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MINERAL INDUSTRY OF ALASKA IN 1934

BY

PHILIP S. SMITH

Mineral resources of Alaska, 1934
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By PHILIP S. SMITH [1]

INTRODUCTION

The value of its mineral resources has long been recognized as a matter of concern in the welfare of every nation, and all wise governments almost from time immemorial have taken steps to find out about, utilize, and safeguard such of these natural resources as lie within their own boundaries or to acquire rights in those they need that lie outside those boundaries. Necessarily, therefore, the determination of a nation's potentialities and needs calls for information on a wide range of subjects and has diverse avenues of approach. Obviously one of these lines concerns itself with the record of present performance—how much of the different mineral commodities is the country at present producing, where does this production come from, and what are the facts as to the current developments in the industry? To answer some of these questions authoritatively is part of the work of the Alaskan branch of the Geological Survey, and answers to those questions for the year 1934 are given in the accompanying report. To be of more service, however, the current year's record is supplemented by records for earlier years, because in that way certain trends may be recognized which are not only of historical significance but are also useful in suggesting the course that the industry is likely to take in the future. This, then, is a continuing service that has been rendered by the Geological Survey from almost the earliest years that active mining has been in progress in Alaska, and the present report is the thirty-first of the series.[2]

To obtain the information recorded in these reports the Geological Survey, in addition to its other investigations of mineral resources, conducts an annual canvass of the entire mineral industry of Alaska. The collection of the facts requisite for the preparation of these

[1] The canvass of producers, the tabulation of their replies, and general assistance in all phases of the office work connected with the preparation of the statistics set forth in this report have been carried through effectively by Kathleen S. Waldron, 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, 844, 857, and 864.

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 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 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 in Alaska—on which are 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 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 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 which record the statistics of mineral production. This limitation should be stressed so that the reader will 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 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. Thus the reports of the operators of small placer mines who sold their gold at a discount in local trade, or those of the larger producers from the value of whose gold deductions were made for shipping, insurance, and other expenses incident to handling, were so edited that the full value of the gold produced was recorded.

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 either to 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.

ACKNOWLEDGMENTS

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. Kiessling and other officers of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce; the collectors and other officers of the Alaska Customs Service and of the Bureau of the Mint; the officers of the Forest Service; Col. O. F. Ohlson, Ralph Tuck, and other officers of the Alaska Railroad; F. H. Moffit, S. R. Capps, J. B. Mertie, Jr., R. H. Sargent, Gerald FitzGerald, and R. D. Ohrenschall, of the Geological Survey; officers of the Alaska Road Commission; the Alaska Weekly and Volney Richmond, of the Northern Commercial Co., of Seattle, Wash., and the agents of his company, especially C. B. Haraden, at Eagle; Orie Shade, at Tanana; and J. W. Farrell, at Hot Springs; Ralph and Carl Lomen, of Seattle and New York; the Arrowhead, of Sitka; the Alaska Juneau Gold Mining Co., the Daily Alaska Empire, and J. J. Connors, of Juneau; the Ketchikan Alaska Chronicle, of Ketchikan; Joseph J. F. Ward, of Skagway; the Cordova Daily Times, of Cordova; the Kennecott Copper Corporation of Kennicott and New York; Carl Whitham and M. J. Knowles, of Chitina; W. J. Erskine, of Kodiak; the Bank of Alaska and the Anchorage Weekly Times, of Anchorage; W. E. Dunkle, of Luckyshot; H. W. Nagley, of Talkeetna; Charles Zielke, of Ferry; A. W. Amero, of Beaver; the First National Bank, O. J. Egleston, J. D. Harlan, and other officers of the Fairbanks Exploration Department, the Fairbanks Daily News-Miner, L. S. Peck, of the Pacific Alaska Airways, Inc., and G. E. Jennings, of Fairbanks; C. E. M. Cole, of Jack Wade; John B. Powers and J. J. Hillard, of Eagle; Thomas J. DeVane, of Ruby; George Jesse, of Poorman; the Miners & Merchants Bank, of Iditarod; Alex Mathieson and Harry Donnelley, of Flat; Christian Bolgen, of Ophir; Lee F. Merry, of Livengood; J. W. Wick, of Russian Mission; Charles Mespelt and E. M. Whelan, of Medfra; Oliver Anderson, of McGrath; John Haroldson, of Quinhagak; the Nome Nugget, Hammon Consolidated Gold Fields, Grant R. Jackson, of the Miners & Merchants Bank, A. C. Stewart, and C. W. Thornton, of Nome; A. S. Tucker, of Bluff; Arthur W. Johnson, of Haycock; Edgar Tweet, of Teller; Lewis Lloyd and James C. Cross, of Shungnak; and Art M. Hansen and W. J. Dowd, of Kotzebue.

MINERAL PRODUCTION

GENERAL FEATURES

The total value of the mineral production of Alaska in 1934 was $16,721,000. This was furnished by several mineral products, but gold accounts for more than 95 percent. Compared with the total mineral production in 1933 the output in 1934 shows an increased value of nearly $6,500,000. This very notable increase is of course a source of satisfaction to those concerned with the general development of the mining industry. However, it cannot be regarded as due to a great increase in the quantity of metals produced so much as to the greatly increased price paid for gold in 1934. In fact, in the foregoing comparison the statistics of gold production for 1933 were computed on the old standard price of gold, $20.67 an ounce, even though during the last part of that year the price offered by the Government was steadily being advanced, whereas the entire production in 1934 has been computed as worth $35 an ounce, which has been the official price for more than a year.

Not only did the selling price of gold show a marked increase, but those of most of the other metals as well were higher in 1934 than in 1933. Thus, according to the Bureau of Mines, the average price of newly mined silver from domestic ores was a little more than 64.6 cents an ounce in 1934, as compared with 35 cents in 1933; copper was 8 cents a pound, as compared with 6.4 cents; tin was 52 cents a pound, as compared with 39.1 cents; and platinum was $34.50 an ounce, as compared with $30.75. Lead was the only metal produced in Alaska in any notable amount that did not sell at a higher price in 1934 than in 1933, and it remained stationary at 3.7 cents a pound. However, the increased selling prices of the metals other than gold augmented the total value of the production of the Territory less than $60,000 over what it would have been had the prices of 1933 prevailed in 1934.

Considering the mining industry of the Territory as a whole, it appears to be in good condition. In subsequent pages in describing the individual mineral commodities, statements will be given as to specific factors that advanced or retarded certain developments. At this place, however, mention will be made of two items that adversely affected the entire mineral industry of the Territory. The first and by far the most significant was that this country, as well as most of the rest of the world, has not yet emerged from the violent depression that has deterred normal activities for years. Although it is true that Alaska has felt the intensity of the situation less keenly than many other regions, it has not escaped unscathed. Capital has been reluctant or unable to finance new developments, and even

the small operator has had to contract his plans to make them fit his depleted purse. Signs that this stage is passing are evident in many of the Alaska camps, but the opening of large low-grade deposits is not a thing that can be carried through quickly if it is to be done well. There is a large amount of dead work that must be done before such a property can begin productive mining. The preliminary preparation, perhaps more than any other phase of mining work, exemplifies the old adage "the more haste the less speed."

One of the beneficial effects of the stagnation of business has been that it has induced a partial revival of the old prospecting spirit. This has led to the reexamination of some of the low-grade deposits that were passed by in the boom days as unattractive, and it has caused some of the more hardy to set forth in the search for deposits in the less well-known tracts. Some of these efforts have been highly advantageous to the individual, though the novice should be warned that much is required in successful prospecting besides a desire for riches, and that the chances are extremely poor for finding bonanza deposits that merely await the taking. 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 already 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 with little outlay of capital. Today by far the larger part of all the mineral production of 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 well direct his attention to finding deposits that appear to hold promise of yielding large quantities of average or even low-grade ore. Such a prospector, however, must realize that usually he has neither the technical nor the financial capacity to carry through the development of such properties to a producing stage, and so if he places an excessive value on his discoveries he jeopardizes benefits to himself and to the mining industry, because the value of his service

is but a small part of the heavy outlays that will be required for testing the property and equipping it adequately.

The second of the general incidents that adversely affected the Alaska mining industry in 1934 was a general tie-up of shipping for more than a month at the beginning of the open season through a longshoremen's strike. In a region like Alaska, which is almost entirely dependent for mining equipment, machinery, and supplies on outside sources and which in many parts has a working season of only about 100 days, even a short interruption of the regular transportation service is serious. Even after regular sailings were resumed the congestion of freight was so great and the crews so hurried or inexperienced that orderly handling of the accumulation was impossible, and parts of shipments were left behind to follow on later boats, thus temporarily rendering unserviceable even the parts that went forward. This was a severe handicap on all enterprises, and for some of the newly organized mining companies that were getting ready to work it resulted in the loss of practically the entire season.

TOTAL MINERAL PRODUCTION

From the time of the earliest records of mining in Alaska to the end of 1934 minerals to the value of more than $680,316,000 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 is 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 stimulus 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 last few years ranging between $10,000,000 and $14,000,000, until in 1934, owing largely to the advance in the price of gold, it approached $17,000,000.

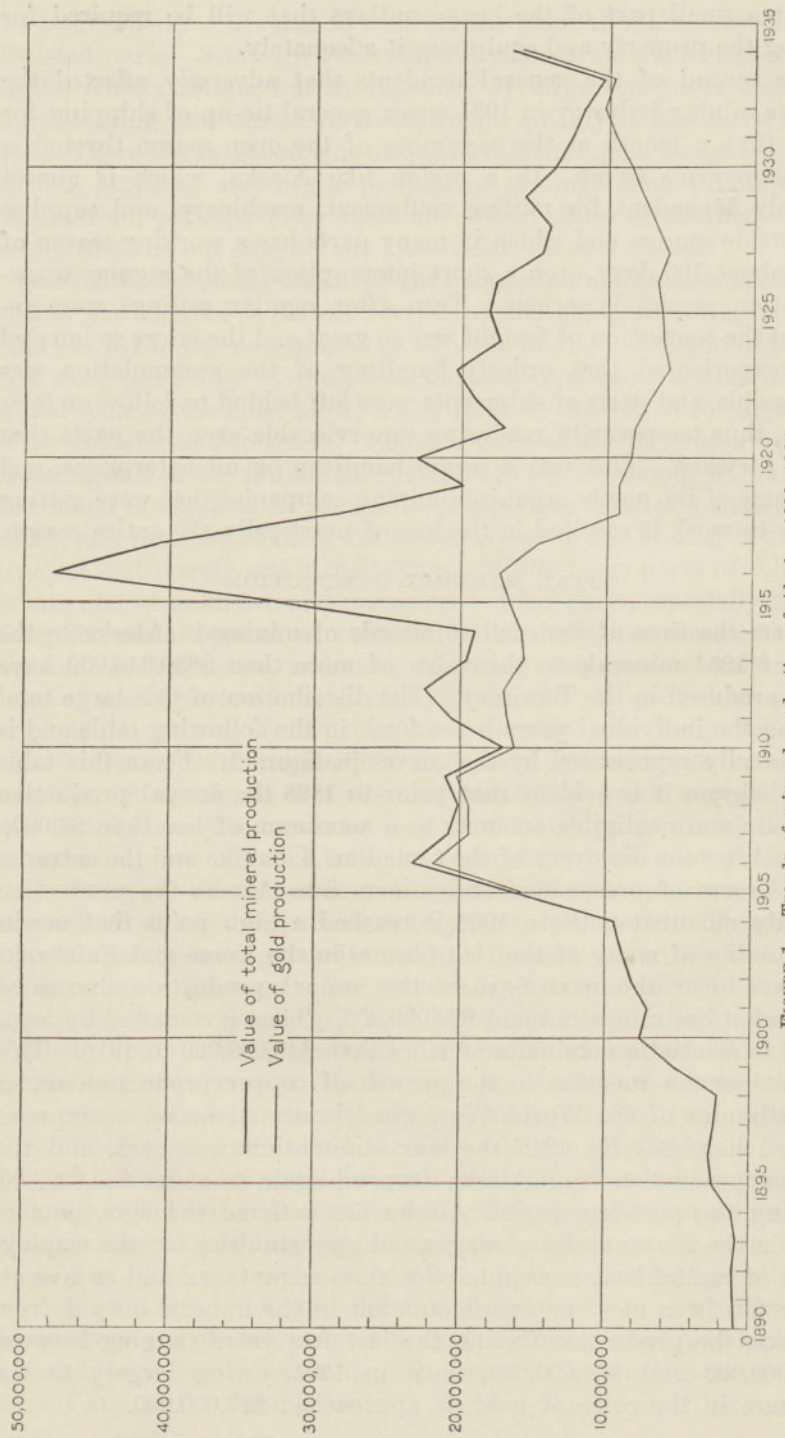

FIGURE 1.—Trends of mineral production of Alaska, 1890–1934.

Value of total mineral production of Alaska, by years, 1880–1934

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	1933	10,366,000
1896	2,885,029	1915	32,790,344	1934	16,721,000
1897	2,539,294	1916	48,386,508		
1898	2,329,016	1917	40,694,804		680,316,000

NOTE.—$37,305 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 the table it will be seen that gold accounted for nearly 64 percent of the total value of the mineral production and that gold and copper, together, accounted for nearly 95½ percent.

Total value of mineral production of Alaska, by substances, 1880–1934

Gold	$434,741,000
Copper	214,691,700
Silver	12,218,000
Coal	9,375,500
Tin	1,100,300
Lead	2,092,100
Other mineral products (including platinum metals)	6,097,400
	680,316,000

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 1934 and 1933, distributed by quantity and value among the main kinds of substances, so that a comparison between the two years may be readily made. From this table it is apparent that there was an increase in the value of the production of gold, silver, platinum, tin, and copper, but that only coal, platinum, copper, and tin increased in quantity.

Mineral output of Alaska, 1934 and 1933

	1934		1933	
	Quantity	Value	Quantity	Value
Gold.....fine ounces..	457,343	$16,007,000	469,286	$9,701,000
Copper.....pounds..	121,000	9,700	29,000	1,900
Silver.....fine ounces..	154,700	100,000	157,150	55,000
Coal.....short tons..	107,500	451,500	96,200	481,000
Tin, metallic.....do....	4.14	4,300	2.92	2,300
Lead.....do....	839.50	62,100	1,157	85,600
Platinum metals.....fine ounces..	2,555	85,600	605	18,600
Miscellaneous mineral products.....	----------	800	----------	20,600
	----------	16,721,000	----------	10,366,000

GOLD

GENERAL FEATURES

The most noteworthy feature of the year in the gold-mining industry was the official stabilization of the price of domestic gold throughout the year at $35 an ounce. This price had been set for a short time at the end of 1933, but then there was no certainty of its continuation, and it seemed best in recording the production of that year to retain the old standard price of $20.67, especially as that procedure would better allow comparison with the statistics of earlier years. However, with the formal adoption of the new price it became necessary to use that figure in the current statistics. The reader should therefore recognize the difference in the bases on which the production of gold was computed in the years prior to 1934 and the statistics set forth in this volume for that year.

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. During the post-war period from 1920 to 1927 there was a still further decline in Alaska gold production, and it touched new lows in 1923 and 1927, when it was less than $6,000,000 a year. Since 1927 there has been in general a marked increase in the value and quantity of gold produced, and in 1934, owing to the increased price of gold, the value of the output was more than $16,000,000, a figure that has not been equaled since 1916.

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 19 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 annual production for each year from 1880 and the sources, from 1884, are graphically shown in figure 2. Of the $434,741,000 in gold that has been produced from Alaska mines $283,433,000, or about 65 percent, has come from placers and $151,308,000, or about 35 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 the two sources has showed approximately a constant ratio. 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 by no means yet been reached.

Gold produced in Alaska, 1880–1934

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	2, 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
1933	469, 286	9, 701, 000	5, 152, 000	4, 549, 000
1934	457, 343	16, 007, 000	8, 955, 000	7, 052, 000
	20, 713, 608	434, 741, 000	283, 433, 000	151, 308, 000

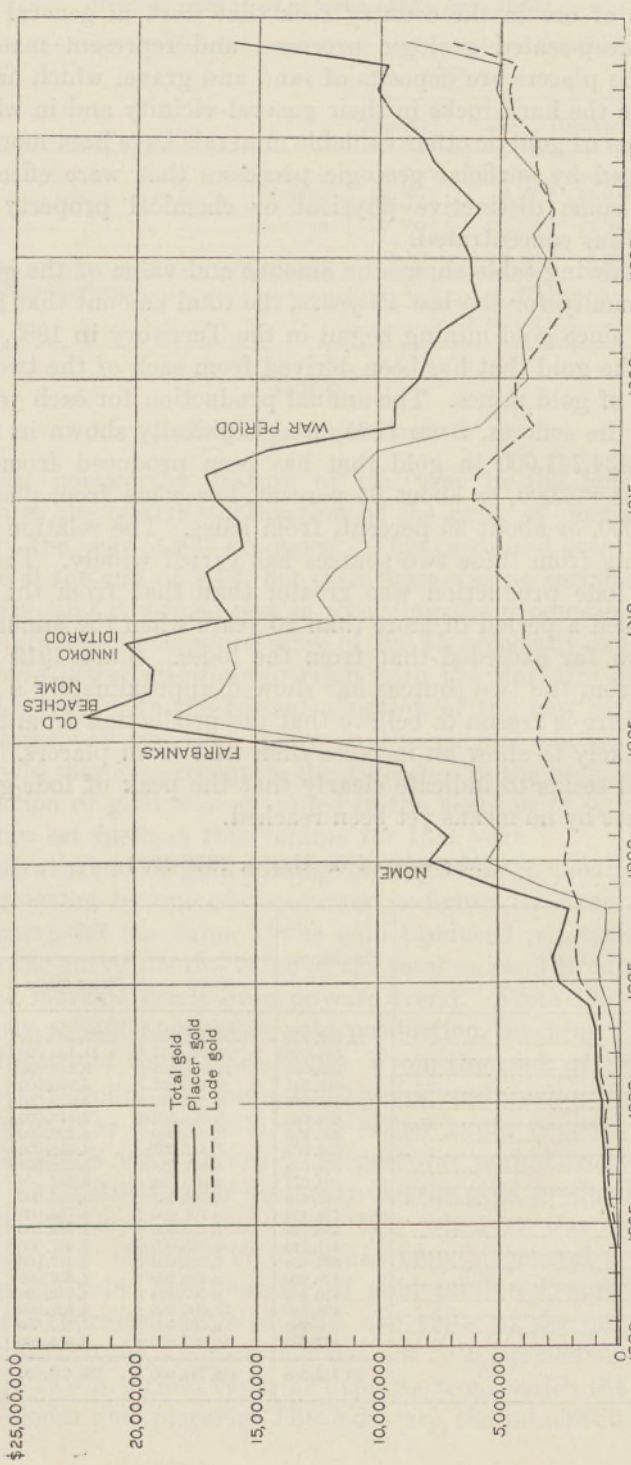

FIGURE 2.—Trend of value of gold production of Alaska, 1880–1934.

