THE OCCURRENCE OF GYPSUM AT IYOUKEEN COVE, CHICHAGOF ISLAND, ALASKA

By B. D. STEWART

EARLIER MINING OPERATIONS

LOCATION AND EXTENT OF THE DEPOSIT

The occurrence on Chichagof Island of gypsum deposits of commercial grade and size was known prior to 1905. Active mining of the largest known deposit was commenced in 1906 and continued thereafter with but brief interruptions for a period of nearly 20 years, until the deposit was exhausted.1

This deposit was situated on Gypsum Creek, which enters deep water on Chatham Strait near the head of Iyoukeen Cove, on the east side of Chichagof Island, and was owned by the Pacific Coast Gypsum Co.

The lowest horizon from which gypsum was mined was at the 300-foot level. The workings on that level are said to have been about 600 by 800 feet in extent, and the quality of the product mined was excellent. On the 160-foot level the deposit is reported to have had a length of more than 1,000 feet and a width of about 500 feet, measured on a horizontal plane.2 The gypsum produced throughout the life of the mine was of exceptional purity. The color ranged from white to light bluish gray. The gray gypsum was translucent, and some of it approached alabaster in texture and appearance. The crude gypsum was shipped to Puget Sound, where a mill was built that for many years supplied the market with a large percentage of the plaster products consumed on the Pacific coast. The productive capacity of the mine was over 100 tons of gypsum a day, and the total output was probably in the neighborhood of 500,000 tons.


2 These approximate measurements were furnished by Mr. M. S. Hudson, formerly mine foreman at Gypsum.

173
DIFFICULTIES OF OPERATION

As this deposit was about a mile from the mouth of Gypsum Creek, shipping of the product mined involved the building of a railroad 1 mile in length, on which a steam-driven "dinky" engine was used, and the construction of a wharf 2,000 feet in length with storage bunkers on the seaward end. The mine workings below the level of Gypsum Creek were so situated with reference to the stream that twice during the life of the property the mine was flooded. An underground watercourse was also encountered following a channel in the conglomerate formation that overlay the gypsum deposit. To keep the water from entering the workings entailed heavy expense for pumping. The fact that profitable operations were possible at this locality in spite of the heavy costs involved in pumping water and in maintaining the railroad line and long wharf attests the high quality of the gypsum produced.

RECENT DEVELOPMENTS

LOCATION AND GENERAL GEOLOGY

As the deposit at Gypsum Creek underlies the creek valley the surface is so thickly covered by modern stream gravel that bedrock outcrops are scarce. For this reason and because the old mine workings were confined almost wholly to the gypsum beds, the geology in the immediate vicinity of that deposit is somewhat obscure. It is known, however, that the underlying bedrock is cherty limestone and that a chert conglomerate overlies the gypsum beds.

Eastward from Gypsum Creek along the shore of Iyoukeen Cove evidences of additional gypsum deposits have been discovered, and at one locality development work has recently revealed the possibility of the occurrence of an extensive body. The deposit is about 1½ miles due east of the mine on Gypsum Creek and underlies an elevated bench land adjacent to the shore of Iyoukeen Cove. The property on which this deposit is found comprises eight claims, known as the Gypsum-Camel group, which is owned by Larson & Anderson, of Juneau, Alaska, and associates. The underlying bedrock formation at this locality is exposed at numerous places along the shore line of the property and comprises tilted beds of lime-chert breccia and yellowish and bluish-gray cherty limestone. The trend of the marine terrace that skirts the shore is slightly east of north.

EXPLORATORY WORK

Three tunnels have been driven in a westerly direction into the terrace at an altitude of about 15 feet above high-tide line. Tunnel 1, which is the southernmost tunnel, is about 130 feet in length. It
enters the terrace at the outcrop of a prominent bluff of yellowish calcareous breccia. Two faults, apparently of moderate displacement, were encountered in this tunnel, the first about 25 feet from the portal and the second about 70 feet. Between the portal and the first fault the material exposed is coarse breccia. Between the two faults a fine yellowish-white breccia is exposed, and from the second fault to the face, as it appeared in June, 1928, the tunnel was in homogeneous fine-grained light-gray to yellowish limestone.

