Gypsum Deposits Near Iyoukeen Cove Chichagof Island Southeastern Alaska

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GYPSUM DEPOSITS NEAR IYOUKEEN COVE, CHICHAGOF ISLAND, SOUTHEASTERN ALASKA

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ABSTRACT

Two deposits of high-grade gypsum are located near tidewater at Iyoukeen Cove, on the northeastern part of Chichagof Island, southeastern Alaska. A group of claims, formerly operated by the Pacific Coast Gypsum Co., was acquired by the Kaiser Gypsum Division of Kaiser Industries, Inc., during World War II. Claims at the other deposit are held by Dave Housel of Juneau and Seattle, Washington, in the name of the Gypsum-Camel group.

Gypsum was first reported in the area in 1902, and by the end of 1905 the Pacific Coast Gypsum Co. had completed a considerable amount of development work on their deposit at Gypsum Creek. Development and production was essentially continuous until 1923. Underground workings are now caved or flooded and the mine and buildings are in ruins. Production totalled about 500,000 tons.

Claims at the Gypsum-Camel property were first staked in 1912 but it was not until about 1925 that any appreciable development took place. In 1946 there were about 850 feet of accessible underground workings and an additional 190 feet of filled or flooded workings. A few tons of gypsum recovered during exploratory work were stacked on the beach but there has been no commercial production.

The oldest rocks in the area are predominantly gray, coarsely crystalline limestones believed to be of Carboniferous age. Except on ridges and in a few creek beds, the older rocks are covered by Quaternary marine, fluviatile, and glacial deposits. The limestone at places is cut by lamprophyric dikes with no apparent regularity. A breccia, composed of angular and subangular fragments of limestone which range from ¼ inch to 3 feet in longest dimension in a matrix of cream or buff limestone, may be an intraformational breccia at the top of the limestone or may be a fault breccia. The only other igneous rock known in the vicinity is a granitic rock reportedly exposed in a mountain north of the deposits.

Gypsum from both deposits is translucent fine-grained white rock gypsum with irregular narrow gray bands. Solution cavities and drainage channels occur in both deposits. Past writers have favored a sedimentary origin but the possibility exists that the gypsum may have been deposited from solutions along a fault zone or zones marked by limestone breccia.

No valid estimate of gypsum reserves can be made for either deposit from available data on underground workings or from surface exposures. The drilling

of a few core holes would indicate the commercial possibilities of the Gypsum-Camel property; but further exploration work at the Gypsum Creek mine would require the diversion of a creek and the pumping out of extensive underground workings.

INTRODUCTION

The two known gypsum deposits in southeastern Alaska are at Iyoukeen Cove on northeastern Chichagof Island (fig. 9). Iyoukeen