GOLD LODES

Alaska lode mines in 1934 yielded $7,052,000 in gold, or about $2,500,000 more than in 1933, when the production was $4,549,000. The gold derived from the lodes was about 44 percent of the entire gold production of the Territory. In 1933 lodes furnished about 47 percent of the total. The lode gold was recovered from widely distributed mines, but more than 69 percent came from mines in southeastern Alaska, as shown in the following table:

Gold produced from gold-lode mines in Alaska in 1934, by districts

District	Fine ounces	Value
Southeastern Alaska	139,343	$4,877,000
Willow Creek	39,743	1,391,000
Fairbanks district	11,514	403,000
Other districts	10,886	381,000
Total	201,486	7,052,000

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 1934. The magnitude of the 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 1934 was 4,302,600 tons, an average of nearly 11,790 tons a day. Of this amount 1,915,462 tons of coarse tailings were rejected and 2,387,138 tons were fine-milled. The average gold content of all the material mined was 83 cents 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 $1.35 a ton. Of this content gold worth 24 cents was lost during the treatment, $1.04 was recovered as bullion, and 7 cents was recovered in the concentrates, which were subsequently smelted. All the foregoing statements regarding gold content, losses, and recoveries are calculated on the former price of gold, $20.67 an ounce, so that to convert them to the basis of gold at $35 an ounce they should be multiplied by the factor 1.693. 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, 1893–1934

Year	Ore (tons)			Metals recovered			
	Total	Fine milled	Coarse tailings rejected	Gold (ounces)	Silver (ounces)	Lead (pounds)	Total value
1893–1913	507,254	330,278	176,976	34,240	(1)	(1)	$707,730
1914–15	242,328	239,918	2,410	12,175	6,192	117,031	261,326
1916	180,113	180,113		5,565	2,844	61,068	121,379
1917	677,410	677,410		20,767	12,248	296,179	460,666
1918	592,218	574,285	17,933	20,809	11,828	273,297	459,445
1919	692,895	616,302	76,593	24,141	16,431	359,762	542,714
1920	942,870	637,321	305,549	35,456	23,348	487,574	791,390
1921	1,613,600	904,323	709,277	46,914	40,619	550,913	1,035,251
1922	2,310,550	1,108,559	1,201,991	62,707	49,405	687,315	1,388,679
1923	2,476,240	1,134,759	1,341,481	69,047	41,876	755,423	1,514,774
1924	3,068,190	1,367,528	1,700,662	92,277	63,191	1,256,857	2,055,782
1925	3,481,780	1,537,884	1,943,896	98,213	55,971	1,288,974	2,184,384
1926	3,829,700	1,649,678	2,180,002	93,423	52,333	1,300,915	2,067,837
1927	4,267,810	1,839,695	2,428,115	112,653	61,232	1,513,306	2,463,262
1928	3,718,140	1,795,191	1,922,949	152,047	77,591	2,038,655	3,316,019
1929	3,836,440	2,020,470	1,815,970	164,993	90,635	2,501,832	3,627,247
1930	3,924,460	2,066,239	1,858,221	163,312	97,607	2,640,771	3,551,950
1931	4,162,350	2,298,998	1,863,352	179,532	118,508	3,309,176	3,879,839
1932	4,001,630	2,414,469	1,587,161	151,578	94,519	2,509,263	3,236,183
1933	4,085,960	2,466,832	1,619,128	150,967	109,483	2,299,777	3,960,166
1934	4,302,600	2,387,138	1,915,462	128,015	86,458	1,662,894	[2] 4,582,559
	52,914,538	28,247,390	24,667,148	1,818,831	1,112,319	25,910,982	42,208,582

[1] Lost in tailings. [2] Gold in 1934 computed at $34.88 an ounce.

The cost of mining for 1934 was stated by the company to have been 30.56 cents for each ton of ore trammed to the mill, the cost of milling was 19.32 cents, and all other marketing costs and expenses, including interest, amounted to 6.59 cents, making the entire operating cost for each ton of ore trammed only 56.47 cents. This indicates the exceedingly efficient operation of this low-grade type of deposit, which could have been brought about only through capable management and the adoption of all technical means for maintaining and stimulating production in all stages of the enterprise.

There was a considerable falling off in the quantity of gold from the Alaska Juneau in 1934 as compared with that from the same property in 1933. According to the published report of the company, this decrease amounted to about 15 percent and is explained as follows: "The gold production fell off because the ore from the south ore body, about 90 percent of the total mine production, was lower than average grade, and at the same time the increase in production of deep-level ore was but nominal." During the year the company successfully closed negotiations that had been in progress for some time whereby it acquired the contiguous mining claims, power plants, and other property of the Alaska Mining & Power Co. The Alaska Juneau Co. immediately commenced extending its mining program into the newly acquired ground with the aim of preparing for large-scale production from it as soon as practicable, but it will be at least 3 years before the preparatory work will have been com-

pletely carried out. In addition to the work on its main property several other Alaska prospects were examined by its technical staff, but no development work was reported to have been undertaken by the company at any of them.

The next most productive gold-lode district in southeastern Alaska is the western part of Chichagof Island. On this island the two principal mines are those of the Chichagoff Mining Co. and Hirst-Chichagof Mining Co., the former near Klag Bay, about 60 miles northwest of Sitka, and the latter near Kimshan Cove, a few miles beyond to the northwest. No detailed report has been received from the Chichagoff property as to operations during the year, but to judge from the amount of gold recovered it had a more successful season than during the preceding year. At the Hirst-Chichagof property the principal new work done during the year was the sinking of the main shaft about 150 feet, so that it now has a depth of about 1,000 feet. About 600 feet of drifting was also done. The mill was operated almost continuously for about 10 months but was closed down for 2 months while the sinking of the shaft was in progress. In addition to treating considerable newly mined ore the mill re-treated more than 1,000 tons of old tailings that had accumulated in the course of earlier mining. The milling process consists of crushing in stamps to about 10 mesh, regrinding in a tube mill to 65 mesh, amalgamation, and the treatment in flotation units of the tailings. The ore is practically unoxidized and has a siliceous gangue in which there is usually less than 1 percent of the sulphides of lead, copper, antimony, and arsenic.

The successful development of these two larger properties on Chichagof Island and the increased price of gold have had a stimulating effect on the search for valuable mineral deposits through that entire area, and several companies and individuals have been active during the year reexamining and reopening some of the old properties that had been idle for many years or have been searching to find new leads. Among the operations of this sort may be mentioned the work that was in progress in the vicinity of Mineral Hill near Kimshan Cove. On this property, locally known as the "Clyde claims", a small production was reported to have been made from ore that was treated in a small Gibson mill, power for which was generated by a water wheel. Other properties in the neighborhood have also disclosed veins on which some development work is in progress. Near the north end of Yakobi Island is the old El Nido property, which a few years ago was one of the highly productive mines but lately has been relatively inactive. In 1934 a little development work was done on the property, with the result that some gold was recovered, and it is understood that plans for resumption of mining on a much larger scale are being formulated.

On Admiralty Island the most productive work was done at the properties of the Alaska Empire Gold Mining Co., at the head of Hawk Inlet, and of the Admiralty Alaska Gold Mining Co., on Funter Bay. The work at the Hawk Inlet property was carried throughout most of the open season on a somewhat larger scale than in any recent year, and some new equipment, including a 25-ton rod mill, was installed, with the expectation that it will enable the output to be still further increased.

Throughout the Juneau-Chichagof district, or the northern part of southeastern Alaska, in addition to these producing mines there were many other lode-mine developments in progress, which, while not yet placing the respective properties in the list of lode producers of notable amounts of gold, indicate the revival of interest in searching for and attempting to develop some of the more promising areas. Among the enterprises of this sort that may be mentioned was the taking over of the old Kensington mine, in the Berners Bay district, north of Juneau, and the carrying on of such investigations as will be required to formulate plans for the reopening of the property. In the Herbert River area the Holland-Alaska Gold Co., which is reported to have acquired the old Herbert River mine, shipped in considerable equipment which is to be used in the prospective work on the property. To the south of Juneau, in the Windham Bay area, the Alaska-Windham Gold Mining Co. had a crew of about 15 men engaged throughout most of the season in preparatory work and the installation of the newly acquired equipment with the expectation that by the end of the season the preliminary work would be completed so that the mine would be in shape for productive mining in 1935. The building of a trail from the bay to the property by a crew financed from emergency relief funds, contributed greatly to the ease with which the preparatory work could be accomplished.

It must not be inferred that the places mentioned in the foregoing paragraphs are the only places in southeastern Alaska at which mining development is in progress. Throughout this area there are scores of places where lode prospecting is being done, and doubtless some of them may turn out to be more capable of profitable development than some of those mentioned. Some properties that were formerly productive but have lately been idle may well warrant reexamination in the light of the greatly enhanced price of gold and the advances that have been made in mining and ore-dressing practices.

In the Ketchikan district the greatest production reported came from the Gold Standard mine, near Helm Bay, and from the property of the Alaska Gold & Metals Co., on Kasaan Peninsula. The

extreme dryness in the early summer handicapped the operation of the mill at the Helm Bay property, but on the whole the operations were regarded as satisfactory. A crew of about 8 was employed in the mine and at the mill for about 9 months. The developments at the Kasaan Peninsula property consisted of the reopening of the old Salt Chuck and Rush Brown mines, principally with the aim of making a thorough examination so as to determine whether or not the deposits were workable and, if so, the best methods by which they could be mined and milled. In the course of this work some new ore was broken down, and considerable amounts of old tailings were treated in the mill, the concentrates from which were shipped to Tacoma for smelting. These preliminary investigations resulted in the recovery of gold, copper, and palladium and were apparently so satisfactory that plans are reported to be in progress for enlarged activity in 1935. Elsewhere in the Ketchikan district there was a notable increase in the search for lode deposits and the reexamination of properties that had been dormant for several years. Thus, in the vicinity of Dolomi, on Prince of Wales Island, renewed activity was shown at the property formerly known as the "Valparaiso mine", and the Alaska British Columbia Gold Mines, Ltd., is reported to have had a crew ranging from 5 to 30 men busy throughout the summer in preparatory and development work, looking toward placing the mine again in active production by another year. Near Hollis the old Puyallup, Ready Bullion, and Crackerjack properties were reexamined by engineers employed by private interests, and although no definite statements as to their findings have been made public there seemed to be considerable likelihood that new developments were likely to be undertaken in that neighborhood shortly. A rather intensive examination of the old Sea Level mine, on Thorne Arm, and some of the nearby properties was made early in the summer, but no definite steps were reported to have been taken toward reviving activities at that place. At several other places prospecting or a small amount of development work was in progress, which, though not likely to lead to productive mining in the near future, is indicative of the renewed interest that is being taken in mining and is likely to lead to worth-while results if intelligently carried on, for it is believed that there are many areas in the district that are well worth intensive investigation.

In the Hyder district, which includes a considerable tract of country at the head of Portland Canal, no extensive productive lode mining was in progress, but it is reported that prospecting and development work on lodes in that district were especially active. One indication of this activity is shown by the fact that at least 60 new claim locations were recorded during the year. Rumors were current that several of the properties that formerly were productive but had lately

been idle were about to be revived and given more adequate financial support. So far as can be determined from geologic evidence, there is every reason to believe that the conditions which have produced the rich deposits on the British Columbia side of the line do not suddenly alter at the boundary but have affected portions of the Alaska area as well, so that thorough search of those places is likely to lead to the establishment of a significant mining industry in the Alaska part of the district.

The Willow Creek district, at the head of Cook Inlet, has long been the second most productive lode-gold district in the Territory, having produced gold worth nearly $7,150,000 since lode mining started there in 1909. The principal producing property in the district is that of the Willow Creek Mines, Inc., which holds claims on Craigie Creek and gets its ore mainly from the Lucky Shot and War Baby mines, on the northern slopes of the valley of this stream. This company employs about 100 to 125 men in the various phases of mining and milling, and the property is in continuous operation throughout the year. The principal new work accomplished in 1934 was the continued sinking of the shaft on the War Baby vein, from which a crosscut was driven to intercept the Lucky Shot vein. No details as to the outcome of this work have been given publicity, but this should open up considerable ground and give evidence as to the continuity of mineralization in depth, as it would prove the character of the vein material at a depth of about 700 feet below the surface as measured along the dip of the vein. Among the main new installations at this property was the completion of the cyaniding plant, which was started in 1933 and put into operation by midsummer of 1934. The completion of the road from the railroad at Little Willow up the Little Susitna Valley and thence to the mine has greatly reduced the difficulties and expense of bringing in the necessary supplies and equipment. Perishable materials and some of the other supplies are still brought in by the old road from Wasilla over the Hatcher Pass, and persons and emergency supplies are largely transported by airplanes, the trip from Anchorage to the camp taking about half an hour. In addition to a larger landing field some 3 miles west of the mine, a smaller field constructed principally of the tailings from the mill has been built immediately adjacent to the bunk houses and other buildings. The property continues to be a model of a small rich lode mine, capably handled administratively and technically.

Farther north up Craigie Creek the development work that had been in progress on the old Kempf property in 1933 was discontinued, and no work was done there in 1934. At the extreme head of Craigie Creek the Marion Twin Gold Mining Co. maintained a camp for several months during the summer on its property, which it has

been prospecting at intervals during the last 3 years. The results from these operations seem to have been such that the owners apparently intend to go ahead in a more intensive fashion next year at this place rather than at its other property on the Little Susitna River, locally known as the old "Mint or Hatcher mine." Some prospecting was continued on Purches Creek, which heads in the same general group of hills as the northern part of Craigie Creek.

The other productive mines in the Willow Creek district lie to the east of Craigie Creek. The two largest are the Fern mine, near the head of Archangel Creek, and the Gold Cord, near the head of Fishhook Creek. Some production was also reported from the Independence and High Grade mines, also on Fishhook Creek, and prospecting was in progress at several other places in the district. At the Fern mine some 15 men were employed almost continuously during the open season while the mill could be operated, and a somewhat reduced crew worked underground during the winter. The results of the developments are reported to have been highly encouraging in opening up additional ore. At the Gold Cord work was continued at practically the same rate as in 1933. The mill of this company was connected by aerial tram with the Independence mine and milled considerable ore from that property. Unfortunately, late in the season the main bunk house and one of the adjacent buildings at the Gold Cord were destroyed by fire, which in addition to the actual money loss considerably handicapped the carrying out of the winter work that had been planned, because the necessary supplies and materials for reconstruction could not be readily transported to the camp in the winter.

The showings already made throughout the district give a firm basis for the belief that the excellent record of the Willow Creek camp in 1934 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 output of lode gold in 1934, as stated, was $403,000. This marks the greatest value of lode gold produced by this camp in any year since 1910, when lode mines first began to operate in the district. Even as to quantity of lode gold produced in the Fairbanks district, the year 1934 would hold the record except for the single year 1913. The total output of lode gold from the Fairbanks district since 1910 has been about $2,900,000. 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 embraces parts of Ester Dome and 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 Co., near the junction of Bedrock and Cleary Creeks, formerly known as the Rhoads-Hall mine. The sinking of the main shaft and the opening up of additional areas underground have made it possible for the mine to increase its output notably. The installation of a flotation unit in the mill has resulted in affording a larger recovery of gold from the ore treated. The second largest producing lode mine in this district is the old Hi-Yu mine, on Too Much Gold Creek, a tributary of Fairbanks Creek. As a result of considerable new underground development work, the methods of handling the ore have been much improved, reducing the costs of transportation. The milling practice was also improved by the installation of a flotation unit. Some exploratory work was done at the Newsboy property, at the head of Cleary Creek, and for part of the season its mill was used in treating custom ore from nearby prospects, notably that of the Chatham Mining Co. on Chatham Creek. At the latter place some 400 feet of drifts and 240 feet of raises were driven, and active development work was in progress for about 8 months and, though stopped late in August, will be resumed in 1935. Some gold was also recovered from the lodes on the Soo mine, north of Dome Creek, and a little work was in progress at the property of the Alaska Mining & Development Co., which includes the old Wyoming mine, on Bedrock Creek, east of the Cleary Hill mines. In fact, at a large number of places throughout a more or less definite eastward-trending belt extending from Pedro Dome small camps were engaged in the search for or development of lodes, which are common and rather widely scattered in this belt.

In the Ester Dome area of the Fairbanks region search for gold lodes was carried on fully as energetically as heretofore, but all the work there is done by small outfits with meager resources of capital and equipment, so that the mining is on a small scale and the production of gold correspondingly slight. However, some production was reported to have been made by at least half a dozen different camps. There was considerable revival of interest in that area when it became known that an option had been given to an adequately financed company to do considerable exploration on the old Ryan lode, on Ester Dome. This interest gradually waned as no definite steps were taken to start active development, and so far as publicly reported no plans have been made to undertake this work in the near future.

Among the districts producing lode gold grouped together in the table on page 13 under the heading "Other districts" the most productive, named in the order of output, are the Nabesna district, which lies north of the Wrangell Mountains of the Copper River

region; the Nixon Fork district, in the Kuskokwim region; the mines in the vicinity of Valdez and other parts of the Prince William Sound region; Kenai Peninsula, including the Nuka Bay area, the area south of Hope, and the hills north of Girdwood; and the Bonnifield district, north of the Alaska Range. 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 on White Mountain west of the Nabesna River, between its tributaries Jack and Jacksina Creeks. Development and construction work have been carried on actively throughout the year. Perhaps the most important work of this sort was the erection of several new camp buildings and the protection of all the structures against cold weather, so that they are suitable for year-round operation of the property. Unfortunately, breakage of the main shaft of the power plant late in the year necessitated suspension of productive work for a month or more, but by making every exertion to obtain a new shaft from Seattle, including transportation from Cordova to the mine by airplane, the repairs were completed in an exceptionally short time, and the mill was again put into operation. From the company's report to its stockholders it is learned that some 2,900 feet of underground development was done during 1934, a larger crushing plant was installed, and a new tram connecting the mine and the mill was built. The mill is now said to be treating about 60 tons of ore a day, but it has a much greater capacity, except for the rather scanty supply of water now available. The free gold is recovered at the mill, and the heavy concentrates are shipped to the smelter in the States for further treatment. These concentrates in addition to the precious metals carry considerable amounts of copper and lead, which are recovered at the smelter. The number of men employed on the property averages about 35. In the milling process considerable metal is carried off in the tailings. This is not permanently lost, for these tailings are impounded so that later they can readily be picked up and retreated. The road to the mine from the Richardson Highway at Gulkana has now been completed so that it is available for trucking in supplies and equipment, thus greatly facilitating operations, though for speedy or emergency service the airplane is still extensively utilized.

In the Kuskokwim Valley the only lode-mining area is in the vicinity of Nixon Fork, north of Berry Landing. The principal producing mine in this area is the Nixon Fork mine, operated by Mespelt & Co., but some ore was mined from the Southern Cross

mine by Winan & McGowan and treated at the mill of the Nixon Fork mine, which is not far distant. The work at the Nixon Fork mine was continued throughout the year on about the same scale as heretofore but somewhat more profitably. Only a small crew is engaged on the property, and the general practice has been to do most of the underground work during the winter and get a sufficient stock of ore on hand to supply the mill during the open season. Then when water for milling becomes available the underground work is suspended and the men are mainly busy in the mill or in preparing for the next winter's work. The mill is equipped with 10 gravity stamps, and its capacity is limited by the supply of water that is available in normal seasons.

