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MINERAL INDUSTRY OF ALASKA IN 1932

BY

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MINERAL INDUSTRY OF ALASKA IN 1932

By PHILIP S. SMITH [1]

INTRODUCTION

The mineral industry of Alaska was for many years the dominant incentive for the development of the Territory. Later, as the other possibilities of the Territory became better known, other industries sprang up and partly reduced the preeminence of mining, though they have by no means displaced the hold that mining has on the welfare of the people. Although the annual value of the minerals produced in Alaska is now second to that of the fish products, it is probably safe to say that mining developments still hold first place in the general interest of most of the residents. Assistance to the mining industry of Alaska has therefore long been recognized as a Federal obligation, and through the Geological Survey efforts have been made to determine the distribution and extent of these resources and to disseminate all pertinent information about them to the miner, prospector, or business man who might undertake their development. As a result several hundred reports have been issued by the Geological Survey describing the different mineral commodities or mining camps and setting forth, both in text and by illustrations and maps, the facts that have been determined and the inferences that may be drawn from them. Among these studies relating to the mineral industry is the collection of current information regarding the kinds and quantities of minerals produced and the places from which they came. To obtain this information the Geological Survey conducts an annual canvass of the mineral production of Alaska and makes the results available through reports published as soon as practicable after the end of the year to which the records relate. The present report, which is of this type, is the twenty-ninth of the series.[2]

The collection of the facts requisite for the preparation of these annual statements involves difficulties, because the great size of the Territory, the diversity of its mineral products, and the large number but small size of many of the enterprises make it impracticable to gather all the desired information at first hand. The information used is therefore derived from many sources, which necessarily

[1] The canvass of producers, the tabulation of their replies, and some of the compilation of the statistics set forth in this report have been made in association with Edith Bennett and Kathleen P. Stead, of the Alaskan branch of the U.S. Geological Survey.

[2] The other volumes of this series, commencing with that for 1904, are Bulletins 259, 284, 314, 345, 379, 442, 480, 520, 542, 592, 622, 642, 662, 692, 712, 714, 722, 739, 755, 773, 783, 792, 797, 810, 813, 824, 836, and 844.

vary in reliability and completeness. Efforts are made, however, to reduce all the statements to a comparable basis and to give only those that appear to be well substantiated. Among the most reliable sources of information are the geologists and engineers who are sent out each year by the Geological Survey to conduct surveys in different parts of Alaska and who acquire not only much accurate information regarding the mineral production of the regions in which they work but also general information by contact with miners and operators in the course of their travels to and from the field. Members of other Government organizations—for instance, the Bureau of Mines, the Bureau of the Mint, the Alaska Railroad, the Bureau of Foreign and Domestic Commerce, and the Customs Service—in the course of their regular duties collect many data which are extremely valuable in these studies and the use of which avoids unnecessary duplication in collecting records. Most of the banks, express companies, and other business organizations in Alaska collect for their own use data regarding mineral commodities of their particular districts. Some of these data are extremely pertinent to the general inquiry conducted by the Geological Survey, and through the cordial cooperation of many of these companies important facts have been made available to the Geological Survey, though some of this information is confidential and is not released for publication. Most of the larger Alaska newspapers and certain papers published in the States that feature Alaska matters are courteously sent by their publishers to the Geological Survey, and from these and the technical and scientific periodicals are gleaned many items regarding new developments.

In addition to all these sources the Geological Survey each year sends out hundreds of schedules—one to every person or company known to be engaged in mining—on which are a number of questions regarding the mining developments and production of each individual property during the year. These schedules when filled out by the operators of course constitute a most authoritative record. Unfortunately, however, not all of them are returned by the operators, and even some of the operators who return them have not all the specific data desired, misunderstand the inquiries, or reply in such a manner that the answers may not be correctly interpreted when the schedules are edited. It is a gratifying evidence of the general appreciation of these annual summaries that so many of the operators cooperate fully and cordially with the Geological Survey by furnishing the information called for on the schedules as well as volunteering much other pertinent information.

It is apparent, however, that facts collected from one source, although of themselves strictly accurate, are likely to be computed or stated on a different basis from equally reliable reports received from

another source, so that considerable editing and revision must be done in trying to bring all to one standard. It is not possible to know exactly all the corrections that should be applied in order to reduce the reports of production to a strictly uniform standard. However, though some uncertainties necessarily remain, it is believed that they do not have significant effect on the results expressed and that the report is consistent within itself and with the other reports of this series. The reader should realize that while the statistics given in these reports are comparable among themselves, they necessarily differ from those published by some of the other Government bureaus, because these are primarily records of production, whereas those issued by the Bureau of the Mint, for instance, relate to receipts at the offices of that bureau, those issued by the Customs Service relate to shipments recorded at its stations, and those issued by other organizations may be computed on still other bases.

Another reason why the totals used in this volume for certain mineral commodities may differ from the reports received from other sources is that all values here stated are computed on the average selling price for each of the individual mineral commodities for the year, as determined by the Bureau of Mines, and not on the prices actually received by the individual producers. It is obvious that this method of computation disregards the amount received by individual mines, but it is believed to afford a better representation of the industry as a whole. The adoption of this method probably does not introduce any significant differences in the totals, inasmuch as higher prices received by the more shrewd and efficient mine operators should be about balanced by lower prices received by the less fortunate ones.

It is the constant aim of the compilers to make these annual summaries of mineral production as accurate and adequate as possible. The Geological Survey therefore bespeaks the continued cooperation of all persons concerned in the Alaska mineral industry and urges them to communicate any information that may lead to this desired end. It should be emphasized that all information regarding individual properties is regarded as strictly confidential. The Geological Survey does not use any facts that are furnished in a way that will disclose the production of individual plants nor allow access to its records in any way disadvantageous to either the individuals who furnish the information or those to whom it relates. So scrupulously is this policy followed that in this volume it has been necessary to combine or group together certain districts or products so that the production of an individual may not be disclosed.

In addition to all the mining operators and prospectors of the Territory who have filled in and returned the inquiry blanks sent out by the Geological Survey, special acknowledgment is due to O. E. Kies-

sling and other officers of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce, of the Department of Commerce; the collectors and other officers of the Alaska Customs Service and of the Bureau of the Mint, of the Treasury Department; the officers of the Forest Service, of the Department of Agriculture; Col. O. F. Ohlson and other officers of the Alaska Railroad; F. H. Moffit, S. R. Capps, J. B. Mertie, Jr., B. D. Stewart, R. H. Sargent, Ralph Tuck, P. A. Davison, J. J. Corey, C. F. Fuechsel, and Gerald FitzGerald, of the Geological Survey; the agents of the American Railway Express Co. in Alaska; officers of the Alaska Road Commission; the Alaska Weekly and Volney Richmond, of the Northern Commercial Co., of Seattle, Wash.; Ralph and Carl Lomen, of Seattle and New York; the Hyder Weekly Herald, of Hyder; C. Clausen of Petersburg; the Alaska Juneau Gold Mining Co., the Daily Alaska Empire, and J. C. McBride, of Juneau; Jos. J. F. Ward, of Skagway; the Cordova Daily Times, of Cordova; J. B. O'Neill, of Cordova and Seattle; the Kennecott Copper Corporation, of Kennecott and New York; Carl Whitham, of Gulkana; C. T. O'Neill, of McCarthy; Durell Finch, of Unalaska; H. N. Evans, of Kanatak; W. J. Erskine, of Kodiak; the Anchorage Weekly Times and Alex. Liska, of Anchorage; W. E. Dunkle, of Wasilla; Ross Heckey, of Chickaloon; H. W. Nagley, of Talkeetna; Charles Zielke, of Ferry; C. C. Heid, of Nenana; the First National Bank, O. J. Egleston, and J. D. Harlan, of the Fairbanks Exploration Co., the Fairbanks Daily News-Miner, the Pacific Alaska Airways, Inc., and the formerly independent companies that have become associated with it, the Wien Airways, Inc., James S. Newlan, and G. E. Jennings, of Fairbanks; Mrs. Jessie M. Howard, of Tanana; C. E. M. Cole, of Jack Wade; William Yanert, of Beaver; Chris Thyman, of Rampart; George Jesse, of Poorman; the Miners & Merchants Bank, of Iditarod; D. E. Browne, Alex Matheson, and Harry Donnelley, of Flat; H. S. Wanamaker, of Wiseman; J. W. Wick, of Russian Mission; C. M. Link, of Bethel; Charles Mespelt, of Medfra; Oliver Anderson, of McGrath; John Haroldson, of Quinhagak; the Nome Nugget, the Northern Air Transport Co., Hammon Consolidated Gold Fields, Grant Jackson, of the Miners & Merchants Bank, Col. E. R. Stivers, A. C. Stewart, J. G. Galvin, and C. W. Thornton, of Nome; A. S. Tucker, of Bluff; T. P. Roust, of Candle; Arthur W. Johnson, of Haycock; Ethel M. Marx, of Teller; and Lewis Lloyd, of Shungnak.

MINERAL PRODUCTION

GENERAL FEATURES

The total value of the mineral production of Alaska in 1932 was $11,638,000. This was furnished by several mineral products, but gold and copper account for more than 92 percent of the total. The value was about 95 percent of that of 1931, showing a decrease of

about $640,000. To persons familiar with the general business situation throughout the world in 1932 the statement that the value of the Alaska mineral output in that year showed a falling off of only 5 percent is indicative of the extremely sound condition of the mining industry in the Territory. To those who have not followed closely the conditions in industry in general, it may be pointed out that increasing stagnation, retrenchment, and suspension have occurred in practically every line of endeavor during 1932. As part of the vicious circle created by that condition people ceased to buy, prices dropped, and production dwindled. How this condition affected the mining industry of the States as well as Alaska may be learned from the following comparison of the average selling prices, in cents, of three of the common metals for the last 4 years:

	1929	1930	1931	1932
Copper, pound	17.6	13	8.3	6.3
Silver, ounce	58.0	38.5	29.0	28.2
Lead, pound	6.3	5.0	3.6	3.0

Translating the decline in prices represented by these figures into other terms, it may be said that had the price of copper in 1932 been the same as in 1929 the value of last year's production would have been nearly a million dollars more than it was. Or if the comparison is made only with the preceding year we should find that in 1932 copper brought only 76 percent, silver 97 percent, and lead 83 percent of the prices in 1931, so that had those prices held good in 1932 the value of the output of 1932 would have been nearly $200,000 greater, and the decrease from 1931 would have been only about $450,000. There was of course no change in the unit price of gold during the year.

But it was not the direct effect of decrease in selling price of these metals that has had a depressing effect on the mineral industry so much as the indirect and less obvious effect in deterring operators from opening up new properties or maintaining even a normal rate of output from many of the mines already producing. In many places development work was considerably curtailed, retrenchments were instituted in order to effect economies required, and the undertaking of new enterprises except gold mining practically ceased. That these conditions are only temporary cannot be doubted, for the metals enter too fundamentally into every phase of life to be displaced, but it is too much to expect that there will be early resumption of extensive mining ventures looking to the development of the intrinsically less valuable of Alaska's minerals. With the return to normalcy, however, Alaska may well be expected to share in the general improvement, for it certainly contains mineral deposits of value that have not yet been thoroughly tested.

While large parts of Alaska remain almost unknown and unexplored, other parts, especially those along the main avenues of communication, have lost most of their frontier characteristics, and their facilities compare favorably with those of many parts of the States proper. In many of these areas large, stable mining enterprises have been built up, and there is the constant tendency to undertake operations on a larger scale than formerly, so that the unit cost of the work may be kept at a low figure. That mining may be done in parts of Alaska at an extremely low cost has been demonstrated by the past performance of one of the mines in southeastern Alaska, where costs are below those of any comparable enterprise in the world. This tendency to operate in larger units marks a distinct departure from the old days when the search for mineral deposits was directed mainly toward the discovery of small rich deposits that could be worked by relatively crude methods and little outlay of capital. Today by far the larger part of all the minerals produced from Alaska comes from mines utilizing extensive equipment to handle large volumes of relatively low-grade material. The modern prospector is therefore not limited in his search to small rich stringers or concentrations but may much better direct his attention to finding deposits that appear to hold promise of yielding large quantities of average or even low-grade ore.

TOTAL MINERAL PRODUCTION

From the time of the earliest records of mining in Alaska to the end of 1931 minerals to the value of more than $653,000,000 have been produced in the Territory. The distribution of this large total among the individual years is set forth in the following table and is graphically represented by the curves in figure 1. From this table and diagram it will be evident that prior to 1898 the annual production ranged from negligible amounts to a maximum of less than $3,000,000. After the discovery of the Canadian Klondike and the entrance of a swarm of prospectors and miners into Alaska the production quickly mounted until in 1906 it reached a high point that marks the mining of many of the rich placers in the Nome and Fairbanks regions. For the next 8 years the annual production fluctuated somewhat but ranged around $20,000,000. Then it mounted by leaps until it reached a maximum of more than $48,000,000 in 1916. This rapid increase was due to the growth of copper production under the stimulation of the World War, when prices advanced to unprecedented heights. By 1919 the war stimulation was over, and the annual production from Alaska dropped again to about $20,000,000. During the post-war period Alaska has suffered through the fact that in the States scales of wages and opportunities for the employment of capital have seemed to offer more advantages, and as a result there has been more or less fluctuation in

the mineral output from Alaska, the production during the period from 1921 to date ranging between about $12,000,000 and $20,000,000. It is believed, however, that the decrease shown during recent years does not mark a permanent downward trend. In fact, as will be noted elsewhere in this report, there is direct evidence that the mining of certain of the metals is decidedly on the increase.

Value of total mineral production of Alaska, by years, 1880–1932

1880	$6,826	1899	$5,425,262	1918	$28,218,935
1881	15,000	1900	7,995,209	1919	19,626,824
1882	23,000	1901	7,306,381	1920	23,330,586
1883	67,146	1902	8,475,813	1921	16,994,302
1884	72,000	1903	9,088,564	1922	19,420,121
1885	425,000	1904	9,627,495	1923	20,330,643
1886	540,000	1905	16,490,720	1924	17,457,333
1887	657,000	1906	23,501,770	1925	18,220,692
1888	667,181	1907	20,840,571	1926	17,664,800
1889	847,490	1908	20,092,501	1927	14,404,000
1890	873,276	1909	21,140,810	1928	14,061,000
1891	1,014,211	1910	16,875,226	1929	16,066,000
1892	1,019,493	1911	20,720,480	1930	13,812,000
1893	1,104,982	1912	22,581,943	1931	12,278,000
1894	1,339,332	1913	19,547,292	1932	11,638,000
1895	2,588,832	1914	19,109,731		
1896	2,885,029	1915	32,790,344		653,229,000
1897	2,539,294	1916	48,386,508		
1898	2,329,016	1917	40,694,804		

NOTE.—$37,205 for coal produced prior to 1890 has been credited to 1890, as data are not available for distributing the value by years.

In the following table the value of the total mineral production from Alaska is distributed among the metals and nonmetallic products. From this table it will be seen that gold accounted for more than 62 percent of the total production and that gold and copper together accounted for about 95½ percent.

Total value of mineral production of Alaska, by substances, 1880–1932

Gold	$409,033,000	Marble and other products (including platinum metals)	$5,972,000
Copper	214,680,000		
Silver	12,063,000		
Coal	8,443,000		653,229,000
Tin	1,094,000		
Lead	1,944,000		

Each mineral product is discussed in more detail in the following pages, in which are set down such facts as are available regarding the amount of each product, the places from which it came, and any new developments. The following summary table shows the production for 1932 and 1931, distributed by quantity and value among the main kinds of substances, so that a comparison between the two years may be readily made. A very great increase in the quantity and value is shown for gold, but decreases are shown for all the other

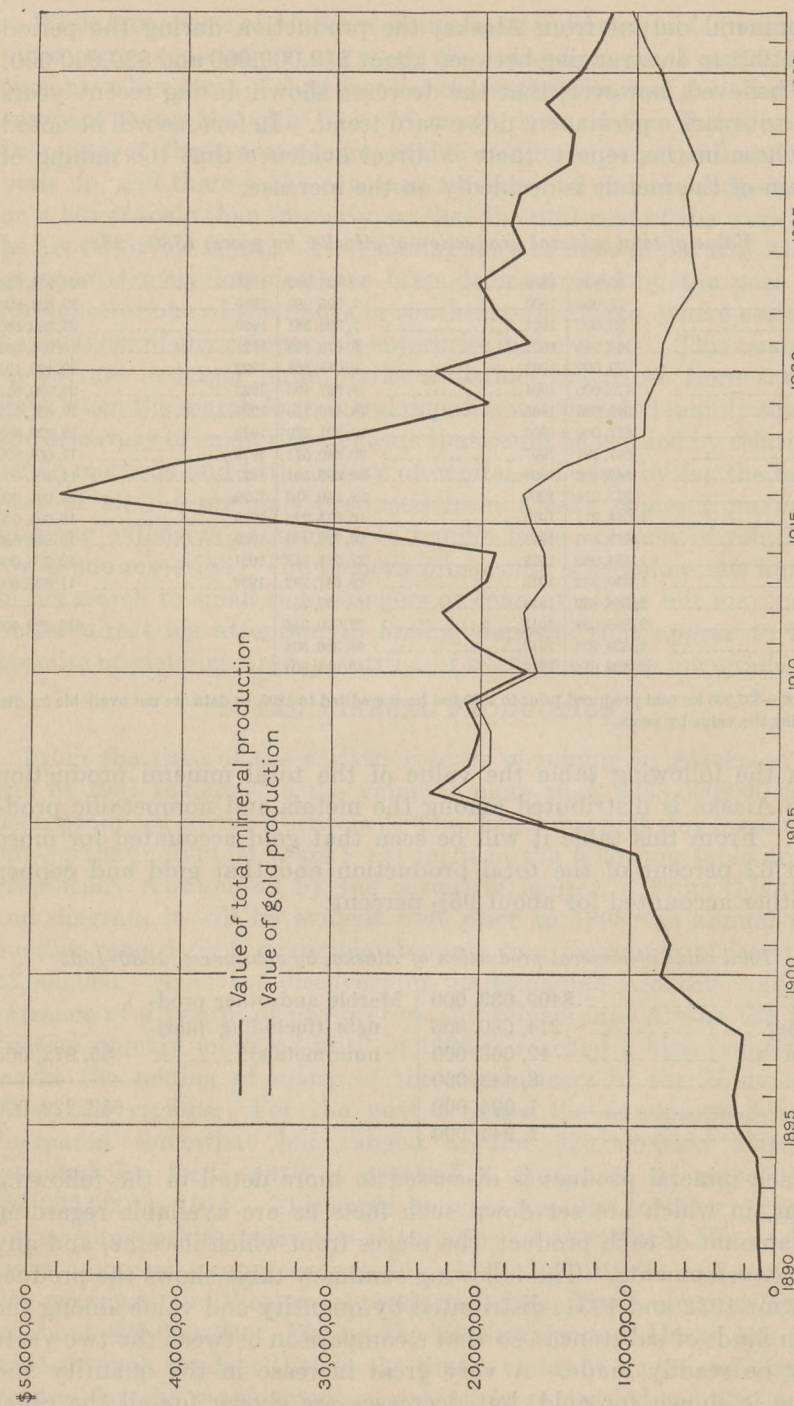

FIGURE 1.—Trends of mineral production of Alaska, 1890–1932.

mineral commodities, the decrease in value of all substances being more than in the quantity, for the reasons stated on a preceding page.

Mineral output of Alaska, 1932 and 1931

	1932		1931	
	Quantity	Value	Quantity	Value
Gold.....fine ounces..	493,860	$10,209,000	459,000	$9,507,000
Copper.....pounds..	8,738,500	550,500	22,614,000	1,877,000
Silver.....fine ounces..	234,050	66,000	352,000	102,000
Coal.....short tons..	102,700	513,500	105,900	556,000
Tin, metallic.....do....			4.07	2,000
Lead.....do....	1,260	75,600	1,660	126,000
Miscellaneous mineral products, including petroleum, platinum metals, marble, gypsum, etc.....		223,400		108,000
		11,638,000		12,278,000

GOLD

GENERAL FEATURES

The total value of gold produced from Alaska mines in 1932 was $10,209,000, as contrasted with $9,507,000 in 1931, an increase of more than $700,000. The general trend of gold mining in Alaska since 1890 is graphically represented by one of the curves in figure 1. From 1890 to 1904 the curve for the value of the gold produced practically coincides with the curve for the value of the total mineral production of Alaska and marks a fairly even upward trend. From 1904 to 1906 there was an abrupt increase in gold production, marking the boom periods of many of the placer camps. From the peak of 1906 there was a gradual decline for the next 10 years, and during the period of the World War there followed a rather rapid decrease to less than $10,000,000 a year. From 1920 to 1927 the annual gold production was fairly uniform and ranged between about $6,000,000 and $8,000,000. In each year since 1927 there has been a marked increase in the amount of gold, and in 1932 the output was greater than in any other year since 1917.

There are two principal types of deposits from which the gold is recovered—lodes and placers. The lodes are the mineralized veins or masses of ore in the country rock that were in general formed through deep-seated geologic processes and represent material in place. The placers are deposits of sand and gravel which have been worn from the hard rocks in their general vicinity and in which the loose grains of gold or other valuable minerals have been more or less concentrated by surficial geologic processes that were effective because of some distinctive physical or chemical property of the material thus concentrated.

The following table shows the amount and value of the gold produced annually for the last 17 years, the total amount that has been

produced since gold mining began in the Territory in 1880, and the value of the gold that has been derived from each of the two principal types of gold mines. The same information, except that the annual production for each year from 1880 is also included, is graphically represented by figure 2. Of the $409,033,000 in gold that has been produced from Alaska mines $269,326,000, or about 66 percent, has come from placers and $139,707,000, or about 34 percent, from lodes. The relation between the outputs from these two sources has varied widely. Thus up to 1898 the lode production was greater than that from the placers. Then ensued a period of more than 20 years when the annual placer production far exceeded that from the lodes. Since 1919 the production from each source has been approximately the same as in 1932. There is reason to believe that the production from the lodes is more likely to show an increase than that from placers. In fact, the record seems to indicate clearly that the peak of lode-gold production has not yet been reached.

Gold produced in Alaska, 1880–1932

Year	Fine ounces	Value		
		Total	Placer mines	Lode mines
1880–1915	12,592,121	$260,302,243	$185,200,444	$75,101,799
1916	834,068	17,241,713	11,140,000	6,101,713
1917	709,049	14,657,353	9,810,000	4,847,353
1918	458,641	9,480,952	5,900,000	3,580,952
1919	455,984	9,426,032	4,970,000	4,456,032
1920	404,683	8,365,560	3,873,000	4,492,560
1921	390,558	8,073,540	4,226,000	3,847,540
1922	359,057	7,422,367	4,395,000	3,027,367
1923	289,539	5,985,314	3,608,500	2,376,814
1924	304,072	6,285,724	3,564,000	2,721,724
1925	307,679	6,360,281	3,223,000	3,137,281
1926	324,450	6,707,000	3,769,000	2,938,000
1927	286,720	5,927,000	2,982,000	2,945,000
1928	331,140	6,845,000	3,347,000	3,498,000
1929	375,438	7,761,000	4,117,000	3,644,000
1930	410,020	8,476,000	4,837,000	3,639,000
1931	459,900	9,507,000	4,842,000	4,665,000
1932	493,860	10,209,000	5,522,000	4,687,000
	19,786,979	409,033,000	269,326,000	139,707,000

In the following table, which lists the sources from which gold was produced in 1932, all the ores from gold mines that yielded gold have been included, and the gold recovered from placers has been listed separately. It is a noteworthy feature that no gold is recovered from the Alaska ores that are principally valuable for their copper content, though those ores are usually the source of most of the silver that is recovered.

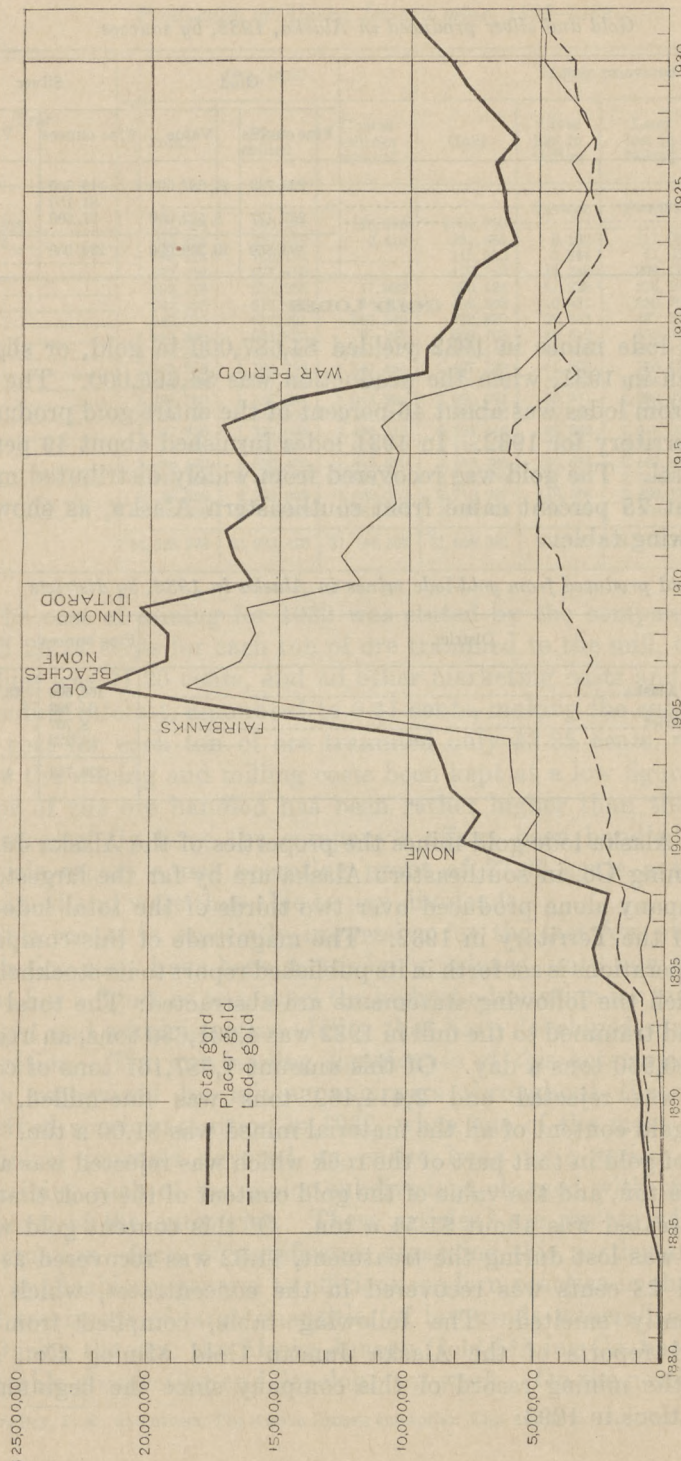

FIGURE 2.—Trend of value of gold production of Alaska, 1880–1932.

