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ARTHUR S. EAKLE

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BULLETIN No. 67

Minerals of California

COMPLIMENTS OF
F. McN. HAMILTON
STATE MINERALOGIST

By ARTHUR S. EAKLE, Ph.D.

MARCH, 1914

Issued by California State Mining Bureau
F. McN. HAMILTON
STATE MINERALOGIST

CALIFORNIA
STATE PRINTING OFFICE
1914

LETTER OF TRANSMITTAL.

To his Excellency, the HON HIRAM W. JOHNSON,
Governor of the State of California.

SIR:

I have the honor to transmit herewith Bulletin 67 of the State Mining Bureau upon the Minerals of California.

This work was made possible at this date through the co-operation of Prof. Arthur S. Eakle, Ph.D., of the Department of Geology and Mineralogy of the University of California, with this Bureau. Dr. Eakle has given freely of his time and effort and has closely checked his own records with those of this Department in order that the most complete list of minerals possible be published.

It is hoped that this bulletin will be of service to the mineral industry.

Respectfully submitted.

FLETCHER MCN. HAMILTON,
State Mineralogist.

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INTRODUCTION

The first list of California minerals was published by W. P. Blake in 1866, and it comprised about seventy-five mineral species. At that early time California was a new and largely unexplored field, and only a few scattered localities were known for mineral specimens; consequently the list was short and not at all representative.

The second list appeared in 1884 as a part of the Fourth Annual Report of the State Mining Bureau, by Henry G. Hanks, who was then State Mineralogist. This list included double the number of previously known minerals, and gave detailed descriptions of some of the localities, and much instructive matter relating to minerals of economic value.

Since the appearance of the second list, our knowledge of the geology and mineralogy of the State has vastly increased. The ore deposits of many of the counties, the gem and borate deposits of the southern counties, and the petrography of many districts, have been investigated and described, so that our present knowledge of the mineralogy of the State is much more general.

The present list contains more than double the number of definite mineral species given by Hanks, besides many sub-species and varieties. The desire has been to make the list as complete as possible of the known minerals, and where they occur, but the list of localities where the same mineral might be found is necessarily incomplete. Many minerals are so commonly distributed throughout the State, such as small bodies or pockets of metallic minerals and the rock-forming minerals, that it would be useless and impossible to cite all of their occurrences. In such a vast area as California, localities may be known to local collectors where excellent specimens may occur, unknown to the author. Some minerals may be known to occur in the State which have not been mentioned in this work, but it is believed that they will be very few in number.

So many minerals and localities are included in the list, that geological and petrographical descriptions in detail, have had to be omitted, and reference must be made to the bibliography at the end of the work

under the author's name and number. This bibliography includes with few exceptions, only those articles which bear directly on the minerals of the State, omitting the great amount of literature of a general nature on the geology and mining industry of the State. The excellent bibliography of A. W. Vodges, Bulletin 30 of the State Mining Bureau, may be referred to for such literature.

The various kinds of minerals have been grouped under a chemical classification in order to be more instructive and show better the relations of the various species and varieties. The crystal forms have been cited and the chemical analysis given, to show what has been done in these two lines of work on California minerals.

New minerals and important localities for known minerals are constantly being discovered as California becomes more settled and prospected, and this list must be considered more as a check-list to form a basis for continual additions.

March, 1914.

CHAPTER I.

NATIVE ELEMENTS.

Non-metals.	*Metals.*	*Metals.*
Diamond.	Gold.	Platinum.
Graphite.	Gold amalgam.	Iridium.
Sulphur.	Bismuth gold.	Platiniridium.
	Electrum.	Palladium.
	Silver.	Iridosmine.
Semi-metals.	Copper.	Osmium.
Antimony.	Mercury.	Rhodium.
Arsenic.	Lead.	Ruthenium.
Bismuth.	Tin.	Iron.
Tellurium.	Zinc.	Awaruite.

1. DIAMOND.

Native carbon, C.

Isometric. Octahedrons and hexoctahedrons common. Crystal faces often curved. Perfect octahedral cleavage. Brittle. Yellow and colorless crystals common. Red, orange, green, blue, brown and black are rarer shades. H = 10; G = 3.5.

Bort is a hard rounded form without distinct cleavage, unsuitable for gems.

Carbonado is a hard black variety without cleavage.

Diamonds were found in California soon after placer mining began. As early as 1849, Lyman[3] reported seeing a pale yellow crystal about the size of a small pea, which came from one of the placers. A few years later they were observed in the gold gravels at Cherokee, Butte County, and this locality became the most noted one in the State for the number found.

Placer deposits elsewhere have also yielded them from time to time, so their occurrence has not been limited to any one field. No record has been kept of the total number found but it is probably between four and five hundred. Since all of them have been chance finds, there can be no doubt that many more have been overlooked or destroyed. A few of the stones found are over two carats in weight and of good quality, but the majority are small and mostly "off color," usually with a pale yellow tinge. Most of these diamonds now in the possession of different individuals were found during the days when placer mining and hydraulicking were at their height, and since that time diamond finds have been rare.

The mode of origin and sources of the diamond are as yet unknown. They have only been found in placer gravels and in "black sands" and concentrates of placer mines. Presumably their origin has been in the basic igneous rocks from which the serpentines of the gold regions

have been derived, and continued search may yet reveal them *in situ*. The discovery near Oroville of an apparent pipe of serpentinized rock bearing a resemblance to the diamond pipes of South Africa has led to some active operations on the part of the United States Diamond Mining Company, and a shaft has been sunk, which has not proved successful. The rock is a hard eclogite differing in its character from the kimberlite of South Africa. Hanks[6] gives an interesting account of the diamonds found during the early days of gold mining, and Turner[6] contributes a short article on California diamonds.

Amador County: A few small stones have been picked up near the towns of Volcano, Oleta and Fiddletown.

Butte County: In 1853 it was observed that diamonds occurred in the gravels at Cherokee Flat, about nine miles north of Oroville. More than three hundred good diamonds have been obtained from the placers in this district and it leads all other districts in the State. It seems quite probable that the source of these diamonds is not far from this vicinity. Silliman[7][8] gave the contents of the black sands at Cherokee as platinum, iridium, iridosmine, gold, pyrite, chromite, magnetite, limonite, diamonds, quartz, rutile, almandite garnet, topaz, zircon and epidote.

El Dorado County: A diamond weighing 1¼ carats was found at Forest Hill. About sixty have been found near Placerville, namely, on Webber Creek, in White Rock canyon and at Smith's Flat.

Fresno County: Small diamonds are reported to have been found a few miles north of Coalinga.

Nevada County: A 1½ carat stone was found at French Corral.

Siskiyou County: Diamonds occur in the placer gravels at Hamburg Bar.

Trinity County: Microscopic examinations of the black sands of Trinity River and some of its tributaries have shown the presence of small diamonds as a constituent of these sands.

2. GRAPHITE—Plumbago—Black Lead.

Native carbon, C.

Hexagonal, rhombohedral. Commonly in scaly or foliated masses. Color dark steel-gray to dull black. Perfect basal cleavage. Soft with greasy feel. H=1—2; G=2.2.

Graphite is a common constituent of crystalline limestones and is often disseminated through the limestone in minute flakes and in larger foliated masses. It is also prominent as layers in some schists and gneisses and when present in considerable amount the graphitic gneiss or schist is sometimes mined for the graphite. In mining districts it is often seen coating the walls of veins and mixed with the talcose gouge.