Gold-lode production in the Prince William Sound region came principally from the El Primero Mining & Milling Co., which was operating the old Granite mine, and from small properties in the vicinity of Valdez, notably those of the Alaska Finley Co. at the old Ramsey-Rutherford mine and those of Clarence Poy and associates on the Little Giant, Rose, and Star groups of claims. Details as to the new developments at these properties have not been received by the Geological Survey, but the amount of gold recovered indicates that the work was especially remunerative, and there is every indication that an even greater output is to be expected from several of these properties when all of the equipment that was brought in to them this year is installed and fully employed. At the properties being managed by Mr. Poy the novel expedient of dropping much of the equipment, including a ball mill, dynamite, etc., from airplanes was successfully employed, with the result of cutting freight charges from as much as 35 cents a pound by ordinary means of transportation to about 4 cents a pound by airplane, without damage to a single article carried. An interesting account of this achievement was given by Mr. Poy at the February (1935) meeting of the American Institute of Mining and Metallurgical Engineers in New York. Another innovation at this property, due to the character of the terrane, is the placing of the mill underground. The attempt to unwater and reopen the old Cliff mine, a short distance south of Valdez, was carried on for several months in the early part of the year but was ultimately abandoned, as the task developed into a more difficult undertaking than was expected.

The principal districts in the Kenai Peninsula region in which some lode-gold production was reported in 1934 were Nuka Bay, Moose Pass-Hope, and Girdwood. The Nuka Bay district embraces country near the extreme southern part of Kenai Peninsula; the Moose Pass-Hope 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 lies just north of Kenai Peninsula, 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 and which extends even over into parts of the Valdez district 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 gold content is largely free gold, though sulphides are by no means uncommon.

The principal producing mines in the Nuka Bay district are the Sonny Fox mine, largely owned and operated by Babcock & Downey, and the Alaska Hills mine, under the management of J. T. Coffey. There are, however, more than a dozen other properties in the district on which some prospecting and development work was in progress. On the whole small-scale prospecting does not appear to have been so active during 1934 as in several of the preceding years, but rumors were afloat of several deals pending with a view to the undertaking of more intensive work. The district is still much handicapped by its remoteness and lack of frequent transportation facilities, but both of these handicaps could be removed if sufficient tonnage were developed, for the district is readily accessible to deep-water steamers, and none of the properties are more than a short distance inland.

Farther north in the Moose Pass-Hope district and, in fact, at intervals between Seward and Moose Pass, are small gold-lode properties at which more or less prospecting and development work was in progress for at least part of the year. Probably the most intensive work that was done at any of these properties was that at the old Alaska Oracle mine, on Summit Creek, about midway between Moose Pass station and Sunrise. Exploration at this place had been in progress for some time, in the attempt to determine whether or not a considerable tonnage could be developed, but after thorough test the findings were not such as to encourage continuation of the work, and the option was given up late in the summer. Subsequently the original owners were negotiating to interest other parties or to obtain financial assistance from other sources, for, as shown by Tuck,[3] there is a small amount of ore disclosed in the workings which might repay extraction if it could be mined and milled cheaply.

In the Girdwood district, north of Turnagain Arm, the principal area in which some development of gold lodes was in progress in 1934 was near the head of Crow Creek, a tributary of Glacier Creek.

[3] Tuck, Ralph, The Moose Pass-Hope district, Kenai Peninsula, Alaska: U. S. Geol. Survey Bull. 849–I, pp. 469–530. 1933.

The chief operating mine in this camp is the Monarch, under the management of H. I. Staser. No detailed report has been received by the Geological Survey as to the recent activities at this mine, but in spite of the fact that much effort appears necessarily to have been diverted to various jobs of construction for the surface plant, considerable progress was made in mining and milling, so that the returns from the property appear to have been encouraging and on the whole satisfactory.

In the Bonnifield district, north of the Alaska Range, the principal lode-mining activity was that of the Prospect Mining Co. on California Creek. This property is accessible from the Alaska Railroad by an excellent wagon road from Ferry to Eva Creek and thence by a few miles of fair road to the mine, which is in the canyon portion of California Creek. This mine has been developed mainly for the silver content of its ores, which also carry subordinate amounts of gold and copper. Little mechanical equipment has yet been utilized on this property, the main object of the investigations having been to obtain as much information as possible in regard to the local conditions before embarking on plans that may not prove feasible or justified by later developments. A very little work was also said to have been done at the Eva mine, but it was of a desultory character, as the excessive caving of the ground made the mining that had been actively in progress there in the two preceding years too expensive to be justified by the amount of gold recovered.

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 any ore mined or any gold produced except the little that may have been recovered in the course of testing the ore during development work. Considerable prospecting for gold lodes is reported to have been done in the Bremner district, in the Copper River region. According to local reports, more than a score of men were engaged in mining developments and construction work connected therewith in this district during 1934, and as a result several leads that are regarded as promising have been found and partly opened up. The property on which most work was done is that of the Ramer Bros., on Golconda Creek. As a result of the favorable showings that had been disclosed by the prospecting of the preceding year the owners felt justified in shipping in a mill late in the season to be erected on the property. Transportation of the mill and equipment to the property was considerably hampered by the interruption of service on the Copper River & Northwestern Railroad, owing to damage to the bridge northeast of Chitina, so that it was very late in the season before the delivery was completed. It was expected, however, that the construction would be pushed ahead, so that the mill would be in running order early in 1935.

Elsewhere in the Copper River region little new prospecting for gold lodes has been done, though reorganization of some of the properties, especially in the McKinley Lake district, is expected to lead to more active development in the future. In the vicinity of Tiekel surface prospecting disclosed several new veins that appear promising, and subsequently arrangements were made to put equipment on the ground for the purpose of more adequately testing some of the better showings by underground development. A number of gold-lode claims are still held in the Kotsina district, but no new developments of note are reported to have been made on any of these during the year.

One of the notable new lode developments of the year, though not yet affecting the annual lode-gold production, was the reopening of the old Golden Horn mine, in the Iditarod region. This work is being undertaken by W. E. Dunkle, to whose effective management of the Willow Creek mines has been mostly due their recent large output. Associated with Mr. Dunkle as manager of the mine is B. B. Nieding, formerly in charge of the Kennecott Copper Corporation's mines at Kennicott and later of the Chichagoff Mining Co. The season of 1934 was devoted at this place mainly to getting the surface plant into good condition and in installing the necessary equipment, including hoist and compressor, so that underground work may be carried along more effectively. The ore near the surface is free-milling, and according to such information as is available is not expected to become base within the depths to which the immediate developments are to be carried. The operators, therefore, are not expecting to have to solve any complex milling problems in their treatment of the ore.

In the Kantishna district the extensive underground tests that were started late in the season of 1933 were continued into the early part of 1934. In the absence of close supervision the exploratory work ran into many difficulties, which ultimately caused the cessation of the work without disclosing workable ore bodies. From all the available evidence it seems certain that the failure to find ore by no means indicates that none occurs there, for the tests do not seem to have been well planned or executed. This region is now becoming much more accessible through the completion of the road from McKinley Park station on the Alaska Railroad practically as far as Wonder Lake.

In the Valdez Creek district, the Alaska Exploration & Mining Co. spent all of the open season in prospecting and development work on the Denali and Timberline properties. As a result of this work an adit about 60 feet long was driven to the vein, and about 60 feet of drifts were turned off from it. A 16-ton ball mill was brought in to the property and put into operation late in the

season for a test run. So much of the season had been expended in preparatory work that little gold was reported to have been recovered, but the property should be in condition to operate continuously in 1935.

In the Chisana (Shushanna) district activity is reported to have been shown in lode prospecting in the area between Erickson Gulch and Bonanza Creek, where more than 45 claims have been staked. Several veins have been found lying near the contact with a granitic intrusive. Specimens taken from the veins at the surface show a spongy-textured mass of deeply iron-stained quartz that apparently was originally heavily impregnated with sulphides. Owing to the remoteness of the region, most of the supplies and equipment have had to be brought in by airplane. Some outside capital has been made available to continue prospecting work on the claims, but in the main the developments have been carried through by the owners with their own efforts and resources.

In Seward Peninsula prospecting on lodes containing gold was in progress at several places, though so far as reported none of the deposits yielded gold in appreciable amounts. Projected developments of lodes in the Bluff and Solomon districts have been discussed for several years, but no material progress has been made on the ground in carrying the plans into effect. Nevertheless considerable interest is still being displayed in carrying on these enterprises, and it is likely that before long active work may be undertaken at some of the properties.

GOLD PLACERS

GENERAL CONDITIONS

Placer mining in Alaska in 1934 returned gold worth $8,955,000. This marks a great increase in value and some increase in quantity over the output of the preceding year. In fact, the value of the placer production was larger than for any other year since 1917, though the quantity was exceeded by the output in 1918 and in 1932. 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 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 15 years from that time to 1933 it fluctuated between that amount and $3,000,000. In 1934, owing to the great increase in the price of gold, the value of the output suddenly jumped to the abnormally high figure stated above.

The great amount of placer gold produced from Alaska mines in 1934 is not to be explained as due to abnormally favorable conditions that are unlikely to be duplicated again in the near future. Instead, there are many facts which seem to indicate that quite the reverse is true, and that with even average conditions and with the equipment already in the field the mines are likely to better their current records. This opinion is based on different lines of evidence, some of which are applicable to a single district only, while others have a more widespread effect. The more local causes are discussed in greater detail in the sections of this report that treat of the different camps, but some of the more general causes may be briefly noted here. Perhaps the most cogent reason for believing that placer mining in 1934 was not especially favored is that at many of the camps the weather conditions, which affect the water supply so urgently needed in placer mining, were decidedly adverse. Thus, throughout Seward Peninsula and in many of the camps in the southern and eastern part of the Territory the season was unusually dry, and water for sluicing was deficient. Another general cause that hampered placer mining as well as most other enterprises in the Territory was the tying up of shipping through the longshoremen's strike, in the early part of the open season, which badly delayed or even prevented the receipt of necessary supplies and equipment. Still another reason why the placer production of 1934 is likely to be soon exceeded is that in almost all the larger camps construction and development of new enterprises were in progress which were not completed early enough to have a marked effect on the year's output but are likely to make a much better showing when they are in operation for the full season.

The trend of placer mining in Alaska for the last 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. Such enterprises are not undertaken casually, nor can they be made productive quickly, so that in spite of the stimulation brought about by the increased price of gold there must necessarily be a considerable lag before the larger new enterprises become noteworthy producers. Small operations, which do

not require such elaborate preparations, show less lag in attaining production, and consequently many small new prospecting ventures have been started and some have made good showings. The life of the prospector has in it much that is attractive to offer 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. Many of the incidents in the life of the prospector are hard, and outstanding success comes to few in any line of endeavor; but it is believed that Alaska still holds 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 now involved in 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 known that there are still large tracts of Alaska that have not yet been thoroughly prospected or adequately examined for large-scale placer operations. Although most of these areas do not appear to give promise of holding bonanza deposits that can be won easily and cheaply, there are 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 regions, the following table has been prepared to show the comparative standing of the different regions as accurately as possible. It should be remembered that in this table, as well as elsewhere throughout this volume, all statements of the value of the gold produced prior to 1934 are based on the old standard price of gold at $20.67 an ounce, whereas those relating to 1934 are based on the present standard price of $35 an ounce.

In the following table the different regions are arranged in geographic order from southeast to northwest. The largest amount of placer gold came from the Yukon Basin, and the next largest from Seward Peninsula. Placer mining in each of these main regions is discussed in some detail in the following pages, and the more notable events of the year are recorded for each region.

Value of placer gold produced in Alaska in 1934 and 1933

Region	1934	1933	Increase 1934
Southeastern Alaska	$4,000	$3,000	$1,000
Copper River region	59,000	51,000	8,000
Cook Inlet-Susitna region	192,000	121,000	71,000
Yukon Basin	7,115,000	3,716,000	3,399,000
Kuskokwim region	246,000	102,000	144,000
Seward Peninsula	1,329,000	1,156,000	173,000
Northwestern Alaska	10,000	3,000	7,000
	8,955,000	5,152,000	3,803,000

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.

The entire placer production from southeastern Alaska in 1934 is estimated to have been worth only $4,000, 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 1934, though a small amount of gold was recovered in the course of casual single-man operations at two or three places. None of the placer claims in the Porcupine district afforded a production worthy of mention. There was, however, a revival of activity in this region, and an extensive program of drilling was begun to test some of the gravel deposits of the Klehini River, with the expectation that if the tests confirmed the showings of some of the samples from surface cuts, large-scale mining might be undertaken. In the Lituya-Yakataga district 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, though in a measure favorable for concentration of the beach material, is 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 2 principal areas and 1 minor area that have yielded 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. The value of the placer gold produced from the Copper River region in 1934 was $59,000, or practically the same as in 1933. In the Nizina district the bulk of the placer gold came from the properties of the Chititu placer mines, on Rex and Chititu Creeks, where mining continued on practically the same scale as heretofore. The other formerly large producer, the Nicolai placer mines, on Dan Creek, was not in productive operation, as practically the entire season was devoted to extensive reorganization of its water supply and other surface improvements. Several changes in the management of the company have been made, and it has been renamed the Pardners Mines Corporation. The new water supply, which will be carried by nearly a mile and a half of iron pipe, as well as several hundred feet of woodstave pipe, and will entail considerable rock work, will have a considerable head and thus make much additional ground available for effective mining. A dam on Dan Creek was built to allow additional impounding of water and thus assure a more continuous supply. Some of these plans were delayed by the shipping situation in the early part of the season and the lack of transportation on the railroad owing to the destruction of the bridge near Chitina, but it was expected that practically all the necessary installations would be made in time to be used uninterruptedly in 1935. In the lower reaches of Chititu Creek on ground owned by J. H. Murie an option was taken by W. C. Hammon, who put two Keystone drills and crews of men at work conducting extensive tests of the placer deposits. According to local reports this drilling will be continued practically throughout the winter. Continuation of prospecting and the production of a small amount of placer gold are reported by prospectors in the Bremner River region, to the south of the Chitina, 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.

Little productive placer mining was in progress in 1934 in the Chistochina district, at the head of the Copper River. One outfit on Slate Creek that had spent most of the early part of the season in dead work preparatory to undertaking productive work shortly, had all this work go for naught when the heavy rains of early August caused such high water that it swept tailings and creek wash from farther up the creek down onto the prepared ground and buried it so deeply that it could not be cleared again this season. An en-

couraging find of placer gold was made on Grubstake Creek, which is a small tributary of Ahtell Creek, at a point about 6 miles north of Slana, or 4 miles from the highway. Little more than preliminary prospecting of the ground was accomplished in 1934, and only a small amount of gold was recovered. The gold is very rough and is associated with much silver and some copper and has evidently not traveled far from its bedrock source, which is probably in the nearby creek valley. This occurrence was hurriedly examined by F. H. Moffit, of the Geological Survey, and further notes on his investigations are published in another chapter of this volume.[4] The area likely to be occupied by the placer ground appears to be small, but several parties of prospectors were planning to spend the winter of 1934–35 putting down holes to determine its extent and other features.

In the Nelchina district, which is in the extreme western part of the Copper River region, all the mining was done by a few small camps consisting of only 2 or 3 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 1934 the value of output of placer gold from this region showed an increase of about $71,000 over that reported in 1933 and is estimated to have been $192,000, though the quantity of gold produced in the 2 years was about the same. In the relative order of their placer production in 1934 these districts ranked as follows: Yentna-Cache Creek, Kenai Peninsula, Valdez Creek.

In the Yentna-Cache Creek district at least 95 men were actively engaged in productive mining, and about a score more were doing casual prospecting and development work, which in many localities amounted to little more than that required to hold the claims. By far the largest and most productive operations in this district were those carried on by the Peters Creek Mining Co. on the lower part of Peters Creek, by several outfits on Cache Creek, notably that of Murray & Harper, and by the Alaska Exploration & Mining Co. on

[4] Moffit, F. H., Upper Copper and Tanana Rivers, Alaska: U. S. Geol. Survey Bull. 868–C.

Bird Creek. In addition, there were camps on Dollar, Falls, Thunder, and Nugget Creeks, which are tributaries of Cache Creek, and at some of these several thousand dollars' worth of placer gold was produced. In the Peters Creek drainage basin, in addition to the larger camps noted above, there were several smaller outfits that reported some placer-gold production. Northwest of the divide at the head of Bird Creek and in the valley of the tributaries of Dutch Creek prospecting disclosed some placer ground that is said to appear promising. North of Peters Creek a few prospectors usually spend part of the season in the valley of the Tokichitna and some of its tributaries, but no direct word was received by the Geological Survey of any such camps having been established there in 1934. Southwest of the Cache Creek area, in the valley of the Kahiltna River and in the Fairview district, prospecting is reported to have been particularly active, and more than a dozen men are said to have been working there during the open season. Rumors are persistently heard of plans being considered for starting a rather extensive mining operation in this district in the near future, but so far no definite steps are known to have been taken to effect that end. The attempt to develop placer ground in the vicinity of Beluga Mountain, which was noted in the Survey report for 1933, seems to have failed to find workable deposits and to have been discontinued.

The producing camps in the Kenai Peninsula region are situated mainly in the vicinity of Hope, Sunrise, and Girdwood. In the area near Hope special mining activity was noted in the northern part of the Resurrection Creek Valley, where two camps had an unusually successful season mining some of the deposits of the main streams near the mouth of Palmer Creek. These two were the Palmer Creek Mining Co., on property formerly known as the "St. Louis claims", and the Hope Mining Co., on the old Mathison claims. Elsewhere in the Hope-Sunrise district the placer camps are mostly small, yielding only a few thousand dollars at most, and some of them only a few hundred dollars for a meager grubstake. These smaller camps were situated at practically the same places as in the last few years, especially on Sixmile, Canyon, and Lynx Creeks.

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 gold was that managed by A. S. Erickson about 4 miles north of Girdwood. The placer that is being mined is a thick deposit of bench gravel on the north side of Crow Creek. A well-planned and efficiently managed hydraulic plant has been in operation here for several years and has about reached the limit of the property that can be profitably mined under existing conditions. Neither at the

old Girdwood property, upstream, nor at the property on California Creek, downstream from the ground mentioned above, was any placer mining in progress.

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 1934, the returns to the few placer operators who were in the district appear to have been at about the same rate as during recent years. Both hydraulic and drift placer mining is carried on at different claims in the district. Among the places at which some placer gold was mined during the season were on lower Valdez Creek, where Wallace Fairfield and Dan Ohman, with 6 others, were hydraulicking, and Ole Nicola, with 4 associates, was mining, mainly by hand methods, and farther up the valley, where Fred Bucke, with 6 others, had sunk a shaft nearly 140 feet deep from which considerable drifting had been done. On Lucky Gulch 3 men were engaged in groundsluicing on Discovery claim, and in the valley of White Creek 2 men were hydraulicking on bench claims.

YUKON REGION

The Yukon Valley embraces a tremendous extent of territory, and scattered through it from one end to the other are 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 18 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 chief 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 placer gold from all the camps in the Yukon Valley in 1934 had a gross value of $7,115,000, which is very much more than in 1933, and even in quantity exceeded the output of the preceding year.