Gold and silver produced in Alaska, 1932, by sources

	Gold		Silver	
	Fine ounces	Value	Fine ounces	Value
Gold ores	226,733	$4,687,000	115,300	$32,500
Copper ores			81,150	22,900
Placers	267,127	5,522,000	37,600	10,600
	493,860	10,209,000	234,050	66,000

GOLD LODES

Alaska lode mines in 1932 yielded $4,687,000 in gold, or slightly more than in 1931, when the production was $4,665,000. The gold derived from lodes was about 46 percent of the entire gold production of the Territory for 1932. In 1931 lodes furnished about 49 percent of the total. The gold was recovered from widely distributed mines, but about 75 percent came from southeastern Alaska, as shown in the following table:

Gold produced from gold-lode mines in Alaska in 1932, by districts

District	Fine ounces	Value
Southeastern Alaska	169,506	$3,504,000
Willow Creek	34,298	709,000
Fairbanks district	8,707	180,000
Other districts	14,222	294,000
	226,733	4,687,000

Of the Alaska lode-gold mines the properties of the Alaska Juneau Gold Mining Co. in southeastern Alaska are by far the largest, and that company alone produced over two thirds of the total lode-gold output of the Territory in 1932. The magnitude of this company's mining operations is set forth in its published report to its stockholders, from which the following statements are abstracted: The total rock mined and trammed to the mill in 1932 was 4,001,630 tons, an average of over 10,960 tons a day. Of this amount 1,587,161 tons of coarse tailings was rejected and 2,414,469 tons was fine-milled. The average gold content of all the material mined was $1.00 a ton. The amount of gold in that part of the rock which was rejected was about 17 cents a ton, and the value of the gold content of the rock that was further treated was about $1.54 a ton. Of this content gold worth 24 cents was lost during the treatment, $1.02 was recovered as bullion, and 28 cents was recovered in the concentrates, which were subsequently smelted. The following table, compiled from the published reports of the Alaska Juneau Gold Mining Co., summarizes the mining record of this company since the beginning of its operations in 1893:

Production of Alaska Juneau mine, 1893–1932

Year	Ore (tons)			Metals recovered			
	Total	Fine milled	Coarse tailings rejected	Gold	Silver lost in tailing	Lead lost in tailing	Total value
					Ounces	*Pounds*	
1893–1913	507, 254	330, 278	176, 976	$707, 730			$707, 730
1914–15	242, 328	239, 918	2, 410	251, 655	6, 192	117, 031	261, 326
1916	180, 113	180, 113		115, 022	2, 844	61, 068	121, 378
1917	677, 410	677, 410		429, 262	12, 248	296, 179	460, 666
1918	592, 218	574, 285	17, 933	430, 124	11, 828	273, 297	459, 445
1919	692, 895	616, 302	76, 593	499, 002	16, 431	359, 762	542, 714
1920	942, 870	637, 321	305, 549	732, 870	23, 348	487, 574	791, 389
1921	1, 613, 600	904, 323	709, 277	969, 703	40, 619	550, 913	1, 035, 251
1922	2, 310, 550	1, 108, 559	1, 201, 991	1, 296, 157	49, 405	687, 315	1, 388, 679
1923	2, 476, 240	1, 134, 759	1, 341, 481	1, 427, 199	41, 876	755, 423	1, 514, 774
1924	3, 068, 190	1, 367, 528	1, 700, 662	1, 907, 374	63, 191	1, 256, 857	2, 055, 782
1925	3, 481, 780	1, 537, 884	1, 943, 896	2, 030, 067	55, 971	1, 288, 974	2, 184, 384
1926	3, 829, 700	1, 649, 678	2, 180, 002	1, 931, 052	52, 333	1, 300, 915	2, 067, 836
1927	4, 267, 810	1, 839, 695	2, 428, 115	2, 328, 540	61, 232	1, 513, 306	2, 463, 262
1928	3, 718, 140	1, 795, 191	1, 922, 949	3, 142, 808	77, 591	2, 058, 655	3, 316, 019
1929	3, 836, 440	2, 020, 470	1, 815, 970	3, 410, 408	90, 635	2, 501, 832	3, 627, 247
1930	3, 924, 460	2, 066, 239	1, 858, 221	3, 375, 659	97, 607	2, 640, 771	3, 551, 950
1931	4, 162, 350	2, 298, 998	1, 863, 352	3, 710, 927	118, 508	3, 309, 176	3, 879, 839
1932	4, 001, 630	2, 414, 469	1, 587, 161	3, 133, 122	94, 519	2, 509, 263	3, 236, 183
	44, 525, 978	23, 393, 420	21, 132, 558	31, 828, 681	916, 378	21, 948, 311	33, 665, 854

The cost of mining for 1932 was stated by the company to have been 26.24 cents for each ton of ore trammed to the mill, the cost of milling was 21.20 cents, and all other marketing costs and expenses, including interest, amounted to 6.41 cents, making the entire operating cost for each ton of ore trammed only 53.85 cents. Not only have the mining and milling costs been kept at a low figure, but the tenor of the ore handled has been rather higher than the average. So successfully have the company's affairs been handled that the officials report a net operating profit of 27.02 cents a ton of ore trammed and were thus able to pay dividends.

This record is especially impressive for the last few years, when operating costs have been successively reduced, until now they stand at so low a figure as to compel the highest admiration for the technical insight and administrative ability that have developed such efficient operation. The outstanding significance of this enterprise has long been recognized by mining engineers throughout the world but received special attention in 1932, when one of the most prominent technical journals devoted an entire issue to a series of articles describing each of the major subdivisions charged with the conduct of parts of the enterprise. These articles [3] are replete with specific information—facts of significance regarding this particular property but applicable in general to efficient modern practice in the handling and treatment of large quantities of low-grade mineralized rock.

During the year the Alaska Juneau Gold Mining Co. has done considerable prospecting and development work. On the north ore body

[3] Bradley, P. R., and others, The Alaska Juneau enterprise: Eng. and Min. Jour., vol. 133, pp. 459–503, 1932.

about 18,750,000 tons of ore has been partly blocked out, and preparatory work to bring out this ore has been advanced to such a stage that some 300 tons a day is now being taken out, and by the end of 1933 this should be increased to more than 1,000 tons a day. In the southern part of the mine, where 38,900,000 tons of ore has been blocked out above level 3, the new developments have consisted mainly in preparatory work and the cutting out of cone 8. There was a small decrease in the tonnage trammed during the year, but a larger proportion of it was fine-milled. Milling operations were carried on without change from the preceding year and at slightly lower cost.

In addition to the work on its main property, the Alaska Juneau Gold Mining Co. undertook some prospecting in other parts of the Juneau District. The Hallum-Dora group of claims, on which it had done considerable testing under option, was dropped during the year because, as stated by the company, "exhaustive prospecting in the claims failed to indicate sufficient value to justify continuing the work." In the Taku River Valley the company also has undertaken considerable prospecting work, which is thus summarized in the company's report: "In addition to the group of 20 claims under option on the Tulsequah River, options were taken on the White Water group and on the McDougall group, all contiguous. It is proposed to move portable gasoline-driven compressors on the ground this summer (1933) and to do some underground prospecting at those places showing the best assays."

The next most productive gold-lode district in southeastern Alaska is Chichagof Island. On this island the two principal mines are those of the Chichagoff Mining Co. and the Hirst-Chichagof Mining Co., the former situated near Klag Bay, about 60 miles northwest of Sitka, and the latter near Mine Bay, about 10 miles beyond to the northwest. At the Chichagoff property the new development work, which had been in progress for some time, was so far advanced that an output of ore was maintained to supply the mill practically without interruption. More than 50 men were employed at the property in various capacities, both above and underground. Further underground development was in progress, especially in extending the work on the fifteenth level and in preparing to sink and open up ground on the sixteenth level. At the Hirst-Chichagof mine operations were carried on almost continuously throughout the year by a force of about 30 men. The main new feature at this property was the installation in the mill of apparatus required in treating part of the ore by flotation, in the expectation that thereby the recovery of gold would be greatly increased. The method seems to have worked successfully, not only in treating freshly mined ore but also in re-treating considerable

amounts of the old tailings that had been accumulated from the earlier milling activities, when the recovery of gold was not so efficient.

The developments at these two larger properties on Chichagoff Island have revived interest in prospecting in the entire region, and as a result several new finds of ore have been made, and development work has been resumed at several of the properties that lately have been inactive. Among these properties is that of the Alaska Chichagoff Mining Co., more generally known as the Bez property, or sometimes as the McKallick Chichagoff Gold Mines, Inc., where several men were employed during the season in development work.

Farther north on Yakobi Island the Apex-El Nido mine, which in the past had yielded much lode gold, was the scene of some mining, and a small amount of ore was milled. Work at this place is reported to have been carried on by a crew of a dozen or more men and consisted mostly of prospecting and development work. Still farther north, on Dundas Bay, on the north shore of Cross Sound, a small crew did some work on the property of the Alaska Independence Mining Co. The general revival of interest in the whole western part of Chichagoff Island and adjacent areas is regarded as a promising indication of increased mining activity. Unfortunately, however, this interest is being utilized by some unscrupulous promoters to impose on a credulous public. Among the schemes of this sort which were set on foot was the sale of stock in a company said to hold claims on Fish Bay, on the northern coast of Baranof Island, in the so-called Blackhawk district. This enterprise appears to have been purely a promotional scheme, as there had been no recent developments on the property, and former investigations had not disclosed conditions that would give a basis for the roseate claims of the promoters.

Elsewhere in the northern part of southeastern Alaska the only other property from which gold was produced in 1932 appears to have been that of the Admiralty Alaska Gold Mining Co., on Funter Bay, Admiralty Island. During the year this company acquired an option on a large number of claims adjacent to its own property and extending all the way to Hawk Inlet. Further prospecting and exploration are reported to be contemplated before definite plans looking toward placing the property on a continuously productive basis are formulated. A little new work is reported to have been done on the old Marty claims, on Windham Bay, but it was mostly of a prospecting type. About 6 miles north of Juneau a small crew did considerable prospecting on Carlson Creek on ground that had been known as the Clark claims. It is understood that this work was being done by a subsidiary of the Premier Gold Mining Co., whose principal holdings are in British Columbia, a short distance inland from Hyder, at the head of Portland Canal.

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In the Ketchikan district, in the southern part of southeastern Alaska, there was considerable prospecting for gold lodes but only a little production. Some gold was recovered from ores mined on the property of the Gold Standard, on Helm Bay, Cleveland Peninsula, north of Ketchikan, and from the old Sea Level mine, on Thorne Arm, southeast of Ketchikan. During the year appreciation of the opportunities that mining offered in building up and stabilizing the development of the entire district led a group of the more forward-looking citizens of Ketchikan to associate themselves together for the purpose of aiding prospecting in the district. This enterprise had been under way too short a time to have achieved noteworthy results, but it is understood that a start was made and that five prospecting projects were undertaken.

Little detailed information has been received by the Geological Survey regarding recent developments in the Hyder district, east of Ketchikan. Apparently work was continued there on about the same scale and at about the same places as in 1931. The greatest amount of development work appears to have been done on claims along the flanks of Banded Mountain, near the head of the Chickamin River, and at the head of the West Fork of Texas Creek. Some steps were taken toward reopening the old Riverside mine, in the eastern part of the valley of the Salmon River, but up to the end of the year these had not led to any definite action.

The Willow Creek district, at the head of Cook Inlet, has long been the second most productive gold-lode district in the Territory, having produced gold worth nearly $5,000,000 since lode mining started there in 1909. The principal producing company in this district is the Willow Creek Mines, Inc., which holds considerable property on Craigie Creek and gets its ore mainly from the Lucky Shot mine, on the northern slopes of the creek valley. Between 80 and 100 men were employed on the property in construction work, as well as in the mine and at the mill. This property has been capably managed and adequately equipped, so that it is an excellent example of a modern plant capable of producing and treating about 50 tons of ore a day, most of which will average better than $25 a ton. Heretofore the cost of freighting supplies to the mine has been high, owing to the fact that the wagon road crosses a high ridge that remains blocked by snow for nearly 8 months each year and at all times presents steep slopes. During the year, however, a new road following the creek grade leading from the railroad at Willow to the mine was completed, so that tractors can be used on it throughout the year. A landing field for airplanes was also built a short distance from the mine, so that communication with Anchorage and other places may be quickly effected.

A short distance north of the Lucky Shot, on Craigie Creek, considerable development was undertaken on the old Kempf claims by

the Gold Top Syndicate. Work on this project was considerably delayed by the lateness with which the season opened in the spring of 1932 and by the heavy freshets which occurred during the summer. In spite of these handicaps a camp was established, several hundred feet of underground development begun, and an aerial tramway built, and every indication points to the conclusion that prospecting will be vigorously continued.

Throughout the Willow Creek district the winter of 1931–32 was marked by exceedingly heavy snowfall, and this badly hampered normal activities and led, with the softening of the snow, to serious slides that wrecked many of the buildings at the various camps, so that much time was lost from productive mining in the necessary work of reconstruction. Damage of this sort was especially severe at the Fern mine, on Archangel Creek; at the camp of the Marion Twin, at the head of Craigie Creek; and at the Gold Cord, on Fishhook Creek. Furthermore, the summer of 1932 was marked by several heavy floods that swept out considerable stretches of the main road leading from the railroad at Wasilla to the district and at times made the other roads and trails impassable and destroyed many of the mining facilities. Among the heavy sufferers from the floods was the Marion Twin mine, in the Little Susitna Valley, where flumes and pipe lines were carried away. In spite of these difficulties productive mining was done at the Gold Cord, Fern, and High Grade mines, and considerable development work was also accomplished on a number of the other properties that have long been known. Some cruder exploratory work was also carried on at points more remote from the proved productive areas, and a general revival in mining throughout the district was evident. The showings already made give a firm basis for the belief that excellent as was the showing of the Willow Creek camp in 1932, that record by no means marks the limit of the output that may be expected as developments now in progress are brought to a productive stage.

The third most productive lode-gold district in the Territory is in the vicinity of Fairbanks. Its lode-gold output in 1932 was somewhat more than in 1931, and the indications are that an even greater increase may be looked for in the future. The total output of lode gold from the Fairbanks district during the period since 1910, when that type of mining began, has been about $2,300,000. There are two principal producing lode-gold areas more or less close to Fairbanks; one embraces the country adjacent to Pedro Dome and lies 15 to 20 miles north and east of the town, and the other, embracing parts of Ester Dome, lies 6 to 10 miles west of the town. In the Pedro Dome area the largest production came from the property of the Cleary Hill Mines, near the junction of Bedrock and Cleary Creeks, formerly known as the Rhoads-Hall mine. Smaller camps at which

some development work was in progress and some gold recovered are widely scattered throughout a more or less definite eastward-trending tract about 10 miles long. Of these smaller camps the one maintained by C. M. Hawkins, on part of the old Spaulding claims on Dome Creek appears to have been most successful. Work on this property was discontinued during the summer, however, and Mr. Hawkins transferred his activities to the development of one of the properties in the vicinity of Ester Dome. In the Ester Dome area the search for gold lodes was carried on fully as energetically as heretofore, but the amount of productive mining was somewhat less than usual. This condition is regarded as merely temporary, for, in fact, several of the lines of evidence indicate an early resumption of work at several of the properties on a more productive scale. The lode deposits of the whole Fairbanks district were examined with special thoroughness by J. M. Hill,[4] of the Geological Survey, and his report discloses evidence that leads him to conclude that with adequate financial support and skillful technical and administrative assistance many of the Fairbanks lode deposits are likely to be developed profitably.

Among the districts producing lode gold grouped together in the table on page 12 under the heading "Other districts" the most productive, arranged in the relative order of their output of lode gold, are the Nabesna district, which lies north of the Wrangell Mountains, of the Copper River region; the Bonnifield district, north of the Alaska Range; the Nixon Fork district, in the Kuskokwim region; Kenai Peninsula, including the Nuka Bay area, the area south of Hope, and the hills north of Girdwood; and the mines in the vicinity of Valdez, in the Prince William Sound region. In most of these districts the production came from a single mine, so that to avoid disclosing the individual output it has been necessary to combine the statistics.

In the Nabesna district the only producing gold-lode mine is that of the Nabesna Mining Corporation, which is sometimes referred to as the Carl Whitham mine, from the name of its principal owner and manager. This mine is situated on White Mountain west of the Nabesna River, between its tributaries Jack and Jacksina Creeks. Active production began at this mine in 1931, and a large part of that season was spent in necessary construction work, so that 1932 was the first year when the full open season was utilized in productive mining. The results of that work were decidedly encouraging and have induced the operators to put in additional equipment, so that an increased amount of ore will be mined, and a better recovery of value from the ore treated is expected another year. So far the property has been operated only during the open season, a period of

[4] Hill, J. M., Lode deposits of the Fairbanks district, Alaska: U.S. Geol. Survey Bull. 849-B, 1933.

about 4 months, though considerable freighting of the needed supplies is done during the winter. With continued development it seems probable that year-round mining would prove not only feasible but advantageous in reducing costs. This mine was visited by Fred H. Moffit [5] in 1931, and his description of it has recently been published by the Geological Survey.

In the Bonnifield district the only lode mining in progress was that on the property of the Eva Creek Mining Co. This property is reached from the Alaska Railroad station at Ferry by a good wagon road about 14 miles long. The deposit has been known for many years, but it was not until late in the fall of 1931 that the owners felt that they were justified in placing a mill on the property and beginning productive mining. The deposit consists of a large body of mixed sulphides, largely arsenopyrite, lying at a very flat angle in schists. Its position makes it particularly difficult to mine by ordinary methods without excessive caving. After attempting to extract the richer portions of the ore by means of drifting, that scheme was abandoned, and a method somewhat similar to that of the longwall retreating method used in many coal mines was adopted. By this plan it is practicable to take out almost all the mineralized rock, though by so doing the tenor of the ore is considerably less than that recovered by the more selective system formerly in vogue. The ore is concentrated in a mill on the property, and the concentrates are shipped to a smelter in the States for treatment. A description of the property based on examinations made in 1930 by Fred H. Moffit and in 1931 by J. M. Hill has recently been published by the Geological Survey.[6]

In the Kuskokwim Valley the only lode-gold production reported came from the old Pearson & Strand mine, on Ruby Creek, in the Nixon Fork district, which was operated by Charles Mespelt and associates. No details regarding the recent developments at this mine are available, but the output of gold seems to indicate that less work was done than in 1931. The mine was in operation throughout the year, but the mill was operated only during part of the summer. A crew of half a dozen or so was employed. Although no other mine in this district reported having produced any lode gold in 1932, some prospecting was said to be in progress at the old Whelan mine. This work consisted mainly in the digging of several surface trenches in search of veins worthy of more intensive examination. It is reported that this work disclosed some ore that appeared of sufficiently high grade to justify continuation of the search.

The principal districts in the so-called Kenai Peninsula region in which some lode-gold production was reported in 1932 were the Nuka Bay, Hope-Sunrise, and Girdwood. The Nuka Bay district embraces

[5] Moffit, F. H., The Suslota Pass district, Alaska: U.S. Geol. Survey Bull. 844-C, 1933.

[6] Moffit, F. H., Mining development in the Tatlanika and Totatlanika Basins, Alaska: U.S. Geol. Survey Bull. 836, pp. 340-345, 1933.

country near the extreme southern part of Kenai Peninsula; the Hope-Sunrise district embraces much of the country lying north of the Moose Pass station, on the Alaska Railroad, and extending to the old settlements of Hope and Sunrise on Turnagain Arm; the Girdwood district really does not fall within the limits of Kenai Peninsula proper but lies just north of it, extending a few miles northward from the shores of Turnagain Arm. The entire belt of rocks in which the deposits of these three districts occur is dominantly a deformed series of slate and graywacke which has locally been intruded by igneous dikes that are currently referred to as greenstones. The veins occupy fractures of rather irregular form and moderate extent, and their values are largely free gold, though sulphides are by no means uncommon. In the Nuka Bay district the greatest amount of work has been done and the most gold recovered from the Sonny Fox mine, operated by Babcock & Downey, but there are at least a dozen other properties on which considerable exploration work has been done, and from several of these some shipments of ore have been made. The entire district was recently examined by Earl Pilgrim, under the auspices of the Territorial Government, and the results of his findings have been incorporated in a report recently published.[7] In this report, which is accompanied by an excellent sketch map of the district, is given detailed information regarding the extent of developments on each of the properties.

Farther north, in the Hope-Sunrise district, the principal producing property is the Lucky Strike mine, on Palmer Creek, long successfully developed by John Hirshey but in 1932 operated under a new management. In addition there are more than a dozen places where lode developments have been undertaken in the past, and at some of these active prospecting is still in progress. A comprehensive description of all the lode prospects in this part of Kenai Peninsula, prepared after a thorough field examination, has been published by the Geological Survey.[8] Late in the fall of 1932 an examination of one of the prospects near Hope was made by engineers representing sound financial interests with a view to undertaking an extensive exploration of it if the conditions seemed to justify that outlay. No information has yet been made public as to the conclusions reached from this examination.

In the Girdwood district, north of Turnagain Arm, the principal area in which the search for gold lodes was made in 1932 was near the head of Crow Creek, a tributary of Glacier Creek. The production from the district was small, and most of the work was carried on by parties of 2 or 3 men with very slight financial backing and almost no

[7] Stewart, B. D., Mining investigations and mine inspection in Alaska, biennium ending Mar. 31, 1933, pp. 26–51, 1933.

[8] Tuck, Ralph, The Moose Pass-Hope district, Kenai Peninsula, Alaska: U.S. Geol. Survey Bull. 849–I, 1933.

adequate mechanical equipment. The entire region was studied in some detail by a Geological Survey party, and a report on the results of that work,[9] accompanied by a detailed topographic map of the district, by W. G. Carson, has been published.

Lode-gold production from the Valdez district in 1932 was small, but at several properties development work was in progress, and there were reports that negotiations were in progress for the reopening of several of the old properties that have long been inactive, though in the past they produced considerable gold. The region is easily accessible to deep-water transportation, and the known occurrence of mineralization in it gives adequate incentive to reexamine some of the known deposits in the light of present conditions, because costs have decreased very much from those that prevailed at the time the mines were being worked. This statement, of course, applies only to the gold mines, inasmuch as their product has a fixed value. The lodes in which the principal metallic minerals are ores of the base metals can hardly be expected to be attractive to capital at this time of excessively low prices for base metals.

Prospecting for gold lodes was continued at many other places throughout the Territory, though at none of them, so far as reported to the Geological Survey, was there any real production of ore, and at none of them was any gold produced except the little that may have been recovered in the course of testing the ore during development work. In the Copper River region considerable prospecting for gold lodes is reported to have been done in the Bremner district. According to local reports, more than a dozen men were engaged in the search there during 1932, and as a result several leads that are regarded as promising have been found and partly opened up. The property on which most work is said to have been done is that of the Ramer Bros., on Golconda Creek. Elsewhere in the Copper River region little new prospecting for gold lodes has been done, though some work was done at two lode properties in the Tiekel district, and claims are still held in the Kotsina and McKinley Lakes districts.

In the past many other districts in Alaska have disclosed evidence of containing lode-gold deposits that merit careful consideration as potential sources of that metal. Several of the more promising of these districts, adjacent to the Alaska Railroad, in central Alaska, were examined in considerable detail in 1931, and comprehensive reports, most of which are accompanied by maps, were prepared and published. Among the districts of this sort may be mentioned Mount Eielson, on the northern flanks of the Alaska Range, about 60 miles west of McKinley Park station;[10] the West Fork of the

[9] Park, C. F., The Girdwood district, Alaska: U.S. Geol. Survey Bull. 849-G, 1933.
[10] Reed, J. C., The Mount Eielson district, Alaska: U.S. Geol. Survey Bull. 849-D, 1933.

