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MINERAL INDUSTRY OF ALASKA IN 1938

BY

PHILIP S. SMITH

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(Pages 1–113)

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CONTENTS

ILLUSTRATIONS

MINERAL INDUSTRY OF ALASKA IN 1938

By PHILIP S. SMITH [1]

INTRODUCTION

The presentation of a yearly record of the Alaska mineral industry is a continuing service that has been rendered by the Geological Survey from almost the earliest years of extensive mining in Alaska, and the present report, for 1938, is the thirty-fifth of this series.[2] Such a record, especially when supplemented by the statistics for the preceding years, not only affords an authoritative summary of current and past conditions but also indicates trends that are of significance in suggesting the lines along which future developments of the industry are likely to proceed. These reports therefore serve miners, prospectors, and businessmen concerned with Alaska affairs as useful historical records, statements of contemporary conditions, and starting points on which some conjectures concerning future operations may be predicated.

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 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 without undue delay and expense 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

[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 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, 722, 739, 755, 773, 783, 792, 810, 813, 824, 836, 844–A, 857–A, 864–A, 868–A, 880–A, 897–A, and 910–A. The reports for 1902 and 1903 were included with other "contributions to economic geology" in Bulletins 213 and 225.

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 general 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.

The restriction of the statistics in this report to those relating to production should be stressed, so that the reader will realize that while the statistics 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. The term "production," however, is rather indefinite because it may refer to the raw ore as it is broken from the ledge, or the metal content of the placer gravel before it has been sluiced, or it may be applied to any of the later stages that intervene before the final product is disposed of in usable form. Thus, the miner produced so much ore, the millman so much concentrates, the smelter so much metal of varying degrees of purity, the refiner so much pure metal. Between each of these stages there are inevitable losses of the valuable metals contained in the material treated, so that at no two stages is the amount "produced" the same. The cost would far exceed the value of the results for the Geological Survey to attempt to collect records as to the quantities of the different mineral commodities produced at each of these several stages. Consequently, it has been necessary to adopt the stage that seemed to represent one of the common determinable and significant steps. For most materials this has been considered to be the stage when the true recoverable content of valuable minerals can be closely determined and the material is in shape to be disposed of on that basis. In other words, the metals contained in the rock but lost in the tailings would not be considered "produced," but ore mined, though not milled or smelted, would be credited with the metallic content that could reasonably be expected to be recovered from it after such treatments. Unless there are obvious inconsistencies the individual reports showing the quantities of minerals produced are accepted as final.

Much difference between statements from different sources arises also through various methods of computing the value of the different mineral commodities. It has been the standard practice in these volumes to base all computations of values on the average selling price for the year and not on the prices actually received by the

individual producers. Obviously, this method of computation disregards the amount received by individual mines, but it is believed to afford a more useful 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, who may have made deductions for shipping, insurance, and other expenses incident to handling their product, were so edited that the full value of the gold produced was recorded. Because of this method of computing the values of the different commodities, if for no other reason, the statistics necessarily differ greatly from those that might be collected for tax or similar purposes.

It is the constant aim of the compilers to make these annual summaries of mineral production as helpful, 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 facts relating to individual properties are regarded as strictly confidential. The Geological Survey does not use any information that is 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

To all the mining operators and prospectors of the Territory who have so generously made available information regarding their recent activities special acknowledgments are made. Without their friendly cooperation this report could not have been prepared. Thanks are also expressed to the various Federal and Territorial officials who have generously made available to the Geological Survey many helpful facts from their special fields of investigation.