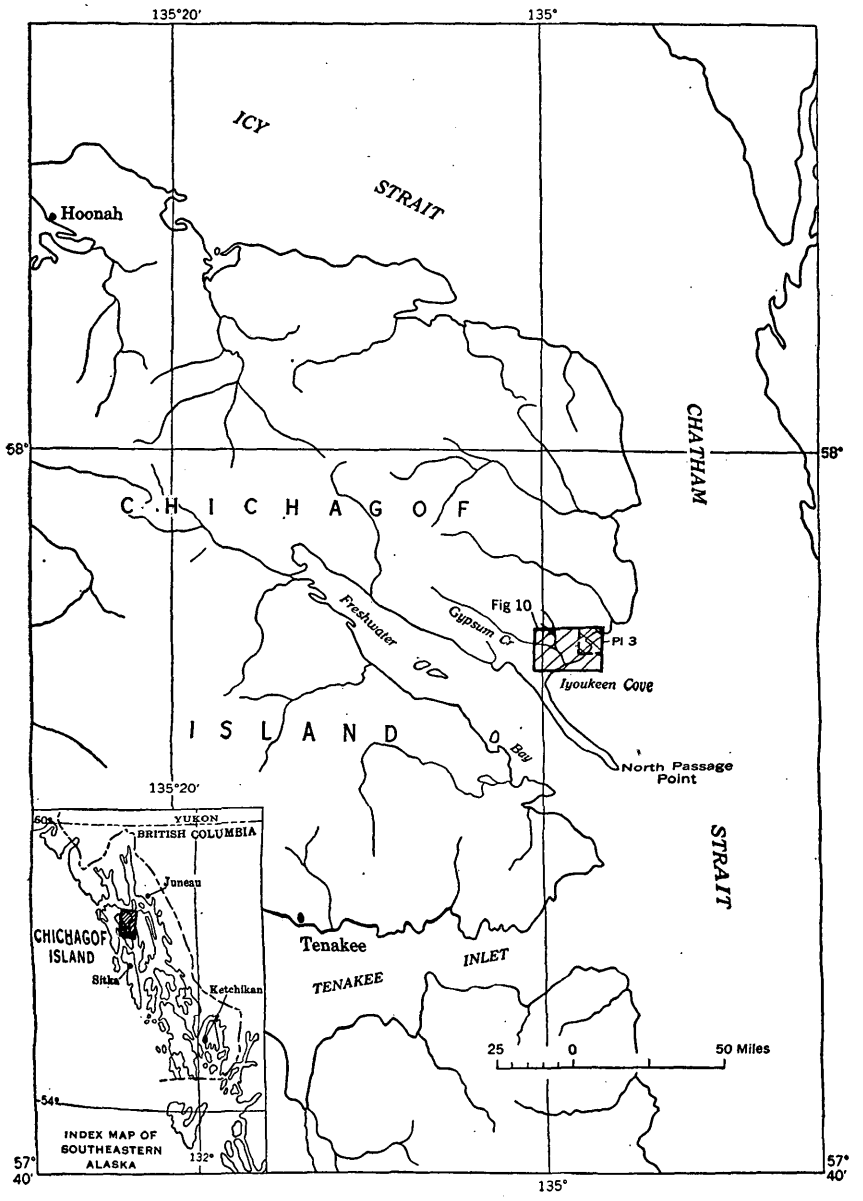

FIGURE 9.—Index map of northeastern Chichagof Island, southeastern Alaska, showing location of areas studied.

Cove is about 35 air miles southwest of Juneau and is on the airline route between Juneau and Sitka. The property which was first developed and for a time worked by the Pacific Coast Gypsum Co. is approximately 1 mile upstream from the mouth of Gypsum Creek at an altitude of about 70 feet above sea level. A second deposit, known as the Gypsum-Camel property, is on tidewater 1½ miles northeast of the mouth of Gypsum Creek.

Topographic and geologic maps of these deposits (fig. 10 and pl. 3) were prepared in the course of an examination by a Geological Survey party during the summer of 1946. Accessible underground workings at the Gypsum-Camel property were mapped. (See fig. 11.)

HISTORY OF INVESTIGATION, DEVELOPMENT, AND MINING

The history of the Pacific Coast Gypsum property and the Gypsum-Camel property involves the period 1902–48. Brief reports, published by the Geological Survey and the Territorial Mine Inspector during this interval, are scattered through numerous publications, many of which are available only at libraries. This report records and consolidates for future reference the significant highlights as gleaned from personal communications with owners and former operators, inspection of the properties by the authors in 1946, and data scattered through the following reports:

1. Annual Report of the Territorial Mine Inspector, 1920: p. 22, Juneau, 1921.
2. Annual Report of the Territorial Mine Inspector, 1921: p. 45, Juneau, 1922.
3. Annual Report of the Territorial Mine Inspector, 1922: p. 65, Juneau, 1923.
4. Anonymous, 1939, Camel Gypsum—A new mine project in southeast Alaska: Mining World, Aug., p. 22.
5. Brooks, A. H., 1921, The Alaskan Mining Industry in 1920: U. S. Geol. Survey Bull. 722–A, p. 33.
6. Brooks, A. H., and others, 1906, Progress of investigations of mineral resources of Alaska in 1905: U. S. Geol. Survey Bull. 284, pp. 58–59.
7. Housel, Dave, 1946, Personal communication.
8. Hudson, M. S., 1946, Personal communication.
9. Martin, G. C., 1920, The Alaskan Mining Industry in 1918: U. S. Geol. Survey Bull. 712–A, p. 27.
10. Mining and Scientific Press, 1902, vol. 84, no. 20, May 17, p. 274.
11. Moffit, F. H., 1927, Mineral Industry of Alaska in 1925 and Administrative Report: U. S. Geol. Survey Bull. 792–A, p. 38.
12. Mosier, A. G., 1946, Personal communication.
13. Report of the Mine Inspector for the Territory of Alaska for the fiscal year ending June 30, 1912, p. 16.
14. Report of the Mine Inspector for the Territory of Alaska for the fiscal year ending June 30, 1917, p. 18.
15. Stewart, B. D., 1931, The occurrence of gypsum at Iyoukeen Cove, Chichagof Island, Alaska: U. S. Geol. Survey Bull. 824–E, pp. 173–177.
16. Stone, R. W., 1914, Gypsum: U. S. Geol. Survey, Mineral Resources U. S., pt. 2, pp. 363–364.

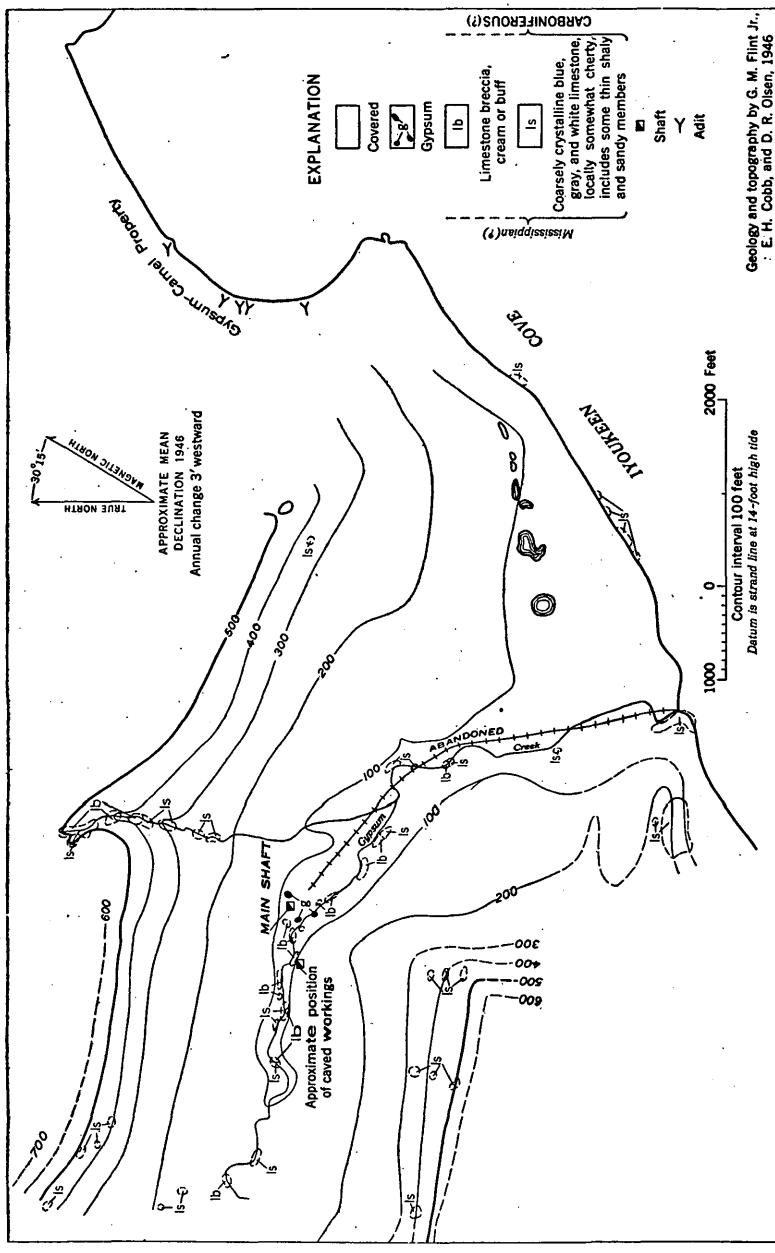

FIGURE 10.—Map of Iyoukeen Cove area, Chichagof Island, southeastern Alaska.