Chulitna River, some 10 miles west of Colorado station;[11] the Eureka area, in the Kantishna district, northwest of Mount Eielson;[12] and the Valdez Creek district, some 60 miles east of Cantwell station.[13]

In addition to the foregoing, the reported occurrence of lode-gold prospects in the vicinity of Hidden River some 25 miles west of Curry was examined by Ralph Tuck in 1932, and a report of his findings is in preparation.[14]

In Seward Peninsula development work was in progress at a number of places on lodes containing gold, though so far as has been reported none of the deposits yielded appreciable amounts of gold. Probably the most significant prospecting of this sort was that undertaken in the neighborhood of Bluff, some 60 miles east of Nome, where J. G. Galvin and associates took over and propose to test thoroughly a large tract of country known to contain veins that had been somewhat cursorily prospected in the past. Much of the ore contains considerable free gold, but that from other veins contains much sulphide, principally arsenopyrite, so that it will have to be concentrated and shipped to a smelter in the States for treatment. Development work was also in progress in the divide between the Stewart and Snake River Valleys in the vicinity of Mount Distin, on the Head & Strand property and to the west at the Jannsen prospect. At the Jannsen camp considerable difficulty was experienced at the time of the writer's visit, owing to the large amount of surface water in the underground workings, and it was proposed to suspend work until the winter, when that source of trouble would disappear. Some lode prospecting was also in progress on sulphide-bearing lodes disclosed in the course of placer mining within 5 or 6 miles of Nome and along the southern slopes of Anvil Mountain. Rumors continue to be current that plans are under consideration for the reopening of the old Big Hurrah quartz mine in the Solomon district, some 40 miles east of Nome, but so far as could be learned nothing was done on the ground in 1932 to carry that purpose into effect.

GOLD PLACERS

GENERAL CONDITION

Placer mining in Alaska in 1932 returned gold worth $5,522,000. This marks a very considerable increase over the output of the preceding year and in fact was larger than for any other year since 1918. The annual production of placer gold and certain other data relating to Alaska's gold production are represented graphically in figure 2. From this diagram may be traced many of the changes that have

[11] Ross, C. P., Mineral deposits near the West Fork of the Chulitna River, Alaska: U.S. Geol. Survey Bull. 849-E, 1933.

[12] Wells, F. G., Lode deposits of Eureka and vicinity, Kantishna district, Alaska: U.S. Geol. Survey Bull. 849-F, 1933.

[13] Ross, C. P., The Valdez Creek district, Alaska: U.S. Geol. Survey Bull. 849-H, 1933.

[14] Tuck, Ralph, The Curry district, Alaska: U.S. Geol. Survey Bull. 857-C (in preparation).

taken place in the industry. Thus in no year from the beginning of the industry in 1880 to 1898 did the production of placer gold amount to as much as $1,000,000, and the average during that period was less than $280,000. In 1899 there was a sudden increase, marking the discoveries of Nome and some of the camps in the upper Yukon Valley, which were soon followed by the discovery of Fairbanks and many of the other camps of the interior. The resulting golden period lasted through 1916, during which the annual yield of placer gold averaged more than $10,000,000 and in 1906 reached the peak of nearly $19,000,000. In 1918, after the entry of the United States into the World War, placer production dropped to about $5,000,000 and in the 14 years since that time it has fluctuated between that amount and $3,000,000.

The trend of placer mining in Alaska for the past few years has been toward the development of large enterprises requiring the installation of expensive equipment such as dredges or other mechanical devices and the mining of relatively low grade deposits through careful control of costs. With the unemployment situation in the States and with the financial stringency that has made it difficult to raise funds for undertaking new enterprises there has been some revival of prospecting and the development of small properties by outfits of 2 or 3 men without much equipment. In fact, it appeared that more men were in the hills in 1932, looking for suitable places to put forth their efforts, than in any of the recently preceding years. With continued lack of employment in other fields it seems not at all improbable that an even larger number of men will turn to prospecting, as that occupation offers many attractions to a man who enjoys the simple life, working more or less as his own boss, when, where, and how he pleases, and with the allurement of possibly discovering a real prize as a result of his efforts. Such a career obviously should be undertaken only by the physically fit and those reasonably skilled in understanding nature's secrets and the ways of acquiring what she has to offer. The life of the prospector is hard, and success comes to few in any line of endeavor; but it is believed that Alaska still holds out opportunities for the capable placer prospector to find tracts that, while not bonanzas, will well repay his best endeavors. There also seems to be an increasing interest among capitalists and others in the mining development of the Territory, and doubtless, as they hold out incentives for finding workable properties, they will discover men ready and willing to undertake the quest. Anyone who remembers the difficulties of the early days and sees the present enormously better facilities and lower costs, however, has little sympathy with the laments that are often heard as to the difficulties of carrying on prospecting work. It sometimes seems as if we had become so tied to automobiles, railroads, and wagon roads that we forget that

the bulk of the placer gold of Alaska was produced practically without dependence on these facilities. It is believed that there are still large tracts of Alaska that have not yet been thoroughly prospected or adequately examined for large-scale placer operations. Most of these areas do not appear to give promise of holding bonanza deposits that can be won cheaply. There are, however, extensive areas in which, it is confidently believed, large, well-organized, and well-managed companies will find placers that can be mined profitably for many years.

PRODUCTION BY DISTRICTS

The description already given as to the methods used in collecting and interpreting the information that forms the basis of this report indicates that it is more difficult to obtain accurate facts regarding the production of placer gold than regarding any of the other items. This is due to the great number of small producers, who are widely scattered and many of whom are in the most remote parts of the Territory. The gold they produce frequently passes through many hands before it finally reaches a mint or assay office, so that a single lot is difficult to trace, for it may appear in the reports of the individual and then lose its identity by being lumped with other gold by the storekeeper who took it in exchange for supplies, and still further consolidated by the bank, perhaps in some distant district, to which it was sent by the merchant, and its course perhaps still further obscured by being shipped to another bank before being turned in to the mint. Every reasonable effort has been made to check the information from different sources and to adjust discrepancies so far as possible. As a result it is believed that the figures given for the total placer production are in accord with the actual facts. The distribution of this total among the different districts, however, is open to more serious errors, as gold produced in one district, unless reported to the Geological Survey by the original producer, may be credited to some other district through which it passed in the course of trade. In spite of the possibility of some error in the distribution of placer gold among the different districts, the following table has been prepared to show the comparative standing of the different districts as accurately as possible. The largest amount came from the Yukon Basin, and the next largest from Seward Peninsula. Placer mining in each of the main regions will be discussed in some detail in the following pages, and the more notable events of the year will be recorded for each region.

Value of placer gold produced in Alaska in 1932 and 1931

Region	1932	1931	Decrease or increase, 1932
Southeastern Alaska	$3,000	$3,000	----------
Copper River region	68,000	88,000	−20,000
Cook Inlet and Susitna region	114,000	105,000	+9,000
Yukon Basin	3,648,000	3,269,000	+379,000
Kuskokwim region	153,000	158,000	−5,000
Seward Peninsula	1,533,000	1,215,000	+318,000
Northwestern Alaska	3,000	4,000	−1,000
	5,522,000	4,842,000	+680,000

SOUTHEASTERN ALASKA

Although southeastern Alaska is rich in lodes of gold and other metals, its placers are of relatively small extent and yield only a little gold, because throughout most of the region the topography is mountainous, with precipitous slopes leading down from the crests of the ridges to the ocean waters or to the valley floors and affording little or no lodgment for detrital material. Furthermore, so much of the region was occupied in the relatively recent past by glaciers that there is an almost complete lack of deposits produced through the long-continued sorting action that is so essential for the formation of rich placers. Even along the coast there are almost no beaches where concentration has long been effective. In the lowlands of the larger streams, in some of which great amounts of detrital material have been dumped by past geologic processes, sorting action such as is conducive to the formation of rich placers has been relatively slight, and much of the material handled by the streams has not been subjected to weathering and similar processes, which unlock the mineral grains of different kinds and thus promote their separation through physical differences. There is, therefore, small likelihood that southeastern Alaska as a whole holds much promise as a placer region, though in a few places where special geologic conditions prevail there is a chance of finding placers of value.

As shown in the table above, the entire placer production from southeastern Alaska in 1932 is estimated to have been worth only $3,000, so that even the largest operations were small camps of two or three men each who took out only enough gold to make a very modest grubstake. There are three areas in southeastern Alaska in which, in the past, placer mining has been active; namely, near Juneau, in the valley of the Porcupine River, and in the beaches between Lituya and Yakataga Bays. No placer mining is reported to have been in progress in the Juneau district in 1931, and only a little gold was recovered from the placers in the Porcupine district, though there were a number of prospectors in it, and construction work was continued on the large group of claims that belonged to

one company which has been doing preparatory work there for several years. During the year half a dozen prospectors associated themselves together to examine reported placer deposits in part of the valley of the Endicott River south of Haines. The results apparently were not sufficiently encouraging to induce the party to continue its work in that area for more than a few weeks. In the Lituya-Yakataga region placer mining was continued on about the same scale as it has been for several years. The placers there are all of the beach type, exposed to the waves of the Pacific Ocean. This position in a measure is favorable for concentration of the beach material, but it is also disadvantageous, because except under suitable weather conditions the placers cannot be mined, and even then the use of extensive fixed mechanical appliances is precluded by the necessity of removing them during times of storm.

COPPER RIVER REGION

In the Copper River Valley there are two principal areas and one minor area that yield placer gold, though there are a few small camps widely scattered throughout the river basin. The principal areas, named in order of their production, are the Nizina and Chistochina districts, and the minor area is the Nelchina district. As will be noted from the table on page 25, the value of the placer gold produced from the Copper River districts in 1932 was $68,000, or somewhat less than in 1931. In the Nizina district the bulk of the placer gold came from the properties of the Chititu Mines, on Chititu and Rex Creeks, and the Nicolai Placer Mines, on Dan Creek. About 55 men were employed at these two properties, and a few others were engaged in prospecting on their own account elsewhere in the district. At the Chititu and Rex Creek properties the work was conducted along the same general lines as heretofore. At the Dan Creek property, steps for obtaining water at a higher elevation than heretofore were in progress, with a view to enabling the company to mine some of the bench deposits that have long been known to be auriferous. The principal new area near the Chitina Valley that is attracting prospectors is in the Bremner River region to the south, especially in the vicinity of Golconda and Monahan Creeks. Work there has been confined mainly to simple prospecting methods of testing the deposits and has yielded only small amounts of gold recovered in the course of development. Apparently the results so far obtained indicate that the tenor of much of the ground that has been tested is too low to repay mining on a small scale by simple hand methods.

In the Chistochina district, at the northern limits of the Copper River Valley, the principal placer production came from two camps, one on Slate Creek and the other near the head of Middle Fork. The property on Slate Creek was worked under lay from the Slate Creek

Mining Co., and eight men were employed, using hydraulic methods. In addition, a camp employing four men was mining placers on Miller Gulch, a tributary of Slate Creek. Mining at the property at the head of the Middle Fork was carried on by the Alaska Middle Fork Mining Co., which employed five men throughout most of the open season.

In the Nelchina district, which is situated in the extreme western part of the Copper River region, all the mining was done by a few small camps consisting of only two or three men each, centering around Albert Creek, and the total production amounted to only a few thousand dollars.

COOK INLET-SUSITNA REGION

In the Cook Inlet-Susitna region, as the term is used in this report, are included the placer camps in Kenai Peninsula and adjacent country, the Yentna-Cache Creek district, and the Valdez Creek district, near the head of the Susitna River. In the past many of these districts have been highly productive, but their annual production has dwindled until now in most of them the annual output is only a fraction of what it was, and in some of them only a few score miners are now at work where formerly there were hundreds. However, in 1932 the output of placer gold from this region showed an increase of about $10,000 over that reported in 1931 and is estimated to have been $114,000. In the relative order of their placer production in 1932 these districts ranked as follows: Yentna-Cache Creek, Valdez Creek, Kenai Peninsula.

In the Yentna-Cache Creek district there were somewhat more than a dozen camps employing altogether between 50 and 60 men at which productive mining was in progress during 1932, and many other places where some prospecting work was done, though it amounted to little more than the annual required assessment work. By far the largest and most productive operations in the district were those carried on by the Peters Creek Placer Co., on Peters Creek, and by Murray & Harper, on a lease from J. C. Murray. In the drainage basin of Cache Creek there were in addition camps on Dollar, Falls, Thunder, and Nugget Creeks. In the Peters Creek Basin there were camps not only on the main stream but also on Bird and Willow Creeks. According to local reports a new company acquired much of the placer ground at the head of Peters Creek and all of Bird Creek and did a great deal of prospecting and preliminary work preparatory to engaging in active mining another season. The large operator near the eastern part of the Peters Creek Valley, in addition to mining, did a large amount of new construction work during the season, including the building of a long ditch from Martin Creek to bring additional water for hydraulicking. North of Peters Creek one small camp was mining on Long Creek, a tributary of the Tokichitna River, and pos-

sibly there were other prospecting parties in that region, though the Geological Survey has received no direct information as to the work accomplished or the specific places at which it was done. Southwest of Cache Creek, in the valley of the Kahiltna River and in the Fairview district, there were five small prospecting camps, three of which were on Lake Creek. None of these reported any new developments of note. On the whole the conditions in the Yentna-Cache Creek district seemed to indicate a noteworthy increase in placer-mining activity and promise of a greater production from the district in the near future. In fact, as one person who is well acquainted with the district stated, "The country looks better than it has for many years past, and a little boom is on."

In the Valdez Creek region, which lies some 125 miles north of Anchorage, near the head of the Susitna River and about 40 miles in an air line east of the main line of the Alaska Railroad, prospecting for both lodes and placers has been going on for many years. Although no new finds were reported to have been made during 1932, the returns to the few placer operators who were in the district appear to have been especially satisfactory, as they were larger than they have been in any of the preceding 10 years. The largest amount of gold came from properties mined by John E. Carlson and associates, comprising both bench and creek claims. From 10 to 15 men were employed in mining on these claims, and the ground was worked principally by hydraulicking. Some placer gold was also recovered from placers on White Creek. The Valdez Creek district was one of the areas studied in considerable detail by a Geological Survey party in charge of C. P. Ross in 1931, and a report on the results of that work is now available.[15]

The producing placer camps in the so-called Kenai Peninsula region are situated mainly in the vicinity of Hope, Sunrise, and Girdwood. All the camps in the Hope-Sunrise district are small, the largest of them yielding only a few thousand dollars and some of them only a few hundred dollars or a meager grubstake to the operators. In the vicinity of Hope and Sunrise placer mining was carried on at practically the same places as in the last few years, the largest operations being on Canyon and Lynx Creeks, south of Sunrise, and at the Resurrection River and Bear Creek, south of Hope. All the producing camps were visited in 1931 by Ralph Tuck, of the Geological Survey, and are described in a report prepared by him.[16]

In the Girdwood district, which lies north of Turnagain Arm and includes the valleys of Glacier Creek and its tributary Crow Creek, the only placer property that reported any notable production of

[15] Ross, C. P., The Valdez Creek mining district, Alaska: U.S. Geol. Survey Bull. 849-H, 1933.

[16] Tuck, Ralph, The Moose Pass-Hope district, Kenai Peninsula, Alaska: U.S. Geol. Survey Bull. 849-I, 1933.

gold was that of Holmgren & Erickson, about 4 miles north of Girdwood. The placer that is being mined is bench ground on the north side of Crow Creek, where a face of gravel 25 to 30 feet high stands about 15 feet above the present stream. The deposit presents many puzzling geologic features, as well as obstacles to easy mining, because much of it is frozen and does not break down readily under the attack of the hydraulic giants, and the lower part is full of boulders that must be drilled and blasted before they can be got rid of through the sluice boxes. Neither at the old Girdwood property, upstream, nor at the property on California Creek, downstream from the Holmgren ground, was any placer mining in progress. A comprehensive examination of all the mineral deposits in this district was made in 1931 by C. F. Park, and his report on the different properties is now available.[17]

YUKON REGION

The Yukon Valley embraces a tremendous extent of territory, and scattered through it from one end to the other are many placer-gold camps. In the past gold has been reported from almost every stream in the entire basin, though the quantities in some have been so small as to be of no commercial significance. For convenience of description in this report all the producing placer camps in this vast area have been grouped into 17 more or less distinct tracts that are here called districts. It should be noted that the boundaries of these districts are by no means well defined and do not necessarily correspond with any of the legal subdivisions, such as the precincts or recording districts. In the main, the names here given to these districts have been chosen from some of the more prominent features occurring in them. The main purpose of this grouping is to combine areas having in general similar interests and similar conditions and to separate those that are dissimilar. This results in throwing some large tracts together and in splitting up some other parts of the Yukon Valley into several small districts. In some places the boundaries of the different districts almost overlap; in others the boundaries of one district lie far from those of its nearest neighbor.

The gross output of placer gold from all the camps in the Yukon Valley in 1932 was worth $3,648,000, which is considerably more than the corresponding figure for 1931. The increase is attributed mainly to the especially favorable supply of water available for sluicing at most of the camps and to the increased activity in placer mining generally throughout the region.

In the following table the districts are arranged in order of their placer production in 1932, and for comparison the production from the same districts in 1931 is given. The total is believed to be correct

[17] Park, C. F., The Girdwood district, Alaska: U.S. Geol. Survey Bull. 849-G, 1933.

as stated, but the distribution of this total among the districts is open to some uncertainty, owing to the great number of small producers, their wide distribution, and the failure of some of them to supply the essential information. However, every reasonable precaution has been taken to guard against serious errors and to keep the estimates in accord with all the available facts, so that the figures stated are regarded for all practical purposes as accurate and comparable with similar figures for earlier years.

Value of placer gold produced in Yukon Basin, 1932 and 1931, by districts

District	1932	1931	District	1932	1931
Fairbanks and Richardson	$2,785,000	$2,486,000	Fortymile	$28,000	$66,000
Iditarod	364,000	237,000	Eagle	28,000	16,000
Innoko	107,000	96,000	Marshall	11,000	10,000
Hot Springs	72,000	59,000	Kantishna and Bonnifield	10,000	8,000
Ruby	72,000	54,000	Rampart	9,000	9,000
Tolovana	62,000	138,000	Chisana	7,000	3,000
Circle	59,000	55,000			
Koyukuk and Chandalar	34,000	32,000		3,648,000	3,269,000

In the foregoing table two small districts, the Richardson and Chandalar, have been grouped with the nearby larger districts, Fairbanks and Koyukuk, respectively, and two other small districts, the Kantishna and Bonnifield, have been combined. These combinations have been made to conform with earlier reports and to avoid disclosing confidential information regarding individual production from some of the small districts, where the bulk of the placer gold has come from only one or two mines. None of these small districts produced as much as $10,000, and some of them only a few thousand dollars.

The region adjacent to Fairbanks, here called the Fairbanks district, has long been and still is the main placer district in interior Alaska. The greatest amount of gold from this district was produced by dredges of the Fairbanks Exploration Co. on the Chatanika River and Cleary, Pedro, and Goldstream Creeks; and by lessees of the property of the Fairbanks Gold Dredging Co. on Fairbanks Creek. Considerable placer gold was also recovered by hydraulic or open-cut methods, and a little by drift mining. Placer gold recovered by other methods than dredging came principally from Goldstream, Pedro, Sourdough, Ester, Vault, and Dome Creeks, and the Big Chena and some of the tributaries of the Chatanika River east of its junction with Cleary Creek. Several thousand dollars' worth of placer gold, in addition to that produced by the dredges, came from placers on Fairbanks Creek. There were also smaller camps in the valleys of several of the other streams, whose production, though individually only a few hundred or a few thousand dollars, in the aggregate swelled the total production for the district considerably.

The extensive mining project being carried on by the Fairbanks Exploration Co., embracing large tracts on Goldstream and Cleary Creeks and the Chatanika River, continued to be the outstanding placer-mining enterprise not only in the Fairbanks district but throughout the Territory. Although new problems are constantly arising and being solved in connection with the work on this project, the underlying plan and methods have been outlined so adequately and skillfully that the work is proceeding in systematic fashion and, except for details, in the same manner as heretofore. Because of especially favorable supplies of water necessary for the various stages of operation a considerably greater volume of material was handled in 1932, and consequently a considerably larger amount of gold was recovered. The facts relating to the general operations of this company, with special reference to the methods of thawing the frozen ground and dredging the gold-bearing gravel, are set forth in a recent article by a member of the company's staff.[18] Among the significant news items regarding the operations of this company may be noted its announcement that during the winter it acquired considerable placer ground in the vicinity of Ester Creek. This will result in either an enlargement of the company's activities or the assurance of a greatly prolonged life of its enterprises in the district, either of which will mean much in stabilizing all forms of business activity in the district as well as in central Alaska.

East of the main mining area adjacent to Fairbanks are a number of small camps at intervals all the way to Richardson and south of that old settlement, including parts of Jarvis Creek and other tributaries of the Big Delta, south of the Tanana River. In years gone by, the Richardson or Tenderfoot camp had a rather large placer production, but at present there are not half a dozen men mining in that district. Therefore the use of its name in combination with Fairbanks in this report is not so much to designate two separate camps as to indicate a single ill-defined area between Fairbanks on the west and Richardson on the east. Thus between what may be called the real Fairbanks district and the Richardson district considerable gold was taken out by fairly large camps on Big Chena, during at least part of the open season as well as by small camps on the Salcha River and its tributaries. No information has been furnished to the Geological Survey as to the placer mining south of Richardson in the valley of Big Delta and its tributaries. However, from current reports it appears probable that only a few prospectors were in that region and that such work as they did was mainly prospecting or preliminary development work.

[18] Ogburn, R. H., Thawing and dredging gold at Fairbanks, Alaska: Min. and Met., vol. 14, no. 317, pp. 214-216, 1933.

Placer mining in the Iditarod district showed a notable increase in production in 1932 over 1931, due largely to exceptionally favorable supplies of water during the mining season and to the successful operation of some of the newly installed mechanical devices for handling large volumes of gravel at a low cost. As in the past the largest amount of gold recovered in the district was obtained by the two dredges, that of the North American Dredge Co., on Flat Creek, and that of the J. E. Riley Investment Co., on Otter Creek about 2 miles south of Flat, but there were in addition more than a dozen other properties each of which recovered at least several thousand dollars' worth of gold during the season. In all it is estimated that between 110 and 125 men were engaged in productive mining in the district during 1932, and there were a few others who probably accomplished little more than prospecting or development work. Next to the dredges the most effective method employed seems to have been the dragline scraper. Outfits of this sort were mining on Flat Creek and Happy Gulch, and while at the Flat Creek property much of the season was lost in installing the equipment and in dead work, the results on Happy Gulch were especially satisfactory. On Flat, Willow, Otter, and Chicken Creeks there were several camps mining by hydraulic methods and doing well. Among the larger hydraulic plants that were in operation were 1 leased from the Chicken Creek Mining Co., 2 on Flat Creek, under the direction of David Strandberg and Yost & Nash; 1 on Otter Creek, by Peter Miscovich; and 1 on Willow Creek, by LaChance & Thibault. The prospect of an even greater production from the Iditarod district next season seems not at all unlikely if the water supply and other factors that affect mining are essentially as favorable as they were in 1932.

The information reaching the Geological Survey regarding the recent mining developments in the Innoko district has not been as complete as desired or as that available for many of the other districts in the Yukon region. However, from such reports as are available it appears that the amount of placer gold mined in the district in 1932 was somewhat more than in 1931, though much less than during the earlier days of that camp. Here, as in many of the other districts, the largest output from a single property in the district was obtained by dredging. This property was on Little Creek, where a dredge operated under lease by Anderson, Pontella, Utilla & Larson was running the later part of the season. This enterprise was especially favored because considerable ground that had been artificially thawed by earlier operators was already available for mining, and thus the necessity for doing its own thawing was obviated. The dredge on Yankee Creek under the management of Archie Higgins was started early in the season but after running a short time encountered conditions that caused it to cease for the rest of the year. In addition to the dredges there were

several other placer camps on Little and Yankee Creeks and other camps on Ophir, Cripple, and Spruce Creeks and Victor Gulch, as well as a number of prospectors in other parts of the district. Most of these other plants were using hydraulic methods of mining, but at the property on Cripple Creek these methods were supplemented by the use of a slipline scraper.

The Hot Springs district, as the term is here used, consists of two rather widely separated tracts—one including the western part of the district from Tofty to Woodchopper Creek and even extending as far west as American Creek, the other including the eastern part, which centers around Eureka Creek and may be spoken of as the Eureka Creek section. The value of the placer gold produced in the entire district was somewhat more in 1932 than in 1931. More than two thirds of the gold from this district is recovered from dredges and hydraulic and other open-cut mines that are operated only during the summer and the rest from underground or drift mines. Between 50 and 60 men were engaged in the mines. Perhaps the most significant item of interest regarding the mining activities in the district was the resumption, in August, of productive mining by the dredge of the American Creek Dredging Co. on American Creek, after having been inactive for several years. Among the other larger producers in the region were Bock & Co. and Albrecht & Hanson, on Woodchopper Creek; Tilleson & L'Heureux, on Sullivan Creek; Johnson & Toftaker, on Glenn Creek; Farmer & Jones, on benches of Eureka Creek; J. R. Frank & Co., on benches of Pioneer Creek; and the estate of M. S. Gill, on Skookum Gulch. Smaller producing camps were situated on California, Boulder, Thanksgiving, and Omega Creeks, and a number of prospecting outfits were widely scattered at other points through the district. A comprehensive examination of practically all the mining operations in the Hot Springs district was made by J. B. Mertie, Jr., in 1931, and his report covering the results of that work is now available.[19]

The Ruby district, as that term is used in this report, is applied to a rather ill-defined area extending from the settlement at Ruby, on the Yukon, southward for 60 to 75 miles, to and beyond the small settlement of Poorman. Placer mining in this district has been in progress for several years, and a few years ago a mild rush followed on the discovery of some new deposits. This excitement soon died down when it was found that the new finds required laborious efforts to win, and many of the seekers for easy money left the district. The finds, however, did stimulate prospecting, and the workers developed some worth-while deposits, so that for the last 2 years the output of the district has shown a gratifying increase. The increase in 1932

[19] Mertie, J. B., Jr., The mineral deposits of the Rampart and Hot Springs districts, Alaska: U.S. Geol. Survey Bull. 844-D, 1933.

over 1931 is estimated to have been $18,000. Nearly two thirds of the production from the Ruby district comes from mines that are developed by drifting methods, and practically all of the mines in the southern part of the area are of this type. The most productive streams in the Poorman area are Poorman Creek itself and its tributaries Moose and Beaver Creeks. About 30 men are engaged in productive mining in this area. The two largest plants on Moose Creek are those of Shropshire, Gragan & Pedretti and Odergaard & Ross. On Poorman Creek the larger camps are those of Forno & Coyle and of Jensen and associates. On Timber Creek, a tributary of Poorman Creek, Monaghan, Stevens & Lohr carried on productive mining throughout the season. Several smaller camps were active on some of the smaller tributaries of these streams and in the more remote parts of the district. Nearer Ruby and in some of the longer-known creeks some placer gold continues to be mined each year. Of these creeks the most productive in 1932 were Long, Flat, Greenstone, and Meketchum Creeks and Bear Gulch.