Among the private individuals and companies who have been especially courteous in supplying information of general significance outside that pertaining to their own operations may be mentioned the Alaska Weekly and Volney Richmond, of the Northern Commercial Co., of Seattle, Wash., and the agents of this company, especially J. W. Farrell at Hot Springs and Laurence L. Reed at Ophir; Ralph and Carl Lomen, of Seattle and New York; the Alaska Juneau Gold Mining Co., the Daily Alaska Empire, the First National Bank, the B. M. Behrends Bank, and J. J. Connors, of Juneau; the Ketchikan Alaska Chronicle, the First National Bank, and Miners & Merchants

Bank, of Ketchikan; Sidney Anderson, of Hyder; Hardy Trefzger, of Yakutat; the First National Bank, of Skagway; the Cordova Daily Times, of Cordova; the First Bank of Valdez and M. J. Knowles, of Valdez; the Kennecott Copper Corporation, of Kennecott and New York; Carl Whitham, of Chitina; Elwyn Swetmann and the Seward Weekly Gateway, of Seward; the Bank of Alaska, the First National Bank, W. E. Dunkle, Walter G. Culver, David Strandberg, and the Anchorage Weekly Times, of Anchorage; Ralph Tuck, formerly chief geologist of The Alaska Railroad at Anchorage and later of Fairbanks; B. H. Mayfield and H. W. Nagley, of Talkeetna; Frank H. Waskey, of Dillingham; Charles Naughton, of Kodiak; A. W. Amero, of Beaver; the First National Bank, R. B. Earling and other officers of the Fairbanks Exploration department of the United States Smelting, Refining & Mining Co., the Fairbanks Daily News Miner, the Alaska Miner, and G. E. Jennings, of Fairbanks; C. W. Hudson, of Livengood; John B. Powers and J. J. Hillard, of Eagle; the Miners & Merchants Bank, Alex Mathieson, Harry Donnelley, and Fred Lusher, of Flat; Jessie M. Howard and Frank Speljack, of Ophir; the Kusko Times, of Takotna; H. S. Wanamaker and Ernest Johnson, of Wiseman; J. W. Wick, of Russian Mission; E. M. Whelan, of Medfra; J. L. Jean and John Haroldson, of Goodnews Bay; Charles Johnston, of the Goodnews Bay Mining Co., of Platinum; the New York-Alaska Gold Dredging Corporation and Alfred Andersen, of Akiak; the Nome Nugget, the Nome department of the United States Smelting, Refining & Mining Co., G. R. Jackson, of the Miners & Merchants Bank, and C. W. Thornton, of Nome; John Gross, of Council; A. S. Tucker, of Bluff; Arthur W. Johnson, of Haycock; and Lewis Lloyd and James Cross, of Shungnak.

MINERAL PRODUCTION

GENERAL FEATURES OF THE YEAR

The total value of the Alaska mineral production in 1938 was $28,607,000. This was furnished by a number of different mineral products, but gold accounts for about 81 percent. Compared with the mineral production of 1937, the output in 1938 was $1,618,000, or about 6 percent greater. This notable increase is, of course, a source of satisfaction to those concerned with the general development of the mining industry in the Territory, especially as in large part it does not seem to be attributable to temporary conditions that are not likely to be repeated in the near future. In other words, this large output appears to be fairly representative of at least a reasonable rate that may be expected to be maintained for some time by the mines of the Territory under the conditions now prevailing. That

this production by no means approaches the limit of which the Territory is capable must be apparent to anyone who is even moderately familiar with the developments in progress or in contemplation. A number of new enterprises were well under way that had not yet reached the stage of production, and none of the larger operations that were active, except certain of the copper mines, showed signs of nearing the point where they appeared likely soon to encounter difficulty in maintaining their present output.

The total production of minerals from the Territory in 1938, as stated, reflects the complex interaction of many different factors, some favorable and others adverse; some affecting a single commodity and others applying to the industry as a whole. Those factors affecting a single kind of product will be discussed in later pages where the commodity in question is treated specifically. Here it is proposed to refer briefly to some of the factors that had general application.