Tunnel 2 starts at a point 600 feet north of tunnel 1 and has been driven a distance of 250 feet, approximately at right angles to the shore line and roughly parallel to tunnel 1. This tunnel throughout its length exposes material consisting of either solid gypsum or lumps of gypsum embedded in a claylike mass which is believed to be gypsite that has been formed by the disintegration of solid gypsum. The gypsum appears to be very pure in quality and resembles closely in appearance the white variety that was produced at the mine of the Pacific Coast Gypsum Co.

Tunnel 3 is 270 feet north of tunnel 2, and its general course is parallel to that of the other tunnels. The main section of this tunnel is about 225 feet in length. At 10 feet from the face a cross-cut has been driven N. 14° E. a distance of 25 feet. From a point 100 feet in from the portal a slope has been driven on the north side of the tunnel and at an angle of about 30° from the tunnel line. This slope inclines downward at an angle of about 12° and has a length of about 75 feet. From a point in the tunnel opposite the top of this incline a vertical shaft was sunk to a depth of 40 feet, from the bottom of which a drift was driven west for a distance of about 80 feet approximately parallel with the adit tunnel above.

For a distance of 130 feet from the portal tunnel 3 penetrates partly cemented fine-grained beach sand containing perfectly preserved marine shells. A continuous narrow band of small shells in this section of the tunnel shows that the sand stratum has an inclination toward the present beach of about 4 feet to 100 feet. At a distance of 130 feet from the portal a band of partly cemented coarse beach gravel from 2 to 3 feet thick that underlies the sand stratum appears in the walls of the tunnel at the floor level and continues with an upward inclination of about 14 feet to 100 feet to the face, where it occupies the upper third of the tunnel. At a point 160 feet from the portal solid gypsum is exposed at the floor level of the tunnel, and from that point to the face gypsum is exposed in both walls of the tunnel, either solid or as lumps embedded in gypsite clay. At the face the lower two-thirds of the tunnel is in solid gypsum.

At the time of the writer's visit to the property, in 1928, the presence of water in the incline below the tunnel level at the 100-foot
station prevented a complete examination. The sand and gravel strata were observed in the walls, however, occupying the same relative positions as in the tunnel above. The owners of the property report that the incline penetrated gypsum at a point 50 feet down from the top and continued in gypsum to the face, a distance of 25 feet. The vertical shaft at the 100-foot station has been filled and was inaccessible. The owners report that this shaft penetrated a foot of solid gypsum at the bottom, that in the drift which was driven west from that point solid gypsum was exposed in the floor for about 35 feet, and that thence to the face, a distance of 45 feet, the drift was entirely in gypsum.

About 300 feet northeast of the portal of tunnel 3 yellowish cherty limestone crops out on the shoreward side of the terrace. Immediately northeast of these limestone beds is a zone of yellowish limestone breccia that extends between 200 and 300 feet to the mouth of a small stream, where the breccia is in contact with folded beds of bluish-gray limestone. The strata of the breccia zone strike S. 70° E. and dip steeply to the southwest.

Geologic conditions have not been observed in the area lying inland from the shoreward face of the marine terrace. Within the limits of the Gypsum-Camel group this area consists wholly of bench land sloping gently upward from the shore terrace. It is covered by overburden and a thick growth of underbrush, and bedrock exposures are lacking.

**SUMMARY OF INDICATIONS**

Underground conditions, as revealed by the development work so far accomplished, indicate that tunnels 2 and 3 and the workings connected with No. 3 have penetrated the upper portion of a body of gypsum of undetermined extent. It also seems evident that this body of gypsum lies unconformably on tilted and folded beds of cherty limestone and limestone breccia and is overlain by partly consolidated beach gravel and sand of recent geologic age. The entire area described has been elevated since the marine sediments were deposited. It is also apparent that the geologic relations of the indicated body of gypsum at this locality are similar in all essential respects to those existing at the deposit on Gypsum Creek and that the gypsum itself is of similar type and quality.

A moderate amount of additional underground work should serve to demonstrate the continuity and extent of the gypsum deposit. Extension of tunnels 2 and 3 and the sinking of additional winzes therefrom are suggested as the logical program for such development. The low-lying bench land, which extends for a considerable distance back from the shore line, also affords favorable topographic condi-
tions for the drilling of the area beyond the limits of underground development.