The Tolovana district, as the term is used in this report, embraces a considerable tract of country lying north and northwest of Fairbanks. This is one of the few districts in the Yukon region whose output of placer gold showed a marked falling off in 1932 compared with its output in 1931. This decrease is almost entirely attributable to the destruction by fire of the only dredge in the region, which heretofore had been one of the largest producers. The lost dredge was the property of the Beaver Dredging Co., mining on Nome Creek. So far as learned no steps have been taken looking toward the building of a new dredge on this property. In the past the placer gold mined in the Tolovana district has been taken in about equal amounts from deep mines and hydraulic or open-cut mines. Lately, however, the amount of deep mining has decreased so much that in 1932 only one large producer—Silva & Co., near the head of Livengood Creek—mined by this method. At this place the overburden, which is penetrated to reach the pay streak, is in places nearly 100 feet thick. Most of the larger producing mines are on tributaries of Livengood Creek—Lillian, Ruth, Amy, and Gertrude Creeks and Glen Gulch. Some placer gold was also recovered from the Tolovana River and its tributaries east of Livengood Creek. Among these tributary streams the most productive were Olive Creek and Lucky Gulch, which join the Tolovana from the north, and Wilbur Creek, which enters it from the south. Late in the fall, according to local reports, a new organization acquired a considerable tract of potential placer ground on Livengood Creek, with the intention of thoroughly testing it by means of drilling, with the expectation that if the tests justify such action a dredge will be built to mine it. The drilling was not to be started until the spring of 1933 and even if successful can hardly be

expected to be followed up by productive mining until 1934. Accessibility of the Tolovana district will be considerably improved when the road now under construction from Fairbanks is completed, for at present except for such transportation as can be effected by airplanes, the trip to the district involves long, circuitous travel attended by much rehandling of freight and labor.

Placer-gold production in the Circle district was slightly more in 1932 than in 1931, though not nearly as large as the amount of mining activity in the district would at first sight promise. This condition was undoubtedly in large part attributable to that most uncommon complaint of placer miners—too much water. The extremely heavy rains and the resulting floods in the streams did serious damage at many of the properties by washing away the equipment or burying it under heavy deposits of gravel and detritus swept down by the storm waters, necessitating much dead work to clear away the debris and reset the sluice boxes, ditches, and other necessary mining apparatus. Placer-mining activities in 1932, as in the past, centered mainly in the valleys of those streams heading in the vicinity of Mastodon Dome and in the highlands adjacent to it, especially those flowing northward. On Miller Creek, the northernmost tributary of Mammoth Creek, there was one camp mining, and on Mastodon and Independence Creeks, which unite farther south to form Mammoth Creek, there were three camps each that were hydraulicking considerable areas. To the east, on Deadwood Creek and its principal tributary, Switch Creek, there were four mining camps working creek claims and two small camps searching for high-level old channels on the western flanks of the valley. Still farther east on Ketchum Creek and its tributary, Holdem Creek, there was a considerable flurry, owing to the discovery of some especially promising prospects, and several small outfits were actively prospecting. West of the Fairbanks-Circle trail, on Bonanza Creek, a tributary of Porcupine Creek, one camp was hydraulicking placers lying about a mile south of the mouth of the creek, near the junction of Yankee Creek and Porcupine Creek a small camp had been established, and farther east down Porcupine Creek some prospecting of the wide-floored valley was in progress. According to local reports some prospecting was in progress on Loper Creek, a tributary of Preacher Creek, with the aim of determining the practicability of installing a dredge there. No information has been made public as to the outcome of this search. South of Mastodon Dome practically the only productive mining that was done during the season was at the mouth of Eagle Creek, at its junction with Birch Creek, and a short distance southwest, near the junction of Butte and Birch Creeks. Prospecting was also in progress at several other points but so far as known did not swell the gold output of the district materially or disclose new deposits of note.

The Koyukuk district, as the term is here used, embraces a very large tract of country and consists of at least three rather widely separated areas in which placer gold has been mined. These subordinate areas are the Indian Creek-Hughes area, in the central part of the Koyukuk Valley; the Hogatza River area, somewhat north of Hughes and embracing country north of the Koyukuk River; and the upper Koyukuk area, which includes that part of the Koyukuk Valley lying north and northeast of Bettles and the country near Wiseman. Mining in the two more southern placer areas was practically negligible, and the Geological Survey has received no specific information regarding work there. The production of gold from the northern area shows a slight increase in 1932 over the amount produced in 1931, but the output is far below that of the earlier years of the camp. Much of the Koyukuk district lies in one of the more remote and inaccessible parts of Alaska, so that its development presents many obstacles, but the demonstrated extent and richness of its mineral deposits will inevitably lead to its further development. However, success in bringing this about will call not only for funds but also for the skill, persistence, and courage of the best miners and prospectors, and at present there are but a few score men undertaking that task. All the camps are small; the largest that was operating in the district, so far as known, consisted of only half a dozen men. So far as reported, the largest placer production came from three camps on the Hammond River and Nolan Creek and four camps on the Wild River and its tributary, Lake Creek. In the valley of the Wild River and Lake Creek the miners were especially handicapped this year by the heavy floods that occurred in midseason, which not only swept away the sluice boxes and other equipment but also swamped many of the pits and made prospecting especially difficult. Much of the Koyukuk district is so little known and so small a part of it has been accurately mapped, even on a reconnaissance scale, by the Geological Survey that a sketch map of the district showing all the available information regarding the position and names of the various creeks may be of interest. Such a sketch map, prepared by Robert Marshall, who spent several years in the district, has been published by the Geological Survey.[20] Those interested in a general description of the district, including some notes on the relation of its inhabitants to its mineral resources, will find much that is significant in a book by Mr. Marshall recently issued.[21]

In the table on page 30 the placer-gold production of the Chandalar district has been combined with that from the Koyukuk. The

[20] Marshall, Robert, Reconnaissance of northern Koyukuk Valley, Alaska: U.S. Geol. Survey Bull. 844-E, 1934.

[21] Marshall, Robert, Arctic village, 382 pp., New York, Harrison Smith & Robert Haas, Inc., 1933.

amount of gold that comes from the Chandalar is much less than that from the camps in the Koyukuk Valley. So far as reported, practically all the placer gold recovered from the Chandalar district in 1932 came from the properties on Big Creek. A small amount of gold was also taken from a claim on Little Squaw Creek, but most of the work at this claim was of a prospecting character. Much of the Chandalar district is so remote that, except for indirect reports, little information is available as to mining activities in it. It is probable, however, that there are not more than half a dozen active propsectors in the thousands of square miles embraced in the drainage basin of the Chandalar River. According to a recent news item in one of the technical journals, an arrangement was made late in 1932 whereby the Idaho-Alaska Corporation took over the leases and options formerly held by the Engineers' Exploration Syndicate on various gold properties in the Chandalar district.[22] While the principal deposits on the tract thus acquired are lodes, some of the prospective placer areas are also included, so that it is by no means improbable that the explorations by the company may result in both lode and placer developments.

The output of placer gold from the Fortymile district in 1932 was very much less than in 1931. The decrease is largely attributable to the fact that the property of the company that usually is the heaviest producer in the district was not being mined but instead was being put into condition for the installation of a dredge next season. This called for considerable dead work not only on the ground proper but also in extending the ditch line so as to make an adequate supply of water available. When the installation is completed the property will be equipped not only with its present dragline scraper but also with a modern dredge. Another though somewhat less significant reason for the decline in placer production from the Fortymile district in 1932 was that the exceptionally rainy season kept the larger rivers at so high a stage that the smaller outfits, which usually recover considerable placer gold from the bars, were able to do little of that sort of mining this year. In the Fortymile district both drift mining and open-cut work is done, but by far the larger amount of gold is recovered from the open cuts. According to the available records 25 to 30 men were engaged in drift mining and from 40 to 50 in the open-cut work. The most productive area in the district was the valley of Chicken Creek and its tributary Jack Wade Creek. Smaller amounts of placer gold were recovered from Eagle, Napoleon, Davis, Squaw, Poker, and Smith Creeks, Franklin Gulch, and the bars of the Fortymile River and the South Fork. Rumors are current that the holders of a considerable tract of unmined ground along the South Fork of the Fortymile River have under consideration a plan

[22] Eng. and Min. Jour., vol. 134, no. 1, p. 41, 1933.

for putting in a dredge in the near future to mine this ground. So far as known, however, no definite steps have been taken to acquire such a dredge.

In the Eagle district the production of placer gold in 1932 was nearly twice as great as in 1931, owing to the plentiful supply of water and the coming of a score or more of prospectors and miners to the district from Fairbanks during the open season. Among the largest producing mines in the district may be mentioned those of the July Creek Placer Co., on Fourth of July Creek; of Froelich, Kummer, Ott & Scheele, on Crooked Creek; of Wm. Fritsch, on American Creek; and of Axel Johnson, on Seventymile River. Smaller camps were at work at other places on many of the same streams and elsewhere in the district, and prospecting throughout the district was being done much more extensively than in any of the immediately preceding years.

The Marshall district, as the name is used in this report, includes practically all of the western part of the Yukon Valley below Holy Cross and is somewhat more inclusive than the so-called Wade Hampton recording precinct. In this large area there is but very little placer mining or prospecting, and what there is is more or less localized at two points—one near Marshall and the other in the Stuyahok or Bonasila Valley. A few miles upstream from Marshall (Fortuna Ledge post office), Willow Creek, the source of most of the placer gold that in earlier years was mined in the Marshall district, joins the Yukon. This stream heads in hills composed principally of Upper Cretaceous sediments and Paleozoic greenstones and related rocks. Within the hills the creek flows in a narrow-floored valley whose deposits contain many large boulders that interfere seriously with mining. In 1932 it is reported that only two prospectors were working in the area. On Montezuma Creek two men were mining the creek gravel and reported a fair return for their season's work. About 50 miles northeast of Marshall, in the valley of the Stuyahok River, a tributary of the Bonasila River, a party of four men were mining with a hydraulic lift and plant. No details have been learned by the Geological Survey as to the progress of the work at this place, but the amount of gold recovered indicates that the season was reasonably successful, and that success suggests that further exploration in the region might lead to the discovery of other favorable places to search for productive placer deposits.

Placer mining in the Bonnifield district was carried on by a few small camps, the largest of which employed not more than 4 or 5 men, and none of them yielded gold worth more than a few thousand dollars. Among those reporting some production of gold during 1932 may be mentioned operators on Gold King, Marguerite, Moose, and Platte Creeks. The production from this district has been combined

in the table on page 30 with that from the Kantishna district, but it may be stated that the placer gold from this district was somewhat more than half of the combined total. In the Kantishna district there were altogether less than a dozen men engaged in placer mining or prospecting, and they were distributed through small camps on several of the creeks, notably Eureka, Little Moose, Glen, and Yellow Creeks. None of these camps, however, recovered gold worth more than a few hundred dollars. All the ground is shallow and is mined by simple methods. An examination of all the mineral deposits in the vicinity of Eureka was made by F. G. Wells, and the results of that work have been published by the Geological Survey.[23]

Records received by the Geological Survey regarding placer mining in the Rampart district indicate that eight camps, the largest consisting of only two men, were active during 1932. Several of these operations recovered only a few hundred dollars' worth of gold. The greatest amount of gold seems to have come from two properties on Hunter and Little Minook Creeks. Some gold was produced at smaller camps in the valleys of Big Minook, Slate, and Hoosier Creeks. Some prospecting was also done on the high gravel deposits of Idaho Bar. A more detailed investigation of the mineral deposits and the progress of mining in the Rampart district was made by J. B. Mertie, Jr., in 1931, and his report is now available.[24] In the Gold Hill district, which lies west of the town of Tanana and in this report has for convenience been grouped with the Rampart district, a little prospecting was done in 1932 on Mason Creek. Only a little gold was recovered in this work, but it is significant as indicating the continuation of mining interest in this district, and on at least one of the properties the showings already found are said to be sufficiently good to convince the owner that they warrant the installation of a hydraulic plant.

Reports from the Chisana district (locally called Shushanna) indicate that an increase was shown in its mining activities, about 20 prospectors and miners having done some work in various parts of the district, and the plentiful supply of water made it possible to carry on more work than during the recently preceding years. The largest output from the district is reported to have come from the property on Little Eldorado Creek, owned by Carl Whitham and operated under a lay by B. J. Davis. Among the new developments in the district may be mentioned the construction of two new dams, one near the mouth of Gold Run and the other on Bonanza Creek.

[23] Wells, F. G., Lode deposits of Eureka and vicinity, Kantishna district, Alaska: U.S. Geol. Survey Bull. 849-F, 1933.

[24] Mertie, J. B., Jr., Mineral deposits of the Rampart and Hot Springs districts, Alaska: U.S. Geol. Survey Bull. 844-D, 1934.

KUSKOKWIM REGION

Included in the Kuskokwim region are four principal districts where gold placers were mined in 1932. For convenience of description they may be called the Mount McKinley, Georgetown, Tuluksak-Aniak, and Goodnews Bay districts. The Mount McKinley district embraces all the eastern part of the Kuskokwim Valley, but the placer mining in it is more or less localized around McGrath, Takotna, and Medfra. The Georgetown district is in the central part of the Kuskokwim Valley, and work there centers more or less closely around the settlement of Georgetown, on the Kuskokwim, about 45 miles in an air line south of Iditarod. The Tuluksak-Aniak district is named from two rivers that traverse parts of it; the Tuluksak enters the Kuskokwim from the south some distance east of the settlement of Bethel, and the Aniak enters the Kuskokwim about 50 miles still farther upstream, to the east. Goodnews Bay is a small indentation of the coast on the east side of Kuskokwim Bay, about 125 miles in an air line south of Bethel.

The production of placer gold in the Kuskokwim region in 1932 is estimated at $153,000, or essentially the same as in 1931, when $158,000 was produced. Considering the enormous area of the Kuskokwim region this amount is small, but when it is remembered that there are probably less than a hundred white miners in the whole region, that their activities are much handicapped by their remoteness from supplies, and that their expenses are consequently large and their funds small, the wonder is that the production is as large as it is. From such geologic information as is available regarding the Kuskokwim region, it seems certain that there are areas in it that well deserve more intensive investigation and that in the vast totally unexplored areas that fall within its confines there is a fair probability that examination and intelligent prospecting might disclose not only workable gold placers but also other mineral deposits.

Reports regarding placer mining in the Mount McKinley district are extremely meager, and so far as could be learned most of the work was done by several camps of 1 or 2 men at widely separated points, most of which, however, are adjacent to McGrath or in the hills north of the Kuskokwim River farther upstream, near Medfra. Less than a score of men were employed in this work, and no notable new finds appear to have been made. Mining is carried on only during the summer, and most of it is done by ordinary open-cut or simple hydraulic methods. Among the more productive operations in the district were those carried on by a camp of 6 to 8 men on Moore Creek, a tributary of the Takotna River, about 50 miles in an air line southwest of McGrath, and by a smaller camp on Candle Creek, a tributary of the Tatalina River, 8 or 10 miles southwest of McGrath. The work on Candle Creek appears to have been done

principally on tracts that had been missed or were inaccessible when the area was dredged some years ago.

Placer mining in the Georgetown district appears to have been restricted to the placers of Donlin and Julian Creeks. The mineralized areas on these streams lie only about 25 miles south of the town of Flat, in the Iditarod district, and as they are reached most easily from that district they might really be considered as outliers of the deposits of that district. The property on Julian Creek proved especially productive, and 7 or 8 men were employed throughout the season in mining there. The demonstration that conditions comparable with those in favorable parts of the Iditarod region occur in adjacent parts of the Kuskokwim region is having a stimulating effect in broadening the area in which search for productive placers is warranted. During the past year this has led several small parties of prospectors to visit parts of the Georgetown area, and though so far as learned none of these have yet reported any finds of moment, their activity is regarded as a distinctly promising move for the district as a whole.

In the Tuluksak-Aniak district the bulk of the placer gold production in 1932 came from the property on Bear Creek that is being mined by the New York Alaska Dredging Co. The dredge has been modernized in its power plant and has thus been enabled to increase its capacity. The company has undertaken to widen out the tract dredged by including more of the placer ground on both sides of the main channel and has thus been able to increase the reserves on its property that can be mined by the dredge. About 20 men were employed, and work was carried on continuously until stopped early in November by the shutting in of winter. Next to the dredge production the largest placer production in the Tuluksak-Aniak district and, in fact, the largest in the whole Kuskokwim region came from the property of Luther C. Hess, on Marvel Creek, which was operated under lay by Dahl & Wilson. Marvel Creek is a tributary of the Salmon River, which in turn flows into the Aniak River. Six men were employed at this camp, and all reports indicate that it experienced an especially good season. Several other small camps of a few prospectors each are reported to have been carrying on a search for placers on some of the streams that head in the general vicinity of Marvel Dome, and there is said to be a revival of interest in prospecting throughout the area, but returns from this work have not yet indidated any notable increase in the output of placer gold.

In the Goodnews Bay region the prospectors lately have been so much more interested in the search for platinum placers and their efforts have been so much better repaid that the search for gold placers and their development have been more or less abandoned. However, during 1932 there was some evidence of a return of interest

in prospecting for gold, and three small camps are reported to have recovered a total of a few thousand dollars from placers in the district. The largest amount of placer gold is reported to have come from claims on Wattamuse Creek and the Arolic River, but the total from the whole district was worth only a few thousand dollars. There are only about a dozen prospectors in the entire region, and by far the greater number of these are most active in the search and development of the platinum placers that lie in the southern part of the district. According to local reports steps are in progress for the examination by engineers in 1933 of a considerable tract of ground in the vicinity of Wattamuse Creek, with a view to determining whether or not its character and tenor are such as to justify the installation of a dredge on it. Probably the accessible richer deposits have largely been mined out by the hand methods that have been used in the past, and the hope of material future production must rest largely on being able to work extensive low-grade deposits profitably. No recent information has been received by the Geological Survey as to the progress of testing the extensive low-grade deposits in the Arolic River Valley, and the absence of such reports suggests that results of significance have not yet been obtained.

SEWARD PENINSULA

The production of gold from Seward Peninsula in 1932 was considerably more than in 1931, amounting to $1,533,000. As was the case in other parts of Alaska, the open season in Seward Peninsula was marked by unusually heavy rainfall, so that supplies of water for the various mining operations were greater than normal, and the other natural conditions which affect mining were favorable. A very large part of the gold recovered from Seward Peninsula placers is mined by dredges. In 1932 gold worth $1,315,000, or over 85 percent of the placer output of the peninsula, was mined by 13 dredges, one or more of which were active in practically every one of the larger districts of the peninsula. Additional data regarding dredge mining on Seward Peninsula, as well as in other parts of Alaska, are given on pages 49–53.

In the relative order of their output of placer gold in 1932 the mining districts of Seward Peninsula stood as follows: Nome, Fairhaven (including the Candle and Inmachuk districts), Solomon (including the Casadepaga River region), Council, Kougarok, Bluff, the Koyuk River region, and Port Clarence. So much of the placer gold from some of these districts came from only one or two mines that it has not seemed advisable to publish the production of the separate districts, as it might disclose the output of the individual mines.

The outstanding mining enterprise in the Nome region, as well as in the whole of Seward Peninsula, continues to be that of the Hammon

Consolidated Gold Fields, with its three dredges between Little and Dry Creeks, its scores of claims, and its extensive ditches and other equipment for properly conducting its work. Work at this property was conducted on the same general lines as heretofore, two of the dredges mining near the site of the ancient beaches some distance inland from the shore and the other about half a mile inland from the present beach. A considerable force of men was also employed by the company at the hydraulic pit near Center Creek and in cleaning the rough bedrock exposed there to recover the gold that has penetrated far down along the cracks and crevices in the limy schist bedrock on which the old beach concentration took place. For a while it seemed that this large enterprise was nearing its conclusion, as the work was fast being carried to the property limits and negotiations had failed to acquire additional ground in the neighborhood at satisfactory terms. Early in the spring of 1933, however, according to newspaper reports, it was learned that suitable arrangements had finally been made for the company to obtain additional ground, so that its work will not be interrupted. This outcome is of great significance not only to the district but to the whole mining development of Alaska. On Newton Gulch, near Nome, the Dry Creek Dredging Co. was mining throughout the summer and apparently had a successful season. On the old second beach, a short distance east of Nome, a small dredge known locally as the McCarthy & Panos dredge worked part of the season. There were also a number of open-cut mines on many of the creeks in the vicinity of Nome. Most of these mines were small and employed only a few men; the largest appears to have been that of the Monument Creek Mining Co., on Monument Creek, a tributary of the Nome River, where seven to nine men were employed throughout most of the open season. The manager of this company was also carrying on development work in the coastal-plain deposits south of Sunset Creek with a view not only of testing out the gold contents of these deposits but also of determining an efficient way of mining those whose contents proved high enough. For this work a gasoline engine was used to elevate and stack tailings and to recirculate the water needed in sluicing.

The greatest amount of placer gold mined in the Fairhaven district came from three main tracts—Candle Creek, the Inmachuk River, and Bear Creek. Altogether somewhat more than 100 men were employed on different mining properties in this district in 1932. Candle Creek is a large tributary of the Kiwalik River from the west, close to the town of Candle. On Candle Creek and its tributaries, Patterson and Jump Creeks, the greatest amount of placer gold was recovered by the dredge of the Keewalik Mining Co. Production continued at essentially the same rate as heretofore, and no new developments of significance were reported. Altogether about six camps,

employing a total of about 50 men, were mining on this creek and its tributaries. Farther up the Kiwalik River, on Quartz Creek, which enters from the east, a little productive placer mining was done, and on Gold Run, which enters the Kiwalik River from the west a few miles below Quartz Creek, some prospecting was in progress.

In the Inmachuk Valley the principal producer was the hydraulic mine of A. V. Cordovado, on the Pinnell River a short distance upstream from its junction with the Inmachuk. Work at this place has been in progress for several years, but much ground still remains to be mined, and according to the records of production the tenor seems to show no marked change. Several small hydraulic-mining camps were established on nearby creeks. The largest of these was on Humboldt Creek, where four men had a fairly successful season. On the Inmachuk River a small dredge that was formerly known as the Fries dredge was reconditioned by the Forsgren & Vollmer Dredging Co. and was in operation at intervals throughout the season. Altogether between 35 and 40 men were engaged in mining in the Inmachuk area in 1932. Some prospecting is reported to have been continued during the year in searching for the old stream courses that were buried under the great outpourings of Tertiary and later lavas which cover a tract of more than 1,000 square miles in the central part of Seward Peninsula. This is a difficult and time-consuming quest and so far as learned has not yet disclosed workable placer deposits.

The third tract in which placers were mined in the Fairhaven district lies on Bear Creek east of the hills that form the divide between the Buckland and Kiwalik Rivers. No specific reports have been received as to the individual mining operations in that tract and the absence of news indicates that there have not been any notable developments during the year. However, the production seems to have been maintained at approximately the same rate as in preceding years, and apparently 8 to 10 men were engaged in mining there.

In the Solomon district by far the larger part of the placer production was obtained by the dredge of the Spruce Creek Dredging Co., though there were two other dredges in the district and a number of small camps using hydraulic or open-cut methods situated on the streams, especially in the southern and central parts of the district. The success of the dredging at Spruce Creek is of special significance not only as a contributor to the output of the district but also in encouraging further search in the coastal-plain deposits of the district for old placer concentrations, comparable in origin with those at Nome and likely to be of economic value where they were adjacent to mineralized bedrock.

The other dredges were the Goldsmith or Coal Creek dredge, near the head of the Solomon River, and the dredge on Ruby Creek, in the Casadepaga Valley, just north of the Solomon River divide. The principal open-cut mines were on West, Big Hurrah, Jerome, and Rock Creeks, Moran Gulch, and the Solomon River. Few of these smaller camps had an output of as much as several thousand dollars, and many of them yielded only a very modest grubstake.

In the Council district, as in the other larger producing districts of Seward Peninsula, most of the placer gold produced in 1932 came from dredges. Two dredges were operated on Ophir Creek—one belonging to the Ophir Gold Dredging Co. and the other to the Northern Star Dredging Co. The last named was in the lower part of the valley, where the stream traverses the lowland of the Niukluk. The recovery of gold by the dredges in 1932 is said to have been somewhat greater than in the immediately preceding years. The largest open-cut mine in the district is on Aggie Creek, a tributary of the Fish River. At that place a crew of seven men was engaged in hydraulicking throughout the open season. Two small open-cut mines were also in operation on Ophir and Crooked Creeks, and one small camp was reported to have been mining on Benson Gulch, a tributary of Melsing Creek. Although there were doubtless a few other small camps scattered through the district, no direct reports have been received from them, and nothing is known about the progress of their work, though to judge from the total amount of gold received from this district by the banks, most of them made at best only a modest grubstake.