Among the general conditions that affected the mining industry of Alaska, as well as the rest of the world in 1938, was the general decrease in prices of all mineral commodities except gold that prevailed during that year, as compared with 1937.[3] The decrease in the selling prices of Alaska silver, platinum metals, lead, copper, tin, antimony, and coal resulted in a decrease of more than $1,500,000, in the total that would have been obtained had the prices that prevailed in 1937 been maintained in 1938. The price throughout 1938 of silver that qualified for purchase under the requirements laid down by the Government was 64.64 cents an ounce, as compared with 77.57 cents in 1937. This price, which was determined by Executive order issued December 30, 1937, was based on a stipulated price of $1.2929+ an ounce, subject to a deduction of 50 percent for seigniorage and services performed by the Government. As apparently all Alaska silver was eligible for purchase under this order, that price has been used in all the computations in the following pages rather than 43.225 cents, which was the average commercial price for silver that did not thus qualify. The average price of copper was only 10 cents a pound in 1938, against a price of 13.17 cents in 1937, or only about 76 percent of the former price. During January 1938 the price of copper was about 10.2 cents, but it gradually dropped, until in June it reached a low of about 8.77 cents. It then gradually mounted, until in November it stood at the highest monthly average for the year—11.025 cents a pound. The platinum metals produced from Alaska mines that in 1937 had yielded products having an average value of $48.90 an ounce showed comparable returns in 1938 of only

[3] The prices quoted for the various mineral commodities in 1938, unless otherwise stated, are based on statistics published by the Engineering and Mining Journal.

$35.71. These prices for the platinum metals differ somewhat from the average prices stated in the Engineering and Mining Journal, but the Alaska product, because of its composite character, does not permit direct comparison with those records. The trend of prices for the platinum metals during 1938 is clearly shown by the monthly averages reported by the Engineering and Mining Journal. In January the price was $36 an ounce, which remained constant until May, when it dropped, and in June reached the low of the year of $33.23 an ounce; the price then gradually improved to the high of the year of $39 in September, but it gradually decreased until in December it was only $34. The price of lead decreased in 1938 so that it sold for an average of 4.74 cents a pound as contrasted with 6.01 cents in 1937. The general selling price of lead reflected much the same trends as already described for copper and platinum metals. Its average price in January was 4.84 cents, gradually dropping to about 4.15 cents in June, then rising to 5.1 cents, the high of the year, in October, but declining to about 4.82 cents in December. Tin, which sold at an average price of 54.33 cents a pound in 1937, brought only 42.3 cents in 1938. This average resulted from fairly wide fluctuation during the year, from about 41.55 cents in January to a low of 36.88 cents in May, through the high point of 46.26 cents in November, and sagging to 46.18 in December. The average selling price of antimony in 1938 was 12.35 cents a pound, as against 15.35 cents in 1937. The price of Alaska coal is determined by local conditions, and the price for 1938 adopted in this report has been computed by the Geological Survey as $3.90 a ton, as against the price of $4.20 adopted for 1937.

In general throughout the Territory labor conditions were satisfactory in 1938. The strictly seasonal character of much of the work necessarily calls for heavy employment during the summer with greatly reduced rolls during the rest of the year. This condition is well recognized by all, so that most employees are fully aware of the desirability of giving their best efforts to make each moment count during the time they are working, so as to take care of their needs during the off season. Doubt as to whether mutually satisfactory new arrangements could be made to extend the shipping agreement, which was to expire in September, led to some uneasiness for a while, but the matter was settled without any interruption of transportation service.

The many newly enacted or pending laws and regulations affecting the operation of mines, as well as of other business, have had an unsettling effect on the work. This has resulted not so much from a direct application as from the uncertainty of the interpretations to be placed on the language used. As an example of this situation

reference may be made to the act to promote so-called fair labor standards which, among other things, raised moot questions regarding the precise meaning of the terms "interstate commerce" and "seasonal industries" and regarding the conditions under which overtime was permissible. This law did not go into effect until October, so it had little direct influence on mining in 1938, but how it could be administered under Alaska conditions without working undesirable restrictions caused grave concern to both employers and employees. The Territorial tax on the gross production of gold, silver, and platinum metals continued to draw adverse criticism from many interests other than those directly concerned with mining, and an attempt made in the legislature early in 1939 to increase the rates then in force met unanimous disapproval. Under certain conditions the requirement of performing annual assessment work on claims was again waived during the year July 1, 1937, to July 1, 1938. On the whole, the general sentiment of mining men is not in favor of this exemption, as it does not encourage attempts to open up the smaller properties, and it cuts off one source of employment to some prospectors.