17. Stone, R. W., and others, 1920, Gypsum deposits of the United States: U. S. Geol. Survey Bull. 697, pp. 47–48.
18. Twenhofel, W. S., Reed, J. C., and Gates, G. O., 1949, Some mineral investigations in southeastern Alaska: U. S. Geol. Survey Bull. 963–A, pp. 24–28.
19. Wright, C. W., 1907, Non-metalliferous mineral resources of southeastern Alaska: U. S. Geol. Survey Bull. 314–C, pp. 79–80.
20. —— 1908, The building stones and materials of southeastern Alaska: U. S. Geol. Survey Bull. 345–B, pp. 124–125.

PACIFIC COAST GYPSUM COMPANY PROPERTY

Between 1902 and 1905 the Pacific Coast Gypsum Co. began development of the newly discovered deposit at Gypsum Creek. Two adits approximately 600 feet apart were driven and two shafts 65 and 75 feet deep were sunk almost entirely in gypsum. A 90-foot crosscut was driven from the bottom of the east or 65-foot shaft. Development was rapid. By the end of 1906 the east shaft had been extended to a depth of 190 feet and 90-foot and 160-foot levels had been opened. A total of 600 feet of drifts were driven on the two levels, exposing gypsum over an area having a maximum length of 200 feet and a maximum width of 150 feet. By the end of 1907, 1,200 feet of workings on the 160-foot level exposed gypsum on that level in a block 450 by 225 feet. In 1912 a raise was put through to the surface. In 1913 the 160-foot level had an east-west extent of 750 feet, a north-south extent of 270 feet, and the total length of underground workings was estimated as approximately 1 mile. During 1917, the east shaft was extended to a depth of 315 feet and the 300-foot level was opened. When operations ceased in 1924, workings on the 160-foot level were reported to have opened up an area of more than 1,000 by 500 feet, while those on the 300-foot level measured 800 by 600 feet.

Apparently the west adit and shaft were not worked until near the close of operations when "one small cargo" was gouged out from what appeared to be insignificant fingers of gypsum.

In 1905 the Pacific Coast Gypsum Co. built a shaft house and rock bins with a capacity of about 1,500 tons. A railroad 1 mile long was laid from the mine to a 2,000-foot dock on which was located a 1,000-ton bunker. The first shipment to the company's plaster mill at Tacoma, Washington, was made in May 1906. The dock and bunker collapsed in 1912, but were replaced and production was only temporarily curtailed. In 1917 the capacity of the rock bin at the mine was increased to 2,500 tons. Cars carrying 1,000 pounds of gypsum were used underground, hand-trammed to the shaft, hoisted to the surface, and dumped in the rock bin. Gypsum was hauled in 10-ton cars by steam engine to the dock. Difficulties caused by water in the lower levels were first recorded in 1917. In 1918 production was temporarily halted by the burning of the mine buildings. In 1920 the mine

was flooded for the second time and, in 1921, the operators planned to sink a new shaft and to make other changes to prevent recurrent flooding by surface waters and underground springs. Electric and steam pumps with an aggregate capacity of 2,800 gpm were in operation, although average demands required only 1,000 gpm.

During much of its operation the plant employed 20 to 25 men who were quartered at the company village at the mouth of Gypsum Creek. It is estimated that when the operations ceased in December 1923, the property had produced about 500,000 tons of gypsum.

In August 1924, the Standard Gypsum Co. took over the mine and made plans for a new mill and development work; but royalty difficulties arose and the project was abandoned and the equipment removed. Underground workings are now caved or flooded and the mine and buildings are in ruins.