According to available reports the return from placer-mining operations in the Kougarok district was somewhat larger than it has been of late years. The bulk of this output came from the operations of the Henry Creek Gold Dredging Co. on claims near the junction of Henry Creek and the Kougarok River. Some difficulties in starting work in the spring were encountered, owing to low water, which required raising the dams so as to gain adequate flotation for the dredge, and some financial complications caused early cessation of work in the fall. Elsewhere in the Kougarok district the mining was carried on by small camps consisting usually of only 1 or 2 men each. In the vicinity of Coffee Dome, in the southern part of the district, the Coffee Creek Mining Co. continued its explorations and is reported to have found encouraging prospects. Small hydraulic plants were in operation on Eagle and Wonder Gulches, tributary to Coffee Creek. Dahl Creek yielded the most gold of all the creeks in the southern part of the district, and more than 10 men were mining at different points along its course. Near the head of the Kougarok several claims were being developed, especially on Macklin and nearby creeks. All these claims are being developed by open-cut methods and shoveling in, few of them being equipped with mechanical labor-saving devices.

Some mining is also reported to have been done at small camps on Dick Creek and some of the other valleys that head against the northern divide of the Kougarok River. During the year the property on Merritt Gulch and adjacent parts of the Henry Creek Valley, long held by the Wells brothers, was purchased by the Continental Gold Mining Co. This company shipped in a large amount of supplies and equipment, established a good camp, and repaired and extended the old ditch and otherwise did preparatory work to put the property into shape to be actively mined next year.

South of the Kougarok district, in the vicinity of Iron Creek, six men are reported to have done some hydraulic mining during the year. On American Creek, about 8 miles east of Iron Creek, one camp employing several men was said to have been engaged in constructing a ditch to lead water for use in hydraulicking placer ground on that stream. The entire production of gold from the Iron Creek area, however, was so small that it amounted to little more than wages for the men concerned.

In the vicinity of Bluff the principal placer mining in 1932 was done on claims lying along the lower course of Daniels Creek, by the Topkok Chief Mines Co. Mining at this place is carried on by a crew of 18 to 20 men, using a dragline scraper which excavates the decomposed limestone bedrock and overlying unconsolidated deposits. Much of the ground is quite deep, and the gold penetrates far into the bedrock. Some small amounts of placer gold were also produced from one property farther north up Daniels Creek and from claims on Swede Creek. The mining on Swede Creek at first sight resembles lode mining more than normal placer mining, for the sediment-filled cracks and openings in the bedrock have been followed down by the miners in places more than 20 feet without reaching the limits to which the placer gold has traveled. North of Bluff, in the valley of the Klokerblok, a flurry of excitement was caused during the year by the reported discovery of prospects that appeared encouraging. No details regarding this find have been received by the Geological Survey.

The Koyuk district, as the term is used in this report, includes most of southeastern Seward Peninsula and is so named from the principal stream that traverses it. Most of the placer deposits that are mined are on Dime Creek and a few of the other streams in the vicinity of Haycock. Although in the past one small dredge has been active in the district, in 1932 it did not operate, and all the placer gold came from bench and creek placers mined by hydraulic or open-cut methods. Five camps employed a total of 10 to 12 men during the summer. All these camps were on Dime Creek except two on Sweepstake Creek. The water supply in this district is reported to have been unusually deficient in 1932, so that mining operations were badly hampered.

The Port Clarence district, in western Seward Peninsula, is the only one of the large sections of the peninsula in which no dredge is in operation. The production from the district in 1932 was valued at only a few thousand dollars, and probably there are not more than 15 to 20 men in it that are doing any mining. So far as learned from local reports, the greatest amount of gold was recovered by one camp of four men on Coyote Creek and from smaller camps on Gold Run, Offield Creek, and the American River. In the valley of Burke Creek, which is a tributary of the Agiapuk River, 4 or 5 men were prospecting during the summer and report that they feel sufficiently encouraged by the outcome of their work to go ahead with further exploration and the extension of their ditches to furnish a more adequate supply of water.

Lying east of Seward Peninsula but more or less closely related to it is the Bonanza district, so named from a small stream which has long been known to carry some placer gold. Prospecting has been carried on at several places in this general area in the past and for the last 2 or 3 years has been localized in the narrow coastal plain that lies between the waters of Norton Bay and the hills to the east. The bedrock in this part of the area consists mostly of dark slate and sandstone and thus differs markedly from the schist bedrock that occurs in most of the other placer camps in Seward Peninsula. The history of the coastal plain at this place in the main seems to have been comparable to that of the coastal plain at Nome and elsewhere in Seward Peninsula, so that prospecting for ancient beaches in this district is well justified. Whether the ancient beaches will prove to be gold bearing, however, depends on the occurrence of mineralization in the material that formed this coastal plain and, if it occurred, on the effectiveness of any subsequent concentration. The present production from this entire tract amounts at most to only a few hundred dollars a year.

NORTHWESTERN ALASKA

The Kobuk River Valley is the only one in northwestern Alaska that is reported to have been the scene of any placer mining in 1932. In this valley there are two principal areas where placer mining is being done. The western area is near Kiana, and the principal placer tract is in the valley of the Squirrel River and especially in the valley of its tributary Klery Creek. The eastern area is in the vicinity of Shungnak, a small settlement about midway between the head and mouth of the Kobuk River. Kiana is about 50 miles in an air line above the mouth of the Kobuk, and Shungnak is about 90 to 100 miles in an air line east of Kiana. Both of these tracts are so remote and so poorly served by any means of regular transporta-

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tion or communication that their development is much retarded and hampered by high costs, unavoidable delays, and short working season.

The Geological Survey has received no recent information regarding placer-mining activities in the area near Kiana, but it is assumed that work was carried on there during 1932 at about the same places and on the same scale as in recent years—that is, probably there were not over half a dozen small outfits who were testing ground principally in the valley of Klery Creek, and the output from it amounted to not much more than a thousand dollars. It was reported in 1931 that a new drill was being shipped into the region for the purpose of testing some of the deeper bench gravel which could not be advantageously explored by other methods. It was expected that the drilling would be done during the winter of 1931–32, but if this was done the results obtained have not been made public.

In the tract near Shungnak the placer deposits occur in the lowland adjacent to the Kobuk, close to the places where the small streams that come down from the hills to the north traverse that lowland, or in the valleys of the streams within this belt of hills. The source of the placer gold found in these deposits appears to be local, as in general it is rough and shows little evidence of having been transported far. This conclusion is further supported by many quartz veins carrying free gold in the metamorphic rocks that form the hills in which these streams rise or which they traverse. In 1932, 7 small camps, employing a total of 15 men, were established on streams in the vicinity of Shungnak—3 on Dahl Creek, 2 on the Shungnak River, and 1 each on Lynx Creek and California Creek. Lynx and California Creeks are tributaries of the Kogoluktuk River, which joins the Kobuk some 3 or 4 miles east of Shungnak, and the Shungnak River enters the Kobuk about 15 miles west of Shungnak. The largest of these camps were those of the Kobuk Alaska Mines, on the Shungnak River, and Ferguson & Son, on California Creek. Mining at the camp on the Shungnak River was done by hydraulic methods, but it was reported that the season of 1932 was so dry that the supply of water was inadequate and little productive work was accomplished. It is understood that the company is proposing to extend its ditch lines so as to tap supplementary water supplies. The property on California Creek was mined by hydraulic methods and on about the same scale as during the preceding year. The remoteness of the district makes mining there expensive, as transportation facilities for moving heavy supplies and equipment are meager. For the transportation of persons or small or light commodities airplanes make the district relatively accessible, and already some of the prospectors are using this means of travel.

In addition to the productive mining noted, it is stated that some prospecting was in progress in the more remote parts of northwestern Alaska. According to reports prospectors were investigating possible placer ground on the Mauneluk River east of Shungnak, on tributaries of the Kobuk near the head of its valley, and in the eastern part of the Noatak Valley. The indications found were said to have been sufficiently good to warrant further prospecting in these areas another season.

DREDGING

Nearly 78 percent of all the placer gold produced in Alaska in 1932 was mined by dredges. The total gold thus recovered was $4,293,000, of which the greater part came from 11 dredges in the Yukon region and the rest from 13 dredges in Seward Peninsula and 1 in the Kuskokwim region. This total is considerably larger than the amount recovered by dredges in 1931, and the increase is very largely to be attributed to increased output from the larger dredges in the Fairbanks and Nome districts. The accompanying table gives the output of gold by Alaska dredges, beginning in 1903, the earliest year for which records are available.

Gold produced by dredge mining in Alaska, 1903–32

Year	Number of dredges operated	Value of gold output	Gravel handled	Value of gold recovered per cubic yard
			Cubic yards	
1903–15		$12,431,000		
1916	34	2,679,000	3,900,000	$0.69
1917	36	2,500,000	3,700,000	.68
1918	28	1,425,000	2,490,000	.57
1919	28	1,360,000	1,760,000	.77
1920	22	1,129,932	1,633,861	.69
1921	24	1,582,520	2,799,519	.57
1922	23	1,767,753	3,186,343	.55
1923	25	1,848,596	4,645,053	.40
1924	27	1,563,361	4,342,667	.36
1925	27	1,572,312	3,144,624	.50
1926	32	2,291,000	5,730,000	.40
1927	28	1,740,000	6,084,000	.29
1928	27	2,185,000	6,371,000	.34
1929	30	2,932,000	8,709,600	.336
1930	27	3,912,600	9,906,000	395
1931	28	3,749,000	10,214,000	.367
1932	25	4,293,000	10,310,700	.416
		50,962,000		

The total value of the gold produced by dredges since 1903 is 18.9 percent of the total value of gold produced from all kinds of placer mining since 1880, and lately there has been a general tendency each year for a greater and greater percentage of the placer output to be mined by dredges. During 1932 the ratio of dredge production to the output from all other kinds of placer mining was nearly 78 to 22, and there are no signs of a diminution in dredge mining in the near future—in fact, an even higher ratio seems not unlikely.

In the foregoing table the figures given for yardage mined and value of the gold recovered per cubic yard are subject to some inaccuracy because several of the dredge operators have not furnished specific information on those subjects for their individual properties, and the figures for these properties have therefore had to be estimated. In making these estimates the following procedure has been adopted to determine the unknown factors: Operators of dredges that produced approximately $4,008,654 in gold, or a little more than 93⅜ percent of the total mined by dredges, report that that amount came from 9,627,797 yards of gravel. The average yield thus shown is about 41.64 cents in gold to the cubic yard. Applying this average to determine the unreported yardage gives a total of 10,310,700 cubic yards, and this is the figure that has been used in the table. This procedure is obviously open to criticism, because the companies that reported fully the amount of gravel mined were the larger ones, and doubtless they worked ground of a lower tenor than that mined by some of the smaller companies. As a result, the average value adopted may be too low and consequently may indicate a larger volume of gravel than was actually handled. This method, however, has been followed for the last 8 years, so that the quantities and values given for 1932 are comparable with those reported for the preceding 8 years. If this value as stated is correct, it will be evident from the table that the average tenor of the ground dredged in 1932 was considerably higher than the average for 1927 to 1929, though considerably lower than the average for most of the preceding years.

The length of time that the different dredges were operated varied widely. The longest season reported was 247 days for one of the dredges of the Fairbanks Exploration Co., which was operating in the Fairbanks district of the Yukon-Tanana region. The longest season reported for any of the Seward Peninsula dredges was for one of the dredges of the Hammon Consolidated Gold Fields, at Nome, which mined for 185 days. The earliest date for beginning work in the spring and the latest date for ending work in the fall were reported by the Fairbanks Exploration Co., which began mining April 2 and did not stop its last dredge until December 5. The earliest and latest dates on Seward Peninsula were May 13 and November 14, both reported by the Hammon Consolidated Gold Fields. The average length of working season in 1932 of the 10 companies for which information is available, as determined from the beginning and ending dates reported by each company, irrespective of how many dredges it operated, was 122 days. Obviously, the shortness of the average season as compared with the record of 247 days for the longest working season was due not to climatic conditions, but to breakage or some other purely local cause at the different dredges. The lesson that is demonstrated by this dredging

record is that throughout most of interior Alaska a moderate-sized dredge reasonably well handled may be expected to have at least an average working season of 4½ months, and that with skill and special provisions against unfavorable climatic conditions the dredging season may be extended for an additional period of 2 to 3 months in practically any of the placer camps south of the Arctic Circle. The longest dredging season yet recorded is that of one of the dredges of the Fairbanks Exploration Co. in 1930, which was in operation for 269 days. This unusually long season, however, was found to be undesirable, as the difficulties experienced outweighted the advantages gained:

The following is a list of the dredges that did some productive mining during 1932:

Yukon Basin:	
Fairbanks district:	
Fairbanks Exploration Co. (5)	Goldstream and Cleary Creek.
J. R. Murphy, lessee from Fairbanks Gold Dredging Co., Ltd. (2)	Fairbanks Creek.
Hot Springs district: American Creek Dredging Co.	American Creek.
Iditarod district:	
North American Dredge Co	Flat Creek.
J. E. Riley Investment Co	Otter Creek.
Innoko district: Anderson, Pontella, Utilla & Larson, lessees	Little Creek.
Kuskokwim region, Tuluksak-Aniak district: New York Alaska Gold Dredging Corporation	Bear Creek.
Seward Peninsula:	
Council district:	
Northern Star Dredging Co	Ophir Creek.
Ophir Gold Dredging Co	Do.
Fairhaven district:	
Keewalik Mining Co	Candle Creek.
Forsgren & Vollmer Dredging Co	Inmachuk River.
Kougarok district: Henry Creek Gold Dredging Co.	Kougarok River.
Nome district:	
Dry Creek Dredging Co	Newton Gulch.
Hammon Consolidated Gold Fields (3)	Old beach line.
McCarthy & Panos	Second beach line.
Solomon district:	
Ruby Dredging Co	Ruby Creek.
Goldsmith Dredging Co	Solomon River.
Spruce Creek Dredging Co	Spruce Creek.

During 1932 four dredges that had been active in 1931 were idle, but mining was done by one dredge that had not been in operation in 1931. The net result of these changes was that the total number of active dredges in 1932 was 25. The dredges that were active in 1931 but idle in 1932 were the dredge of the Chatham Gold Dredging Co., on Chatham Creek, a tributary of Cleary Creek, in the Fairbanks

district; one of the small dredges on Ganes Creek, in the Innoko district; the dredge of the Beaver Dredging Co., on Nome Creek, in the Tolovana district; and that of the Dime Creek Dredging Co., on Dime Creek, in the Koyuk district, of Seward Peninsula. The dredge that was in operation in 1932 and not in 1931 was that of the American Creek Dredging Co., on American Creek, in the Hot Springs district, of the Yukon region. This dredge had been in operation before and had only been laid up temporarily in 1931 while certain details of management and finance were being worked out.

Much of the placer ground at practically all the places where dredges are now working in Alaska is frozen, so that extensive plants for thawing it must be available. This adds heavily to the cost of the work, and unless the thawing has been done adequately it slows up or actually checks mining. Most of the dredge camps are now using cold water for thawing, though in the past steam or hot water was thought to be necessary. At any large dredging operation, such as at Nome or Fairbanks, miles of pipe are used for the thawing process, and a larger force of workmen is required in the various tasks connected with the thawing than in actual mining. In addition to the labor costs for thawing operations, there is need for large quantities of water, both for thawing and for sluicing. Adequate supplies of water for most of the dredging camps in interior Alaska and Seward Peninsula are difficult to find and costly to develop. In places it has been necessary to go scores of miles to get water under sufficient head and then lead it by means of long ditches and siphons to the mining ground. The regulation of this water and the maintenance of the ditches require the constant attention of a considerable force of men throughout the working season, especially if the construction is new and the ground has not settled.

The success of most of the good dredges already built has induced many individuals and companies to reexamine formerly known extensive deposits that were too low in tenor to be worked by any of the methods that require less capital. As a result rumors are heard regarding dredging projects to be undertaken on placer ground from one end of interior Alaska to the other. Unquestionably these projects deserve most careful consideration, and some of them will doubtless be successfully carried through, but there is a tendency to regard the dredge as a magic method by which even worthless deposits may be mined at a profit, so that a word of caution may not be amiss to those who are considering investment in some of the projects. The amount of money needed to finance the building of a dredge and furnish the necessary equipment is so great that the cost of a report by a competent engineer is relatively insignificant, and such a report should be obtained as almost the first step in any well-advised project. Furthermore, adequate prospecting in advance,

although apparently costly, well repays the outlay, as it prevents unwise commitments and enables the competent manager to effect savings through constructive planning.

Rumors are so numerous of places where prospecting is said to be contemplated or in progress, with a view to determining their suitability for dredging operations, that it is difficult to distinguish those that are merely forlorn hopes from those that are being seriously considered by persons or companies who would be able to carry through any enterprise they might undertake. It has therefore seemed inexpedient to attempt to list here all the places that have been mentioned as being under consideration. However, in earlier parts of this report describing the different placer districts mention has been made of some of the enterprises that have been most extensively discussed. It should be realized, however, that although some of them may be regarded as approaching a real prospective stage others will inevitably be dropped, and that in all probability there are many others that, though they have not yet advanced so far as to be extensively discussed, may be even more meritorious and may be developed first.

COPPER

Deposits containing some copper minerals are found throughout most of the length and breadth of Alaska. During 1932, however, nearly all of the Alaska copper came from two mines in the Copper River region that are operated practically as a unit, though owned by different companies. Besides the copper recovered from these mines, a few thousand pounds of copper was reported to have been recovered in 1932 at smelters in the States from ores and concentrates shipped principally from southeastern Alaska. The total amount of copper recovered from Alaska ores in 1932 has been computed as 8,738,500 pounds, valued at $550,500. The bare statement of the quantity of copper produced is more or less meaningless, however, unless the basis on which it is computed is stated, because in all the processes that the ore undergoes, from the time it is broken out of the vein in the mines until all of the metallic copper that can be recovered from it is finally placed on sale, there are inevitable losses, so that at no two stages is the amount of copper exactly the same. Even though the losses incurred in these different stages are small compared with the amount recovered, the quantities involved are so large that even a small percentage of loss is equivalent to many thousands of pounds. For instance, with a production in the neighborhood of 9,000,000 pounds, a loss of only 1 percent is equivalent to 90,000 pounds.

Furthermore, owing to various causes, the amount of ore mined may bear only a remote relation to the amount of ore shipped from the same property, so that the content of copper in the ore mined

may be greater or less than the amount in the ore shipped, either because more or less ore was shipped or because of the inevitable losses in the various steps through which the material passed. As illustrating this condition it may be stated that according to the reports of one of the mining companies it mined 31,154 tons of ore which had an estimated copper content of about 6,119,000 pounds. When, however, this crude ore was processed for shipment the bulk was reduced to 5,842 tons and its content of copper to about 5,319,000 pounds. The difference between these two figures for copper is 800,000 pounds, or 13 percent, a difference that is partly to be attributed to loss in handling and partly to the fact that not all ore mined was shipped at once. Under any circumstances there is always a considerable lag between the time when the ore starts on its progress from the mine and the time when it reaches the market. It is therefore apparent why authoritative statements as to mineral output taken from different sources may appear to differ widely and why it is essential in comparing statistics that the basis on which they are computed be clearly stated, so that it may be evident whether or not they are in terms that permit direct comparison. For the purpose of the present report the quantity of copper in the ore and concentrates that were shipped is adopted as the amount of copper yielded by Alaska mines during 1932. The total ore mined in Alaska in 1932 primarily for its copper content is estimated to have been 56,900 tons. This ore as concentrated or otherwise prepared and ready for shipment to the smelter amounted to about 9,700 tons, which together with the small amounts of copper recovered as a minor byproduct from other ores had a copper content of 8,738,500 pounds.

In attempting to set a value for this copper many methods may be employed, and the results will vary widely. Obviously it would be inaccurate to value all the copper in the ore as it comes from the mine at the current market price for the metal as it comes from the smelter, because not all of it is recovered, and most of it is not in the form of metal and so is not worth the full price of metallic copper. Although the same conditions are also in a measure true of the ore and concentrates that are shipped to the smelter, the losses that they undergo in the smelting process are generally much less. As a consequence it has been the practice of the Geological Survey to compute the value of the Alaska output on the assumption that the copper in the ore and concentrates, as shipped to the smelter, is worth the average price at which metallic copper sold during the year. The average price of all copper sold in the United States in 1932, according to computations by the Bureau of Mines, was 6.3 cents a pound. The total value of the copper in the ore and concentrates shipped from Alaska mines during the year is there-

fore regarded as $550,500. It is recognized that this method of calculating the value does not take into account the fact that an efficient and fortunate selling agent would take advantage of fluctuations in the price of copper and thus dispose of as much as possible during periods of high prices and hold as much as possible during periods of low prices. The figures given for the value of the Alaska output of copper cannot, therefore, be regarded as representing the amounts received by the different companies for their copper. They do, however, serve to indicate within close limits the magnitude of the industry and are comparable with the figures for earlier years as stated in these reports.

In the following table are shown the amount and value of the copper produced in Alaska since the earliest recorded mining of copper. For the last few years there has been a great decrease in the output, and the output in 1932 marks a lower point than had been touched in any year since 1910. Between the production of 1931 and that of 1932 there was a decrease of 13,875,000 pounds in quantity and of over $1,326,000 in value.

Copper and silver produced at Alaska copper mines, 1880, 1900–1932

Year	Ore mined (tons)	Copper		Silver	
		Pounds	Value	Fine ounces	Value
1880		3,933	$826		
1900–1915	1,232,396	220,773,969	35,031,225	2,351,726	$1,297,756
1916	617,264	119,654,839	29,484,291	1,207,121	794,286
1917	659,957	88,793,400	24,240,598	1,041,153	857,911
1918	722,047	69,224,951	17,098,563	719,391	719,391
1919	492,644	47,220,771	8,783,063	488,034	546,598
1920	766,095	70,435,363	12,960,106	682,033	743,416
1921	477,121	57,011,597	7,354,496	544,311	544,311
1922	581,384	77,967,819	10,525,655	623,518	623,518
1923	731,168	85,920,645	12,630,335	715,040	586,333
1924	761,779	74,074,207	9,703,721	572,078	383,292
1925	860,023	73,855,298	10,361,336	596,607	412,131
1926	670,000	67,778,000	9,489,000	605,190	377,600
1927	645,000	55,343,000	7,250,000	525,100	297,800
1928	579,500	41,421,000	5,965,000	350,430	205,000
1929	590,400	40,510,000	7,130,000	351,730	187,400
1930	531,000	32,651,000	4,244,600	279,990	107,800
1931	88,000	22,614,000	1,877,000	193,850	56,200
1932	56,900	8,738,500	550,500	81,150	22,900
	11,062,900	1,253,992,500	214,680,000	11,928,150	8,763,900

The general trend of the copper-mining industry in Alaska is graphically indicated by one of the curves in figure 3, which shows the output of copper in pounds for each year from 1900 to 1932. On the same diagram has also been plotted the average price of copper for each year. It is significant to note the very close relation that has been maintained between the price of copper and the Alaska output. In other words, when the price of copper was high there was a corresponding stimulation in output, and when the price was lower the output fell off. The foregoing statement applies only

to trends and does not at all mean that a certain price for copper will bring out a certain tonnage. The extraordinary decline in the price of copper during the last 3 years and its effect in discouraging the mining of copper in Alaska is clearly indicated by the diagram. This condition, of course, affects not only the production of copper from Alaska mines but was of world-wide significance. Obviously until the market improves there is little incentive for the mining of copper anywhere, and revival of the Alaska copper-mining industry must await an even greater improvement in prices than in many other districts to be on a competitive basis with them.

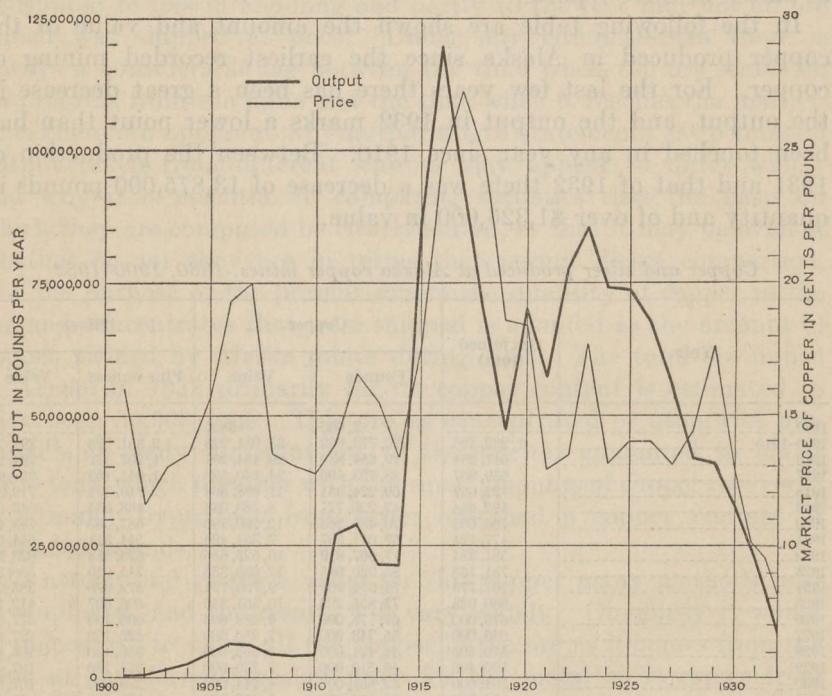

FIGURE 3.—Copper produced from Alaska mines, 1900–1932, and fluctuations in the price of copper during that period.