The increase in value is due mainly to the increased price of gold, but the increase in quantity is largely to be explained by the fact that several new plants were in operation and that some of the older ones had become better broken in and able to work more efficiently. On the whole the conditions affecting the water supply throughout the region were good but by no means unusually favorable.

In the following table the districts are arranged in order of their placer production in 1934, and for comparison the production from the same districts in 1933 is given. The total is believed to be correct 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, 1934 and 1933, by districts

District	1934	1933	District	1934	1933
Fairbanks and Richardson	$5,474,000	$3,077,000	Koyukuk and Chandalar	$50,000	$21,000
Iditarod	574,000	261,000	Marshall	29,000	5,000
Innoko	367,000	76,000	Eagle	21,000	12,000
Circle	149,000	71,000	Chisana	18,000	13,000
Tolovana	130,000	50,000	Kantishna and Bonnifield	17,000	10,000
Ruby	127,000	48,000	Rampart and Fort Gibbon	9,000	7,000
Hot Springs	91,000	48,000			
Fortymile	59,000	17,000		7,115,000	3,716,000

In the foregoing table three small districts, the Richardson, Fort Gibbon, and Chandalar, have been grouped with the nearby larger districts, Fairbanks, Rampart, 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 United States Smelting, Refining & Mining Co., Fairbanks Exploration Department, 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 United States Smelting, Refining & Mining Co., Fairbanks Exploration Department, 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 productive work is proceeding in systematic fashion and, except for details, in essentially the same manner and in the same general area as heretofore. In addition to its immediately productive work the company is engaged in large-scale prospecting and preparatory work on its extensive holdings in the Ester Creek area to the west of Fairbanks. This work has entailed not only an enormous amount of drilling and sampling to determine the distribution and extent of the workable deposits but also the construction of miles of ditches and pipe lines to bring water under head to the area to be mined, a pumping plant that will lift water from Chena Slough so as to furnish a reliable supply for these water carriers, and a model camp with the necessary accessories to care for the required personnel and make this entire project a more or less self-contained unit. The task of getting this ground into condition to be mined involves many abstruse technical problems, because of the depth below present drainage levels of some of the placers and the difficulties attendant on the disposal of the worthless overburden and tailings. Some idea of the magnitude of this task may be gained from the fact that some of the drill holes show that in places more than 100 feet of muck and slide rock overlies the gravel deposits, which themselves are in places nearly 150 feet thick. The present plans contemplate that the larger part of the mining in this area will be done by dredging, but some of the shallower ground near the western part of the area will be hydraulicked. This new work in the Ester Creek area will greatly prolong the operations of this company in the Fairbanks district and thus give added assurance of the stability, not only of the mining industry in this

camp, but also of all forms of business activity in the contiguous country and in fact throughout much of interior 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.

The placer camps in the Iditarod district were the second most productive in the Yukon region and bettered their output of 1933 by several hundred thousand dollars in value and by about 3,700 ounces in quantity. This increase is largely to be attributed to the fact that in 1933 the water supply was small and in consequence the production from the camp was less than usual, but it was also due to the fact that several new, well-equipped outfits began operations. Altogether there were nearly 150 men engaged in placer mining in the district. As in the past, the largest amount of gold recovered in the district was obtained by two dredges—that of the J. E. Riley Investment Co., on Otter Creek about 2 miles south of Flat, and that of the North American Dredging Co., on Flat Creek—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. Next to the output from dredging, the largest amount of gold was recovered from mines using mechanical shovels or power-operated scrapers of one or another type. Among the largest mines of this kind are those of Olson & Co. on Happy Creek, of the Northland Development Co. on Flat Creek, of the Iditarod Mining Co. on Willow Creek, of Duffy & Co. on Chicken Creek, and of Utilla & Ogris on Slate Creek. Hydraulic plants were also in operation by Miscovich & Roslund on Otter Creek, Salen on Granite Creek, Lusher on Malamute Creek, Strandberg and Sacco & Scott on Flat Creek,

and Loranger & Jensen, and Belanger, Thibault & La Chance on Willow Creek. As some of the new equipment was not delivered in time to be completely installed and put into operation in 1934, there is good reason to expect that the output of the district will be even better in 1935, if other conditions are equally favorable.

Work in the Innoko region was somewhat retarded, owing to the shipping situation in Seattle, which delayed receipt of some of the needed equipment until long after the usual beginning of the season. In spite of this condition the camp showed a notable increase in production of placer gold, far exceeding, in both value and quantity, the output in 1933. A large part of the increase is attributable to the especially successful operations of the dredge of the Ganes Creek Mining Co., which apparently struck some unusually good ground. The 3 other dredges in the district, that of Felder-Gale & Co. on Yankee Creek and the 2 dredges of Waino Puntila on Ganes and Little Creeks, were also operated continuously throughout the season and reported a good return. In addition to the dredges there were several other placer camps on Little and Yankee Creeks and also camps on Ophir, Cripple, and Spruce Creeks and Victor Gulch. Most of these camps were small, utilizing ordinary hydaulic methods. The camps on Cripple Creek, of Wilson & Hard, equipped with a slack-line scraper, and of Strandberg & Ohlson, using a drag-line outfit, were the largest mining camps in the Innoko district except the dredge camps. It is currently reported that arrangements were made to install a new drag-line outfit on Yankee Creek in 1935 and that some preliminary work getting the ground into shape for this purpose was started late in 1934. Altogether in the Innoko district in 1934 there were about 20 producing camps and between 110 and 120 men engaged in the work. Except at one camp on Anvil Creek no drift mining was done in the district.

The output of placer gold from the Circle district in 1934 was more than double that recovered in 1933 and indicates the greatly increased activity throughout the district. Although some gold continues to come from drift-mining operations in this district, by far the larger part comes from hydraulic mines and open-cut workings. Practically all the placer camps are situated on streams that head in the vicinity of Mastodon Dome and the highlands east and west of the dome and that derive their gravel mainly from the bedrock on the northern slopes of this upland. According to local estimates, about 100 men were engaged in mining or prospecting in this district during the year. The largest outputs from the district as reported to the Geological Survey came from the properties of the C. J. Berry Dredging Co. and of John A. Anderson, on Mastodon Creek, and the Independence Mining Co., on Independence Creek.

There were, however, smaller producers on these creeks, as well as on Eagle, Miller, Switch, Deadwood, Ketchum, Holdem, Harrison, Porcupine, and Bonanza Creeks. All these creeks have long been the scene of productive mining. Some drilling of bench claims in the valley of Eagle Creek is said to have disclosed prospects that appear attractive, and plans were under way to drift this tract during the winter of 1934–35. Considerable interest was also shown in prospecting on Coal Creek, about 40 miles southeast of Circle, where a crew was carrying on extensive tests under the direction of E. N. Patty, for a group of Canadian capitalists. No public announcement of the results of these investigations has been made.

The Tolovana district, as the name is used in this report, embraces a considerable tract of country lying north and northwest of Fairbanks. It has long been difficult to reach, except by airplane or by a circuitous, time-consuming journey, but the completion in 1934 of a road connecting it with Fairbanks will doubtless aid much in its development, as well as opening up some of the intervening tracts. The value of the output of placer gold from this district in 1934 was very much greater than in 1933. Part of this increase may be discounted somewhat, because 1933 was an exceedingly dry year and the production from the camp was abnormally small. A good share of the increase, however, is to be attributed to the greater amount of mining that was in progress and the better values that were found in several of the areas that were mined. The camp was hurriedly visited late in the open season by R. D. Ohrenschall, of the United States Geological Survey, whose records have been of special assistance in compiling the following notes because some of the operators have not furnished the Survey with direct information as to their season's work. So far as known, only two outfits in this district were engaged in drifting during the winter of 1933–34, and both of these were on benches in the valley of Livengood Creek. About 30 men were engaged in productive mining during the open season in 11 camps, but several others were doing prospecting or development work that did not contribute directly to the output of the district. The bulk of the production came from essentially the same general areas as heretofore—namely, from Livengood Creek and its tributaries, Lillian, Ruth, Amy, and Gertrude Creeks and Glen Gulch, and from some of the tributaries of the Tolovana River east of Livengood Creek, mainly Olive and Wilbur Creeks and Lucky Gulch. According to Mr. Ohrenschall the principal camps on Lillian Creek were those of Mandich & Jurich and Falls & Barker; on Ruth Creek, those of Bentley Falls and Estorffe & Radak; on Olive Creek, those of T. Hudson and C. W. Hudson; on Lucky Creek, which is sometimes known as "Goodluck Creek", those of J. Healy, near the

mouth of the stream, and of C. LeBoyteau, near its head; on Amy Creek, those of C. Stadelman and Luckman & Co.; on Lucille Creek, one small prospecting outfit; on Gertrude Creek, that of Dahl & Co.; and on Wilbur Creek, that of Bostrum & Wickstrom. The prospecting that has been in progress for more than a year in the Livengood Creek Valley by the Mines Development Syndicate, under the management of Clifford Smith, apparently had not been carried far enough to determine whether or not the ground could be successfully mined, because so far as learned no formal announcement was made by the company as to whether it would continue to hold or to give up its options. It is understood that the company, if it took up the property, would expect to mine by means of dredging.

The Ruby district as described in this report is a rather ill-defined area extending southward from the settlement at Ruby, on the Yukon, for 50 to 60 miles to include the settlement of Poorman and the various camps adjacent thereto. By far the larger part of the production from this district is recovered by drift mining, which is done mostly during the winter, and the dumps are sluiced during the following open season when water is available. There are two principal centers of mining activity in the district—one near Long, about 25 miles south of Ruby, and the other near Poorman, some 25 miles farther south. In the area near Long two camps were mining on Long Creek or a short distance up its small tributaries, and preparatory work was in progress on Trail Creek for both open-cut and drift mining to be undertaken in the winter of 1934–35 or the open season of 1935. One small camp was mining on Greenstone Creek about 8 miles south of Long. In the area adjacent to Poorman five outfits were mining on Poorman Creek or its tributaries within 2 or 3 miles of the town, 1 was on Solomon Creek, 1 on Timber Creek, 2 on Flat Creek, a tributary of Timber Creek, and 2 on Moose Creek, 9 to 10 miles southwest of Poorman and near the small settlement locally called "Placerville." Between the Long and Poorman settlements there was one mining camp on Meketchum Creek. No productive mining was in progress on any of the creeks immediately adjacent to Ruby, though in the past several of them have yielded considerable placer gold. Among the plans for the future that seem likely to be carried through may be noted the probable reopening of the mines on Spruce and Birch Creeks. More than 10 men were engaged practically throughout the open season, cutting cord wood and moving in onto the properties so that they would be able to carry on drift mining during the coming winter.

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 extending as far west as American Creek, the other including the eastern part, which centers around Eureka Creek and is locally referred to as the "Eureka Creek district." The largest producer in the western area was the dredge of the American Creek Operating Co., which, after several years of idleness, resumed operations and made highly satisfactory progress under the management of Roy Ferguson. Elsewhere in this western area there was a considerable falling off in production, as much of the ground in the Sullivan Creek Valley had been sold to the Cleary Hill Mines Co., and it was busy in the preparatory work of stripping a large block of ground, removing the overburden, and building about 9 miles of ditches. Mining will be done by a drag-line scraper. This property, therefore, gives every assurance of becoming one of the largest producers in the whole district in another year, so that the temporary loss of production in 1934 from this ground is likely to be made up many times in the coming years. Some 60 claims are included in the block of ground that was acquired by this company. The pay streak so far as determined is said to be about 500 feet wide and is covered by about 45 feet of overburden. The gravel in which the pay occurs is about 5 feet thick. One of the other interesting developments in the Tofty area is the mine of the Albright & Hanson Co. on Deep Creek, which is a new deep-ground placer that was previously prospected by drilling. The pay streak occurs at a depth of about 125 feet below the present surface, and the samples taken in the course of the prospecting give every indication of its containing good values. A. Bock did considerable drilling in the lower part of the Woodchopper Creek Valley and is reported to have discovered a large block of virgin ground, which he proposes to develop by drifting next year. In the Eureka area of the Hot Springs district the largest amount of placer gold appears to have been mined by A. W. Pringle and associates on Rhode Island Gulch. Considerable placer gold was also recovered by one camp on Glen Gulch, from half a dozen small outfits on Eureka Creek, from 1 outfit on Jordan Bar, and from 2 outfits on Orange Creek. In addition there were several prospectors at other places throughout the district, and undoubtedly in the aggregate their finds swelled the total, though individually they got only small amounts.

The main item of news regarding placer mining in the Fortymile district centered around the installation and beginning of operation of the dredge of the Walker's Fork Gold Corporation. Preparations for this dredge had been in progress for more than a year, so that when it arrived on the ground early in 1934 the work of assembling it was carried on expeditiously, and it was in running order and was beginning to mine by about the first of September. Necessarily it had only a short run before the end of the open season, but when it

has a full season of active mining it should materially increase the output from the district. In the Fortymile district about one-seventh of the placer production was derived from drift mines and the rest from the dredge, hydraulic, and open-cut workings. Even the primitive rocker was in use by many of the single-man outfits that were working some of the deposits of the district, such as the shallow bar diggings along the Fortymile River. Altogether about 70 men were engaged in some form of placer mining in the Fortymile district in 1934 and in addition to the places named above had established camps on Chicken, Jack Wade, Ingle, Napoleon, Franklin, Davis, Poker, Canyon, and Squaw Creeks, as well as on the bars of the North and South Forks of the main Fortymile River.

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 in 1934 from the camps in the northern part of the Koyukuk Valley was about the same in quantity as in 1933, though, of course, because of the difference in price of gold, its value was very much greater. The following list of places where mining was in progress in the northern part of the Koyukuk district was derived mostly from notes by R. B. Ohrenschall, supplemented by the reports received direct from the operators: On Archibald Creek, a tributary of Nolan Creek, Peter Dow and Oliver Chappell; on the lower part of Nolan Creek, John Wooll (two camps), Peter Haslem and associates, Charles LeBoyteau, Sam Standish, Oliver Chappell, and J. Ulen; on Smith Creek, the drift mines of Jones, White & O'Leary and Wanamaker, Allen & Eaton, open cuts of Smith Wanamaker and Hugh Boyle; on Hammond River, the drift mines of Michael Anglich, Kelly, Foley & Burke, Thomas Brady, Watts, Harvey & Neck, and Spinks & Irish and the summer prospecting on the bench on the west side of the creek by Ernest Collins; on Union Creek, the open cut of Verne Watts; on Sheep Creek, the drift mine of Frank Miller and associates; on Gold Creek, the summer work of Creecy and of Patrick Kelleher; on Jim Pup, in the Big Lake area, the drift mine of Hans Christenson; on Lake Creek, the drift mines of George Mangles and John Rooney; on Mascot Creek, the open

cut of Vincent Knorr; on Porcupine Creek, the drift mine of Samuel and O'Brian Standish and the open-cut mine of Victor Neck; on Clara Creek, the open-cut mine of Kenneth Harvey; and on Myrtle Creek, the open-cut mines of Haslem and associates and William Marr. Rumors were current that a considerable tract of prospective placer ground on Twelvemile Creek was to be examined late in the season by a competent mining engineer with the understanding that if the report was favorable, funds for development would be made available.

In the table on page 35 the production of placer gold in the Chandalar district has been combined with that of the Koyukuk. The yield from the Chandalar district is much less than from the camps in the Koyukuk Valley. So far as reported to the Geological Survey the only placer mining in progress in the Chandalar district in 1934 was at two camps on Big Creek and one on Tobin Creek. At one of the mines on Big Creek and at the mine on Tobin Creek the method of mining employed was drifting. So far as could be learned the property on Little Squaw Creek, which had been the principal producer in the district in preceding years, was idle in 1934. Practically no prospecting was in progress, and few rumors were current as to prospective developments.

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 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. It is reported that in 1934 three camps, utilizing the services of 10 men, were working in the area and had an especially good year. One camp did a little work on Elephant Creek. On Montezuma Creek two men were mining the creek gravel and reported a return of more than wages 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 three men were mining with a hydraulic lift and plant. No specific 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 camp must have had a fairly satisfactory season, though without notable new developments.

In the Eagle district the production of placer gold was practically the same in amount as in recent years, though the increased price of

gold made its value proportionately greater. Among the streams having the largest production in the district were Fourth of July, American, Crooked, Barney, Broken Neck, Woodchopper, and Fox Creeks and the Seventymile River. The largest camp consisted of only 6 men, and at several of the camps there was only 1 man each. Altogether about 20 to 25 men were employed in mining in the district. Practically no winter mining is carried on in this district, the placers being worked by simple hydraulic or open-cut methods.

Reports from the Chisana district, locally called "Shushanna", indicate that the season of 1934 was generally regarded as better than the average. This seems to have been due not so much to any single new development as to the general revival of activity throughout the district. Altogether some 15 to 20 men were engaged in placer mining or prospecting, and seven camps reported some production. The largest camp was that of the Nelson Mining Co. on Bonanza Creek, which employed six men through a large part of the season. Mining is also reported to have been in progress at three other camps on Bonanza Creek and at one camp each on Big Eldorado, Little Eldorado, and Gold Run Creeks.

Placer mining in the Bonnifield district was carried on by a few small camps, the largest of which employed not more than six men and none of which yielded gold worth more than a few thousand dollars. Among those reporting some production of gold during 1934 may be mentioned operators on Gold King, Marguerite, Moose, Platte, and Eva Creeks. The production from this district has been combined in the table on page 35 with that from the Kantishna district, but it may be stated that the placer gold from the Bonnifield district was about two-thirds 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, Glen, Glacier, and Willow Creeks. Almost none of these camps, however, recovered gold worth more than a few hundred dollars. All the ground is shallow and with the exception of one drift mine on Eureka Creek is mined by simple open-cut methods.

Reports received by the Geological Survey regarding placer mining in the Rampart district indicate that about a dozen camps, employing about 30 men, were active during 1934. Several of these operations recovered only a few hundred dollars' worth of gold. The greatest amount of gold seems to have come from properties on Little Minook, Quail, and Hunter Creeks. Some gold was also produced at camps in the valleys of Big Minook, Little Minook, Jr., Bear, Slate, and Hoosier Creeks. Prospecting was also continued on the high gravel deposits of Idaho Bar. In the Fort Gibbon area,

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 1934 by two camps on Morelock Creek and one camp on Moran Gulch. Only a little gold was recovered in this work, but it is significant as indicating the continuation of mining interest in this district.

KUSKOKWIM REGION

Included in the Kuskokwim region are four principal districts where gold placers were mined in 1934. For convenience of description they may be called the Mount McKinley, Georgetown, Tuluksak-Aniak, and Goodnews Bay districts. The Mount McKinley district, as the term is here used, 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 the settlement of Georgetown, on the Kuskokwim, about 45 miles in an air line south of Iditarod, is situated near the center of the southern border of the district. Although lying in the Kuskokwim drainage basin, the district has closer affiliation with the Iditarod district, to which it has better transportation facilities than to any of the Kuskokwim points. 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 the Kuskokwim Bay, about 125 miles in an air line south of Bethel.