There were many signs of increased development in the Territory, in which mining shared. The many new buildings in process of erection and the universal evidence of rehabilitating and modernizing old structures showed the faith of their owners in the stability of the enterprises on which the settlements depend. The low rates of interest that money has commanded in general channels and the permissible deductions that can be taken for unprofitable business undertakings have increased the activity shown by some investors in looking into Alaska mining ventures. The Government's policy of assisting mining through loans from the Reconstruction Finance Corporation has already resulted in production from several enterprises and in the prospecting of others that are considered likely to repay the loans that have been made. The outstanding loans from the Reconstruction Finance Corporation for Alaska mining projects, which are restricted to those in which gold, silver, or platinum metals are the valuable metals sought, already amount to about $1,000,000.

Certain of the minerals that at least have been mined intermittently in the past were not mined at all in 1938. For example, there was no production of petroleum products from the oil wells near Katalla, or elsewhere in the Territory; no marble from the quarries on Prince of Wales Island in southeastern Alaska, and no chromite from the deposits in the southern part of Kenai Peninsula. To this list might be added a number of other mineral commodities that in the past have been mined from Alaska deposits. None of the deposits at the places specifically named have been exhausted, and the

cessation of production from them is regarded as due solely to extraneous causes which doubtless will not long prevail.

The foregoing outline of the general features of the year 1938 clearly shows that not only has the record for that year been good but it holds out encouraging prospects for the future. Although this optimism is probably thoroughly well justified, it seems desirable to interject a word of caution to those who might be carried away by the glamor that distance always gives to things with which we are not fully acquainted and who might thus be tempted to feel that Alaska is waiting to disclose its bounty to the chance seeker. Such dreamers should realize that for more than a third of a century hardy pioneers, who are at least somewhat experienced in mining, have toiled over most of the more accessible parts of Alaska, seeking its riches. A novice should therefore be warned that much more is required in finding a workable deposit than a mere desire for wealth, and that the chances of finding bonanza deposits that merely await the summons of the newcomer to disclose their treasures are extremely poor. It is expensive and not the job for a novice to get far off the beaten tracks in the search for new areas for prospecting. 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 performances of many of its mines. This is especially true of one of its lode 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 unless he has extensive technical or financial ability he is not fitted 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 in finding a prospective deposit is usually but a small part of the heavy outlays and intricate planning that will be required for testing the property adequately and bringing it successfully into production.

In subsequent pages, in describing the individual mineral commodities, statements will be given as to specific factors that advanced or retarded certain developments in each of them, as well as general information on the accomplishments during the year. Before taking up these more detailed items the following high lights of the year 1938 may be pointed out in summary form.

1. The value of the total mineral production from Alaska mines in 1938 was greater than in any other year with the exception of the 3 years, 1915, 1916, and 1917, when the World War demand for copper lifted the output of that metal from Alaska to unprecedented heights.

2. The value of the output of gold from Alaska mines in 1938 was more than $1,000,000 greater than that for any year during the entire history of the Territory.

3. The quantity of the platinum metals recovered from Alaska mines in 1938 was much greater than in any preceding year and, in fact, was about equivalent to 88 percent of all the platinum metals that have come from Alaska mines in all preceding years.