No new developments of note were reported at the productive mines of the Kennecott Copper Corporation at Kennecott, in the Copper River region, during 1932. The ore from this property, as in the past, was largely high-grade copper sulphide and carbonate containing considerable silver but no gold. The highest-grade ore is sacked and shipped directly to the smelters, but the lower-grade ores are concentrated before shipment. According to the published statements of this company,[25] 31,154 tons of ore was mined during the year, which was estimated to have an average content of 9.82 percent of copper and 1.73 ounces of silver to the ton. At the mine

[25] Kennecott Copper Corporation 18th Ann. Rept., for 1932, p. 6, 1933.

of the Mother Lode Coalition Mines Co., which is contiguous to the properties of the Kennecott Copper Corporation and is operated by that corporation, although the accounting and bookkeeping are conducted separately, the ore is essentially the same, being a high-grade copper sulphide and carbonate containing considerable silver. The report of this company[26] shows that during the year 25,710 tons of ore was mined, which had an estimated content of 8.07 percent of copper and 1.24 ounces of silver to the ton.

That there are other places in Alaska where copper minerals occur is well known. That some of these deposits contained enough copper to enable them to be worked at a profit under past conditions is a matter of history. For instance, the old Beatson mine, on Latouche Island, during its period of activity yielded copper ore worth millions of dollars, and some of the old mines in southeastern Alaska, notably in the Ketchikan district, contributed ore worth a few million dollars. It is extremely doubtful whether any of the known copper deposits that are not now being mined can be worked at a profit under present conditions. As a consequence, practically all field investigation of these properties has been discontinued and doubtless will not be resumed until the price of copper has materially advanced. That there may be deposits, as yet unknown, which might repay development is possible, but the incentive to search for them is so small and the probability of failure so great that prospectors are not willing to take the gamble. At present, therefore, search for new copper deposits or development of those already known has practically ceased. Even at the operating mines retrenchment of activities has been the guiding policy, and all of them are operating far under their capacity and curtailing output or unnecessary outlays. Obviously, no forecast can be made as to when these conditions are likely to change. Various remedial or palliative measures have been proposed which might encourage the copper-mining industry, but it seems doubtful whether much improvement can be looked for in the near future. Probably, the thing that may bring about any notable increase in the production of copper from Alaska ores will be the mining of ores in which the copper is a by-product and gold or some other metal more sought after is the principal object. In recent years ore of this type has not attracted much favorable attention in Alaska, and it is by no means certain that there are any such bodies that can be mined on a larger scale profitably, but with the revival of interest in lode-gold mining the possibility of defraying some of the costs of development by means of by-products must be given serious consideration.

[26] Mother Lode Coalition Mines Co. 14th Ann. Rept., for 1932, p. 3, 1933.

SILVER

None of the ores that are mined in Alaska are valuable solely for the silver they contain, and by far the greater part of the silver that is produced occurs as a relatively minor constituent in ores whose principal value lies in some other metal. Thus, as shown by the table below, more than a third of the silver recovered was received in 1932 from ores that are valuable principally for copper, and nearly one half came from the ores that are valuable principally for their gold, the rest being intimately associated with the gold recovered from the placers. The amount of silver in these ores, however, is actually very small, as the average silver content of all the copper ore that was reported amounted to only a little more than 1.5 ounces to the ton, and the ore from the mine that reported the highest average silver content contained only 1.73 ounces to the ton.

All the gold-lode mines yield some silver in addition to their gold. Thus the mine of the Alaska-Juneau Gold Mining Co., though worked principally for gold, yielded 94,519 ounces of silver in 1932, according to the company's published report.[27] The silver from all the gold-lode mines amounted to 115,300 ounces and was worth $32,500. Some silver is also contained in all the gold that is recovered from Alaska placer mines. This silver is not recognizable, as it is intimately alloyed with the gold and is recovered only after the gold is treated chemically or refined. The total silver from this source was 37,600 ounces, worth $10,600.

Data regarding the production of silver have been referred to in several places in the preceding pages and included in some of the tables that cover the production of other metals. For convenience the sources and quantity and value of the production from each source in 1932 and 1931 are set forth in the following table:

Silver produced in Alaska in 1932 and 1931

Source	1932		1931	
	Ounces	Value	Ounces	Value
Gold lodes	115,300	$32,500	129,800	$37,600
Gold placers	37,600	10,600	28,350	8,200
Copper lodes	81,150	22,900	193,850	56,200
	234,050	66,000	352,000	102,000

Perhaps the most striking fact brought out by the foregoing table is the very great decrease in both the quantity and value of the silver produced in 1932. The greatest decrease in quantity was in the silver recovered from the copper ores, and this reflects in large measure the

[27] Alaska-Juneau Gold Mining Co. 18th Ann. Rept., for 1932, p. 13, 1933.

fact already stated elsewhere in this report that the decrease in production of copper ore was very large, as the output in 1932 was only about 64 percent of that of 1931. In addition to this condition, the average silver content of the copper ores in 1932 was also somewhat less than in 1931. These two conditions combined to make the quantity of silver recovered from the copper ores in 1932 only about 41 percent of that from the same source in 1931. Increased production of gold from the lodes and placers affected the output of silver from those sources as well. As a result, for the first time in many years the gold lodes became the principal source of the Alaska silver. However, marked as was the decrease in quantity of silver the decrease in value was even greater, owing to the fact that, according to the computations of the Bureau of Mines, the average market price of silver in 1932 was 28.2 cents an ounce or nearly a cent an ounce lower than in 1931.

The development in Alaska of ores that are valuable principally for their silver content is necessarily attended by many more difficulties and expenses than are likely to be met in developing gold mines. Among the most obvious reasons for this difference are the much lower value per unit of weight of the silver and the fact that more elaborate and expensive processes are usually required to recover silver in a readily salable metallic state than to recover gold. As a result, it is more or less unwarranted at this time to attempt to develop or even to search for silver lodes in remote parts of Alaska unless the ore has an especially high tenor. Therefore, although silver-lead lodes have been reported at many places in interior Alaska, none of them have been very thoroughly examined or seriously considered by capitalists. It is true that some shipments of silver-lead ores have been made from interior Alaska, especially from the Kantishna district, north of the Alaska Range, but although the ore was of high grade and the price of silver more than three times as much as at present, the expense of transporting it to smelters in the States and having it smelted consumed practically all the profits. In southeastern Alaska, however, where the region is much more accessible to deep-water transportation and all operating costs are lower, there have been many attempts to find and develop silver-lead deposits. The greatest amount of work of this kind has been done in the region at the head of Portland Canal, near the international boundary. The richest deposits that have been found lie on the Canadian side of the boundary, and it is there that the famous Premier silver and gold mine is situated. The geologic conditions on the Alaska side of the boundary, in the Hyder district, as it is locally called, in places seem to be comparable to those on the Canadian side and this similarity has sustained interest in the search for profitable silver and gold deposits

there. Several claims have been taken up and more or less prospecting and development work done. The much greater unit price of gold and its more ready recovery have focused the search on gold lodes rather than on silver lodes, so that some of the claims that in the early days of the camp showed indications of prospective value mainly in silver and lead have been neglected. This does not mean, of course, that rich showings would necessarily be overlooked, but simply that work has not been pressed on deposits that appeared only moderately promising. In the past mines in the Hyder district have made shipments of silver ore or concentrates to smelters in the States, but in 1932, so far as has been reported to the Geological Survey, no such shipments were made. Undoubtedly some ore carrying more or less silver was excavated in the course of the prospecting and development work, but this does not appear in the estimates of 1932, as its quantity and value are not known.

A little development and prospecting work on silver-lead ores is reported to have been done during the year on claims lying a short distance north of the settlement of Wrangell. North of Skagway the Inspiration Point Mining Co. is reported to have continued work on its property, where indications of silver-lead lodes that are said to appear promising have been found. The cost of development, however, has proved to be greater than the present owners care to incur under existing conditions, so that further development will be slow or will await suitable arrangements with a larger mining company. In the Susitna Valley of west-central Alaska, about 9 miles east of Chulitna station on the Alaska Railroad, where a unique deposit containing ruby silver was found some 3 or 4 years ago, no active work was in progress, and the property lay practically idle throughout the season of 1932.

LEAD

The lead produced from Alaska ores in 1932 amounted to 2,521,300 pounds, a decrease of about 800,000 pounds under the production of 1931. In partial explanation of this great decrease in quantity it should be remembered that the output in 1931 was abnormally large and, in fact, was the greatest quantity of lead that Alaska had ever produced in a single year. The value of the output at 3 cents a pound, the average market price at which, according to the Bureau of Mines, lead sold in the States in 1932, was $75,600. This marks a considerable falling off in value, owing both to the lesser quantity produced and to the lower average price that prevailed.

Lead produced in Alaska, 1892–1932

Year	Tons	Value	Year	Tons	Value	Year	Tons	Value
1892	30	$2,400	1907	30	$3,180	1922	377	$41,477
1893	40	3,040	1908	40	3,360	1923	410	57,400
1894	35	2,310	1909	69	5,934	1924	631	100,899
1895	20	1,320	1910	75	6,600	1925	789	140,571
1896	30	1,800	1911	51	4,590	1926	778	124,400
1897	30	2,160	1912	45	4,050	1927	1,008	127,000
1898	30	2,240	1913	6	528	1928	1,019	118,000
1899	35	3,150	1914	28	1,344	1929	1,315	166,000
1900	40	3,440	1915	437	41,118	1930	1,365	136,500
1901	40	3,440	1916	820	113,160	1931	1,660	126,000
1902	30	2,460	1917	852	146,584	1932	1,261	75,600
1903	30	2,520	1918	564	80,088			
1904	30	2,580	1919	687	72,822		16,431	1,944,000
1905	30	2,620	1920	875	140,000			
1906	30	3,420	1921	759	68,279			

In Alaska no ores are mined solely for their lead content. Practically all the lead produced is recovered as a byproduct in the course of gold or silver mining, the concentrates containing lead being shipped to smelters in the States for treatment to recover the different metals they contain. Practically all of the lead that is reported in the foregoing table as produced in 1932 was recovered in the course of treatment of the gold ores of the Alaska Juneau Co.'s mines in southeastern Alaska. According to the published reports of this company, it recovered about five eighths of a pound of lead from each ton of ore that is mined and trammed to the mill, or a little more than 1 pound of lead from each ton of ore that is fine milled. Lead ores are widely known throughout the Territory, and in the past shipments valuable at least in part for their lead content have been made from many areas in southeastern Alaska, especially the Hyder district; from the Yukon-Tanana region, especially the Kantishna district; and even from far-away Seward Peninsula, at the Omalik mine; and from the Kobuk district in the vicinity of Shungnak. Lead is, however, a heavy, low-priced commodity which requires rather elaborate treatment to produce in readily salable metallic form, and these drawbacks, coupled with the extremely low current price for the metal, act as deterrents to the development of lead deposits in remote regions. The outlook for any notable increase in the production of this metal, therefore, seems to depend on the stimulation of the mining of other metals and the consequent increase in their production. That this increase in mining lodes of mixed metallic content is likely to take place is regarded as a certainty, and that some of the silver-lead deposits which are now lying idle will be opened up again seems almost equally certain. As general business conditions throughout the world improve an increase in the output of lead from Alaska ores is looked for with considerable assurance.

PLATINUM METALS

Platinum is one of the group of several metals which, because they are closely related in physical and chemical character, are often not differentiated by name or are not even identified specifically in the usual forms of assay or analysis but are spoken of as the platinum metals, or, even more loosely, as platinum. Platinum, palladium, osmium, and iridium are some of the individual members of this group. Some of these metals have been found in lodes and in placers in Alaska. The total quantity of platinum metals produced in Alaska in 1932 is estimated to have been approximately 720 crude ounces or 540 fine ounces, which at $36.45, the average market price for platinum as computed by the Engineering and Mining Journal was worth about $19,700.

By far the greater part of the platinum metals produced in Alaska in 1932 was recovered from placers in the Goodnews Bay district, south of the mouth of the Kuskokwim River. From 12 to 15 men were engaged in mining in this district in 1932. The occurrence of platinum in the Goodnews Bay region has been known for several years, but interest has recently been revived in the district because of its greatly increased production, though with the tremendous drop in the price of platinum metals in the last year or so that interest has waned. In spite of exaggerated statements regarding the richness of these deposits that have been made from time to time in the press, it is true that placer deposits containing platinum, worth continued careful prospecting, occur in this district, and that the search for places where concentration has been great enough to form deposits that can be worked at a profit is well justified. The most extensive work is reported to have been done on streams tributary to Salmon Creek south of Goodnews Bay, especially those that head in the general vicinity of Red Mountain. The greatest amount of platinum recovered in 1932 is reported to have come from Clara Creek, and smaller quantities were recovered from Squirrel, Platinum, and Dry Creeks and Fox Gulch.

In the open season of 1931 Irving Reed, an engineer in the employ of the Territory, spent a week in the Goodnews Bay district, and a report of recent developments in the district based largely on his observations and accompanied by a sketch map has been published.[28] Practically all the producing properties were visited, and much specific information as to the developments on each is given in this report. The conclusion is expressed that not only the district justifies more thorough search for placers but that the possibilities of occurrences of lode platinum in it should not be overlooked. Although the Goodnews Bay district has yielded considerable platinum metals and ap-

[28] Reed, Irving, in Stewart, B. D., Mining investigations and mine inspection in Alaska, biennium ending Mar. 31, 1933, pp. 103-126, 1933.

pears to well warrant further prospecting, the finds so far made do not justify any rush of prospectors into the region in the hope of finding easily won riches. The recovery of so much platinum by so small a force of men as is now mining in the region certainly warrants a complete survey and examination to determine its mineral possibilities but will call for much hard labor and prospecting ability in a remote and difficult area.

Some difficulty has been experienced by the platinum miners in disposing of their product at satisfactory prices. This condition was especially marked during the period from 1929 to 1930, when the prices paid for platinum fluctuated widely but on the whole showed a marked decline. As may not be generally known, none of the Government mints or assay offices pay for platinum sent to them, so that the producer must sell to private purchasers, and the transaction becomes one of bargaining, which at the distance that separates the Alaska producer from the purchaser in the eastern United States is time consuming to conduct and rather difficult for either party to manage satisfactorily.

The only other region in Alaska where some platinum metals are reported to have been recovered in 1932 is Seward Peninsula. In that region a few ounces of platinum metals were recovered from gold placers on Dime Creek, in the Koyuk district, in the extreme eastern part of the peninsula. This place has long been a small though consistent producer of platinum as a byproduct. A new locality at which some placer platinum was reported to have been recovered in 1932 in the course of gold mining was on Quartz Creek, a tributary of the Kiwalik River, in the Fairhaven district, just north of the Koyuk district. Many of the geologic features of the area are comparable with those in the Koyuk district, and it seems probable that the platinum metals in the two areas may have a more or less common source.

Although no other places in Alaska are known to have produced platinum metals in 1932, it is not at all unlikely that small amounts may have been produced elsewhere and held by their producers. Places where platinum has been recognized are widespread through other parts of Alaska, and some of them in other years have produced platinum that has been sold. Among these places may be mentioned the Chistochina district of the Copper River region; Metal Creek, in the Kenai district; some of the beach placers of Kodiak Island, in southwestern Alaska; the Kahiltna River and nearby streams, in the Yentna district of the Susitna region; Boob Creek, in the Tolstoi area of the Innoko district; Granite Creek, in the Ruby district of the Yukon region; and some streams in the Marshall district, in the western part of the Yukon region. In the past a considerable production of platinum metals came from lodes in southeastern Alaska operated by the Alaska Palladium Co., on Kasaan Peninsula, Prince

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of Wales Island, about 30 miles west of Ketchikan. This mine has not been in operation since 1926, but during the time it was running it produced several hundred thousand dollars' worth of platinum metals, mainly palladium, as well as a good deal of gold and some copper. The platinum metals formed only a small part of the total metallic content of the ore—so small a part, indeed, that they could not be identified in the ore by the unaided eye.

TIN

For a number of years Alaska has been a small but consistent producer of tin, and in the course of the 30 years since tin minerals were discovered in Seward Peninsula it has shipped tin worth more than a million dollars. In 1932, however, according to such records as have been received by the Geological Survey, no tin ore was mined in Alaska. This cessation by no means indicates that the known tin deposits have been exhausted but is believed to have been caused by the extremely low price offered for tin—about 22 cents a pound—and the fact that some of the former Alaska shippers of tin ore had not sold all the ore that they had produced and shipped in earlier years. As is probably well known, the Alaska ore requires smelting to yield its tin in a metallic form, and as there are no smelters in Alaska or even in the States that make a practice of treating ore of this sort, most of it is shipped to Singapore for reduction. Resumption of tin mining in Alaska when conditions of world business improve can be predicted with assurance, but until the price paid for tin is considerably higher than at present there is little hope that the mining operations will be conducted on more than a small scale. Tin lodes that have been mined have long been known in the western part of Seward Peninsula near York and Tin City, but the bulk of the past production has come from placers in which the tin minerals, because of their weight, have been concentrated. Most of the placer tin that has been mined in the past has come from the York district in western Seward Peninsula and from the Hot Springs district in the Yukon region. Recent information regarding the occurrence of tin in the Hot Springs district are given in a report by Mertie,[29] based on field investigations made by him in 1931, and some notes on the occurrence of tin minerals in the concentrates derived from some of the streams in that same general region are given in a report by Waters.[30]

The complete record of tin production from Alaska is given in the accompanying table.

[29] Mertie, J. B., Jr., Mineral deposits of the Rampart and Hot Springs districts, Alaska: U.S. Geol. Survey Bull. 844-D, pp. 205-213, 1934.

[30] Waters, A. E., Jr., Placer concentrates in the Rampart and Hot Springs districts, Alaska: Idem, pp. 242-246, 1934.

Tin produced in Alaska, 1902–32

Year	Ore	Metal	Value	Year	Ore	Metal	Value
	Tons	*Tons*			*Tons*	*Tons*	
1902	25	15	$8,000	1919	86	56	$73,400
1903	42	25	14,000	1920	26	16	16,112
1904	23	14	8,000	1921	7	4	2,400
1905	10	6	4,000	1922	2.3	1.4	912
1906	57	34	38,640	1923	3	1.9	1,623
1907	37.5	22	16,752	1924	11	7	7,028
1908	42.5	25	15,180	1925	22.2	13.8	15,980
1909	19	11	7,638	1926	12.85	8	10,400
1910	16.5	10	8,335	1927	37.5	26.7	34,000
1911	92.5	61	52,798	1928	58.6	41	41,000
1912	194	130	119,600	1929	51.6	38.6	35,000
1913	98	50	44,103	1930	21	14.7	9,300
1914	157.5	104	66,560	1931	5.6	4.1	2,000
1915	167	102	78,846	1932			
1916	232	139	121,000				
1917	171	100	123,300		1,834	1,149	1,094,000
1918	104.5	68	118,000				

COAL

The coal produced from Alaska fields in 1932 is estimated to have been 102,700 tons. This marks a decrease of about 3,000 tons from the amount produced in 1931, so that no notable change in the rate of production occurred, and the decline is to be regarded simply as a minor fluctuation. In addition to the coal mined in Alaska, some 42,000 tons of coal was imported from fields outside Alaska, and no Alaska coal was exported. The consumption of coal in Alaska in 1932 was thus 145,000 tons, or about 16,000 tons less than the average for the preceding 10 years. A comparison of coal production and consumption in Alaska for the entire period for which records are available is afforded by the following table:

Coal produced and consumed in Alaska, 1880–1932

Year	Produced in Alaska, chiefly subbituminous and lignite		Imported from States, chiefly bituminous coal from Washington	Imported from foreign countries, chiefly bituminous coal from British Columbia [a]	Total coal consumed
	Short tons	Value			
			Short tons	*Short tons*	*Short tons*
1880–1915	71,633	$456,993	679,844	1,079,735	1,831,212
1916	12,676	57,412	44,934	53,672	111,282
1917	54,275	268,438	58,116	56,589	168,980
1918	75,816	413,870	51,520	37,986	165,322
1919	60,894	345,617	57,166	48,708	166,768
1920	61,111	355,668	38,128	45,264	144,503
1921	76,817	496,394	24,278	33,776	134,871
1922	79,275	430,639	28,457	34,251	141,983
1923	119,826	755,469	34,082	43,205	197,113
1924	99,663	559,980	40,161	41,980	181,804
1925	82,868	404,617	37,324	57,230	177,422
1926	87,300	459,000	35,620	34,254	157,174
1927	104,300	548,000	35,212	27,225	166,737
1928	126,100	662,000	39,184	32,521	197,805
1929	100,600	528,000	32,762	24,172	157,534
1930	120,100	631,000	37,128	23,892	181,120
1931	105,900	556,000	30,772	17,796	154,468
1932	102,700	513,500	28,422	13,959	145,081
	1,541,854	8,443,000	1,333,110	1,706,215	4,581,179

[a] Compiled from reports from Bureau of Foreign and Domestic Commerce. No figures on imports before 1899 are available.

In the table the total value of the coal produced in Alaska in 1932 is stated to have been $513,500. This value can be regarded only as a fair approximation, because the records are not available for precise determination of the actual selling price of the coal. Much of the coal is purchased by the Alaska Railroad on contract for large quantities, so that the price paid by the railroad is not an accurate basis on which to compute the price paid for the lots sold to the smaller consumers, who in the aggregate buy a large part of the output and pay much higher prices. From all the available information, and by weighting the resulting estimate as closely as practicable, it appears that the average price of all the coal mined in Alaska in 1932 was about $5 a ton, which is 25 cents a ton less than in 1931 and is considerably less than the average for the entire period shown in the table.

The Alaska coal came principally from 3 mines—2 in the Matanuska field and 1 in the Nenana or Healy River field. The two mines in the Matanuska field were those of the Evan Jones Coal Co., at Jonesville, and of the Alaska-Matanuska Coal Co., later the Alaska Premier Coal Corporation, in the valley of Moose Creek. Mining at the Evan Jones mine was maintained at an average rate of more than 100 tons a day throughout the year, and in addition to supplying such coal as the railroad required, the company filled many domestic orders and was active in trying to build up an even more extensive market for its coal, furnishing some to canneries in the Alaska Peninsula and other parts of south-central Alaska. During the summer steps were taken to improve the operating conditions at the mine by the installation of new equipment and by replacing the old haulage and conveyor systems. Through September and October active mining was entirely suspended while this work was being done. During the months in which productive mining was in progress from 30 to 50 men were employed in underground and surface work on the property.

At the Premier mine of the Alaska-Matanuska Coal Co. the arrangement entered into in 1931 whereby the Government, for the purpose of protecting its general interest in the public coal lands in the Moose Creek area, should keep the mine free of water, was continued until September. According to this plan the coal company executed a sublease to the Alaska Railroad whereby the railroad agreed to keep the mine pumped out and in return was permitted to mine enough coal for its own use to defray the expenses incurred. This was a mutually advantageous plan, as the private interest of the company in the property was protected and the Government's interest in the whole area was safeguarded. Through an arrangement between the Alaska Railroad and the Geological Survey, J. J. Corey, of the Geological Survey, directed the technical work and served throughout

as an adviser to the railroad in the mining problems involved. While this work was in progress the company was active in trying to make plans whereby it should either resume operations itself or should induce some one else to take over its lease. These negotiations finally resulted in the formation of a new company, the Alaska Premier Coal Corporation, which took over the property late in September. During October this company was engaged in getting the mine into operating condition, but by the end of the month it had completed that work and throughout the rest of the year produced considerable coal.

Two miles east of the Premier mine the Wishbone Hill Coal Co. started opening up one of the old properties, leased the use of the narrow-gage railroad that connects with the standard-gage track at Premier, and produced a small amount of coal. No mining was in progress during the year at the Pioneer coal mine, on Moose Creek about a mile above its mouth, nor at the Ross Heckey property, on Coal Creek south of Chickaloon. The old Government-owned mine at Eska was idle throughout the year, but it was maintained in a more or less stand-by condition, so that if anything should happen which might endanger the supply of coal needed to run the railroad it could be reopened quickly and mining resumed. Railroad facilities on the Chickaloon branch above Sutton and on the Moose Creek spur were badly disorganized during the middle of the summer by the high water and floods, which swept out long stretches of track and put many of the bridges out of commission.

In the Nenana coal field the only producing property was the Suntrana mine of the Healy River Coal Corporation, on the Healy River, about 4 miles east of the junction of that stream and the Nenana River. The plant of this mine has been well laid out and is now equipped with the necessary modern machinery to handle at least 200 tons of coal a day. The largest single user of coal from this property is the Fairbanks Exploration Co. for furnishing power to its dredges and in its large placer-mining operations in the vicinity of Fairbanks. The coal has a somewhat lower heating value than that from the Matanuska and nearby fields and, as a consequence, is not used in the railroad locomotives. This mine was in continuous operation throughout 1932 and yielded considerably more than half of all the coal mined in Alaska during that year. A specially well-designed bunker was built by the company at Fairbanks to provide for storage and for the economical handling of the distribution of its coal locally.

Small amounts of coal are reported to have been mined during the year at the old Chicago Creek mine, in the valley of the Kugruk River, in northern Seward Peninsula; at a recently opened deposit near Unalakleet, east of Norton Sound; and at several points along Kuk Lagoon, south of Wainwright, in northern Alaska. The coal

from these different properties was used only locally and had no significant effect on the general Alaska coal situation, except to confirm the statement, often made before, that throughout the Territory there are many areas containing coal adequate for local use. So far as the Geological Survey is informed, no production was made during the year from the known coal deposits on Admiralty Island, in the Juneau district, where some activity had lately been shown. In the Bering River field, where extensive deposits ranging in composition from bituminous coal to anthracite have long been known, prospecting or other development work relating to the coal resources was apparently at a standstill in 1932. Rumors of renewed activity in this field were heard from time to time, and requests for extensions of some of the Government permits for coal prospecting there were received. It is evident that this field has much potential value, but it is also evident that the present coal consumption of Alaska is not such as to stimulate large companies to undertake extensive projects and that until there is a greater demand for their product or until they are prepared to invade a more distant market, where competition will be more severe, they will not enter this field. Furthermore, the development work already done in this field indicates that some complex geologic conditions will be encountered, so that desultory prospecting by small, poorly financed, or technically unskilled operators holds little promise of success, and full development must await a company that is able to go into the matter in a large way and to bear the necessary expense of exploring a new field.