If a body of gypsum of minable extent exists at this place conditions would be much more favorable for mining the deposit at low cost than at Gypsum Creek. Deep water sufficient for ocean-going vessels extends almost to the shore at this point, and a wharf would need to be only of sufficient size to accommodate bunkers and other requisites for loading. The bench land adjacent to the beach would afford an excellent site for a mine camp and also for a working shaft. The menace of flooding by surface water is absent at this locality.
INDEX

<table>
<thead>
<tr>
<th>Acknowledgments for aid</th>
<th>Page</th>
</tr>
</thead>
</table>
| Admiralty Alaska Gold Mining Co., operations by | 4-5,129
| Admiralty Island, mining on | 16,71-72
| Alaska Consolidated Oil Co., prospecting by | 75
| Alaska Dans Mines Co., operations by | 16
| Alaska Juneau Gold Mining Co., operations by | 12-15,61
| Aniak River, gold mining near | 41,42
| Antimony, occurrence and production of | 79
| Appropriations, amount and purposes of | 83-86
| Asbestos, deposits of | 80
| Babcock & Downey, operations by | 20-21
| Bering River coal field, prospecting | 73
| Birch Creek district. See Circle district |
| Birch Creek schist, type locality of | 158-159
| Bluff district, quicksilver in | 80
| Bonanza Creek (Circle district), gold mining on | 169
| Bonanza district (Norton Sound region), gold mining in | 48
| Bonniffeld district, gold mining in | 40
| Boulder Creek, gold placers on | 164
| Capps, S. R., The Lake Clark-Mulchatna region | 125-154
| Cement, production of limestone for | 78-79
| Chandalar district, gold mining in | 40
| Chichagof Island, gold mining on | 15-16
| gypsum on | 173-177
| Chichagof Mines, operations by | 15
| Chilkat Oil Co., operations by | 73-74
| Chisana district, gold mining in | 39-40
| value of gold produced | 32
| Circle district, area included in | 155
| geologic formations in | 158-161
| gold placer mines in | 155-158,161-172
| production from | 32,36,172
| sketch map showing location of | pl. 3
| location of | 156-157
| means of communication in | 155-156
| physiographic features of | 156-158
| Circle volcanics, correlation of | 159
| Coal, production and consumption of | 69-73
| Collection of information | 93
| Cook Inlet-Susitna region, gold mining in | 28-31
| Copper, occurrence of | 55,60,104
| price in relation to production | 57-58
| production of | 55-60
| Copper River region, copper mining | 58-59
| gold mining in | 22-23,28,122
| surveys in | 90-91,111-124
| Council district, gold mining in | 46
| Deadwood Creek, geographic relations of | 161
| geologic formations along | 161-162
| gold placers on | 162-164
| Drainage maps, compilation and use of | 98-99,102-103
| Dredges in operation in 1929 | 33,51-53
| Dredging, gold produced by | 50-55
| Eagle Creek, gold placers on | 169-171
| Eagle district, gold mining in | 39
| Expenditures, distribution of | 103-106,107
| Fairbanks district, gold mining in | 19-20,32-34
| value of gold produced in | 13,32
| Fairbanks Exploration Co., operations by | 25,33-34
| Fairhaven district, gold mining in | 45
| Fortymile district, gold mining in | 37
| value of gold produced in | 32
| Georgetown district, gold mining in | 41,42
| Gold, price of, differences in | 3
| production of, by dredge mining, in 1903-1929 | 50
| from lodes | 12-28
| from placers | 24-55
| in 1929, by districts | 15,26,32
| total, in 1880-1929 | 10-12
| Gold Hill district, mining in | 40,68
| Gold lodea, production from | 12-23
| Gold placers, general conditions of mining | 24-25
| in northwestern Alaska | 48-50
| in the Circle district | 161-172
| production from | 32,172
| in southeastern Alaska | 27-28
| in the Cook Inlet-Susitna region | 28-31
| in the Copper River region | 28
| in the Kuskokwim region | 41-43
| in the Lake Clark-Mulchatna region | 155-154
| in the Slana district | 122
| in the Yukon region | 31-41
| on Seward Peninsula | 43-48
| production from | 10-12,24-55

