

The Engineering and Mining Journal

VOL. LXXXII.

NEW YORK, SEPTEMBER 1, 1906.

NO. 9

Published Weekly at

505 PEARL STREET, NEW YORK

London Office: 20 Bucklersbury, London E. C., Eng.
CABLE ADDRESS "ENGINJOUR, N. Y."

Subscription, payable in advance, \$5.00 a year of 32 numbers, including postage in the United States, Canada, Mexico, Cuba, Porto Rico, Hawaii or the Philippines.

To Foreign Countries, including postage, \$8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

Copies are on sale at the news-stands of the following hotels:—Waldorf-Astoria, New York; Brown Palace, Denver; and the leading hotels in the principal cities.

Copyright, 1906, by

THE ENGINEERING AND MINING JOURNAL.

Entered at New York Post Office as mail matter of the second class.

During 1905 THE ENGINEERING & MINING JOURNAL printed and circulated 454,250 copies, an average of 8735 per issue. Of this issue 12,000 copies are printed. None sent regularly free. No back numbers beyond current year.

A New Occurrence of Vanadium in Peru.

BY FOSTER HEWETT.*

There was discovered, on Nov. 20, 1905, in the neighborhood of Cerro de Pasco, Peru, a new material containing vanadium, which, aside from scientific interest, will undoubtedly play an important rôle in the approaching commercial application of this metal. The following notes can only be considered preliminary, as it is hoped that within a short time complete analyses and all data pertaining to the geological nature of the deposit will be available for publication. I happened to be in Peru at the time of the discovery, was able to examine the district, and am now engaged in the microscopical examination of the eruptive rocks of the district. Complete analyses of the material and an associated oxidation product, will be made, it is hoped, by Dr. W. F. Hillebrand, of the United States Geological Survey.

The material was collected by several Indians in search of coal, in the main cordillera, and was taken to Señor Antenor Riza Patron, metallurgist of the Huaracaca smelter, nine miles from Cerro de Pasco. Vanadium was recognized in high percentage, and a complete analysis was later made in the laboratory of the Corps of Engineers in Lima.

The physical properties of the material are as follows: Color, dark green, about the same as olivenite; cleavage, conchoidal to uneven; streak, greenish black; hardness, 3.5; specific gravity, 2.65. The

following analysis was made by J. O. Handy, of Pittsburgh: Moisture, trace; silica, 10.88 per cent.; alumina, 3.85; iron, 2.45; vanadium, 16.08; sulphur, 54.06; molybdcic oxide, 0.50; sulphur (soluble in carbon bisulphide), 6.55. Lead, zinc, copper, arsenic, antimony, lime, magnesia, gold, silver and platinum were sought, but were not recognized. Vanadium and iron are expressed as metals, because their exact condition is not yet determined. The amount remaining unaccounted for, is largely carbonaceous matter.

After a preliminary examination, Dr. Hillebrand, comments as follows: "I have found that the vanadium is wholly extractable by caustic alkali; that the residue then contains no iron soluble in hydrochloric acid, that the iron in the residue is in all probability in the form of pyrite, since it is dissolved with violence by nitric acid. After extraction of this pyrite, the final residue is still black, evidently from carbonaceous material. When this is burned off, a considerable residue of silicious nature remains. It would seem as if the vanadium compound must be a sulphide. In any case, there can hardly be any doubt as to its being a new mineral, and one of extreme interest."

It is my own opinion, from the analysis, that the material has no definite molecular constitution, but is rather more of the nature of a mixture.

Briefly, the conditions of its occurrence are as follows: Cretaceous sedimentaries composed of thin-bedded shales, sandstones and limestones have been intruded by two series of eruptives, and now lie with a dip of about 45 deg. The material occurs as a vein about 8 ft. thick, and, together with an associated vein of asphaltite, lies parallel to the bedding of the shales. The vein appears homogeneous, but the vanadium metal content varies from 9.5 to 15.7 per cent. (17 to 28 per cent. if considered V_2O_5). The asphaltite yields 3.31 per cent. ash, of which, 0.533 is vanadic oxide. The asphaltite is peculiar, as it contains about 45 per cent. sulphur, and though it will not hold a flame, burns, when heated, with the characteristic blue flame of sulphur. The exact analysis will undoubtedly be of interest.

A material, apparently intermediate in composition and nature between the vanadiferous material and the asphaltite, occurs between them. It is black, has a conchoidal fracture, and contains .2 per cent. ash, which is highly vanadiferous. A striking characteristic of this material is that it has a vesicular structure, and some of the cavities are filled with coked asphaltite. The appearance of the materials, as well as their occurrence, strongly suggests that they were forced into the shales

in a plastic, or even liquid, condition. Subsequent metamorphism has altered both the composition of the asphaltite and the condition of the sulphur in the sulphide material. The details of the geological conditions need not be mentioned further, at this time.

Along a portion of the outcrop, the "sulphide" has been oxidized to a brown-oxidized mineral, resembling limonite, which is probably vanadium ochre. Large samples contain as high as 45 per cent. vanadic oxide.

I quote again from Dr. Hillebrand's letter: "The brown oxidation material, I agree with you in thinking, is probably derived from the sulphide. It contains a large amount of vanadium in the pentavalent state, somewhere in the neighborhood of 45 per cent., about 15 per cent. water, a little sulphuric acid, and about 14 or 15 per cent. iron oxide, besides 20 per cent., or more, of silicious gangue. It is, however, not a definite mineral species, but a mixture of several things. Whether the iron is in combination with the vanadium, either in whole or in part, I am unable to say with certainty. Close examination shows a greenish mineral forming coatings and composed of minute micaceous scales. Sometimes these appear to be yellowish. Whether the green and yellow are identical or not, they undoubtedly represent some combination of vanadium, of which several are known in nature. I should add that this oxidation substance contains also about 0.9 per cent. of molybdcic oxide. It may very well be that the sulphide also contains some, although I did not test."

To date, the only development consists of a few prospecting pits extending along 400 ft. of the outcrop, but there is already a large quantity of the material exposed. From the above description, it is evident that the new material is richer in vanadium than any previously known. This feature, taken in connection with the large quantity available, appears to assure the commercial future of vanadium, if the many experiments during recent years, by Guillet, Kent Smith and others, are borne out by practice.

It is suggested, in appreciation of the work of the discoverer of the material, Señor Antenor Riza Patron, that it be given the name "patronite."

A steel plant using the Stassano electric furnace is now in regular operation in Turin, Italy. The furnaces use scrap of all kinds—clippings from sheets, wrought scrap, small cast scrap, etc.—turning out sound ingots. The quality of the steel is shown by the fact that it is all taken by the motor-car factories of Turin.

*325 Water street, Pittsburg, Penn.