The production of placer gold in the Kuskokwim region in 1934 is estimated at $246,000, or an increase in value of more than 2⅓ times that of the production in 1933. Part of this increase is to be attributed to the greatly increased price of gold in 1934, and part to the fact that in 1933 the production was abnormally small, owing to the unusually dry season. However, even if due allowance is made for these factors, the current year's record indicates that there was a real increase in the placer-mining activity in the region, which leads to the expectation of continued growth of the industry. Considering the enormous area of the Kuskokwim region even the amount of the present production is extremely small, but when it is remembered that there are less than 100 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 this region that

well deserve more intensive investigation and that there is a fair probability that close examination and intelligent prospecting in the vast totally unexplored areas that fall within its confines might disclose not only workable gold placers but also other valuable mineral deposits.

In the Mount McKinley district there were three main areas in which placer mining was in progress in 1934. One of these is the Moore Creek area, about 50 miles southwest of McGrath, where one hydraulicking outfit, employing 5 men, was the largest individual producer in the district. Moore Creek is a tributary of the Takotna River. On Candle Creek, a tributary of the Tatalina River, one small camp was established about 8 miles in an air line south of McGrath. In the Hidden Creek Valley and on some of the creeks tributary to it, three small hydraulic plants were in operation. No details are available as to the amount of gold recovered from these individual camps, but apparently none of them produced more than a few thousand dollars' worth of gold.

Placer mining in the Georgetown district appears to have been restricted to 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 Iditarod deposits. They are about 20 miles in an air line respectively northwest and north of Georgetown, on the Kuskokwim. The principal producing camp was one on Julian Creek, where seven men were employed throughout the open season. Revival of interest in this region has led to a concerted effort to have a suitable road built between Flat and Georgetown, so that better transportation facilities would be available for prospectors. South of Georgetown, in the valley of the Holitna River, some placer gold is reported to have been found during the winter of 1933–34, and prospectors were reported to be planning to go into the country late in 1934 and spend at least several months in scouting around. No details regarding the results of this prospecting have been received by the Geological Survey, and even the approximate position of the locality has not been learned. As the region has not been mapped, any statement as to the real significance of the find is pure speculation. However, from the probable geologic character of the region, there is good reason to believe that it may contain intrusive rocks which, at their contacts, have induced mineralization that might yield workable placers.

In the Tuluksak-Aniak district the bulk of the placer gold produced in 1934 came from the property on Bear Creek that is being mined by the dredge of the New York Alaska Gold Dredging Corporation. No detailed report of the operations of this company has been received by the Geological Survey, but it is understood that the

dredge enjoyed an exceedingly long working season, having been in operation 211 days. This resulted in a considerably larger output than in the preceding year, though the tenor of the ground is said to have been about constant. Next in volume to the dredge production was the output from the hydraulic and open-cut mines. The largest of these are on Canyon and Marvel Creeks. Canyon Creek is a small tributary of the Kwethluk River, which in turn is a tributary of the Kuskokwim a short distance west of the settlement of Akiak. Marvel Creek is a tributary of the Salmon River, which flows into the Akiak River, and that stream in turn joins the Kuskokwim about 75 miles in an air line northeast of Akiak. The principal property on Canyon Creek was being operated by Kvamme & Andersen, and the one on Marvel Creek by Dahl & Wilson for Luther C. Hess. Several other small outfits of a few men each are also reported to have been working on some of the other streams that head in the same general group of hills, which, for want of a specific name, may be referred to as "Marvel Dome and vicinity." No detailed reports from any of these smaller camps have been received by the Geological Survey, and apparently they recovered only a little 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, in 1934 there was some revival of interest in gold mining, and small outputs were reported from Wattamuse, Kow Kow, and Bear Creeks. It is also reported that there has been considerable scouting done in the Goodnews Bay district looking to the consolidation of holdings so that an operation of moderately large scale might be undertaken. No recent news has been received by the Geological Survey as to the progress of the extensive tests that have been under way for several years in the valley of the Arolic River with a view to finding out the value of some of the low-grade deposits that occur there.

SEWARD PENINSULA

The production of placer gold from Seward Peninsula in 1934 is estimated at $1,329,000. This is an increase of about $175,000 in value over the production in 1933 but is a decrease of about 18,000 ounces in quantity. At first sight this appears to be a disappointing record, especially when it is remembered that 1933 was a year of low production. However, there were many items which combined to cause this decrease but which, though temporarily serious, are not such as affect the industry permanently. Perhaps the greatest single cause of the decrease was the lessened production from the Hammon Consolidated Gold Fields, the large dredging

company near Nome, which is the second largest placer-mining enterprise in the Territory. The decrease at this property, however, was not due to impoverishment of the ground handled or any of the usual things that mark the decline of a mining project; it was caused simply by the lack of advance preparation of the normal amount of ground for mining. Until well into the season of 1933 the company had not been able to arrange for acquiring certain adjacent claims and, consequently, was faced with the necessity of curtailing or closing out its activities in that area. Finally, however, suitable arrangements were made so that an area sufficient to sustain many years' additional work was obtained, but it was too late to prepare the ground for dredging in the immediate future, because adequate preparation takes several years. Under those conditions the company had to enter 1934 without sufficient ground to keep its equipment thoroughly employed and in full production. The conditions are, of course, being rectified as rapidly as possible, and undoubtedly the work will be reflected by increasing production until the enterprise is again going ahead at its full capacity.

The early part of the open season of 1934, up to the end of August, was characterized in Seward Peninsula by less than the normal rainfall, so that water supplies for mining were low. The tie-up of shipping for more than a month by the strike on the west coast delayed many of the operators in receiving their desired equipment and supplies, and the almost complete annihilation of Nome by fire in mid-September had a small though significant effect in causing early cessation of work at some of the properties. Viewed in the light of these various handicaps, the production from the region was extremely creditable and in no sense indicates a waning of the mining industry as a whole in the area. In fact, as will be seen from statements in the following paragraphs regarding the individual districts, there are in almost every camp signs of new enterprises springing up or old ones being enlarged that seem to promise well for the future of the mining industry.

A large part of the gold recovered from Seward Peninsula placers is mined by dredges. In 1934 gold worth $1,005,000, or more than 75 percent of the placer output of the peninsula, was mined by 12 dredges, one or more of which were active in practically every one of the larger districts of the peninsula. Additional data regarding dredge mining in this and other parts of Alaska are given on pages 56–61.

In the relative order of their output of placer gold in 1934 the mining districts of Seward Peninsula stood as follows: Nome, Bluff, Fairhaven (including the Candle and Inmachuk districts), Council, Solomon (including the Casadepaga River region), Kougarok, 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 individuals.

The outstanding placer enterprise in the Nome district, as well as in the whole of Seward Peninsula, and the second largest in the Territory continues to be that of the Hammon Consolidated Gold Fields, with its three dredges between Little and Dry Creeks and its extensive ditches and other equipment for properly conducting its work. Some discussion of the situation at this property is given on page 48. One of the company's three dredges was out of commission for the entire season, and one of the others was inactive for part of the time. In preparation for the resumption of intensive mining considerable additions were made during the season to the company's power plant and generators, which supplied the necessary power for its field operations.

A dredge that was formerly on Osborne Creek was transported during the winter to the coastal-plain area near Sunset Creek, west of the Snake River, and reassembled in the summer of 1934. The task of getting this work done occupied all the early part of the season, and there were the inevitable delays incident to starting up any new enterprise, so that it was well in September before the dredge was ready for even a test run. After the completion of the tests and the making of the necessary adjustments the dredge began mining and, considering the short season available, is reported to have been even more successful than its owners had anticipated. Much of the ground to be dredged is naturally thawed, so that less preparatory work had to be done than in most other areas in Seward Peninsula. With a full season's work the dredge should give a good account of itself in 1935.

The only other dredge that was in operation in the Nome district in 1934 was that of the Dry Creek Dredging Co., which was mining in the same general area as in recent years—the coastal plain east of the Hammon Co.'s ground. The attempt to acquire a considerable tract of ground west of Nome for development by dredging seems to have been at least temporarily suspended, owing to the death of the principal promoter of the project, P. M. de Freidlander.

There were also open-cut mines in operation 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 12 to 15 men were employed throughout most of the open season. The shortage of water gave the miners a considerable problem, but this difficulty was satisfac-

torily solved in large measure by the use of a gasoline stacker of Harvey Grant type, by which part of the tailings were handled. Altogether within a radius of 20 miles of Nome there were nearly a score of small camps engaged in placer mining. According to current reports more men were engaged in prospecting than there had been for several years, and there was practically no unemployment among any of the whites who were physically fit to work.

Almost the entire placer production from the Bluff district was afforded by the scraper plant installed near the mouth of Daniels Creek. About 30 men are employed at this camp, and the output of gold from it in 1934 was especially large. The material mined consists of both stream and bench gravel and a considerable amount of the decomposed surface of the underlying bedrock, which is mainly a metamorphic limestone. The excavation of this material is carried to such a depth that in places the bottom of the pit is below sea level.

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 1934. Candle Creek is a large tributary of the Kiwalik River from the west, close to the town of Candle. The main new development in this district was the organization of the Arctic Circle Exploration Co., composed of persons representing outside capital and some of the former owners of the property acquired by the company, which was formed to take over and develop on a much larger scale the property formerly held by the Keewalik Mining Co., as well as some additional adjacent claims. This arrangement was carried through so late in the season that the new company was not able to do much more than get in some of the new equipment needed and begin some of the additional preparatory work required. As a result no increase in the production of placer gold from the district was to be expected, but rather a falling off. However, as a partial offset, the former company continued the mining of the ground it had in readiness. The main new construction was the building of a small steel-hulled, pontoon type of dredge and a suitable power house and equipment to supply the needed electricity for running the dredge and other uses. It is understood that the company plans to build a larger dredge on its property in 1935. In addition to these dredges some of the property will continue to be mined, as in the past, by hydraulicking. Besides the large company there were several small camps scattered in the area not far from Candle. 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 Forsgren Dredging Co., which was in operation at intervals throughout the season. This company in the past had been operating a small, nearly worn out dredge, but it is reported to have acquired in 1933 the equipment of one of the dredges that had completed its work in the Nome district, and with this machinery had rebuilt the dredge to make it more effective. Farther upstream in the Inmachuk River Valley is the hydraulic mine of A. V. Cordovado, on the Pinnell River a short distance above its junction with the Inmachuk, where work has been in progress for several years. Unfortunately financial and legal difficulties had so involved the property in litigation that it was practically closed down throughout the year. Several small hydraulic plants were established on nearby creeks. The largest of these was on Humboldt Creek, where 4 men had a fairly successful season. 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 more than 1,000 square miles in the central part of Seward Peninsula. According to H. E. Stull, who has done most of this exploratory work, his recent investigations have disclosed deposits which he considers to be rich enough to mine and return a good profit.

The third tract in which placers were mined in the Fairhaven district lies on Bear Creek on the eastern flanks of 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. The production from this area seems to have been somewhat less than in recent years, and apparently not more than 10 men were engaged in mining there in 1934.

In the Council district, as in the other larger producing districts of Seward Peninsula, most of the placer gold produced in 1934 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 latter 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 1934 was about the same in quantity but more in value than in 1933. All the hydraulic and open-cut mines in the district are small, few of them employing more than 2 or 3 men. In addition to the dredges on Ophir Creek there were five open-cut mines in the valley of that stream and its tributaries Albion

Gulch and Crooked Creek, employing altogether perhaps 8 to 10 men. On Aggie Creek, a tributary of the Fish River, a small hydraulic plant was in operation throughout most of the open season. One or two small open-cut mines were also in operation in the valley of Melsing Creek and its tributaries. There were doubtless a few other small camps scattered through the district, but no direct reports have been received from them, and nothing specific is known about the progress of their work, although 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. Among the significant new developments in the district was the construction of a dredge with buckets having a capacity of about 3 cubic feet, in the lowland of the Niukluk River a short distance upstream from the mouth of Ophir Creek. The work was not completed in time for the dredge to mine in 1934, but it was expected to put in a full season in 1935. The report is current that negotiations have about been completed for moving the old Basin Creek dredge over to some ground on Melsing Creek and reconditioning it so that it can resume productive mining.

In the Solomon district by far the larger part of the placer gold produced was obtained by the dredge of the Spruce Creek Dredging Co., on Spruce Creek about 6 miles east of Solomon. Mining was somewhat retarded by the excessive amount of frost that was encountered in the ground unusually late in the season. The success of this dredge 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 are adjacent to mineralized bedrock. The principal open-cut mines were on West, Kasson, Penny, Big Hurrah, Jerome, and Rock Creeks and the Solomon River. A few of these camps had an output of as much as several thousand dollars, but most of them yielded only a very modest grubstake. Little definite information has been received by the Geological Survey as to any mining work in progress in the Casadepaga Valley, which lies immediately north of the valley of the Solomon River. The only creeks on which mining is definitely known to have been in progress in this area were Ruby Creek, Sunshine Creek (a tributary of Canyon Creek), and the main stream between Banner and Ruby Creeks. Although there doubtless were some other prospectors in this tract, the amount of gold that any of them produced was apparently negligible.

Few of the operators in the Kougarok district have furnished the Geological Survey with detailed information regarding their mining activities during 1934, and as no Survey representative has visited

the district lately information about new developments is exceedingly meager and uncertain. Apparently the item that caused the most local interest was the moving during the winter of 1933–34 of the machinery of the old Coal Creek dredge from the Solomon district to the mouth of Nugget Creek, in the southern part of the Kougarok Valley, and its installation on a new hull, which was built during the summer of 1934. This work was completed in time for the dredge to make only a 5-day trial run before the end of the season. It should, however, be in condition to be in continuous operation throughout the season of 1935. Hydraulic mining was in progress at several places, both in the Dahl Creek area near Coffee Dome and farther north along the valley of the Kougarok and its tributaries and even north of the divide of that basin in the valley of Dick Creek. At most of these properties simple open-cut methods of mining were used, and few of them had any extensive mechanical equipment. Apparently the largest production from any of these camps was between $5,000 and $10,000, and several of the smaller ones recovered only a few hundred dollars in gold. It is reported that a nugget worth about $130 was found in the placers of Dahl Creek.

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 uses in hydraulicking placer ground on that stream. A little work was also in progress on Benson Creek. The entire production of gold from the Iron Creek area, however, was so small that it amounted to little more than wages for the few men concerned.

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 other streams in the vicinity of Haycock. The largest amount of placer gold mined in this district was recovered by the dredge of the Dime Creek Dredging Co. from claim 4. Altogether in this district there were, in addition to the dredge, one drift mine operated during the winter and five open-cut mines that have been worked during the summer. The total number of men employed in productive mining was between 15 and 20. The drift mine and three of the open-cut mines were on Dime Creek, and the other two open-cut mines were on Sweepstake Creek, a few miles to the west.

Lying east of Seward Peninsula but more or less closely related to it and forming the eastern border of Norton Sound is the Bonanza

district, so named from a small stream which has long been known to carry some placer gold. For convenience it has here been treated as part of the Koyuk district, though the productive parts of the two areas are widely separated. 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.

The Port Clarence district, as the term is here used, includes the western part of Seward Peninsula, especially that part adjacent to Teller and the Imuruk Basin, including the district formerly known as the "Bluestone", from the principal stream that traverses it. In the season of 1934 only 3 or 4 outfits were placer mining by open-cut methods in the Port Clarence district, and they were all small camps of at most only 2 or 3 men, their production amounting to only a few thousand dollars. The district, however, because of the activity in dredge building that was current attracted considerable attention and is likely to show a marked increase in placer gold output. On Dese Creek N. B. Tweet & Son spent almost the entire season in erecting a dredge, which was not completed till September 23, only in time to allow a 15 days' test before it was necessary to close down for the season. On Gold Run a company acquired a tract of the lowland near the creek several miles in length. The company had a dredge hull shipped in from the States and purchased the machinery of the old dredge that used to mine on Sunset Creek, across from Teller. The hull was not received until late in the fall of 1934, and that winter was spent in hauling all of the material to the Gold Run site and getting the construction under way. It was expected that the dredge would be completed so as to be in operation by the middle of 1935. Rumors are also current that the construction of at least two other dredges is under consideration in the district, but no definite moves for their construction were reported to have been made up to the end of 1934.

NORTHWESTERN ALASKA

The Kobuk River Valley is the only area in northwestern Alaska that is reported to have been the scene of any placer mining in 1934. In this valley there are two principal areas where placer mining is being done, though report has been received that two prospecting parties were in the Selawik Valley during the open season. 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 transportation or communication that their development is much retarded and hampered by high costs, unavoidable delays, and short working season.

In the Kiana area there has been considerable activity in prospecting and development work, though only a little gold has been recovered. Some 10 to 12 men were shoveling in during part of the summer on Klery Creek, and some prospect drilling was done on the benches on the southeast side of the creek. Unfortunately an accident to the rig necessitated discontinuance of the work. In the Central and Bear Creek Valleys an option was taken on a considerable tract of prospective placer ground, and preliminary examinations were started with a view to determining the feasibility of installing hydraulic equipment or a dredge, or possibly both. In the course of this work the line for a ditch about 3 miles long was laid out and surveyed, and other preparatory work was done. According to the original plans prospecting was to be continued throughout the winter of 1934–35, as conditions permitted.

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 1934 9 small camps, employing a total of about 25 men, part of whom are natives, were established on streams in the vicinity of Shungnak—4 on Dahl Creek, 2 on Shungnak River, and 1 each on Boulder, Riley, and Lynx Creeks. Riley and Boulder 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 extensive prospecting that was started some years ago in the valley of the Shungnak River does not seem to have disclosed placers that were attractive to those engaged in that work, for no further work was done at that place in 1934. This section is so remote and so poorly served by regular transportation service that it is among the most difficult places in the country in which to carry on mining development, and therefore placers must have an especially high gold content to prove attractive. 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 extensively.

DREDGING

Over 75 percent of all the placer gold produced in Alaska in 1934 was mined by dredges. The total gold thus recovered was $6,725,000, of which the greater part came from 17 dredges in the Yukon region and the rest from 12 dredges in Seward Peninsula and 1 in the Kuskokwim region. This total is about $2,580,000 more than the value of the gold recovered by dredges in 1933, but the quantity is about 900 fine ounces less. The accompanying table gives the value of the gold output and the yardage handled by Alaska dredges, beginning in 1903, the earliest year for which records are available.

The total value of the gold produced by dredges since 1903 is nearly 22 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 1934 the ratio of dredge production to the output from all other kinds of placer mining was nearly 75 to 25, and there are no signs of a diminution in dredge mining in the near future—in fact, an even higher ratio seems not unlikely.

Gold produced by dredge mining in Alaska, 1903–1934

Year	Number of dredges operated	Value of gold output	Gravel handled (cubic yards)	Value of gold recovered per cubic yard (cents)
1903–15		$12,431,000		
1916	34	2,679,000	3,900,000	69
1917	36	2,500,000	3,700,000	68
1918	28	1,425,000	2,490,000	57
1919	28	1,360,000	1,766,000	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	8,709,000	33.6
1930	27	3,912,600	9,906,000	39.5
1931	28	3,749,000	10,214,000	36.7
1932	25	4,293,000	10,310,700	41.6
1933	25	4,146,000	8,889,000	46.6
1934	30	6,725,000	10,445,000	64.4
Total		61,833,000	[1] 108,261,000	[1] 45.6

[1] Since 1915.