4. The quantity of coal produced from Alaska mines in 1938 was larger than in any preceding year.

TOTAL MINERAL PRODUCTION

From the time of the earliest records of mining in Alaska to the end of 1938 minerals to the value of nearly $778,000,000, or much more than one hundred times the purchase price of the Territory, have been produced by its mines. 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 1899 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

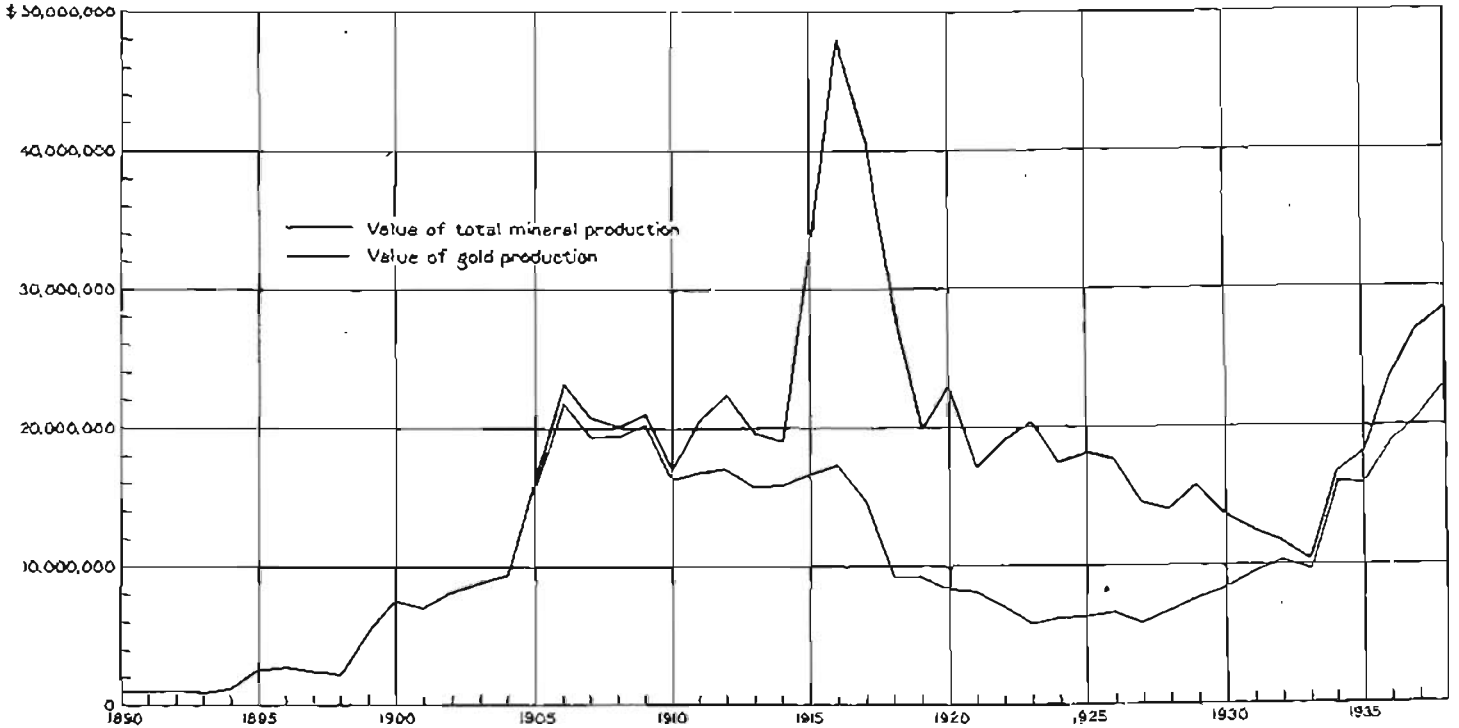

FIGURE 1.—Trends of mineral production of Alaska, 1890–1938.