Whether recurrent flooding of the workings or exhaustion of the deposit caused the Pacific Coast Gypsum Co. to cease mining is not known. The interest shown by the Standard Gypsum Co., Inc., suggests the former to be the reason. Before 1923 some diamond drilling was undertaken in the small creek north of the mine, but poor drilling conditions made the results unsatisfactory.

Patent number 488220 was issued on August 27, 1915, to Harry L. Johnson, President, Pacific Coast Gypsum Manufacturing Co. and included six claims on Gypsum Creek; the Bell Boy, Bell Boy No. 3, Gypsum, Gypsum No. 1, Gypsum No. 2, and Gypsum No. 3. During World War II the Kaiser Gypsum Division of Kaiser Industries, Inc., acquired all of the assets of the Standard Gypsum Co., Inc., whose major stockholders at one time were the owners of the Pacific Coast Gypsum Co.

GYPSUM-CAMEL PROPERTY

As early as October 1912, claims were staked on reported deposits of gypsum to the east of the Pacific Coast Gypsum Co. mine and extending to the shore of Chatham Strait. But it was not until several years after the close of operations at the Gypsum Creek mine that any appreciable development took place. By the time of Stewart's examination in 1929, this second property consisted of eight claims owned by Larson & Anderson and Associates of Juneau, and the development comprised three adits and other workings totaling 825 feet. Development carried on in 1939, prior to the visit by Reed and Coats of the Geological Survey, was said to have been undertaken by the Camel Gypsum Mining Co., made up principally of a group of California men, with ownership of the claims remaining with Dave Housel and Arvid Anderson. No development work has been undertaken since World War II. The claims are not patented. In 1946 the writers mapped about 850 feet of underground workings. The

additional 150 feet of drifts and a 40-foot winze reported by Stewart were inacessible; they were either flooded or filled.

In August 1946, the Fir-Tex Insulating Board Co. of St. Helens, Oregon, obtained an option on the property from Mr. Housel. A field examination was made in September by company engineers.

The workings consisted of five adits (pl. 3) driven from the beach about 15 feet above the high-tide mark. The adits extend under a gently sloping bench which is approximately 100 feet above sea level at the seaward edge. Adits 1 and 5 do not penetrate gypsum. Adits 2, 3, and 4 expose gypsum between 100 and 160 feet from the portals (fig. 11). A winze and an incline in Adit 3 are now inaccessible, but