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 $5,974,616 in gold, or a little less than 89 percent of the total mined by dredges, report that that amount came from 9,280,116 yards of gravel. The average yield thus shown is about 64.38 cents in gold to the cubic yard. Applying this average to determine the unreported yardage gives a total of 10,445,000 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 10 years, so that the quantities and values given for 1934 are comparable with those reported for the preceding 10 years.

Obviously the extremely high value per cubic yard in 1934 was due principally to the increase in price of gold, for if the old standard price of gold had prevailed in 1934 the average value per cubic yard

would have been about 38 cents, or considerably less than that for the last 2 years and much below the average stated in the table for the entire period since 1915.

The length of time that the different dredge companies were operating varied widely. The longest season reported was 275 days for dredges of the United States Smelting, Refining & Mining Co., Fairbanks Exploration Department, operating in the Fairbanks district of the Yukon-Tanana region. This was not only the longest working season for dredges in 1934 but marks also an all-time record for Alaska, as the longest season hitherto reported was 269 days in 1930, which was also set by the Fairbanks Exploration Department. The longest season reported for any of the Seward Peninsula dredge companies was 179 days for the Hammon Consolidated Gold Fields at Nome. 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 Department, which began mining March 17 and did not stop its last dredge until December 16. The earliest and latest dates on Seward Peninsula were May 29 and November 14, both reported by the Hammon Consolidated Gold Fields. The average length of the working season in 1934 of the 11 companies for which information is available, exclusive of those that were completed only in time to make the test run of a few days, as determined from the beginning and ending dates reported by each company, irrespective of how many dredges it operated, was 126 days. Obviously, the shortness of this average season as compared with the record of 275 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 these dredging records is that throughout most of interior Alaska a moderate-sized dredge reasonably well handled may be expected to have an average working season of at least 4½ months, and that, with skill and special provisions against unfavorable climatic conditions, the season may be extended for an additional period of 1 to 2 months in practically any of the placer camps south of the Arctic Circle.

The following is a list of the dredges that did some productive mining during 1934:

Yukon Basin:
  Fairbanks district:

United States Smelting, Refining & Mining Co., Fairbanks Exploration Department (5)	Goldstream and Cleary Creeks.
J. R. Murphy, lessee from Fairbanks Gold Dredging Co. (2)	Fairbanks Creek.
Fish Creek Mining Co	Fish Creek.
Chatham Gold Dredging Co	Chatham Creek.

Yukon Basin—Continued.	
Fortymile district: Walker's Fork Gold Corporation	Walker Fork.
Hot Springs district: American Creek Operating Co	American Creek.
Iditarod district:	
North American Dredging Co	Flat Creek.
J. E. Riley Investment Co	Otter Creek.
Innoko district:	
Waino F. Puntila (2)	Ganes and Little Creeks.
Felder-Gale & Co	Yankee Creek.
Ganes Creek Dredging Co	Ganes Creek.
Kuskokwim region:	
Tuluksak-Aniak district: New York Alaska Gold Dredging Co	Bear Creek.
Seward Peninsula:	
Council district:	
Northern Star Dredging Co	Ophir Creek.
Ophir Gold Dredging Co	Do.
Fairhaven district:	
Forsgren Dredging Co	Inmachuk Creek.
Keewalik Mining Co	Candle Creek.
Kougarok district: Coal Creek Dredging Co	Kougarok River.
Koyuk district: Dime Creek Dredging Co	Dime Creek.
Nome district:	
Hammon Consolidated Gold Fields (2)	Center and Lake Creeks.
Dry Creek Dredging Co	Dry Creek.
Sunset Mines Corporation	Sunset Creek.
Port Clarence district: N. B. Tweet & Son	Dese Creek.
Solomon district: Spruce Creek Dredging Co	Spruce Creek.

The dredge of the Yentna Dredging Co., on Cache Creek, in the Cook Inlet-Susitna region, which was active in 1933, was idle in 1934. Seven dredges that were not in operation in 1933 were active in 1934—in the Yukon region, those of the Walker's Fork Gold Corporation, on Walker Fork, in the Fortymile district; the American Creek Operating Co., on American Creek, in the Hot Springs district; and the Ganes Creek Dredging Co., on Ganes Creek, in the Innoko district; in the Seward Peninsula region, those of the Coal Creek Dredging Co., on the Kougarok River, in the Kougarok district; the Dime Creek Dredging Co., on Dime Creek, in the Koyuk district; the Sunset Mines Corporation, on Sunset Creek, in the Nome district; and N. B. Tweet & Son, on Dese Creek, in the Port Clarence district.

In addition to the foregoing, 3 dredges, 1 each in the Fairhaven, Council, and Port Clarence districts, were under construction in 1934 but not completed in time to contribute materially to that season's output of placer gold.

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 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 are likely to be thoroughly prospected, some 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.

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. As is evident from the following table, more than 70 percent of the silver that has been produced from Alaska in the past has been derived from the ores that are valuable mainly for their copper content. How small the percentage of silver is that occurs in these copper ores may be gathered from the fact that seldom is it as much as 2 ounces to the ton of ore, and the average amount recovered is rarely as much as 1½ ounces to the ton. Inasmuch as none of the mines classified as distinctly copper mines were in operation during 1934 it follows that no silver has been credited to that source either.

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 86,458 fine ounces of silver in 1934, according to the company's published report. The extremely small proportion of silver in the ore from this mine is shown by the fact that this quantity of silver came from 2,387,138 tons of rock that was fine milled—in other words, the quantity of silver recovered was about 0.036 ounce to the ton. The silver from all the gold-lode mines amounted to 118,250 ounces and was worth $76,440. 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 36,450 ounces, worth $23,560.

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, quantity, and value of the production from each source in 1934 as well as for the earlier years are set forth in the following table:

Silver produced in Alaska, 1880–1934, by sources

Year	Total		Copper lodes		Gold lodes		Gold placers	
	Ounces	Value	Ounces	Value	Ounces	Value	Ounces	Value
1880–1918	8,389,398	$5,598,314	5,327,852	$3,666,820	1,319,889	$931,396	1,741,657	$1,000,098
1919	629,708	705,273	488,034	546,598	108,691	121,734	32,983	36,941
1920	953,546	1,039,364	682,033	743,416	246,292	268,458	25,221	27,490
1921	761,075	761,075	545,229	545,229	193,281	193,281	22,565	22,565
1922	729,945	729,945	622,978	622,978	80,598	80,598	26,369	26,369
1923	814,649	668,012	715,040	586,333	77,237	63,334	22,372	18,345
1924	669,641	448,659	572,078	383,292	75,284	50,440	22,279	14,927
1925	698,259	482,495	606,929	419,294	67,186	46,445	24,144	16,756
1926	690,000	430,500	605,190	377,600	59,940	37,400	24,870	15,500
1927	627,800	356,000	525,100	297,800	79,400	45,000	23,300	13,200
1928	454,700	266,000	350,430	205,000	80,340	47,000	23,930	14,000
1929	472,900	252,000	351,730	187,400	94,370	50,300	26,800	14,300
1930	408,570	157,300	279,990	107,800	102,080	39,300	26,500	10,200
1931	352,000	102,000	193,850	56,200	129,800	37,600	28,350	8,200
1932	234,050	66,000	81,150	22,900	115,300	32,500	37,600	10,600
1933	157,150	55,000	----------	----------	128,150	44,850	29,000	10,150
1934	154,700	100,000	----------	----------	118,250	76,440	36,450	23,560
	17,198,091	12,217,937	11,947,613	8,768,660	3,076,088	2,166,076	2,174,390	1,283,201

From the foregoing table it is evident that not only has there been a more or less regular decline in the quantity of silver produced during the past decade until reaching the lowest point of all, 154,700 ounces in 1934, but there has also been a marked decrease in the value of silver that was produced. This has been due to the drop in the selling price of silver from $1 or more an ounce in 1919 to 1922 to the low price of 28.2 cents an ounce in 1932, though in 1934 the price reached a higher point than in any other year since 1925. The average selling price of silver in 1934 is estimated by the Bureau of Mines as 64.64 cents. Various measures to increase the price of silver by legislation have been under consideration. The striking decline in the average selling price of silver is clearly shown by the following table:

Average selling price of silver, 1880–1934

Year	Cents an ounce	Year	Cents an ounce	Year	Cents an ounce
1880–1918	66.7	1925	69.1	1932	28.2
1919	112.0	1926	62.4	1933	35.0
1920	108.0	1927	56.7	1934	64.6
1921	100.0	1928	58.5		
1922	100.0	1929	53.2	Average for period since 1918	66.5
1923	82.0	1930	38.5		
1924	67.0	1931	29.0		

Although, as stated above, none of the Alaska mines are operated at the present time exclusively for the silver content of their ores, the property of the Prospect Mining Co. on California Creek, in the Bonnifield district of the Yukon region, constitutes a near exception to this statement. The ore from this property carries some gold, considerable copper, and a little lead, but its most valuable component is silver. Not enough work has been done at this place to furnish much information as to the mode of occurrence or character of the ore away from the surface zone, but through the open season of 1934 active prospecting was in progress with a view to learning about the deposit and obtaining samples that would not only furnish reliable data as to the tenor of some of the veins, but also material that could be used for experimentation in deciding on the proper method of metallurgical treatment. There was only a small crew on the property, equipped with a compressor, and a truck was used in hauling the supplies to the mine and the selected ore to the railroad. The results of this investigation were said to have been so encouraging that the company proposes to extend its operations at this place in 1935.

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 several years ago some shipments of silver-lead ores were 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 much higher than 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 1934, 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 1934, 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, in southeastern Alaska. In the Susitna Valley of south-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, the property lay practically idle throughout the season of 1934. In the Nixon Fork district of the Kuskokwim region there are galena deposits that carry in addition to their lead and silver possibly enough gold to make their development attractive.

COPPER

The production of copper from Alaska mines in 1934 is estimated as 121,000 pounds, valued at $9,700. This is an increase over 1933 in quantity of more than 90,000 pounds and in value of $7,600, but these are insignificant figures compared with the Alaska copper production for the period from 1915 to 1927, when it practically never fell to less than 50,000,000 pounds a year, with a value of at least $7,000,000. In 1916 it reached the high mark of 119,654,839 pounds, with a value of $29,484,291. The present practical suspension of the industry was brought about by the extremely low price paid for copper, which led the two principal copper mines in the Territory to choose the alternative of closing rather than a heavy operating loss. As a result the only copper produced from Alaska ores in 1934

was that recovered as a minor byproduct in the treatment of ores whose principal value lay in the other metals they contained, notably gold. The necessity for suspension of the large Alaska copper mines is not only to be regretted as a serious direct loss to the mining industry of the Territory but has perhaps an even greater indirect effect through curtailment of the transportation facilities formerly required to bring the ore to the coast and carry it to the smelters in the States for treatment.

The value of the copper produced in Alaska from ores mined in 1934 has been computed on the basis of the average selling price for the year, which, according to the Bureau of Mines, was 8 cents a pound, or 1.6 cents higher than in 1933. At this average price the total value is $9,700. It is realized 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, reaching in 1933 a lower point than had been touched in any other year in the period since 1900 and, although showing slight improvement in 1934, being still less in quantity and value than in any other year since 1900.

Copper produced by Alaska mines, 1880, 1900–1934

Year	Ore mined (tons)	Copper		Year	Ore mined (tons)	Copper	
		Pounds	Value			Pounds	Value
1880		3,933	$826	1926	670,000	67,778,000	$9,489,000
1900–15	1,232,396	220,773,969	35,031,225	1927	645,000	55,343,000	7,250,000
1916	617,264	119,654,839	29,484,291	1928	579,500	41,421,000	5,965,000
1917	659,957	88,793,400	24,240,598	1929	590,400	40,510,000	7,130,000
1918	722,047	69,224,951	17,098,563	1930	531,000	32,651,000	4,244,600
1919	492,644	47,220,771	8,783,063	1931	88,000	22,614,000	1,877,000
1920	766,095	70,435,363	12,960,106	1932	56,900	8,738,500	550,500
1921	477,121	57,011,597	7,354,496	1933		29,000	1,900
1922	581,384	77,967,819	10,525,655	1934		121,000	9,700
1923	731,168	85,920,645	12,630,335				
1924	761,779	74,074,207	9,703,721			1,254,142,500	214,691,700
1925	860,023	73,855,298	10,361,336				

In the foregoing table no quantity of ore mined is shown in the appropriate column for either 1933 or 1934. This has been omitted because the copper produced in those years was but a minor byprod-

uct from the gold ores mined, which are not at all comparable with the ores reported for the preceding years, mined primarily for their copper content.

The general trend of the copper-mining industry in Alaska is graphically indicated by one of the curves in figure 3, which shows

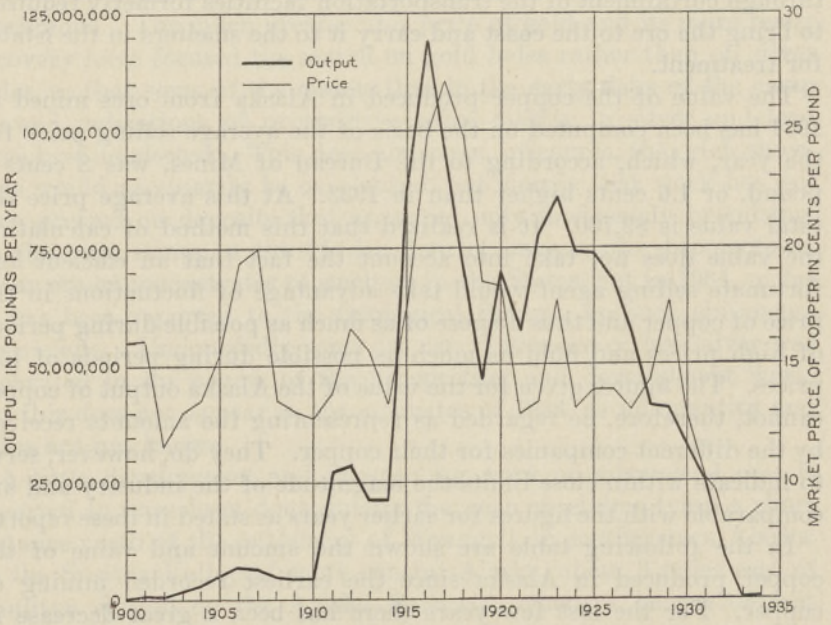

FIGURE 3.—Copper produced from Alaska mines, 1900–1934, and fluctuations in the price of copper during that period.

the output of copper for each year from 1900 to 1934. On the same diagram has been plotted the average price of copper for each year. The diagram tells its own story of the growth of the copper industry from a start in the early boom days of the Territory through fabulous strides in the days of the World War, when all nations were clamoring for copper and paying almost any price to get it and Alaska copper production rose to nearly 120,000,000 pounds a year, then fluctuating up and down until 1923, when the trend became definitely downward and at an accelerating rate, until production practically ceased in 1933 and remained at an extremely low point in 1934.

The three principal mines which furnished the concentrates from which copper was obtained were those of the Nabesna Mining Co. in the Alaska Range region, at the head of the Copper River region, in the valley of the Nabesna River, which is a tributary of the Tanana; the Alaska Gold & Metals Co. on Prince of Wales Island, in the Ketchikan district of southeastern Alaska; and the Prospect Mining

Co. on California Creek, in the Bonnifield district, on the northern slopes of the Alaska Range, a short distance east of the Alaska Railroad. No considerable change in the amount of copper derived from these mines is to be expected in the future unless they greatly alter the size of their general mining operations. Although the principal copper mines have been idle, it by no means follows that their deposits have been exhausted, and doubtless had the price of copper stayed up, the mines would have continued to operate, but it would have been folly to do so in the face of heavy financial loss. Certainly although the copper mines in the vicinity of Kennicott have been closed down they have by no means been abandoned. At both the Kennecott and Mother Lode properties the shafts and other underground workings, as well as the surface equipment and plant, were kept in good stand-by condition. A small crew to carry on this maintenance work was retained, as well as such staff members as will be most needed when operations are resumed.

It must be remembered, however, that the mines near Kennicott, which have contributed perhaps 90 percent of the Alaska copper, have been mining a unique deposit, not comparable with any other known deposit in the world, so that inevitably their mineral wealth is being depleted, and there is no justification for expecting that their loss will be offset by new discoveries of equally marvelous lodes. 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. 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 activity at properties of this kind 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. 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 is most likely to bring about any notable increase in the production of copper from Alaska ores will be the more extensive mining of ores in which the copper is a byproduct and gold or some other metal more sought after is the principal object.

LEAD

The lead produced from Alaska ores in 1934 is estimated to have been 1,679,000 pounds, or about 635,000 pounds less than in 1933. This decrease is to be attributed to the lesser content of lead in the ore produced by the gold mines, because practically all the lead is recovered as a byproduct from the gold ores, the concentrates being shipped to smelters in the States for treatment to recover the metals they contain. From the table on page 14 showing the recovery of metals at the Alaska Juneau mine it is evident that the quantity of lead obtained from the ores of this mine has consistently decreased since 1931, though at the same time, except for 1934, there has been a rather steady increase in the amount of ore fine-milled. The average market price of lead in 1934, according to the Bureau of Mines, was 3.7 cents a pound, which was identical with the price that prevailed in 1933. At this price the value of the Alaska lead production was $62,100, which is less than in any other year since 1923, when the quantity produced was only about one-half as great.

Lead produced in Alaska, 1892–1934

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	1933	1,157	85,600
1904	30	2,580	1919	687	72,822	1934	840	62,100
1905	30	2,620	1920	875	140,000			
1906	30	3,420	1921	759	68,279		18,428	2,091,700

Practically all of the lead that is reported in the foregoing table as produced in 1934 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 three-eighths of a pound of lead from each ton of ore that is mined and trammed to the mill, or a little less than seven-tenths of a 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 a 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 1934 is estimated to have been a little more than 3,101 crude ounces or 2,555 fine ounces, which at $34.50 for platinum, the average market price as computed by the United States Bureau of Mines, and at $22 for palladium, as reported by the seller, was worth about $85,600.

The outstanding development in the platinum-mining industry in Alaska was the beginning of work by a well-mechanized plant installed in the Goodnews Bay district, in the lower Kuskokwim region. The consolidation of claims and the placement of some of the needed equipment was in progress late in 1933, so that much of the preliminary work had been completed and the plant was ready to operate early in 1934, but it was then delayed in getting some of the needed supplies because of the tie-up of shipping caused by the longshoremen's strike. However, the plant operated successfully throughout the larger part of the season, suffering only such incidental stoppages as are almost inevitable in getting a large new enterprise under way. The mine is equipped with a drag-line scraper of the same general type and construction as the owners have used so successfully on their gold placer ground in the Iditarod district. Nearly 60 claims are now controlled by this company, and between 15 and

20 men are employed in its work. In addition to this large company there were several small outfits mining by ordinary open-cut and sluicing methods. The principal streams from which the platinum metals in the Goodnews Bay district were derived were Clara, Squirrel, Fox, and Platinum Creeks. All these streams are tributaries of the Salmon River, which enters Kuskokwim Bay about 12 miles south of Goodnews Bay.