In addition to those private enterprises which are developing or attempting to develop certain of the Alaska fields, the Government itself was active during 1932 in trying to determine the character and extent of certain of the coal lands in its own possession. The initiation of this effort may be traced directly to the investigations made in 1930 by a special committee of the Senate as to what could be done to reduce the operating deficit of the Alaska Railroad. One of the conclusions reached was that mineral tonnage must be sought for supplying much of the business to the road, and to make it possible to search for that tonnage the committee recommended and Congress granted funds for the work. As a result of that grant a reexamination of the surface indications of coal in the Anthracite Ridge field, about 10 to 15 miles east of Chickaloon, in the Matanuska district, was made in 1931. The general conclusion reached from that work was that further tests of the region should be made by putting down diamond-drill holes so as to recover samples of the formations penetrated for examination in detail and tests of any coals found. This advice was adopted, and in 1932 contracts were entered into for drilling some 8,000 feet of holes at localities selected by the Geological Survey and supervised by technical members of its staff. This work was carried on through-

out the greater part of 1932, and the results are in preparation for publication.[31] However, as some time will lapse before the report can be issued, a summary of the more important conclusions reached is given here. High on the slopes of the ridge there is about 750,000 tons of semianthracite in an area that has been intruded by thick masses of igneous rock and is intensely folded and faulted. In the area low on the flanks of the ridge, where the structure is less complex, drill tests showed that, although the formation that carried this high-rank coal was penetrated, the coal beds themselves pinched out so that only thin stringers of coal were encountered. Furthermore, the high-rank coal on the ridge gives place in the lower area to coals of only bituminous grade and consequently of less value. The coals of that region are therefore not regarded as sufficiently extensive or of high enough quality to warrant their development in competition with more accessible beds of similar coal in the western part of the Matanuska Valley.

The western part of the Matanuska coal region was also the site of diamond-drilling tests by the Government in 1932 to determine the coal resources of that part of the field and to find out whether they might be successfully developed in the near future. The locality selected for these tests was about 2 miles west of the Premier mine, on Moose Creek, and a total of 3,700 feet of core drilling was done at five sites. The results demonstrated that although coal-bearing formations extend into that area the coal seams are not continuous. No beds of commercial thickness were encountered—in fact, only thin stringers were penetrated. The quality of the coal, however, was the same as in the beds now being developed in the mines on Moose Creek. Although it is probable that elsewhere in the area west of Moose Creek there are thicker beds than those disclosed by this drilling, their discovery would call for extensive and costly drilling tests, and such an outlay does not seem warranted in view of the fact that the existing mines in the general region can easily supply far more than the demands of the existing markets. A report covering these investigations in the area west of Moose Creek has been prepared by G. A. Waring, who supervised the field operations and gives in detail many of the facts learned.[32]

The whole problem of the development of Alaska's coal resources is exceedingly complex, for while there are in the Territory large areas occupied by coal-bearing rocks, the local demands are fairly well supplied by existing mines, and to attempt to enter a larger field requires large outlays for developing mines and the market. Obviously many consumers are unwilling to commit themselves to any

[31] Waring, G. A., Geology of the Anthracite Ridge coal district, Alaska: U.S. Geol. Survey Bull. 861 (in preparation).

[32] Waring, G. A., Core drilling for coal in the Moose Creek area, Alaska: U.S. Geol. Survey Bull. 857-E (in preparation).

specific agreements to purchase until they are sure that the coal offered them is available at a satisfactory price, and the mining operator, of course, in the initial stages can offer little definite assurance as to costs and availability of his product until he has some certainty as to his market. Certainly many of the steps that must be taken if any extensive use of Alaska coal is to be made require that the enterprise must be undertaken on such a scale as will justify the outlay for the essential facilities. This means that a considerable tonnage must be marketed, but the attempt to dispose of a large tonnage of Alaska coal will bring it into competition with coals from other areas and in places where the competitive conditions appear to be almost insuperable for the Alaska product. Many of the competitive conditions are changing, however, so that the situation must be subjected to constant review. Of course, as Alaska develops and becomes more settled its people and industries will call for more and more coal, and in meeting this demand Alaska coals will have great competitive advantage over those from outside sources. That growth, however, probably will be relatively slow but none the less sure.

PETROLEUM

The only petroleum produced in Alaska comes from the wells of the Chilkat Oil Co., in the Katalla field, near the coast of south-central Alaska. This company obtains oil from several relatively shallow wells, few of which are more than 1,000 feet deep and none more than 2,000 feet. The wells penetrate beds that are identified as of Tertiary age. A small refinery is operated at Katalla by the company, and the products—gasoline and distillate, which are of especially high quality—find a ready market near at hand, especially for use by the fishing fleet near Cordova. So far as learned by the Geological Survey no new developments of note took place at this property in 1932, and production was continued on essentially the same scale as in recent years.

The small domestic production of petroleum from the Katalla field is not adequate to supply even local needs, and the demand for large quantities of petroleum products throughout the Territory is met principally by imports from the States. The most notable feature shown by the subjoined table is that up to 1930 there has been a constant increase since the war in the amount of gasoline and related lighter products of distillation imported. This increase was called for by the growing use of power in fishing boats and other water craft, in the canneries, in many mining developments, and in the operation of means of transportation, such as automobiles and gas cars or engines on practically all the railroads. Beginning with 1930, however, there has been a decided drop in the quantity of petroleum products shipped into Alaska. The decrease in the last 3 years

is interpreted as only a temporary drop in the consumption, brought about by the general decline in all business activities.

Petroleum products shipped to Alaska from other parts of the United States, 1905–32, in gallons [a]

Year	Heavy oils, including crude oil, gas oil, residuum, etc.	Gasoline, including all lighter products of distillation	Illuminating oil	Lubricating oil
1905	2,715,974	713,496	627,391	83,319
1906	2,688,940	580,978	568,033	83,992
1907	9,104,300	636,881	510,145	100,145
1908	11,891,375	939,424	566,598	94,542
1909	14,119,102	746,930	531,727	85,687
1910	19,143,091	788,154	620,972	104,512
1911	20,878,843	1,238,865	423,750	100,141
1912	15,523,555	2,736,739	672,176	154,565
1913	15,682,412	1,735,658	661,656	150,918
1914	18,601,384	2,878,723	731,146	191,876
1915	16,910,012	2,413,962	513,075	271,981
1916	23,555,811	2,844,801	732,369	373,046
1917	23,971,114	3,256,870	750,238	465,693
1918	24,379,566	1,086,852	382,186	362,413
1919	18,784,013	1,007,073	3,515,746	977,703
1920	21,981,569	1,764,302	887,942	412,107
1921	9,209,102	1,403,683	2,021,033	232,784
1922	15,441,542	1,436,050	2,095,675	345,400
1923	12,285,808	4,882,015	473,826	454,090
1924	14,412,120	5,554,859	566,431	506,364
1925	16,270,746	6,993,560	562,844	580,321
1926	14,000,664	5,069,584	328,615	730,924
1927	17,628,744	8,141,574	516,306	620,450
1928	13,000,176	8,025,402	463,134	715,082
1929	17,347,344	6,847,050	589,340	878,094
1930	13,801,746	6,317,934	401,646	701,946
1931	12,282,480	5,532,912	338,310	450,870
1932	14,167,104	4,755,660	297,780	338,310
	429,778,637	90,329,991	21,350,090	10,567,275

[a] Compiled from reports from Bureau of Foreign and Domestic Commerce.

Search for new oil fields in Alaska has practically been discontinued during the last few years, and in 1932 drilling was done at only one place, in addition to the property of the producing company already mentioned. Hundreds of permits for prospecting for oil that have been issued by the Government and cover tracts in all parts of Alaska are outstanding in the hands of individuals or companies, but most of them were evidently taken up solely for speculative purposes and will lapse if no active work is done under them. As prospecting permits for oil are issued on application, without regard to the merits of the land involved as a favorable place in which to search for oil, the investing public should be warned that a permit from the Government is only what it purports to be—permission to search for oil—and it in no way implies that the search has even a remote chance of being successful. Furthermore, the public should realize that prospecting permits if within the law are readily granted by the Government at a nominal charge and so should be warned against unscrupulous companies that offer their services in obtaining permits for their clients at a charge far in excess of any

reasonable fee for the services they render and for any payments they make to the Government.

Drilling for oil was in progress in 1932 in the Matanuska Valley, a few miles west of Chickaloon, on the property of the Peterson Oil Association. Drilling at this place started in 1926, and when work was suspended for the winter of 1931 the hole had reached a depth of about 1,465 feet. During 1932 the work was at a standstill, and although the manager was on the property for a few months during the open season, it is understood that no drilling was accomplished. The geologic conditions in the vicinity of the well, so far as known, are not those usually found in the areas in the States where the larger commercial pools of oil occur, and a geologist cannot but entertain grave doubts as to the occurrence of oil in that locality. However, the finding of a commercial accumulation of oil would be of so much benefit to the region as a whole, as well as to the operators, and so much time and money have already been spent in the enterprise that if any doubt remains as to the probability of finding oil there it would be too bad to stop drilling before that question is definitely settled, either by striking oil or by demonstrating that further search would be fruitless. It is to be regretted that the same amount of time and money was not invested at places that seemed to show more promise of containing oil.

MISCELLANEOUS MINERAL PRODUCTS

The list of minerals of value that have been found in Alaska is long. In addition to those described in the preceding sections of this report others which have at one time or another been produced in quantities large enough to have more than local significance and some of which have been and still are the basis of profitable mining industries include, among metallic products, antimony, arsenic, bismuth, chromium, iron, manganese, mercury or quicksilver, molybdenum, nickel, tungsten, and zinc; and among nonmetallic products, asbestos, barite, building stone, clay, garnet, graphite, gypsum, jade, limestone, marble, and sulphur. Without doubt small quantities of practically all these materials were "produced" in 1932 in the broadest sense of that word, but with the exception of stone and marble none of them were reported to have been produced and sold in quantities that represent a value of more than a few thousand dollars at most, and for any single commodity rarely more than a few hundred dollars.

In the following table, as well as in certain of the other tables in this report, all these minerals that were produced only by a single operator or in quantities so small that to list them separately would disclose the production of individual operators have been grouped together under the collective term "miscellaneous mineral products." Among the mineral products included in the table of miscellaneous

mineral products that have also been described in this report are platinum metals and petroleum. The inclusion of petroleum in this list is due to the fact that at present there is only one producer in the Territory, and therefore it has not been permissible to disclose the quantity or value of the product. The inclusion of platinum metals is a relic of the period when practically the entire production of platinum metals in Alaska came from one mine and so could not be disclosed. Now that there are many producers it is appropriate to state their combined production, and this has been done, but in order that there may be a fair comparison of the production of the minerals grouped together as miscellaneous products in earlier years with those same products in 1932, it has been necessary to include the value of the platinum metals in this table.

Value of output of miscellaneous mineral products of Alaska, including platinum, petroleum, quicksilver, stone, antimony, gypsum, marble, and other products, 1901–32 [a]

Year	Value	Year	Value	Year	Value
1901	$500	1913	$286,277	1924	$348,728
1902	255	1914	199,767	1925	454,207
1903	389	1915	205,061	1926	444,500
1904	2,710	1916	326,737	1927	162,000
1905	710	1917	203,971	1928	164,000
1906	19,965	1918	171,452	1929	194,000
1907	54,512	1919	214,040	1930	157,300
1908	81,305	1920	372,599	1931	108,000
1909	86,027	1921	235,438	1932	223,400
1910	96,408	1922	266,296		
1911	141,739	1923	229,486		5,972,000
1912	165,342				

[a] $117,000 of placer platinum metals mined prior to 1926 and $238,000 of antimony mined prior to 1927 not distributed by years but carried in total.

The largest single enterprise that is included under this section is the quarrying of marble by the Vermont Marble Co. from its properties in southeastern Alaska. For many years this company was a large and consistent producer, but later its output decreased, and in 1931 its quarries were idle throughout the year. Resumption of work is therefore regarded as a very favorable indication that the industry will continue to be significant in the general mineral activity of the Territory. The quarries owned by this company are near Tokeen and Calder, on the west coast of Prince of Wales Island, but the finishing plants to which the rough stone is sent are in Tacoma, Wash., and San Francisco, Calif. The stone has been in great demand throughout the west coast and has been used in many of the most imposing buildings, principally for interior trim and decoration. According to the reports of the company only about two thirds of the marble quarried during the year was shipped to its finishing plants, the rest being held at the mine. Limestone and marble are widely distributed throughout southeastern Alaska, and, according to

Burchard,[33] many different grades, some even approaching statuary quality, are found in the region. It therefore seems strange that more of these limestone and marble deposits, many of which are favorably situated with respect to deep-water transportation, have not been profitably developed.

The other large enterprise included in this section is the quarrying of great quantities of high-grade limestone rock which is transported to the States and used in the manufacture of cement. This work is conducted by Superior Portland Cement, Inc., under a lease from the Pacific Coast Cement Co. The quarry from which the rock is taken is in southeastern Alaska on Dall Island, between Baldy Bay and Tlevak Strait, about 40 miles west of Ketchikan, and in 1932 was in operation only from May to August. The general practice at this place is to drill the limestone in the quarry, blast it down, and haul it to the crushing plant, where it is broken down to suitable size and stored near the wharf, ready for loading on the steamer for Seattle. The round trip, including loading and unloading, takes less than 10 days. Owing to the fact that the producer, transporter, and consumer are all one and the same, it is impossible to arrive at a true market price for the limestone produced by this company. In the table given above it has been necessary to adopt a more or less arbitrary price for the limestone, as a means of including this product with the other mineral resources. The price adopted, however, is believed to be extremely conservative, so that the total value of the output as given probably is not more than the actual cost of mining and transportation, without any charge for the basic raw material, the limestone.

Little detailed information has been received by the Geological Survey regarding the developments during the year at the quicksilver deposits in the Kuskokwim Valley. At the E. W. Parks property, a short distance west of Sleitmut, at the mouth of the Holitna River, about 35 tons of ore was mined, practically all of which was treated in a small furnace and the quicksilver extracted. None of the other quicksilver deposits in the Kuskokwim Valley are reported to have made any production during the year, and it is believed that no work other than the assessment work required by law was done at any of them. In the vicinity of Bluff, in the Seward Peninsula region, development work was continued by the Alaska Mercury Corporation on lodes carrying quicksilver minerals that appear in the sea-cut limestone cliffs at the mouth of Swede Creek. Throughout much of the limestone there are indications of quicksilver mineralization, but most of the metal is so diffused that it could not be profitably mined. The character and extent of the mineralization, however, are such as to justify continuation of the search for places where it may have been more restricted, so that it produced a commercial deposit. In

[33] Burchard, E. F., Marble resources of southeastern Alaska: U.S. Geol. Survey Bull. 682, pp. 29–39, 1920.

this search special attention should be paid to any exposures or indications of relatively recent igneous intrusions, particularly if those intrusions were of acidic types of rock. Only two persons have been attempting the development on this property, and their other duties have diverted much of their activity from the quicksilver prospects. Quicksilver has been recognized in the placer concentrates from streams in many parts of the Territory, but the lodes from which it came were apparently small stringers and, except in the places already mentioned and the Hot Springs district of the Yukon region, none of them appear to be likely to afford ore that can be mined under present conditions.

In 1931 it was reported that renewed interest had been shown in the development of the chrome ores that have long been known in the southern part of Kenai Peninsula and that a test shipment had been made of ore from the Lass & Whitney properties near Red Mountain, south of Seldovia. No news has been received of the continuation of that activity in 1932, and it is probable that while some work was done there it did not result in making further shipments. That there are large bodies of chrome ore in this region has been known for some time, but what average chrome content can be maintained under commercial conditions, what will be the cost of mining it and transporting it to market, and what profit will be left after it is sold are matters that still require investigation.

Molybdenum, one of the elements used in making certain special steels, is found in a number of mineralized areas throughout Alaska. The principal source of this metal is the mineral molybdenite, in which it is combined with sulphur as a sulphide. During 1931 interest was revived in the deposits containing molybdenite that occur on Baker Island, about 80 miles due west of Ketchikan, and the San Antonio Metals Co. was formed to promote their development. The mineralization occurred near the contact of a series of slates and limestones with a granite mass and appears to have been brought about by the intrusion of the granite. In addition to the molybdenite the ore contains gold worth several dollars a ton. No details are known as to the actual work on this enterprise accomplished during 1932, but from informal reports it was learned that exploration by a small crew was continued for several months during the summer.

Antimony ores are widely distributed throughout Alaska, and in the past considerable quantities were produced and shipped from the Territory. In 1932, however, so far as reported to the Geological Survey, no antimony ores were sold, and no prospecting is known to have been done on lodes solely valuable for the antimony they contain. However, according to reports received from the owner, the annual assessment work required by law was kept up on the property near Point Caamano, about 20 miles north of Ketchikan, at which pros-

pecting has been in progress for several years. Many of the lodes of the other minerals, notably gold, contain considerable stibnite, the sulphide of antimony, and in the course of mining them some antimony is necessarily taken out, though most of it is lost in the tailings. At a few places some of the larger masses of stibnite are laid aside until enough has accumulated to be worth shipping. The present low price of antimony of less than 6 cents a pound and the remoteness of most of these deposits in interior Alaska do not encourage their development at this time. Prospecting is said to have been continued on the known nickeliferous sulphides of the Chichagof district, in southeastern Alaska, but no ore is reported to have been produced for sale during the year.

The ore from the Eva Quartz Mining Co.'s property near Ferry, in the Bonnifield district, which is mined principally for the gold it contains, also carries considerable bismuthinite, a sulphide of bismuth, from which bismuth might be obtained if desired. This element, however, is a detriment in the ordinary smelter treatment, so that its presence instead of being a source of revenue is usually penalized by the smelters.

Little new development took place during 1932 on the many kinds of nonmetallic mineral products that occur in Alaska. Early in February the so-called Akun Island sulphur mine, about 9 miles from Akutan post office, was reported to have been sold to the Pacific Sulphur Corporation. The purchaser, however, does not appear to have completed all the arrangements for taking over the property and so far as learned did no actual work on the ground and has not announced any definite plans for future development.

Although the various mineral commodities here grouped under the heading "miscellaneous mineral products" yield small monetary returns—about $223,000 in 1932—yet their diversity, their wide distribution, and the interest that is being displayed in the search for them indicate that they already play an important part in the mineral economics of the Territory and are destined to become even more significant as the development of Alaska proceeds.

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 prices are 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 percent 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 geography and geology of Alaska, by A. H. Brooks. Professional Paper 45, 1906, 327 pp.

The Alaskan mining industry in 1932, by Philip S. Smith. Bulletin 857-A, 1934, 10 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, 20 cents; 836, 1930, 20 cents; 844-A, 1931, 10 cents.

Railway routes from the Pacific seaboard to Fairbanks, by A. H. Brooks. In Bulletin 520, 1912, pp. 45–88. 50 cents.

Geologic features of Alaskan metalliferous lodes, by A. H. Brooks. In Bulletin 480, 1911, pp. 43–93. 40 cents.

Alaska coal and its utilization, by A. H. Brooks. Bulletin 442-J, reprinted 1914, pp. 47–100. 10 cents.

The preparation and use of peat as a fuel, by C. A. Davis. In Bulletin 442, 1910, pp. 101–132. 40 cents.

* Methods and costs of gravel and placer mining in Alaska, by C. W. Purington. Bulletin 263, 1905, 273 pp.

* Geographic dictionary of Alaska, by Marcus Baker (second edition, prepared by James McCormick), Bulletin 299, 1906, 690 pp.

Tin mining in Alaska, by H. M. Eakin. In Bulletin 622, 1915, pp. 81–94. 30 cents.

Antimony deposits of Alaska, by A. H. Brooks. Bulletin 649, 1916, 67 pp. 15 cents.

The use of the panoramic camera in topographic surveying, by J. W. Bagley. Bulletin 657, 1917, 88 pp. 25 cents.

Mineral springs of Alaska, by G. A. Waring. Water-Supply Paper 418, 1917, 114 pp. 25 cents.

Chromite deposits in Alaska, by J. B. Mertie, Jr. In Bulletin 692-D, 1919, pp. 265–267. 15 cents.

The future of Alaska mining, by A. H. Brooks. Bulletin 714-A, 1921, pp. 5–57. 25 cents.

Preliminary report on petroleum in Alaska, by G. C. Martin. Bulletin 719, 1921, 83 pp. 50 cents.

The Mesozoic stratigraphy of Alaska, by G. C. Martin. Bulletin 776, 1926, 493 pp. 75 cents.

The Upper Cretaceous flora of Alaska, by Arthur Hollick, with a description of the Upper Cretaceous plant-bearing beds, by G. C. Martin. Professional Paper 159, 1930, 123 pp., 87 pls. 80 cents.

Glaciation in Alaska, by S. R. Capps. In Professional Paper 170, 1932, pp. 1–8. 15 cents.

In preparation

Past placer gold production from Alaska, by Philip S. Smith.

The Tertiary flora of Alaska, by Arthur Hollick, with a chapter on the geology of the Tertiary deposits, by Philip S. Smith.

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.

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

The Juneau gold belt, by A. C. Spencer, pp. 1–137, and A reconnaissance of Admiralty Island, by C. W. Wright, pp. 138–154. Bulletin 287, 1906, 161 pp. 75 cents.

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

The Ketchikan and Wrangell mining districts, by F. E. and C. W. Wright. Bulletin 347, 1908, 210 pp. 60 cents.

The Yakutat Bay region, by R. S. Tarr and B. S. Butler. Professional Paper 64, 1909, 183 pp. 50 cents.

Occurrence of iron ore near Haines, by Adolph Knopf. In Bulletin 442, 1910, pp. 144–146. 40 cents.

Geology of the Berners Bay region, by Adolph Knopf. Bulletin 446, 1911, 58 pp. 20 cents.

The Eagle River region, southeastern Alaska, by Adolph Knopf. Bulletin 502, 1912, 61 pp. 25 cents.

The Sitka mining district, by Adolph Knopf. Bulletin 504, 1912, 32 pp. 5 cents.

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

*A barite deposit near Wrangell, by E. F. Burchard. In Bulletin 592, 1914, pp. 109–117.

* Mineral deposits of the Yakataga district, by A. G. Maddren. In Bulletin 592, 1914, pp. 119–153.

Geology and ore deposits of Copper Mountain and Kasaan Peninsula, by C. W. Wright. Professional Paper 87, 1915, 110 pp. 40 cents.

*The structure and stratigraphy of Gravina and Revillagigedo Islands, by Theodore Chapin. In Professional Paper 120, 1918, pp. 83–110.

* Geology and mineral resources of the west coast of Chichagof Island, by R. M. Overbeck. In Bulletin 692, 1919, pp. 91–136.

The Porcupine gold placer district, by H. M. Eakin. Bulletin 699, 1919, 29 pp. 20 cents.

Notes on the Salmon-Unuk River region, by J. B. Mertie, Jr. Bulletin 714-B, 1921, pp. 129–142. 10 cents.

Marble resources of southeastern Alaska, by E. F. Burchard. Bulletin 682, 1920, 118 pp. 30 cents.

Water-power investigations in southeastern Alaska, by G. H. Canfield. In Bulletin 722, 1922. 25 cents. Similar previous reports in Bulletins 642, 1916, 35 cents; 662, 1918, 75 cents; *692, 1919; *712, 1920; 714-B, 1921. 10 cents.

Ore deposits of the Salmon River district, Portland Canal region, by L. G. Westgage. In Bulletin 722, 1922, pp. 117–140. 25 cents.

Mineral deposits of the Wrangell district, by A. F. Buddington. In Bulletin 739, 1923, pp. 51–75. 25 cents.

Mineral investigations in southeastern Alaska in 1924, by A. F. Buddington. In Bulletin 783, 1927, pp. 41–62. 40 cents. Similar report for 1923 in Bulletin 773, 1925, pp. 71–139. 40 cents.

Aerial photographic surveys in southeastern Alaska, by F. H. Moffit and R. H. Sargent. In Bulletin 797, 1929, pp. 143–160. 80 cents.

Geology of Hyder and vicinity, with a reconnaissance of Chickamin River, southeastern Alaska, by A. F. Buddington. Bulletin 807, 1929, 124 pp. 35 cents.

Geology and mineral deposits of southeastern Alaska, by A. F. Buddington and Theodore Chapin. Bulletin 800, 1929, 398 pp. 85 cents.

The occurrence of gypsum at Iyoukeen Cove, Chichagof Island, by B. D. Stewart. In Bulletin 824, 1932, pp. 173–177. 20 cents.

Notes on the geography and geology of Lituya Bay, by J. B. Mertie, Jr. In Bulletin 836, 1933, pp. 117–135. 75 cents.

Surface water supply of southeastern Alaska, 1909–1930, by F. F. Henshaw. In Bulletin 836, 1933, pp. 137–218. 75 cents.

In preparation

Glacier Bay and vicinity, by F. E. and C. W. Wright.

Mineral resources of Taku River region, by B. D. Stewart.

TOPOGRAPHIC MAPS

Juneau gold belt, Alaska; scale, 1:250,000; compiled. In Bulletin 287, 1906, 75 cents. Not issued separately.

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.

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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.

Eagle River region; scale, 1:62,500; by J. W. Bagley, C. E. Giffin, and R. E. Johnson. In Bulletin 502, 1912, 25 cents. Not issued separately.

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.

Wrangell district; scale, 1:250,000; 1932, by R. H. Sargent and V. S. Seward (preliminary edition). Free on application.

Sumner Straits and vicinity; scale, 1:250,000; 1933, by R. H. Sargent and V. S. Seward (preliminary edition). Free on application.

