Copper and Silver Mining Company of Great Falls, Montana, and of the Anaconda Copper Mining Company. It is an excellent instance of the revolution which is being worked in many industries by the use of electricity. In these plants the ore is ground and concentrated, and the rough metal is then cast in pigs two feet square and two inches thick. These are used as the anodes in the bath, the kathodes being thin sheets of copper. The refined copper is deposited upon these thin sheets, while the refuse from the pigs falls to the bottom of the bath. This refuse consists chiefly of lead, silver and gold, and is said to be worth about $2,600 a ton. This refuse is sufficient to pay for the whole electrolytic process. The process is carried on without intermission and the effective result is seen in the dividends of these companies.

J. L. H.

RECENT ZOO-PALEONTOLOGY.

A RHINOCEROS WITH A COMPLETE SET OF CUTTING TEETH.

THE chronometer of evolution never errs. It is well known that modern rhinoceroses are distinguished by the loss of most, if not all, of their cutting teeth. On evolution principles it has been predicted that they sprang from ancestors with four cutting teeth.

A few years ago the American Museum party found a maxilla containing the ancestral upper canines, and now F. A. Lucas (*Proc. U. S. Nat'l, Mus.*, No. 1207) has described a still older type, *Trigonias osborni*, with a full set of upper cutting teeth, that is, canines and three incisors, the most anterior of which is enlarged, Fig. 1. In the lower jaw there is some evidence that the enlarged teeth, which have been usually described as canines, are really incisors, because

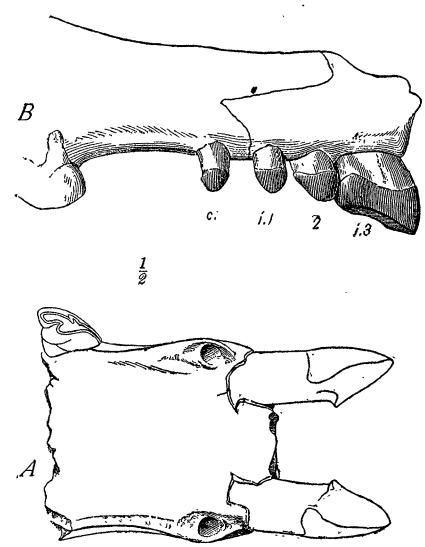

FIG. 1.—*Trigonias osborni*. *A*. Jaw showing alveoli of supposed canines. *B*. Anterior portion of cranium, showing three incisors and small canine. After Lucas.

vestiges of small teeth are present just behind them. This is a most interesting discovery from the Lower Oligocene beds of South Dakota and carries the line of the Rhinoceroses one step further back. The animal is almost as large as the classic *Aceratherium occidentale* of Leidy.

EXTINCT LEMURS FROM MADAGASCAR.

DR. C. J. FORSYTH MAJOR has described from time to time the remarkable lemurs of ancient Madagascar, a zoological region otherwise known as 'Lemuria'; they are of Pleistocene age and show a high degree of specialization or adaptive radiation. *Megaladapis* (see *Phil. Trans.*, Vol. 193, pp. 47–50, 1900) is by far the largest monkey hitherto described; as the name implies, it imitates on a large scale the well-known *Adapis* of the Oligocene of France. Another type, *Nesopithecus* (*Proc. Zool. Soc.*, Dec. 19, 1899), is remarkable in its adaptive resemblance to the Hypsiprimnid marsupials of Australia, proving that the lemurs are a group