179
INDEX

<table>
<thead>
<tr>
<th>Golden Bear Mining Co., operations by</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goodnews Bay district, mining in</td>
<td>19</td>
</tr>
<tr>
<td>Gypsum at Iyoukeen Cove, Chichagof Island</td>
<td>173-177</td>
</tr>
<tr>
<td>Hammon Consolidated Gold Fields, operations by</td>
<td>44</td>
</tr>
<tr>
<td>Harkrader coal claims, Admiralty Island, conditions of mining at</td>
<td>71-72</td>
</tr>
<tr>
<td>Healy River Coal Corporation, operations by</td>
<td>71</td>
</tr>
<tr>
<td>Hirst-Chichagof Mining Co., operations by</td>
<td>15</td>
</tr>
<tr>
<td>Hot Springs district, mining in 30-37, 68 value of gold produced in</td>
<td>32</td>
</tr>
<tr>
<td>Hyder district, mining in 16-17, 62-63</td>
<td>44</td>
</tr>
<tr>
<td>I-Iealy River Coal Corporation, operations by</td>
<td>71</td>
</tr>
<tr>
<td>Hirst-Chichagof Mining Co., operations by</td>
<td>15</td>
</tr>
<tr>
<td>Independence Creek, gold placers on</td>
<td>164-165</td>
</tr>
<tr>
<td>Innoko district, gold mining in</td>
<td>35</td>
</tr>
<tr>
<td>value of gold produced in</td>
<td>32</td>
</tr>
<tr>
<td>International boundary, surveys near</td>
<td>99, 101-102</td>
</tr>
<tr>
<td>Iyoukeen Cove, gypsum at</td>
<td>173-177</td>
</tr>
<tr>
<td>Jade, production of</td>
<td>80</td>
</tr>
<tr>
<td>Juneau district, gold mining in</td>
<td>13-14</td>
</tr>
<tr>
<td>Kantishna district, mining in</td>
<td>40, 79</td>
</tr>
<tr>
<td>Kasan Peninsula, mining on</td>
<td>17, 59</td>
</tr>
<tr>
<td>Katalla oil field, operations in</td>
<td>73-74</td>
</tr>
<tr>
<td>Kenai Peninsula, gold mining on</td>
<td>20-21</td>
</tr>
<tr>
<td>Kennefick Copper Corporation, operations by</td>
<td>58-59, 60</td>
</tr>
<tr>
<td>Ketchikan district, gold mining in</td>
<td>17-18</td>
</tr>
<tr>
<td>Kobuk River Valley, mining in</td>
<td>48-50, 80</td>
</tr>
<tr>
<td>Kougak district, gold mining in</td>
<td>47</td>
</tr>
<tr>
<td>Koyuk district, gold mining in</td>
<td>46</td>
</tr>
<tr>
<td>Koyukuk district, gold mining in</td>
<td>38-39</td>
</tr>
<tr>
<td>Kuskokwim region, mining in</td>
<td>21-22, 41-43, 79</td>
</tr>
</tbody>
</table>

Lake Clark-Mulchatna region, climate of | 132 |
| drainage of | 131-132 |
| explorations in | 125-129 |
| geography of | 129-138 |
| geology of | 138-153 |
| map showing | pl. 2 |
| glacial history of | 149-152 |
| intrusive rocks in | 147-148 |
| location of | 125 |
| Mesozoic rocks in | 140-145 |
| mineral resources of | 153-154 |
| population of | 137-138 |
| Quaternary deposits in | 143-155 |
| relief of | 129-131 |
| routes of travel in | 135 |
| surveys in | 91-92, 126-129 |
| Tertiary volcanic rocks in | 145-147 |
| timber areas in, sketch map | 133 |
| vegetation of | 132-134 |
| wild animals of | 134-135 |

Lead, occurrences of, in the Slana district | 122-124 |
| production of | 64-65 |
| Leasing work, nature and expense of | 107-109 |
| Limestone, production of | 78   |
| Maps issued or in preparation | 87   |
| Marble, production of | 77-78 |
| Marion Twin Co., operations by | 18-19 |
| Marshall district, gold mining in | 40-41 |
| value of gold produced in | 32   |
| Mastodon Creek, geographic relations of | 165 |
| gold placers on | 166-168 |
| production from | 166 |
| rocks along | 165-166 |
| Matanuska Valley, coal in | 70 |
| oil drilling in | 75-76 |
| Mertie, J. B., Jr., Mining in the Circle district | 155-172 |
| Miller Creek, gold placers on | 168-169 |
| Mineral production, 1880-1929 | 7-9 |
| Miscellaneous mineral products, output of | 76-81 |
| Moffit, F. H., The Slana district, upper Copper River region | 111-124 |
| Mother Lode Coalition Mines Co., operations of | 55-56 |
| Mount McKinley district, gold mining in | 41, 42 |
| Mulchatna River region, See Lake Clark-Mulchatna region | 71 |
| Nenana coal field, operations in | 71   |
| Nixon Fork district, gold mining in | 21-22 |
| Nome district, gold mining in | 44   |
| North Fork of Harrison Creek, gold placers on | 171-172 |
| Northwestern Alaska, gold mining in | 48-50 |
| Nuka Bay region, gold mining in | 20-21 |
| Pacific Coast Cement Co., operations by | 78-79 |
| Palladium, production of | 65   |
| Petroleum, occurrence and production of | 73-76 |
| Petroleum products, imports of | 74   |
| Platinum, production of | 65-67 |
| prospecting for, in the Goodnews Bay region | 43-66 |
| Poorman, reported strike near | 37-38 |
| Popof Island, mining on | 23   |
| Port Clarence district, mining in | 47-48, 68 |
| Prince of Wales Island, mining on | 17, 18, 59 |
| Prince William Sound, gold mining near | 22   |
| Production of minerals, collection of information on | 1-5 |
| in 1929, total, 1880-1929 | 5-6 |
| Projects, for season of 1929, scope of | 7-9 |
| for season of 1930, scope of | 89-98 |
INDEX