Another significant item as to the platinum metals developed in the Territory was the partial reopening of the old mine on Kasaan Peninsula, in the Ketchikan district of southeastern Alaska, and the recovery of considerable palladium in the concentrates from its ores. This mine had not been in operation since 1926, but during its period of activity it had produced platinum metals, mainly palladium, worth several hundred thousand dollars. The new company that is undertaking the development of the ore is the Alaska Gold & Metals Co., and it is understood that the work in 1934 was more of a test than a productive mining operation and was done to get the necessary information to determine whether more extensive opening up of the property was justified. The platinum metals in this mine form only a small part of the metallic content of the ore, which contains considerable amounts of gold and copper—in fact, so small a part do the platinum metals form that the individual particles cannot be identified in the ore by the unaided eye. Practically all the material handled in these tests was old tailings from the earlier mining that had been done on the property.

The only other region in Alaska where some platinum metals are reported to have been recovered in 1934 is Seward Peninsula. In that region a few ounces of platinum metals were recovered from gold placers on Dime Creek, a tributary of the Koyuk River, and on Quartz Creek, a tributary of the Kiwalik River, in the Koyuk district, and in nearby areas in the extreme eastern part of the peninsula. The Koyuk district has long been a small though consistent producer of platinum as a byproduct. The streams derive their gravel in large part from the hills formed of Mesozoic basic effusive rocks which have been cut by granite intrusives and in part from lower country in which Paleozoic schists and limestones predominate. No bedrock source of the platinum metals has yet been discovered.

Although no other places in Alaska are known to have produced platinum metals in 1934, 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.

TIN

For many years Alaska has been a small but regular producer of tin, and in the course of the 30 years since tin minerals were discovered in Seward Peninsula and later elsewhere in the Territory, it has shipped tin worth more than a million dollars. In 1934, however, according to such records as have been received by the Geological Survey, the ore mined in Alaska contained only 8,275 pounds of metallic tin. This output marks some slight renewal of activity in the industry, because in 1933 the quantity of metallic tin in the ores mined in the Territory was only about 5,800 pounds. The decline in Alaska tin mining in the last few years by no means indicates that the known tin deposits have been exhausted but is believed to have been caused by the extremely low prices offered for tin—an average of about 22 cents a pound in 1932, 39 cents in 1933, and 52 cents in 1934—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. 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. Already the increased price paid for tin is beginning to stir up renewed inquiries regarding the known deposits and some premonitory moves are already being taken looking toward bringing property owners and capital together in possibly much more extensive development of some of the deposits. 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.

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

Tin produced in Alaska, 1902–1934

Year	Ore (tons)	Metal (tons)	Value	Year	Ore (tons)	Metal (tons)	Value
1902	25	15	$8,000	1920	26	16	$16,112
1903	42	25	14,000	1921	7	4	2,400
1904	23	14	8,000	1922	2.3	1.4	912
1905	10	6	4,000	1923	3	1.9	1,623
1906	57	34	38,640	1924	11	7	7,028
1907	37.5	22	16,752	1925	22.2	13.8	15,980
1908	42.5	25	15,180	1926	12.85	8	10,400
1909	19	11	7,638	1927	37.5	26.7	34,000
1910	16.5	10	8,335	1928	58.6	41	41,000
1911	92.5	61	52,798	1929	51.6	38.6	35,000
1912	194	130	119,600	1930	21	14.7	9,300
1913	98	50	44,103	1931	5.6	4.1	2,000
1914	157.5	104	66,560	1932			
1915	167	102	78,846	1933		2.9	2,300
1916	232	139	121,000	1934		4.14	4,300
1917	171	100	123,300				
1918	104.5	68	118,000			1,156.04	1,100,300
1919	86	56	73,400				

COAL

The coal produced from Alaska fields in 1934 is estimated to have been 107,500 tons. This marks an increase of more than 11,000 tons and has been exceeded in only 3 years since coal mining began in the Territory, and even in those years it was exceeded at most by less than 20,000 tons. In addition to the coal mining in Alaska, 42,992 tons of coal was imported from fields outside Alaska, and no Alaska coal was exported. The consumption of coal in Alaska in 1934 was thus about 150,500 tons, or about 19,000 tons more than in 1933 and about 21,000 tons less than the average for the years from 1923 to 1932, a decrease brought about by lessened importations. A comparison of coal production and consumption in Alaska for the entire period for which records are available is afforded by the table on page 73.

In this table the total value of the coal produced in Alaska in 1934 is stated to have been $451,500. This value can be regarded only as a fair approximation, because 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 index of 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 the coal mined in Alaska in 1934 may be taken as $4.20 a ton. This is 80 cents a ton less than the price that was considered to be the average for 1933 and for the immediately preceding years and is about $1.25 less than the average price that prevailed during the period from 1880 to 1933.

Coal produced and consumed in Alaska, 1880–1934

Year	Produced in Alaska, chiefly subbituminous and lignite		Imported from States, chiefly bituminous coal from Washington [1] (short tons)	Imported from foreign countries, chiefly bituminous coal from British Columbia [1] (short tons)	Total coal consumed (short tons)
	Short tons	Value			
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
1933	96,200	481,000	21,524	14,009	131,733
1934	107,500	451,500	28,317	14,675	150,492
	1,745,554	9,375,500	1,382,951	1,734,899	4,863,404

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

Practically all the Alaska coal mined in 1934 came 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 Wishbone Hill Coal Co., later the New Black Diamond Coal Co., in the valley of Moose Creek. The mine in the Healy River field is owned by the Healy River Coal Corporation.

The mine supplying most of the locomotive and power fuel for the Alaska Railroad was that of the Evan Jones Coal Co. During December, January, and February, the production of the mine is reduced to a minimum or entirely cut off, but in 1934 during much of the rest of the year the mine was being operated on a daily average rate of production of more than 130 tons. Not only did this company supply the railroad with a large part of its fuel, but it filled many domestic orders for coal and was active in trying to develop new markets by furnishing coal to some of the canneries in southwestern Alaska and to Territorial and Federal organizations throughout the Territory. During the period while productive mining was in progress, a crew of 30 or more men were employed in surface and underground work on the property.

At the Wishbone Hill mine, formerly the Rawson property, only a small amount of coal was mined during the early part of 1934, and

then the operators decided that the difficulties of moving the coal over the local narrow-gage track to the standard-gage spur at Premier, with the attendant costs for several rehandlings, were too great to be overcome, and operations were suspended. Later in the season, however, arrangements were made for a new company, the New Black Diamond Coal Co., to resume work there. Most of this company's activities were devoted to development work, in the course of which some coal was mined. A contract with the mine for the delivery of a small quantity of coal to the Alaska Railroad is being filled as opportunity offers.

The mine of the Alaska Matanuska Coal Corporation which had formerly been one of the principal coal mines in the Moose Creek area but which was accidentally flooded late in 1933, lay idle throughout the year. No work was done on the company's other property, some 3 miles farther east, nearer the head of Moose Creek. 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 idleness of all except one operating mine in the Matanuska region capable of supplying fuel in quantities sufficient to meet the needs of the Alaska Railroad became a matter of grave concern to the officials responsible for the maintenance of the railroad, because of dangers inherent to coal mining and the uncertainties of geologic conditions that may be encountered in a relatively undeveloped field of complex structure like the Matanuska area. To be prepared for any contingency the Government had long ago acquired and held the unit known as the " Eska lease " and had developed a coal mine from which in the past it had taken considerable coal. Even after active mining there had been discontinued the mine had been kept in a stand-by condition so as to be available to supply coal in an emergency. Unfortunately the storms of 2 years ago had washed out much of the track to this mine and had done other serious damage. Even if the track were relaid it would be subject to damage by any flood, and the end of the track would be far from the unmined coal beds underground, entailing high costs for tramming. After consideration of the various phases of the problem it was decided to relocate the track where it would be safe from floods and to pick a new site for driving a crosscut to intersect the coal measures at a considerable distance west of the old openings. The site for this crosscut was selected largely on the advice of Ralph Tuck, geologist of the railroad staff, and the work of driving it was carried on during most of the open season. In the course of the work Dr. Tuck took advantage of the opportunity to make very detailed studies and observations of all the available information that might

aid in correctly interpreting the structure of the entire tract and thus reaching conclusions as to the correlation of the various coal beds that occur in the area. Although the crosscut was discontinued before reaching workable coal beds it will be resumed in 1935 as early as weather and other conditions permit and after reaching commercial coal will be kept in a stand-by condition so as to meet any emergency that may arise.

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 about 200 tons of coal a day, as well as excellent quarters for the comfort and convenience of the personnel and adequate protection against the hazards of fire or floods. The largest single user of coal from this property is the United States Smelting, Refining & Mining Co., Fairbanks Exploration Department, for furnishing power to its dredges and in its large placer-mining operations in the vicinity of Fairbanks. During the year arrangements were completed for the extensive use of this coal in Cordova, where the necessary bunkers were built for its storage. The central heating plant that has already been built and that affords service to many of the larger buildings in that town will furnish a market for this coal, and additional users will doubtless be readily found when adequate and reliable stocks of the coal are available. The coal has a somewhat lower heating value than that from the Matanuska and near-by fields and as a consequence is not used in the railroad locomotives, but the shorter haul makes its use more economical in many parts of the interior. This mine was in continuous operation throughout 1934 and yielded considerably more than half of all the coal mined in Alaska during that year.

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 com-

position from bituminous coal to anthracite have long been known, prospecting or other development work relating to the coal resources continued apparently to be at a standstill in 1934. Rumors of renewed activity in this field were heard from time to time, and extensions of some of the Government permits for coal prospecting there have been asked for, as the old permits were near their expiration. 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.

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 would require large outlays for developing mines and the market. Obviously, many consumers are unwilling to commit themselves to any 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 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

For a number of years there has been a small but significant production of petroleum from wells of the Chilkat Oil Co. in the Katalla district, on the coast east of the mouth of the Copper River. According to the published report of this company the boiler house and contents at the refinery were destroyed by fire late in December 1933, and it was considered undesirable to replace the building and equipment, because the outlook was not encouraging for the profitable operation of the property. Until such time as this refinery equipment is replaced there will be no production from the property. The wells from which the company obtained its oil were relatively shallow, few of them being more than 1,000 feet deep and none of them more than 2,000 feet. The bedrock near the surface at the wells is of Tertiary age, but there is considerable uncertainty as to whether these rocks are the source of the oil or whether it may not come from older beds lower in the stratigraphic column. In the past the products of the refinery operated by this company—gasoline and distillate, which are of especially high quality—found a ready market near at hand, especially for use by the fishing fleet near Cordova.

Even when the Chilkat Oil Co.'s property is in operation the small domestic production of petroleum from the Katalla field is not adequate to supply 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 from the end of the war through 1929 there was a constant increase 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 was a decided drop in the quantity of petroleum products shipped into Alaska. But in 1933 there was an upturn in the consumption of most of these petroleum products and in 1934 an even greater increase. The decrease in the first 3 years of this period is interpreted as only a temporary drop in the consumption, brought about by the general decline in all business activities, and the increased consumption later is regarded as due to the improvement in general business conditions and the greatly increased use of petroleum and its products in mining, the road-construction program, and the various power developments that are taking place.

Petroleum products shipped to Alaska from other ports of the United States, 1905–34, in gallons[1]

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
1933	15,340,962	5,677,644	412,230	337,806
1934	16,174,662	6,791,232	421,218	515,508
	461,294,261	102,798,867	22,183,538	11,420,589

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

Search for new oil fields in Alaska has practically been discontinued during the last few years, and in 1934, so far as reported to the Geological Survey, no drilling for oil was done at any place in the Territory. Nevertheless, there were reports that at several places some investigations were in progress that may lead to developments later. Among the most definite moves of this sort that have come to the attention of the Geological Survey was the scouting done in the Iniskin-Chinitna district by a California organization that has lately acquired a considerable tract in this Alaska field. This investigation in 1934 was a continuation of studies started in 1933 and was directed mainly toward getting additional data from which the structure of the region could be worked out and suitable sites selected for drilling with a rig that the company proposed to put on the ground in 1935. It is also reported that many of the claims in the vicinity of Kanatak, where active drilling had been in progress several years ago, were restaked during the season, but no public statement was made as to what further steps were being planned for the near future. The old drill rig, which for some years had been used in exploring a tract near Chickaloon, in the Matanuska district, was idle through-

out the year, though local reports indicate that it is still the intention of the owner to resume operations there shortly.

In connection with the general development of oil claims both in Alaska and the States there is a widespread misunderstanding as to the real significance of Government permits for exploration for oil. Hundreds of such permits have been issued by the Government and cover tracts in all parts of Alaska and 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 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 individuals who offer their services in obtaining permits for their clients at a charge far in excess of any reasonable fee for any service they render and for any payment required by the Government.

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 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 1934 in the broadest sense of that word, but none of them were reported to have been produced and sold in quantities that represent a value of more than a few hundred dollars, and so far as could be determined the total value of the production in 1934, of all the mineral products not described in the earlier pages of this report, was $800. However, it should be noted that in the following table, as well as in certain of the other tables in this report, all the 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 min-

eral products." Among the mineral products included in this table that have also been described elsewhere in this report are the platinum metals. 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 1934, 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, 1901–34 [1]

Year	Value	Year	Value	Year	Value
1901	$500	1913	$286,277	1925	$454,207
1902	255	1914	199,767	1926	444,500
1903	389	1915	205,061	1927	162,000
1904	2,710	1916	326,737	1928	164,000
1905	710	1917	203,971	1929	194,000
1906	19,965	1918	171,452	1930	157,300
1907	54,512	1919	214,040	1931	108,000
1908	81,305	1920	372,599	1932	223,400
1909	86,027	1921	235,438	1933	39,200
1910	96,408	1922	266,296	1934	86,400
1911	141,739	1923	229,486		
1912	165,342	1924	348,728		6,097,400

[1] $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.

It is evident that if the value of the platinum produced in 1934 is deducted from the foregoing total value of these miscellaneous products for the year, the remainder is so small that for all practical purposes it may be regarded as nil. This condition, however, is regarded as marking merely a temporary situation that will speedily change, because there are many mineral resources that not only await development but have been the base of extremely profitable enterprises in the recent past and have by no means been exhausted. For example, one of the hitherto large mining enterprises is the quarrying of marble by the Vermont Marble Co. from its properties near Tokeen and Calder, in southeastern Alaska. No productive mining was done there during 1934, though the property was kept in condition so that work could be resumed promptly when required. The stone from these quarries is used in most of the larger and better buildings in the whole Pacific coast region, being especially in demand for interior trim and decoration. Ordinarily the company ships its rough stone from Alaska to finishing plants it maintains in Tacoma, Wash., and San Francisco, Calif. There is, of course, no basis for believing that the cessation of quarrying during the year

means the permanent closing of the property. It only marks a halt in production until sales of the product now on hand deplete the stock so that replacements are needed, and there is every indication that this will occur shortly so that the quarries will again be running. Limestone and marble are widely distributed throughout southeastern Alaska, and, according to Burchard,[5] many different grades, some even approaching statuary quality, are found in the region. It therefore seems certain that some of these limestone and marble deposits, many of which are favorably situated with respect to deep-water transportation, will ultimately be profitably developed.

Another large enterprise that hitherto has been an important producer in this group but was inactive in 1934 is the quarrying of high-grade limestone rock, which is ground and mixed with other materials to manufacture a cement that is much in demand. In recent years the Superior Portland Cement, Inc., operating under lease from the Pacific Coast Cement Co., has carried on such an enterprise on Dall Island, in the Ketchikan district of southeastern Alaska. From the quarries at this locality the limestone was shipped to the company's plant near Seattle, where it was further treated. No production was reported from this place in 1934, but the owners expect that work may be resumed there in 1935.

Cinnabar, the principal ore of quicksilver, has been recognized in the placer concentrates from streams in many parts of the Territory, but in most of these places the lodes from which it came were apparently small stringers that appear little likely to afford ore that can be mined under present conditions. In the central and western parts of the Kuskokwim Valley there are, however, extensive areas of cinnabar mineralization which have long been known and which appear to hold promise of containing quicksilver deposits that may be profitably developed, though much further exploration will be required to determine their real value. The place in this region where the greatest amount of development work has been done is on the property of E. W. Parks, about 10 miles in an air line downstream from the junction of the Holitna with the Kuskokwim. It is reported that negotiations were entered into during 1934 for the starting of new developments on a greatly enlarged scale, with the expectation that the mine might be brought into significant commercial production as rapidly as practicable. This development, if successful, should be of great service in opening up this part of the Territory, which at the present time is almost unknown and undeveloped. In Seward Peninsula, near Bluff, quicksilver ore has long

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

been recognized, and some development work has been done on it. In 1934 some ore was mined here but not retorted or otherwise disposed of.

Molybdenum, one of the elements used in making certain special steels, is found in several mineralized areas throughout Alaska. The principal source of this metal is the mineral molybdenite, in which it is combined with sulphur as a sulphide. So far as is known, however, the only place where any attempt has been made to develop a property for its molybdenum content is on Baker Island, in southeastern Alaska. This property, owned by the San Antonio Metals Co., has not been visited lately by any Geological Survey party, and no recent detailed reports of the company have been received, though it is understood that some prospecting work was done on the property in 1934. In addition to its molybdenum content the ore at this place is said to carry sufficient gold to defray in considerable measure the cost of operation. A good landlocked harbor near the property affords opportunity to land supplies and equipment economically.

Antimony ores are widely distributed throughout Alaska, and in the past considerable quantities were produced and shipped from the Territory. In 1934, 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. 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 mines, as in the Fairbanks district, some of the larger masses of stibnite are laid aside until enough has accumulated to be worth shipping. The present low price of antimony 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 Chichagof and Admiralty Islands, in the northwestern part of southeastern Alaska, but no ore is reported to have been produced for sale during the year. The desirability, from both a commercial and a national standpoint, of developing a domestic nickel supply has revived interest in these Alaska deposits, especially those at Funter Bay, Admiralty Island, where extensive tests have been made of the deposits. The mineralization occurred in a thick diabase sill, and the metallic minerals are chiefly the sulphides of iron, copper, and nickel, carrying some gold and silver. Power for generation of electricity could be developed at a site some 30 miles south of the mine. Estimates made by engineers after examination of the property indicate that the ore reserves there carrying

not less than 1 percent of nickel may contain as much as 5,000,000 tons.

In the course of gold placer mining operations at several camps some tungsten minerals, notably scheelite, are at times recognized in the concentrates. Lately the amount of this material has been so small that no effort is made to save it, though in the past at a few properties the quantity recovered made it worth while to let it accumulate and from time to time ship it to the States for sale. In 1934 a few hundred pounds of tungsten ore was collected by one of the operators in the Nome district, but it was not sold.

A few ounces of hessite, a silver telluride, is said to have been recovered in the course of mining the placers of the Valdez Creek district. Except for its silver content the mineral is of little economic value, though interesting mineralogically.

Outside of a small amount of prospecting and assessment work no productive mining is reported to have been in progress at any of the chrome-ore deposits in the southern part of Kenai Peninsula, where ores of this sort have long been known and at times have been marketed. In the vicinity of Red Mountain especially large bodies of chrome ore have 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 the market, and what profit will be left after it is sold are matters that still require investigation.