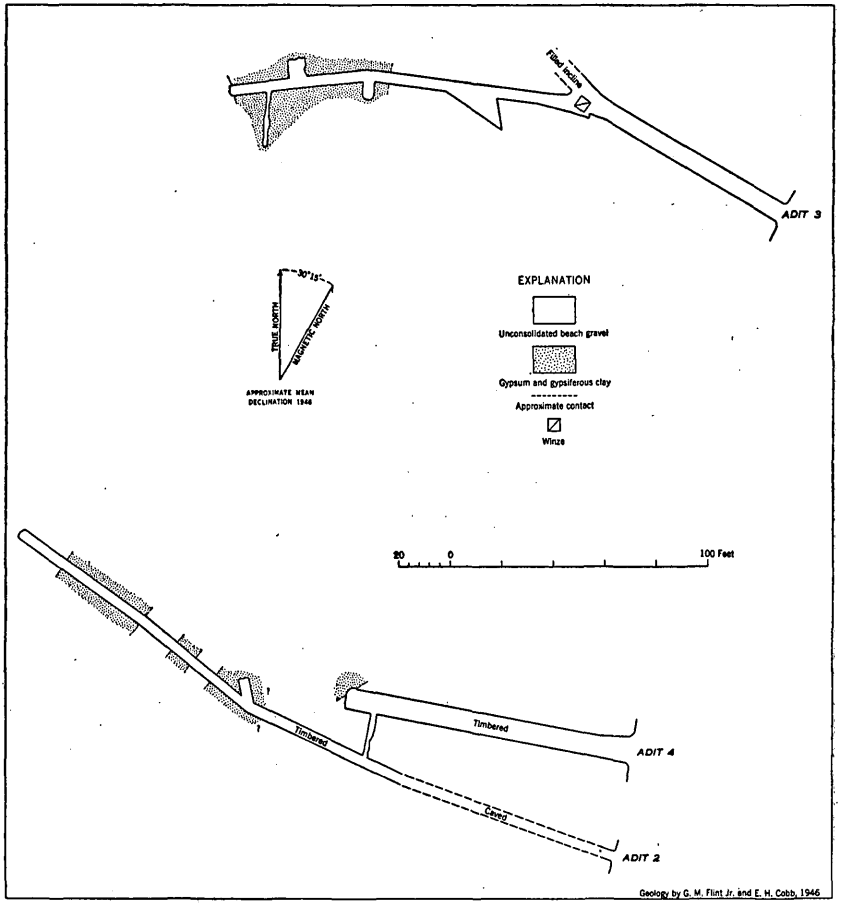

FIGURE 11.—Geologic map, main workings, Gypsum-Camel property, Iyoukeen Cove, Chichagof Island, southeastern Alaska.

are reported by Housel to have exposed gypsum. The property never produced commercially, but development work was carried on intermittently over a period of 15 years prior to World War II and the

few tons of gypsum recovered during exploratory work are stacked on the beach.

Two log cabins, a cookhouse, and several small buildings are on the property and still usable. A pier which was never completed is now in bad condition.

GEOLOGY

GENERAL

The oldest rocks in the area are predominantly gray, coarsely crystalline limestones containing some black chert. Wright (1908, p. 124) and Burchard (Stone, 1920, p. 47) considered them to be of Carboniferous age, and Kindle (1907, pp. 330–331) more precisely determined that the limestone of North Passage Point are of Mississippian age. A small group of fossils collected by the writters in 1946 from the ridge north of Gypsum Creek was examined by J. S. Williams and J. Brookes Knight of the Geological Survey and identified as probably of Carboniferous age.

The youngest sediments are Quaternary marine, fluviatile, and glacial deposits which cover the older rocks except on ridges and in a few creek beds.

Dikes intrude the limestones with no apparent regularity. C. S. Ross of the Geological Survey identified a specimen from one of the dikes as altered lamprophyre. In a mountain to the north, near the head of Gypsum Creek, a granitic rock is reportedly exposed. These are the only igneous rocks known in the vicinity of the gypsum deposits.

A breccia composed of angular and subangular fragments of limestone from ¼ inch to 3 feet in longest dimension in a matrix of cream or buff limestone may be intraformational breccia at the top of the limestone section or may be a fault breccia. In areas where gypsum occurs the limestone breccia has a predominently buff color. In areas away from known occurrences of gypsum the limestone breccia is a cream color. Poor exposures and the complete lack of outcrop in critical areas make it impossible to state definitely the mode of origin of the breccia.

Gypsum was first reported in 1902 in association with cherty limestone in a small bluff in the broad flat valley of Gypsum Creek which is covered with vegetation (Brooks, 1906, p. 59). The only exposures of gypsum accessible in 1946 in the area of the deposit on Gypsum Creek were three small outcrops near the old workings and in the unflooded upper 20 feet of the main shaft. On the Gypsum-Camel property gypsum is exposed only in the underground workings. On the basis that gypsum apparently overlies the limestone, earlier investigators considered the gypsum to have been formed during Permian or Triassic time, although the actual contact relation between the gypsum and the Carboniferous limestone could not be determined. All

outcrops within 1 mile of both deposits and all accessible underground workings were carefully examined by the writers and as many other exposures as could be reached in the time available were visited in 1946. The investigation, however, developed no new evidence bearing on a determination of the age of the gypsum.

Gypsum from the deposit on Gypsum Creek is similar to that at the Gypsum-Camel property. The material is translucent, fine-grained, white rock gypsum with irregular narrow gray bands, and much of it approaches alabaster in grade. Old drainage channels and sinks, most of which are filled with gravel identical with the modern stream gravels nearby, occur in the deposits. At the deposit on Gypsum Creek solution cavities and channels were reported below the 160-foot level. One of these channels was tunnelled for 35 feet without encountering bedrock in place. Burchard reported that a few thin basaltic dikes cut the gypsum and that one vein of anhydrite ranging from 6 inches to 10 feet in thickness was found on the 160-foot level (Stone, 1920, p. 47).