Prospecting, general conditions of………………………………………. 25
Publications issued or in preparation in 1929…………………………… 86-88
Quicksilver, production of……………………………………………… 79-80
Rampart district, gold mining in………………………………………... 40
Revillagigedo Island, gold mines on…………………………………… 18
Richardson district, gold mining in……………………………………… 32
Routes of travel, in the Lake Clark-Mulchatna region………………… 135-137
in the Siana district…………………………………………………... 114
Ruby district, mining in………………………………………………… 37-38, 68-69
value of gold produced in…………………………………………… 32
Salmon River Valley, gold mining in……………………………………... 17
Seward Peninsula, mining on………………………………………… 43-48, 65-66, 68, 80
Shushanna district. See Chisana district.
Silver, production of…………………………………………………… 12-13, 57, 61-63
Slana district, drainage of……………………………………………… 112-113
g eo l o g y o f …………………………………………………………… 115-121
map showing………………………………………………………… pl. 1
mineral resources of…………………………………………………… 122-124
population of…………………………………………………………... 115
relief of……………………………………………………………… 111-113
structure in…………………………………………………………….. 121
timber in……………………………………………………………… 113
trails in……………………………………………………………… 114
Smith, P. S., Administrative report……………………………………... 83-109
Mineral industry of Alaska in 1929……………………………………... 1-81
Solar Development Co., operations by…………………………………… 17, 22, 59, 60, 65
Solomon district, gold mining in………………………………………... 40-47
Sources of information………………………………………………... 2-8
Southeastern Alaska, mining in………………………………………… 27-28,
quarrying in…………………………………………………………… 77-78
surveys in……………………………………………………………… 89-90, 98-99
Southwestern Alaska, surveys in……………………………………… 101
Stewart, B. D., The occurrence of gypsum at Iyoukeen Cove, Chichagof Island……………………………………… 173-177
Surveys made, in 1929………………………………………………… 88-95
scale of……………………………………………………………… 97
total area of, 1898-1929……………………………………………… 96
Sustinia region, gold mining in………………………………………… 28-30
Switch Creek, gold placers on………………………………………… 162-164
Taku district, mineral deposits of……………………………………… 14-15
Tanana River, surveys near…………………………………………… 92
Tellurides in the Willow Creek district………………………………… 18
Tin, production of…………………………………………………….. 67-69
Tolovana district, gold mining in………………………………………... 35-36
value of gold produced in…………………………………………... 82
Treadwell Yukon Co., operations by……………………………………... 14
Tulukskak-Aniak district, gold mining in……………………………… 41, 42
Tungsten, occurrence of, in the Slana district………………………………… 122
Valdez area, gold mining in…………………………………………… 22
Vermont Marble Co., operations by…………………………………….. 77
Volcanologic investigations……………………………………………... 95
Williams Mining Co., operations by……………………………………... 16
Willow Creek district, mining in………………………………………… 18-19
York district, mining in………………………………………………… 68
Yukon Basin, mining in………………………………………………… 51-41, 68-69
value of gold produced in…………………………………………… 32
Yukon-Yukonana region, surveys of……………………………………... 92-93
SELECTED LIST OF GEOLOGICAL SURVEY PUBLICATIONS ON ALASKA

[Arranged geographically]

All these publications can be obtained or consulted in the following ways:

1. The reports are sold, at the prices indicated, by the Superintendent of Documents, Washington, D. C., to whom remittances should be sent by money order. No copies are available of those marked with an asterisk (*); they may be consulted at many public libraries.