Taku district. Compiled principally from aerial photographs taken by the Alaska aerial survey expeditions of the Navy Department, 1926 and 1929.

CONTROLLER BAY, PRINCE WILLIAM SOUND, AND COPPER RIVER REGIONS

REPORTS

Mineral resources of the Mount Wrangell district, by W. C. Mendenhall and F. C. Schrader. Professional Paper 15, 1903, 71 pp. 30 cents.

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

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

Mineral resources of the Kotsina-Chitina region, by F. H. Moffit and A. G. Maddren. Bulletin 374, 1909, 103 pp. 40 cents.

Mineral resources of the Nabesna-White River district, by F. H. Moffit and Adolph Knopf, with a section on the Quaternary, by S. R. Capps. Bulletin 417, 1910, 64 pp. 25 cents.

Reconnaissance of the geology and mineral resources of Prince William Sound, by U. S. Grant and D. F. Higgins. Bulletin 443, 1910, 89 pp. 45 cents.

Geology and mineral resources of the Nizina district, by F. H. Moffit and S. R. Capps. Bulletin 448, 1911, 111 pp. 40 cents.

Headwater regions of Gulkana and Susitna Rivers, with accounts of the Valdez Creek and Chistochina placer districts, by F. H. Moffit. Bulletin 498, 1912, 82 pp. 35 cents.

Coastal glaciers of Prince William Sound and Kenai Peninsula, by U. S. Grant and D. F. Higgins. Bulletin 526, 1913, 75 pp. 30 cents.

The McKinley Lake district, by Theodore Chapin. In Bulletin 542, 1913, pp. 78–80. 25 cents.

Geology of the Hanagita-Bremner region, by F. H. Moffit. Bulletin 576, 1914, 56 pp. 30 cents.

* Mineral deposits of the Yakataga district by A. G. Maddren. In Bulletin 592, 1914, pp. 119–153.

* The Port Wells gold-lode district, by B. L. Johnson. In Bulletin 592, 1914, pp. 195–236.

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

The Ellamar district, by S. R. Capps and B. L. Johnson. Bulletin 605, 1915, 125 pp. 25 cents.

* A water-power reconnaissance in south-central Alaska, by C. E. Ellsworth and R. W. Davenport. Water-Supply Paper 372, 1915, 173 pp.

Copper deposits of the Latouche and Knight Island districts, Prince William Sound, by B. L. Johnson. In Bulletin 662, 1917, pp. 193–220. 75 cents.

The Nelchina-Susitna region, by Theodore Chapin. Bulletin 668, 1918, 67 pp. 25 cents.

The upper Chitina Valley, by F. H. Moffit, with a description of the igneous rocks, by R. M. Overbeck. Bulletin 675, 1918, 82 pp. 25 cents.

* Platinum-bearing auriferous gravel of Chistochina River, by Theodore Chapin. In Bulletin 692, 1919, pp. 137–141.

* Mining on Prince William Sound, by B. L. Johnson. In Bulletin 692, 1919. Similar previous reports in Bulletins * 592, 1914; 622, 1915, 30 cents; 642, 1916, 35 cents; 662, 1918, 75 cents.

* Mineral resources of Jack Bay district and vicinity, by B. L. Johnson. In Bulletin 692, 1919, pp. 153–173.

* Nickel deposits in the lower Copper River Valley, by R. M. Overbeck. In Bulletin 712, 1919, pp. 91–98.

The Kotsina-Kuskulana district, by F. H. Moffit and J. B. Mertie, Jr. Bulletin 745, 1923, 149 pp. 40 cents.

The metalliferous deposits of Chitina Valley, by F. H. Moffit. In Bulletin 755, 1924, pp. 57–72. 40 cents.

The occurrence of copper on Prince William Sound, by F. H. Moffit. In Bulletin 773, 1925, pp. 141–158. 40 cents.

Notes on the geology of the upper Nizina River, by F. H. Moffit. In Bulletin 813, 1930, pp. 143–163. 40 cents.

The Slana district, upper Copper River region, by F. H. Moffit. In Bulletin 824, 1931, pp. 111–124. 20 cents.

The Suslota Pass district, upper Copper River region, by F. H. Moffit. Bulletin 844-C, 1933, pp. 137–162. 15 cents.

In preparation

The Tonsina district, by F. H. Moffit.

The geology and mineral resources of the Chitina Valley and some adjacent areas, by F. H. Moffit.

TOPOGRAPHIC MAPS

Central Copper River region; scale, 1:250,000; by T. G. Gerdine. In Professional Paper 41, 1905, 50 cents. Not issued separately. Reprint in Bulletin 498, 1912, 35 cents.

Headwater regions of Copper, Nabesna, and Chisana Rivers; scale, 1:250,000; by D. C. Witherspoon, T. G. Gerdine, and W. J. Peters. In Professional Paper 41, 1905, 50 cents. Not issued separately.

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 335, 1908, 70 cents.

Headwater regions of Nabesna and White Rivers; scale, 1:250,000; by D. C. Witherspoon, T. G. Gerdine, and S. R. Capps. In Bulletin 417, 1910, 25 cents. Not issued separately.

Latouche Island, part of; scale, 1:21,120; by D. F. Higgins. In Bulletin 443, 1910, 45 cents. Not issued separately.

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.

Nizina district (No. 601B); scale, 1:62,500; by D. C. Witherspoon and R. M. La Follette. In Bulletin 448, 1911, 40 cents. Not issued separately.

Headwater regions of Gulkana and Susitna Rivers; scale, 1:250,000; by D. C. Witherspoon, J. W. Bagley, and C. E. Giffin. In Bulletin 498, 1912, 35 cents. Not issued separately.

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 Ellamar district (No. 602D); scale, 1:62,500; by R. H. Sargent and C. E. Giffin. In Bulletin 605, 1915, 25 cents. Not issued separately.

Nelchina-Susitna region; scale, 1:250,000; by J. W. Bagley, T. G. Gerdine, and others. In Bulletin 668, 1918, 25 cents. Not issued separately.

Upper Chitina Valley; scale, 1:250,000; by International Boundary Commission, F. H. Moffit, D. C. Witherspoon, and T. G. Gerdine. In Bulletin 675, 1918, 25 cents. Not issued separately.

The Kotsina-Kuskulana district (No. 601C); 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.

Tonsina district; scale, 1:250,000; 1932, by C. F. Fuechsel and J. W. Bagley (preliminary edition). Free on application.

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

Geologic reconnaissance in the Matanuska and Talkeetna basins, by Sidney Paige and Adolph Knopf. Bulletin 327, 1907, 71 pp. 25 cents.

* The Mount McKinley region, by A. H. Brooks. Professional Paper 70, 1911, 234 pp.

A geologic reconnaissance of the Iliamna region, by G. C. Martin and F. J. Katz. Bulletin 485, 1912, 138 pp. 35 cents.

Geology and coal fields of the lower Matanuska Valley, by G. C. Martin and F. J. Katz. Bulletin 500, 1912, 98 pp. 30 cents.

The Yentna district, by S. R. Capps. Bulletin 534, 1913, 75 pp. 20 cents.

* Geology and mineral resources of Kenai Peninsula, by G. C. Martin, B. L. Johnson, and U. S. Grant. Bulletin 587, 1915, 243 pp.

The Willow Creek district, by S. R. Capps. Bulletin 607, 1915, 86 pp. 25 cents.

The Broad Pass region, by F. H. Moffit and J. E. Pogue. Bulletin 608, 1915, 80 pp. 25 cents.

The Nelchina-Susitna region, by Theodore Chapin. Bulletin 668, 1918, 67 pp. 25 cents.

Platinum-bearing gold placers of Kahiltna Valley, by J. B. Mertie, Jr. In Bulletin 692-D, 1919, pp. 233–264. 15 cents.

*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 of the vicinity of Tuxedni Bay, Cook Inlet, by F. H. Moffit. In Bulletin 722, 1922, pp. 141–147. 25 cents.

The Iniskin Bay district, by F. H. Moffit. In Bulletin 739, 1922, pp. 117–132. 25 cents.

Chromite of Kenai Peninsula, by A. C. Gill. Bulletin 742, 1922, 52 pp. 15 cents.

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.

An early Tertiary placer deposit in the Yentna district, by S. R. Capps. In Bulletin 773, 1925, pp. 53–61. 40 cents.

Mineral resources of the Kamishak Bay region, by K. F. Mather. In Bulletin 773, 1925, pp. 159–181. 40 cents.

A ruby-silver prospect in Alaska, by S. R. Capps and M. N. Short. In Bulletin 783, 1927, pp. 89–95. 40 cents.

The Iniskin-Chinitna Peninsula and the Snug Harbor district, by F. H. Moffit. Bulletin 789, 1927, 71 pp. 50 cents.

Geology of the upper Matanuska Valley, by S. R. Capps, with a section on the igneous rocks, by J. B. Mertie, Jr. Bulletin 791, 1927, 92 pp. 30 cents.

Geology of the Knik-Matanuska district, by K. K. Landes. In Bulletin 792, 1927, pp. 51–72. 25 cents.

The Skwentna region, by S. R. Capps. In Bulletin 797, 1929, pp. 67–98. 80 cents.

The Mount Spurr region, by S. R. Capps. In Bulletin 810, 1930, pp. 141–172. 50 cents.

The Chakachamna-Stony region, by S. R. Capps. In Bulletin 813, 1930, pp. 97–123. 40 cents.

The Lake Clark-Mulchatna region, by S. R. Capps. In Bulletin 824, 1931, pp. 125–154. 20 cents.

The eastern portion of Mount McKinley Park, by S. R. Capps. In Bulletin 836, 1933, pp. 219–300. 75 cents.

Mineral investigations in the Alaska Railroad belt, 1931, by S. R. Capps. Bulletin 844-B, 1933, pp. 119–135. 5 cents.

Progress of surveys in the Anthracite Ridge district, by R. W. Richards and G. A. Waring. Bulletin 849-A, 1933, pp. 5–27. 5 cents.

The Willow Creek gold lode district, by J. C. Ray. Bulletin 849-C, 1933, pp. 165–229. 20 cents.

Mineral deposits near the West Fork of the Chulitna River, by C. P. Ross. Bulletin 849-E, 1933, pp. 289–333. 15 cents.

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The Curry district, by Ralph Tuck.
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The southern Alaska Range, by S. R. Capps.
Geology of the Anthracite Ridge coal district, by G. A. Waring.

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Matanuska and Talkeetna region; scale, 1:250,000; by T. G. Gerdine and R. H. Sargent. In Bulletin 327, 1907, 25 cents. Not issued separately.

Yentna district; scale, 1:250,000; by R. W. Porter. Revised edition. In Bulletin 534, 1913, 20 cents. Not issued separately.

*Mount McKinley region; scale, 1:625,000; by D. L. Reaburn. In Professional Paper 70, 1911. Not issued separately.

*Kenai Peninsula; scale, 1:250,000; by R. H. Sargent, J. W. Bagley, and others. In Bulletin 587, 1915. Not issued separately.

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Iniskin-Chinitna Peninsula, Cook Inlet region; scale, 1:62,500; 1922, by C. P. McKinley, D. C. Witherspoon, and Gerald FitzGerald (preliminary edition). Free on application. Also published in Bulletin 789, 1927. 50 cents.

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The Alaska Railroad route: Seward to Matanuska coal field; scale, 1:250,000; 1924, by J. W. Bagley, T. G. Gerdine, R. H. Sargent, and others. 50 cents retail or 30 cents wholesale.

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Girdwood district; scale, 1:62,500; 1932; by W. G. Carson (preliminary edition). Free on application.

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Lake Clark-Mulchatna River region; scale, 1:250,000; 1933, by Gerald FitzGerald, C. E. Giffin, R. H. Sargent, and D. C. Witherspoon. 50 cents.

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A reconnaissance in southwestern Alaska in 1898, by J. E. Spurr. In Twentieth Ann. Rept., pt. 7 (Explorations in Alaska in 1898), 1900, pp. 31–264. $1.80.

*Geology and mineral resources of parts of Alaska Peninsula, by W. W. Atwood. Bulletin 467, 1911, 137 pp.

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The Lake Clark-central Kuskokwim region, by P. S. Smith. Bulletin 655, 1917, 162 pp. 30 cents.

Beach placers of the west coast of Kodiak Island, by A. G. Maddren. In Bulletin 692-E, 1919, pp. 299–319. 5 cents.

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The Cold Bay district, by S. R. Capps. In Bulletin 739, 1923, pp. 77–116. 25 cents.

The Cold Bay-Chignik district, by W. R. Smith and A. A. Baker. In Bulletin 755, 1924, pp. 151–218. 40 cents.

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The outlook for petroleum near Chignik, by G. C. Martin. In Bulletin 773, 1925, pp. 209–213. 40 cents.

Mineral resources of the Kamishak Bay region, by K. F. Mather. In Bulletin 773, 1925, pp. 159–181. 40 cents.

*Aniakchak Crater, Alaska Peninsula, by W. R. Smith. In Professional Paper 132, 1925, pp. 139–149.

Geology and oil developments of the Cold Bay district, by W. R. Smith. In Bulletin 783, 1927, pp. 63–88. 40 cents.

Geology and mineral resources of the Aniakchak district, by R. S. Knappen. In Bulletin 797, 1929, pp. 161–223. 80 cents.

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Notes on the geology of the Alaska Peninsula and Aleutian Islands, by S. R. Capps.

The Nushagak district, by P. A. Davison.

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*Herendeen Bay and Unga Island region; scale, 1:250,000; by H. M. Eakin. In Bulletin 467, 1911. Not issued separately.

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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.

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*Cold Bay-Chignik region, Alaska Peninsula; scale, 1:250,000; 1924, by R. K. Lynt and R. H. Sargent (preliminary edition).

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Water-supply investigations in the Yukon-Tanana region, 1907 and 1908 (Fairbanks, Circle, and Rampart districts), by C. C. Covert and C. E. Ellsworth. Water-Supply Paper 228, 1909, 108 pp. 20 cents.

Mineral resources of the Nabesna-White River district, by F. H. Moffit, Adolph Knopf, and S. R. Capps. Bulletin 417, 1910, 64 pp. 25 cents.

*Mount McKinley region, by A. H. Brooks, with descriptions of the igneous rocks and of the Bonnifield and Kantishna districts, by L. M. Prindle. Professional Paper 70, 1911, 234 pp.

The Bonnifield region, by S. R. Capps. Bulletin 501, 1912, 64 pp. 20 cents.

A geologic reconnaissance of a part of the Rampart quadrangle, by H. M. Eakin. Bulletin 535, 1913, 38 pp. 20 cents.

A geologic reconnaissance of the Fairbanks quadrangle, by L. M. Prindle, F. J. Katz, and P. S. Smith. Bulletin 525, 1913, 220 pp. 55 cents.

The Koyukuk-Chandalar region, by A. G. Maddren. Bulletin 532, 1913, 119 pp. 25 cents.

A geologic reconnaissance of the Circle quadrangle, by L. M. Prindle. Bulletin 538, 1913, 82 pp. 30 cents.

Surface water supply of the Yukon-Tanana region, by C. E. Ellsworth and R. W. Davenport. Water-Supply Paper 342, 1915, 343 pp. 45 cents.

The discharge of Yukon River at Eagle, by E. A. Porter and R. W. Davenport. Water-Supply Paper 345-F, 1915, pp. 67–77. 5 cents.

Gold placers of the lower Kuskokwim, with a note on copper in the Russian Mountains, by A. G. Maddren. In Bulletin 622, 1915, pp. 292–360. 30 cents.

Quicksilver deposits of the Kuskokwim region, by P. S. Smith and A. G. Maddren. In Bulletin 622, 1915, pp. 272–291. 30 cents.

The Chisana-White River district, by S. R. Capps. Bulletin 630, 1916, 130 pp. 20 cents.

An ancient volcanic eruption in the upper Yukon basin, by S. R. Capps. Professional Paper 95-D, 1916, pp. 59–64. 5 cents.

The Yukon-Koyukuk region, by H. M. Eakin. Bulletin 631, 1916, 88 pp. 20 cents.

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

Lode mining in the Fairbanks district, by J. B. Mertie, Jr. In Bulletin 662, 1918, pp. 403–424. 75 cents.

Lode deposits near the Nenana coal field, by R. M. Overbeck. In Bulletin 662, 1918, pp. 351–362. 75 cents.

The Lake Clark-central Kuskokwim region, by P. S. Smith. Bulletin 655, 1918, 162 pp. 30 cents.

The Cosna-Nowitna region, by H. M. Eakin. Bulletin 667, 1918, 54 pp. 25 cents.

The Anvik-Andreafski region, by G. L. Harrington. Bulletin 683, 1918, 70 pp. 30 cents.

The Kantishna district, by S. R. Capps. Bulletin 687, 1919, 118 pp. 25 cents.

The Nenana coal field, Alaska, by G. C. Martin. Bulletin 664, 1919, 54 pp. $1.10.

*The gold and platinum placers of the Tolstoi district, by G. L. Harrington. In Bulletin 692, 1919, pp. 339–351.

*Mineral resources of the Goodnews Bay region, by G. L. Harrington. In Bulletin 714, 1921, pp. 207–228.

Gold lodes in the upper Kuskokwim region, by G. C. Martin. In Bulletin 722, 1922, pp. 149–161. 25 cents.

The occurrence of metalliferous deposits in the Yukon and Kuskokwim regions, by J. B. Mertie, Jr. In Bulletin 739, 1922, pp. 149–165. 25 cents.

The Ruby-Kuskokwim region, by J. B. Mertie, Jr., and G. L. Harrington. Bulletin 754, 1924, 129 pp. 50 cents.

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The Nixon Fork country, by J. S. Brown. In Bulletin 783, 1927, pp. 97–144. 40 cents.

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Mining in the Circle district, by J. B. Mertie, Jr. In Bulletin 824, 1931, pp. 155–172. 20 cents.

Geologic reconnaissance of the Dennison Fork district, by J. B. Mertie, Jr. Bulletin 827, 1932, 44 pp. 45 cents.

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The Kantishna district, by F. H. Moffit. In Bulletin 836, 1933, pp. 301–338. 75 cents.

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Mineral deposits of Rampart and Hot Springs districts, by J. B. Mertie, Jr. In Bulletin 844-D, 1934, pp. 163–226. 10 cents.

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Reconnaissance of northern Koyukuk Valley, by Robert Marshall. Bulletin 844-E, 1933, — pp. — cents.

Lode deposits of the Fairbanks district, by J. M. Hill. Bulletin 849-B, 1933, pp. 29–163. 35 cents.

The Mount Eielson district, by J. C. Reed. Bulletin 849-D, 193–, pp. 231–287. 25 cents.

Lode deposits of Eureka and vicinity, Kantishna district, by F. G. Wells. Bulletin 849-F, 1933, pp. 335–379. 20 cents.

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

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Headwater regions of Nabesna and White Rivers; scale, 1:250,000; by D. C. Witherspoon, T. G. Gerdine, and S. R. Capps. In Bulletin 417, 1910, 25 cents. Not issued separately.

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.

Koyukuk and Chandalar region, reconnaissance map; scale, 1:500,000; by T. G. Gerdine, D. L. Reaburn, D. C. Witherspoon, and A. G. Maddren. In Bulletin 532, 1913, 25 cents. Not issued separately.

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.

Rampart quadrangle (No. 643); scale, 1:250,000; 1913, by D. C. Witherspoon and R. B. Oliver. 20 cents retail or 12 cents wholesale. Also in Bulletin 337, 1908, 25 cents, and part in Bulletin 535, 1913, 20 cents.

Fairbanks special (No. 642A); scale, 1:62,500; 1908, by T. G. Gerdine and R. H. Sargent. 20 cents retail or 12 cents wholesale. Also in Bulletin 525, 1913, 55 cents.

Bonnifield region; scale, 1:250,000; by J. W. Bagley, D. C. Witherspoon, and C. E. Giffin. In Bulletin 501, 1912, 20 cents. Not issued separately.

Iditarod-Ruby region; scale, 1:250,000; by C. G. Anderson, W. S. Post, and others. In Bulletin 578, 1914, 35 cents. Not issued separately.

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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Lake Clark-central Kuskokwim region; scale, 1:250,000; by R. H. Sargent, D. C. Witherspoon, and C. E. Giffin. In Bulletin 655, 1917, 30 cents. Not issued separately.

Anvik-Andreafski region; scale, 1:250,000; by R. H. Sargent. In Bulletin 683, 1918, 30 cents. Not issued separately.

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*Upper Tanana Valley region; scale, 1:250,000; 1922, by D. C. Witherspoon and J. W. Bagley (preliminary edition).

*Lower Kuskokwim region; scale, 1:500,000; 1921, by A. G. Maddren and R. H. Sargent (preliminary edition).

Ruby district; scale, 1:250,000; 1921, by C. E. Giffin and R. H. Sargent (preliminary edition). Free on application. Also in Bulletin 754, 1924, 50 cents.

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Nixon Fork region; scale, 1:250,000; 1926, by R. H. Sargent (preliminary edition). Free on application.

Chandalar-Sheenjek district; scale, 1:500,000; by Gerald FitzGerald and J. O. Kilmartin. In Bulletin 810, 1930, 50 cents. Not issued separately.

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Yukon-Tanana region; scale, 1:500,000; by T. G. Gerdine, D. C. Witherspoon, and others.

SEWARD PENINSULA

REPORTS

The Fairhaven gold placers, Seward Peninsula, by F. H. Moffit. Bulletin 247, 1905, 85 pp. 40 cents.

The gold placers of parts of Seward Peninsula, including the Nome, Council, Kougarok, Port Clarence, and Goodhope precincts, by A. J. Collier, F. L. Hess, P. S. Smith, and A. H. Brooks. Bulletin 328, 1908, 343 pp. 70 cents.

Geology of the Seward Peninsula tin deposits, by Adolph Knopf. Bulletin 358, 1908, 71 pp. 15 cents.

Geology and mineral resources of the Solomon and Casadepaga quadrangles, Seward Peninsula, by P. S. Smith. Bulletin 433, 1910, 234 pp. 40 cents.

A geologic reconnaissance in southeastern Seward Peninsula and the Norton Bay-Nulato region, by P. S. Smith and H. M. Eakin. Bulletin 449, 1911, 146 pp. 30 cents.

Geology of the Nome and Grand Central quadrangles, by F. H. Moffit. Bulletin 533, 1913, 140 pp. 60 cents.

Surface water supply of Seward Peninsula, by F. F. Henshaw and G. L. Parker, with a sketch of the geography and geology, by P. S. Smith, and a description of methods of placer mining, by A. H. Brooks. Water-Supply Paper 314, 1913, 317 pp. 45 cents.

*The gold and platinum placers of the Kiwalik-Koyuk region, by G. L. Harrington. In Bulletin 692, 1919, pp. 368–400.

Metalliferous lodes of southern Seward Peninsula, by S. H. Cathcart. In Bulletin 722, 1922, pp. 163–261. 25 cents.

The geology of the York tin deposits, by Edward Steidtmann and S. H. Cathcart. Bulletin 733, 1922, 130 pp. 30 cents.

Pliocene and Pleistocene fossils from the Arctic coast of Alaska and the auriferous beaches of Nome, Norton Sound, by W. H. Dall. Professional Paper 125-C, 1921, 15 pp. 10 cents.

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.

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.

Seward Peninsula, southeastern portion, reconnaissance map; scale, 1:250,000; by D. C. Witherspoon, D. L. Reaburn, H. M. Eakin, and others. In Bulletin 449, 1911, 30 cents. Not issued separately.

Nulato-Norton Bay region; scale 1:500,000; by P. S. Smith, H. M. Eakin, and others. In Bulletin 449, 1911, 30 cents. Not issued separately.

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

A reconnaissance in northern Alaska across the Rocky Mountains, along Koyukuk, John, Anaktuvuk, and Colville Rivers and the Arctic coast to Cape Lisburne, in 1901, by F. C. Schrader, with notes by W. J. Peters. Professional Paper 20, 1904, 139 pp. 40 cents.

Geology and coal resources of the Cape Lisburne region, by A. J. Collier. Bulletin 278, 1906, 54 pp. 15 cents.

Geologic investigations along the Canada-Alaska boundary, by A. G. Maddren. In Bulletin 520, 1912, pp. 297–314. 50 cents.

The Noatak-Kobuk region, by P. S. Smith. Bulletin 536, 1913, 160 pp. 40 cents.

The Koyukuk-Chandalar region, by A. G. Maddren. Bulletin 532, 1913, 119 pp. 25 cents.

The Canning River region of northern Alaska, by E. de K. Leffingwell. Professional Paper 109, 1919, 251 pp. 75 cents.

Pliocene and Pleistocene fossils from the Arctic coast of Alaska and the auriferous beaches of Nome, Norton Sound, by W. H. Dall. Professional Paper 125-C, 1921, 15 pp. 10 cents.

*A reconnaissance of the Point Barrow region, by Sidney Paige and others. Bulletin 772, 1925, 33 pp.

Preliminary report on the Sheenjek River district, by J. B. Mertie, Jr. In Bulletin 797, 1928, pp. 99–123. 80 cents.

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

Geology and mineral resources of northwestern Alaska, by Philip S. Smith and J. B. Mertie, Jr. Bulletin 815, 1930, 351 pp. $1.

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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.

Koyukuk and Chandalar region, reconnaissance map; scale, 1:500,000; by T. G. Gerdine, D. L. Reaburn, D. C. Witherspoon, and A. G. Maddren. In Bulletin 532, 1913, 25 cents. Not issued separately.

Noatak-Kobuk region; scale, 1:500,000; by C. E. Giffin, D. L. Reaburn, H. M. Eakin, and others. In Bulletin 536, 1913, 40 cents. Not issued separately.

Canning River region; scale, 1:250,000; by E. de K. Leffingwell. In Professional Paper 109, 1919, 75 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, 1930, 50 cents. Not issued separately.

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