Little new development of the many kinds of nonmetallic mineral products that occur in Alaska took place during 1934. Extensive use was made of the widespread gravel deposits for railroad ballast and road construction, and with sand they entered largely into the concrete mixtures required in the more permanent structures that were built. Reports have been current of attempts to develop the sulphur deposits that are known to occur in the craters of some of the volcanoes of the Aleutian Islands and nearby portions of the Alaska Peninsula. So far as could be determined, however, none of these plans have yet been brought to actual developments on the ground.

Although the various mineral commodities here grouped under the heading "miscellaneous mineral products" yielded negligible monetary returns in 1934, 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.

INDEX

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. Maps marked "Free on application" are published in extremely small numbers, primarily for acquiring corrections for the preliminary map that would be useful in the preparation of final editions.

4. 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.

Mineral industry of Alaska in 1934, by Philip S. Smith. Bulletin 868–A, 1935, 10 cents. The preceding volumes in this series and years covered are Bulletins *259, 1904; *284, 1905; 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; *722, 1920 (722–A, 10 cents); *739, 1921; 755, 1922, 40 cents; *773, 1923; 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, 75 cents; 844–A, 1931, 10 cents; 857–A, 1932, 10 cents; 864–A, 1933, 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 in 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.

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, 1919, pp. 265–267.

*The future of Alaska mining, by A. H. Brooks. Bulletin 714, 1921, pp. 5–57.
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. 35 cents.
Past placer-gold production from Alaska, by Philip S. Smith. Bulletin 857–B, 1933, pp. 93–98. 5 cents.

In press

The Tertiary flora of Alaska, by Arthur Hollick, with a chapter on the geology of the Tertiary deposits, by Philip S. Smith. Professional Paper 182.

In preparation

Past lode-gold production from Alaska, 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; 1934. 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.
Map of Alaska (two-sheet); scale, 1:1,500,000; 1934. $1 retail or 60 cents wholesale.

SOUTHEASTERN ALASKA

REPORTS

*The Juneau gold belt, by A. C. Spencer, pp. 1–37, and A reconnaissance of Admiralty Island, by C. W. Wright, pp. 138–154. Bulletin 287, 1906, 161 pp.
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.
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.
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.
*The earthquakes at Yakutat Bay, in September 1899, by R. S. Tarr and Lawrence Martin. Professional Paper 69, 1912, 135 pp.
*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.
*The structure and stratigraphy of Gravina and Revillagigedo Islands, by Theodore Chapin. In Professional Paper 120, 1918, pp. 83–100.
*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.
*Notes on the Salmon-Unuk River region by J. B. Mertie, Jr. Bulletin 714–B, 1921, pp. 129–142.
*Marble resources of southeastern Alaska, by E. F. Burchard. Bulletin 682, 1920, 118 pp.
Water-power investigations in southeastern Alaska, by G. H. Canfield. Bulletin 722–B, 1922. 5 cents. Similar previous reports in Bulletins 642, 1916, 35 cents; 662, 1918, 75 cents; * 692, 1919; * 712, 1920; *714, 1921.
Ore deposits of the Salmon River district, Portland Canal region, by L. G. Westgate. Bulletin 722–C, 1922, pp. 117–140. 5 cents.
Mineral deposits of the Wrangell district, by A. F. Buddington. Bulletin 739–B, 1923, pp. 51–75. 10 cents.
Mineral investigations in southeastern Alaska in 1924, by A. F. Buddington. In Bulletin 783, 1926, pp. 41–62. 40 cents. Similar report for 1923 in Bulletin * 773, 1925, pp. 71–139.
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, southeastern Alaska, with a reconnaissance of Chickamin River, by A. F. Buddington. Bulletin 807, 1929, 124 pp.
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.

TOPOGRAPHIC MAPS

*Juneau gold belt, Alaska; scale, 1:250,000; compiled. In Bulletin 287, 1906. 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 (581B); scale, 1:62,500; 1908, by R. B. Oliver. 10 cents retail or 6 cents wholesale. Also contained in *Bulletin 446, 1911.
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.
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.
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.
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 Strait and vicinity; scale, 1:250,000; 1933, by R. H. Sargent and V. S. Seward (preliminary edition). Free on application.
Admiralty Island; scale, 1:125,000; 1935, by R. H. Sargent (preliminary addition). Free on application.
Chicagof-Baranof Islands; scale, 1:250,000; 1935, planimetric base only (preliminary edition). Free on application.
Prince of Wales Island; scale, 1:250,000; 1935, planimetric base only (preliminary edition). Free on application.

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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.

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

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.

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.

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

*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, 1918, 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 gravels 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.

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, 1932, 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 press

Geology of the Tonsina district, by F. H. Moffit. Bulletin 866.

In preparation

The geology and mineral resources of the Chitina Valley and adjacent areas, by F. H. Moffit.
Upper Copper and Tanana Rivers, Alaska, by F. H. Moffit. Bulletin 868–C.

TOPOGRAPHIC MAPS

Central Copper River region; scale, 1:250,000; by T. G. Gerdine. In *Professional Paper 41, 1905. 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. 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.
*Chisana-White River district; scale, 1:250,000; by C. E. Giffin. In Bulletin 630, 1916. 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. 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. 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.
Central Copper River region; scale, 1:250,000.

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, 1919, pp. 233–264.
*Mining developments in the Matanuska coal fields, by Theodore Chapin. In Bulletin 714, 1921, pp. 197–199. (See also *Bulletin 692, 1919; and *Bulletin 712, 1920.)
*Lode developments in the Willow Creek district, by Theodore Chapin. In Bulletin 714, 1921, pp. 201–206. (See also Bulletin 642, 1916, 35 cents; *Bulletin 692, 1919; and *Bulletin 712, 1920.)
Geology of the vicinity of Tuxedni Bay, Cook Inlet, by F. H. Moffit. Bulletin 722–D, 1922, pp. 141–147. 5 cents.
*The Iniskin Bay district, by F. H. Moffit. In Bulletin 739, 1923, pp. 117–132.
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.
*Mineral resources of the Kamishak Bay region, by K. F. Mather. In Bulletin 773, 1925, pp. 159–181.
A ruby-silver prospect in Alaska, by S. R. Capps and M. N. Short. In Bulletin 783, 1926, 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, 1932, 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.
The Girdwood district, by C. F. Park, Jr. Bulletin 849–G, 1934, pp. 381–424. 25 cents.
The Valdez Creek mining district, by C. P. Ross. Bulletin 849–H, 1933, pp. 425–468. 15 cents.
The Moose Pass-Hope district, Kenai Peninsula, by Ralph Tuck. Bulletin 849–I, 1933, pp. 469–530. 15 cents.

The Curry district, by Ralph Tuck. Bulletin 857–C, 1934, pp. 99–140. 10 cents.
Core drilling for coal in the Moose Creek area, by G. A. Waring. Bulletin 857–E, 1934, pp. 155–166. 10 cents.
The southern Alaska Range, by S. R. Capps. Bulletin 862, 1935, 101 pp. 70 cents.
The Willow Creek-Kashwitna district, by S. R. Capps and Ralph Tuck. Bulletin 864–B, 1935, pp. 95–113. 5 cents.

In preparation

The Alaska Railroad route, by S. R. Capps.
Geology of the Anthracite Ridge coal district, by G. A. Waring. Bulletin 861.

TOPOGRAPHIC MAPS

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. 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.
*Moose Pass and vicinity; scale, 1:62,500; by J. W. Bagley. In Bulletin 587, 1915. Not issued separately.
The Willow Creek district; scale, 1:62,500; by C. E. Giffin. In Bulletin 607, 1915. 25 cents. Not issued separately.
Lower Matanuska Valley (No. 602A); scale, 1:62,500; 1931, by R. H. Sargent. 10 cents retail or 6 cents wholesale.
Nelchina-Susitna region; scale, 1:250,000; by J. W. Bagley. In Bulletin 668, 1918. 25 cents. Not issued separately.
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.
Iniskin Bay-Snug Harbor district, Cook Inlet region, Alaska; scale, 1:250,000; 1924, by C. P. McKinley and Gerald FitzGerald (preliminary edition). Free on application. Also published in Bulletin 789, 1927. 50 cents.
The Alaska Railroad route; Seward to Matanuska coal field; scale, 1:250,000; 1924, by J. W. Bagley, T. G. Gerdine, R. H. Sargent, and others. 50 cents retail or 30 cents wholesale.
The Alaska Railroad route: Matanuska coal field to Yanert Fork; scale, 1:250,000; 1924, by J. W. Bagley, T. G. Gerdine, R. H. Sargent, and others. 50 cents retail or 30 cents wholesale.
The Alaska Railroad route: Yanert Fork to Fairbanks; scale, 1:250,000; 1924, by J. W. Bagley, T. G. Gerdine, R. H. Sargent, and others. 50 cents retail or 30 cents wholesale.
Upper Matanuska Valley; scale, 1:62,500; by R. H. Sargent. In Bulletin 791, 1927. 30 cents. Not issued separately.
Girdwood district; scale, 1:62,500; by 1932, by W. G. Carson (preliminary edition). Free on application.
Anthracite Ridge; scale, 1:12,000; 1932, by L. O. Newsome (preliminary edition). Free on application.
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.
Mount Spurr region; scale, 1:250,000; 1933, by Gerald FitzGerald, E. C. Hamilton, W. S. Post, D. L. Reaburn, R. H. Sargent, and K. W. Trimble. 50 cents.
Curry and vicinity; scale, 1:250,000; 1933, by C. P. McKinley and others (preliminary edition). Free on application.

SOUTHWESTERN ALASKA

REPORTS

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

A geologic reconnaissance of the Iliamna region, by G. C. Martin and F. J. Katz. Bulletin 485, 1912, 138 pp. 35 cents.
Mineral deposits of Kodiak and the neighboring islands, by G. C. Martin. In Bulletin 542, 1913, pp. 125–136. 25 cents.
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, 1919, pp. 299–319.
*Sulphur on Unalaska and Akun Islands and near Stepovak Bay, by A. G. Maddren. In Bulletin 692, 1919, pp. 283–298.
*The Cold Bay district, by S. R. Capps. In Bulletin 739, 1923, pp. 77–116.
The Cold Bay-Chignik district, by W. R. Smith and A. A. Baker. In Bulletin 755, 1924, pp. 151–218. 40 cents.
*The Cold Bay-Katmai district, by W. R. Smith. In Bulletin 773, 1925, pp. 183–207.
*The outlook for petroleum near Chignik, by G. C. Martin. In Bulletin 773, 1925, pp. 209–213.
*Mineral resources of the Kamishak Bay region, by K. F. Mather. In Bulletin 773, 1925, pp. 159–181.
*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, 1926, 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.
Notes on the geology of the Alaska Peninsula and Aleutian Islands, by S. R. Capps. Bulletin 857–D, 1934, pp. 141–153. 5 cents.

In preparation

Kodiak and vicinity, by S. R. Capps. Bulletin 868–B.

TOPOGRAPHIC MAPS

*Herendeen Bay and Unga Island region; scale, 1:250,000; by H. M. Eakin. In Bulletin 467, 1911. Not issued separately.
*Chignik Bay region; scale, 1:250,000; by H. M. Eakin. In Bulletin 467, 1911. Not issued separately.
Iliamna region; scale, 1:250,000; by D. C. Witherspoon and C. E. Giffin. In Bulletin 485, 1912. 35 cents. Not issued separately.
*Kuskokwim River and Bristol Bay region; scale, 1:625,000; by W. S. Post. In Twentieth Annual Report, pt. 7, 1900. Not issued separately.
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.
*Cold Bay-Chignik region, Alaska Peninsula; scale, 1:250,000; 1924, by R. K. Lynt and R. H. Sargent (preliminary edition).
Kamishak Bay-Katmai region, Alaska Peninsula; scale, 1:250,000; 1927, by R. H. Sargent and R. K. Lynt (preliminary edition). Free on application.
Aniakchak district, Alaska Peninsula; scale, 1:250,000; 1927, by R. H. Sargent (preliminary edition). Free on application.
Pavlof region, Alaska Peninsula; scale, 1:250,000; 1929, by C. P. McKinley (Nat. Geog. Soc. Expedition) (preliminary edition). Free on application.
Goodnews Bay district; scale, 1:250,000; 1930, by R. H. Sargent and W. S. Post (preliminary edition). Free on application.
Kodiak and vicinity; scale, 1:250,000; 1933, by Gerald FitzGerald (preliminary edition). Free on application.
Nushagak district; scale, 1:250,000; 1933, by Gerald FitzGerald (preliminary edition). Free on application.

In preparation

Kanatak district; scale, 1:250,000; by R. H. Sargent and others.

YUKON AND KUSKOKWIM BASINS

REPORTS

*The Fortymile quadrangle, Yukon-Tanana region, by L. M. Prindle. Bulletin 375, 1909, 52 pp.

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.

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, 1917, 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.

The occurrence of metalliferous deposits in the Yukon and Kuskokwim regions, by J. B. Mertie, Jr. Bulletin 739–D, 1922, pp. 149–165. 5 cents.

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

*Geology and gold placers of the Chandalar district, by J. B. Mertie, Jr. In Bulletin 773, 1925, pp. 215–263.

The Nixon Fork country, by J. S. Brown. In Bulletin 783, 1926, pp. 97–144, 40 cents.

Silver-lead prospects near Ruby, by J. S. Brown. In Bulletin 783, 1926, pp. 145–150. 40 cents.

The Toklat-Tonzona River region, by S. R. Capps. In Bulletin 792, 1927, pp. 73–110. 25 cents.
Preliminary report on the Sheenjek River district, by J. B. Mertie, Jr. In Bulletin 797, 1929, pp. 99–123. 80 cents.
The Chandalar-Sheenjek district, by J. B. Mertie, Jr. In Bulletin 810, 1930, pp. 87–139. 50 cents.
Mining in the Fortymile district, by J. B. Mertie, Jr. In Bulletin 813, 1930, pp. 125–142. 40 cents.
Geology of the Eagle-Circle district, by J. B. Mertie, Jr. Bulletin 816, 1930, 168 pp. 50 cents.
Mining in the Circle district, by J. B. Mertie, Jr. In Bulletin 824, 1932, pp. 155–172. 20 cents.
Geologic reconnaissance of the Dennison Fork district by J. B. Mertie, Jr. Bulletin 827, 1931, 44 pp. 45 cents.
The Tatonduk-Nation district, by J. B. Mertie, Jr. In Bulletin 836, 1933, pp. 347–443. 75 cents.
The eastern portion of Mount McKinley National Park, by S. R. Capps. In Bulletin 836, 1933, pp. 219–300. 75 cents.
The Kantishna district, by F. H. Moffit. In Bulletin 836, 1933, pp. 301–338. 75 cents.
Mining development in the Tatlanika and Totatlanika Basins, by F. H. Moffit. In Bulletin 836, 1933, pp. 339–345. 75 cents.
Mineral deposits of Rampart and Hot Springs districts, by J. B. Mertie, Jr. In Bulletin 844–D, 1934, pp. 163–226. 10 cents.
Placer concentrates of Rampart and Hot Springs districts, by A. E. Waters, Jr. In Bulletin 844–D, 1934, pp. 227–246. 10 cents.
Reconnaissance of northern Koyukuk Valley, by Robert Marshall. Bulletin 844–E, 1934, pp. 247–261. 5 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, 1934, 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.

In preparation

Geology of the Yukon-Tanana region, by J. B. Mertie, Jr.
Mineral deposits of the Ruby-Kuskokwim region, by J. B. Mertie, Jr. Bulletin 864–C.
The Kaiyuh Hills, by J. B. Mertie, Jr. Bulletin 868–D.

TOPOGRAPHIC MAPS

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. 30 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, 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.
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, 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.
* Chisana-White River region; scale, 1:250,000; by C. E. Giffin and D. C. Witherspoon. In Bulletin 630, 1916. Not issued separately.
Yukon-Koyukuk region; scale, 1:500,000; by H. M. Eakin. In Bulletin 631, 1916. 20 cents. Not issued separately.
Cosna-Nowitna region; scale, 1:250,000; by H. M. Eakin, C. E. Giffin, and R. B. Oliver. In Bulletin 667, 1917. 25 cents. Not issued separately.
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.
Marshall district; scale, 1:125,000; by R. H. Sargent. In Bulletin 683, 1918. 30 cents. Not issued separately.
* 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. In Bulletin 754, 1924. 50 cents. Not available separately.
Innoko-Iditarod region; scale, 1:250,000; 1921, by R. H. Sargent and C. G. Anderson. In Bulletin 754, 1924. 50 cents. Not available separately.
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.
Goodnews Bay district; scale, 1:250,000; 1930, by R. H. Sargent and W. S. Post (preliminary edition). Free on application.
Mount Eielson district; scale, 1:62,500; 1932, by S. N. Stoner (preliminary edition). Free on application. Also in Bulletin 849–D, 1934. 25 cents.
Dennison Fork district; scale, 1:250,000; 1932, by J. W. Bagley and D. C. Witherspoon. In Bulletin 827, 1932. 45 cents. Not issued separately.
Eureka and vicinity; scale, 1:62,500; 1933, by S. C. Kain. In Bulletin 849–F, 1933. 20 cents. Not issued separately.

SEWARD PENINSULA

REPORTS

*The Fairhaven gold placers, Seward Peninsula, by F. H. Moffit. Bulletin 247, 1905, 85 pp.
*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.
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. Bulletin 722–F, 1922, pp. 163–261. 20 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. In Professional Paper 125, 1921, pp. 23–37. 60 cents.

TOPOGRAPHIC MAPS

Seward Peninsula; scale, 1:500,000; complied from work of D. C. Witherspoon, T. G. Gerdine, and others, of the Geological Survey, and all other available sources. Reprint, 1935. 25 cents.

Seward Peninsula, northeastern portion, reconnaissance map (No. 655); scale, 1:250,000; 1905, by D. C. Witherspoon and C. E. Hill. Sale edition exhausted. Also in *Bulletin 247, 1905.

Seward Peninsula, northwestern portion, reconnaissance map (No. 657); scale, 1:250,000; 1907, by T. G. Gerdine and D. C. Witherspoon. Sale edition exhausted. Also in *Bulletin 328, 1908.

Seward Peninsula, southern portion, reconnaissance map (No. 656); scale, 1:250,000; 1907, by E. C. Barnard, T. G. Gerdine, and others. Sale edition exhausted. Also in *Bulletin 328, 1908.

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, 1:620,500; 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.

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. In Professional Paper 125, 1921, pp. 23–37. 60 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, 1929, 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 P. S. Smith and J. B. Mertie, Jr. Bulletin 815, 1930, 351 pp. $1.

TOPOGRAPHIC MAPS

* Koyukuk River to mouth of Colville River, including John River; scale, 1:1,250,000; by W. J. Peters. In Professional Paper 20, 1904. 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.

Northwestern Alaska; scale, 1:500,000; by Gerald FitzGerald, E. C. Guerin, R. K. Lynt, and O. Lee Wix. In Bulletin 815, 1930. $1. Not issued separately.