2. The maps whose price is stated are sold by the Geological Survey and not by the Superintendent of Documents. On an order for maps amounting to $5 or more at the retail price a discount of 40 per cent is allowed.

3. Copies of all Government publications are furnished to the principal public libraries throughout the United States, where they can be consulted by those interested.

GENERAL

REPORTS


The Alaskan mining industry in 1930 by Philip S. Smith. In Bulletin 836, 1932, — cents. The preceding volumes in this series and years covered are Bulletins 259, 1904, 15 cents; 284, 1905, 25 cents; 314, 1906, 30 cents; 345, 1907, 45 cents; 379, 1908, 50 cents; 442, 1909, 40 cents; 480, 1910, 40 cents; 520, 1911, 50 cents; 542, 1912, 25 cents; * 592, 1913 (592-A, 15 cents); 622, 1914, 30 cents; 642, 1915, 35 cents; 662, 1916, 75 cents; * 692, 1917 (692-A, 5 cents); * 712, 1918; * 714, 1919 (714-A, 25 cents); 722, 1920, 25 cents; 739, 1921, 25 cents; 755, 1922, 40 cents; 773, 1923, 40 cents; 783, 1924, 40 cents; 792, 1925, 25 cents; 797, 1926, 80 cents; 810, 1927, 50 cents; 813, 1928, 40 cents; 824, 1929, — cents.


In preparation

Tertiary flora of Alaska, by Arthur Hollick.

Igneous geology of Alaska, by J. B. Mertie, jr.

TOPOGRAPHIC MAPS

Map of Alaska (A); scale, 1:5,000,000; 1931. 10 cents retail or 6 cents wholesale.

Map of Alaska (C); scale, 1:12,000,000; 1929. 1 cent retail or five for 3 cents wholesale.

Map of Alaska, showing distribution of mineral deposits; scale, 1:5,000,000; 1925. 20 cents retail or 12 cents wholesale.

Index map of Alaska, including list of publications; scale, 1:5,000,000; 1929. Free on application.

Relief map of Alaska (D); scale, 1:2,500,000; 1923. 50 cents retail or 30 cents wholesale.

Map of Alaska (E); scale, 1:2,500,000; 1931. 25 cents retail or 15 cents wholesale.

SOUTHEASTERN ALASKA

REPORTS


Reconnaissance on the Pacific Coast from Yakutat to Alsek River, by Eliot Blackwelder. In Bulletin 314, 1907, pp. 82-88. 30 cents.


The earthquakes at Yakutat Bay, in September, 1899, by R. S. Tarr and Lawrence Martin. Professional Paper 69, 1912, 135 pp. 60 cents.

In preparation

Geology and ore deposits of the Juneau district, by H. M. Eakin.

TOPOGRAPHIC MAPS

Juneau special (No. 581A); scale, 1:62,500; 1904, by W. J. Peters. 10 cents retail or 6 cents wholesale.
Berners Bay special (No. 581B); scale, 1:62,500; 1908, by R. B. Oliver. 10 cents retail or 6 cents wholesale. Also contained in Bulletin 446, 1911, 20 cents.
Kasaan Peninsula, Prince of Wales Island (No. 540A); scale, 1:62,500; by D. C. Witherspoon, R. H. Sargent, and J. W. Bagley. 10 cents retail or 6 cents wholesale. Also contained in Professional Paper 87, 1915, 40 cents.

Copper Mountain and vicinity, Prince of Wales Island (No. 540B); scale, 1:62,500; by R. H. Sargent. 10 cents retail or 6 cents wholesale. Also contained in Professional Paper 87, 1915, 40 cents.


Juneau and vicinity (No. 581D); scale, 1:24,000; 1918, by D. C. Witherspoon. 20 cents retail or 12 cents wholesale.

Hyder and vicinity (No. 540C); scale, 1:62,500; 1927, by R. M. Wilson. 10 cents retail or 6 cents wholesale. Also published in Bulletin 807, 1929, 35 cents.

Revillagigedo Island; scale, 1:250,000; 1931, by R. H. Sargent (preliminary edition). Free on application.

In preparation

Wrangell district; scale, 1:250,000, by R. H. Sargent.