ORIGIN OF THE GYPSUM

Although Wright stated that "the gypsum beds are folded and steeply tilted and were probably laid down previous to the granitic invasion" (Wright, 1908, p. 124), the writers feel that a sedimentary origin of the gypsum has been assumed rather than proved. The possibility that the gypsum may have been deposited from hydrothermal solutions spreading out from a fault zone or zones marked by limestone breccia should be considered in any future work on the deposits. Information necessary to reach definite conclusions probably could not be obtained without a major exploratory program involving both diamond drilling and trenching.

The top few feet of the gypsum at the Gypsum-Camel property is fractured and solution-pitted and consists of partially dissolved blocks of gypsum separated by clay. The fact that bedding is not apparent in exposures accessible in 1946 seems to lend some slight support to the theory of a hydrothermal origin. Wright (1907, p. 79) stated, however, that in the lower workings of the deposit at Gypsum Creek, the gypsum beds dip 20° to 60° north and the strike ranges from east-west to N. 70° E.

If the limestone breccia is intraformational, then the gypsum is probably also sedimentary and overlies the breccia. If the limestone breccia is a fault breccia, then the gypsum is possibly hydrothermal in origin.

ECONOMIC CONSIDERATIONS

No valid estimate of gypsum reserves can be made for either deposit from available data on underground workings or from surface exposures.

Future development work on the deposit on Gypsum Creek would probably entail the diversion of the creek, as the flume previously used for this purpose is no longer serviceable, and dewatering at least part of the old workings.

The U. S. Bureau of Mines drilled two vertical drill holes at the Gypsum-Camel property in the spring and summer of 1948. Hole 1 is at an elevation of 25 feet and is located 37 feet S. 70° E. of the portal of Adit 3. It passed through three 2-foot layers of gypsum before entering the brecciated limestone in which the hole was terminated at 63 feet. Hole 2 is at an elevation of 74 feet and is located 320 feet N. 38° W. of the portal at Adit 4. No gypsum was encountered and the hole was terminated in "limestone and brown clay" at 105⅔ feet.

Further drilling with both vertical and horizontal holes from points near the faces of Adits 2 and 3 (fig. 11) might determine whether there is enough gypsum to justify commercial operation. No estimate of the extent of the deposit can be made because of the lack of exposures away from the beach, but vertical drill holes from the bench (pl. 9) should reveal the lateral extent of the deposit. The outcrops of limestone breccia near Adits 1 and 5 probably mark the limits of this deposit along the shoreline.

Timber required for development is available from the stands of hemlock and Sitka spruce in the area. Streams in the vicinity of the Gypsum-Camel property are not adequate as a source of power.

Iyoukeen Cove near the mouth of Gypsum Creek is slightly protected from storms by North Passage Point; but because of the gently sloping tidal flats, a pier over 2,000 feet long would be necessary to permit docking of ocean-going vessels. The small point south of the Gypsum-Camel property affords some protection and the water is deep enough to require only a relatively short pier.

REFERENCES CITED

Brooks, A. H., and others, 1906, Progress of investigations of mineral resources of Alaska in 1905: U. S. Geol. Survey Bull. 284, p. 59.

Kindle, E. M., 1907, Notes on the Paleozoic faunas and stratigraphy of southeastern Alaska: Jour. Geology, vol. 15, pp. 330–331.

Stone, R. W., and others, 1920, Gypsum deposits of the United States: U. S. Geol. Survey Bull. 697, p. 47.

Wright, C. W., 1907, Non-metalliferous mineral resources of southeastern Alaska: U. S. Geol. Survey Bull. 314–C, p. 79.

——— 1908, The building stones and materials of southeastern Alaska: U. S. Geol. Survey Bull. 345–B, p. 124.

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