CONTROLLER BAY, PRINCE WILLIAM SOUND, AND COPPER RIVER REGIONS

REPORTS

Geology of the central Copper River region, by W. C. Mendenhall. Professional Paper 41, 1905, 133 pp. 50 cents.

Geology and mineral resources of Controller Bay region, by G. C. Martin. Bulletin 335, 1908, 141 pp. 70 cents.


The gold and copper deposits of the Port Valdez district, by B. L. Johnson. In Bulletin 622, 1915, pp. 140-188. 30 cents.


In preparation

Geology of the Chitina quadrangle, by F. H. Moffit.

TOPOGRAPHIC MAPS


Controller Bay region (No. 601A); scale, 1:62,500; 1907, by E. G. Hamilton and W. R. Hill. 35 cents retail or 21 cents wholesale. Also published in Bulletin 835, 1908, 70 cents.


Chitina quadrangle (No. 601); scale, 1:250,000; 1914, by T. G. Gerdine, D. C. Witherspoon and others. Sale edition exhausted. Also published in Bulletin 576, 1914, 30 cents.


Prince William Sound; scale, 1:500,000; compiled. In Bulletin 526, 1913, 30 cents. Not issued separately.

The Bering River coal field; scale, 1:62,500; 1915, by G. C. Martin. 25 cents retail or 15 cents wholesale.


The Kotsina-Kuskulana district (No. 602C); scale, 1:62,500; 1922, by D. C. Witherspoon. 10 cents retail or 6 cents wholesale. Also published in Bulletin 745, 1923, 40 cents.

Valdez and vicinity (No. 602B); scale, 1:62,500; 1929, by J. W. Bagley, C. E. Giffin, and R. H. Sargent. 10 cents retail or 6 cents wholesale.

In preparation

Prince William Sound region; scale, 1:250,000; by J. W. Bagley, D. C. Witherspoon, and others.

COOK INLET AND SUSITNA REGION

REPORTS


* Mining developments in the Matanuska coal fields, by Theodore Chapin. In Bulletin 714, 1921. (See also Bulletin 692-D, 1919, 15 cents; and Bulletin *712, 1920.)

* Lode developments in the Willow Creek district, by Theodore Chapin. In Bulletin 714, 1921. (See also Bulletin 642, 1916, 35 cents; Bulletin 692-D, 1919, 15 cents; and Bulletin *712, 1920.)
Geology and mineral resources of the region traversed by the Alaska Railroad, by S. R. Capps. In Bulletin 755, 1924, pp. 73-150. 40 cents.

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TOPOGRAPHIC MAPS

Lower Matanuska Valley (No. 602A); scale, 1:62,500; 1931, by R. H. Sargent. 10 cents retail or 6 cents wholesale.
Iniskin Bay-Snug Harbor district, Cook Inlet region, Alaska; scale, 1:250,000; 1924, by C. P. McKinley and Gerald FitzGerald (preliminary edition). Free on application. Also published in Bulletin 789, 1927. 50 cents.
The Alaska Railroad route: Seward to Matanuska coal field; scale, 1:250,000; 1924, by J. W. Bagley, T. G. Gerding, R. H. Sargent, and others. 50 cents retail or 30 cents wholesale.
The Alaska Railroad route: Matanuska coal field to Yanert Fork; scale, 1:250,000; 1924, by J. W. Bagley, T. G. Gerding, R. H. Sargent, and others. 50 cents retail or 30 cents wholesale.
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Lake Clark-Mulchatna River region; scale, 1:250,000; by R. H. Sargent, Gerald FitzGerald, C. E. Giffin, and D. C. Witherspoon.

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**TOPOGRAPHIC MAPS**

- *Herendeen Bay and Unga Island region; scale, 1:250,000; by H. M. Eakin. In Bulletin 467, 1911. Not issued separately.
- *Chignik Bay region; scale, 1:250,000; by H. M. Eakin. In Bulletin 467, 1911. Not issued separately.
- *Kuskokwim River and Bristol Bay region; scale, 1:625,000; by W. S. Post, In Twentieth Annual Report, pt. 7, 1900. $1.80. Not issued separately.
- *Aniakchak district, Alaska Peninsula, 1927; scale, 1:250,000; by R. H. Sargent (preliminary edition). Free on application.
- *Goodnews Bay district, 1930; scale, 1:250,000; by R. H. Sargent and W. S. Post (preliminary edition). Free on application.

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**YUKON AND KUSKOKWIM BASINS**

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The gold placers of the Tolovana district, by J. B. Mertie, Jr. In Bulletin 662, 1918, pp. 221-277. 75 cents.


The Chandalar-Sheenjek district, by J. B. Mertie, Jr. In Bulletin 810, 1930, pp. 87-139. 50 cents.


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Geology of the Yukon-Tanana region, by J. B. Mertie, Jr.

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Circle quadrangle (No. 641); scale, 1:250,000; 1911, by T. G. Gerdine, D. C. Witherspoon, and others. 50 cents retail or 30 cents wholesale. Also in Bulletin 538, 1913, 20 cents.


Fairbanks quadrangle (No. 642); scale, 1:250,000; 1911, by T. G. Gerdine, D. C. Witherspoon, R. B. Oliver, and J. W. Bagley. 50 cents retail or 30 cents wholesale. Also in Bulletin 337, 1908, 25 cents, and Bulletin 525, 1913, 55 cents.

Fortymile quadrangle (No. 640); scale, 1:250,000; 1902, by E. C. Barnard. 10 cents retail or 6 cents wholesale. Also in Bulletin 375, 1909, 30 cents.

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Middle Kuskokwim and lower Yukon region; scale, 1:500,000; by C. G. Anderson, W. S. Post, and others. In Bulletin 578, 1914, 35 cents. Not issued separately.

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- Goodnews Bay district, 1930; scale, 1:250,000, by R. H. Sargent and W. S. Post (preliminary edition.) Free on application.

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REPORTS


TOPOGRAPHIC MAPS

Seward Peninsula; scale, 1:500,000; compiled from work of D. C. Witherspoon, T. G. Gerdine, and others, of the Geological Survey, and all other available sources. In Water-Supply Paper 314, 1913, 45 cents. Not issued separately.

Seward Peninsula, northeastern portion, reconnaissance map (No. 655); scale, 1:250,000; 1905, by D. C. Witherspoon and C. E. Hill. 50 cents retail or 30 cents wholesale. Also in Bulletin 247, 1905, 40 cents.
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Seward Peninsula, northwestern portion, reconnaissance map (No. 657); scale, 1:250,000; 1907, by T. G. Gerdine and D. C. Witherspoon. 50 cents retail or 30 cents wholesale. Also in Bulletin 328, 1908, 70 cents.

Seward Peninsula, southern portion, reconnaissance map (No. 656); scale, 1:250,000; 1907, by E. C. Barnard, T. G. Gerdine, and others. 50 cents retail or 30 cents wholesale. Also in Bulletin 328, 1908, 70 cents.


Grand Central quadrangle (No. 646A); scale, 1:62,500; 1906, by T. G. Gerdine, R. B. Oliver, and W. R. Hill. 10 cents retail or 6 cents wholesale. Also in Bulletin 533, 1913, 60 cents.

Nome quadrangle (No. 646B); scale, 1:62,500; 1906, by T. G. Gerdine, R. B. Oliver, and W. R. Hill. 10 cents retail or 6 cents wholesale. Also in Bulletin 533, 1913, 60 cents.

Casadepaga quadrangle (No. 646C); scale, 1:62,500; 1907, by T. G. Gerdine, W. B. Corse, and B. A. Yoder. 10 cents retail or 6 cents wholesale. Also in Bulletin 433, 1910, 40 cents.

Solomon quadrangle (No. 646D); scale, 1:62,500; 1907, by T. G. Gerdine, W. B. Corse, and B. A. Yoder. 10 cents retail or 6 cents wholesale. Also in Bulletin 433, 1910, 40 cents.

NORTHERN ALASKA

REPORTS


TOPOGRAPHIC MAPS

Koyukuk River to mouth of Colville River, including John River; scale, 1:1,250,000; by W. J. Peters. In Professional Paper 20, 1904, 40 cents. Not issued separately.


North Arctic coast; scale, 1:1,000,000; by E. de K. Leffingwell. In Professional Paper 109, 1919, 75 cents. Not issued separately.

Martin Point to Thetis Island; scale, 1:125,000; by E. de K. Leffingwell. In Professional Paper 109, 1919, 75 cents. Not issued separately.

Chandalar-Sheenjek district; scale, 1:500,000; by Gerald FitzGerald and J. O. Kilmartin. In Bulletin 810, 50 cents. Not issued separately.