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 suffered through the fact that in the States scales of wages and opportunities for the employment of capital seemed to offer more advantages, and as a result there was more or less fluctuation in the mineral output. Between 1929 and 1933 production dropped from $16,000,000 to slightly more than $10,000,000. In 1934, owing largely to the advance in the price of gold, it approached $17,000,000, and later, with the continued high price of gold and resumption of extensive production of copper, the value continued to increase until in 1938 it was $28,607,000.

Value of total mineral production of Alaska, by years, 1880–1938

1880	$6,826	1901	$7,306,381	1922	$19,420,121
1881	15,000	1902	8,475,813	1923	20,330,643
1882	23,000	1903	9,088,564	1924	17,457,333
1883	67,146	1904	9,627,495	1925	18,220,692
1884	72,000	1905	16,490,720	1926	17,664,800
1885	425,000	1906	23,501,770	1927	14,404,000
1886	540,000	1907	20,840,571	1928	14,061,000
1887	657,000	1908	20,092,501	1929	16,066,000
1888	667,181	1909	21,140,810	1930	13,812,000
1889	847,490	1910	16,875,226	1931	12,278,000
1890	873,276	1911	20,720,480	1932	11,638,000
1891	1,014,211	1912	22,581,943	1933	10,366,000
1892	1,019,493	1913	19,547,292	1934	16,721,000
1893	1,104,982	1914	19,109,731	1935	18,312,000
1894	1,339,332	1915	32,790,344	1936	23,594,000
1895	2,588,832	1916	48,386,508	1937	26,989,000
1896	2,885,029	1917	40,694,804	1938	28,607,000
1897	2,539,294	1918	28,218,935		
1898	2,329,016	1919	19,626,824	Total	777,818,000
1899	5,425,262	1920	23,330,586		
1900	7,995,209	1921	16,994,302		

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 various metals and nonmetallic products. From the table it will be seen that gold accounted for nearly 66 percent of the total value of the mineral production and that gold and copper together accounted for more than 95 percent.

Total value of mineral production of Alaska, by substances, 1880–1938

Gold	$512,657,000
Copper	227,378,400
Silver	13,484,000
Coal	11,624,400
Lead	2,482,600
Tin	1,546,500
Other mineral products (including platinum metals)	8,645,100
Total	777,818,000

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 produet, the places from which it came, and any new developments. The following summary table shows the production for 1938 and 1937, distributed by quantity and value among the main kinds of substances, so that a comparison between the 2 years may be readily made. From this table it is apparent that there was an increase in the quantity and value of the production of gold, platinum metals, and coal. But while there was an increase in the quantity of lead produced in 1938, the value of this metal was somewhat less than in 1937. There was a decrease in both the quantity and value of the output of silver, copper, tin, and miscellaneous mineral products in 1938.

Mineral output of Alaska, 1938 and 1937

	1938		1937	
	Quantity	Value	Quantity	Value
Gold.....fine ounces	662,000	$23,170,000	582,085	$20,373,000
Silver.....do	474,940	307,000	495,000	384,000
Platinum.....ounces	34,420	1,229,300	8,131	397,600
Copper.....pounds	29,760,000	2,976,000	36,007,000	4,741,000
Lead.....do	2,224,000	105,400	2,004,000	120,400
Tin, metallic.....do	216,640	89,100	372,000	202,300
Coal.....short tons	159,239	620,900	131,600	552,700
Miscellaneous mineral products		109,300		218,000
Total		28,607,000		26,989,000

GOLD

GENERAL FEATURES

Throughout 1938 the price of gold remained fixed officially at $35 an ounce, the same as it has been since 1933. It should be borne in mind, however, in all comparisons made with the records given of the earlier years, that the value of gold produced prior to 1934 has been computed on the then prevailing price of approximately $20.67 an ounce, or only about 60 percent of the present price. The value of the gold production of Alaska in 1938 was $23,170,000, as against $20,373,000 in 1937, an increase of almost $2,800,000. This marks an all-time high record, the nearest approach to it having been in 1906 when the value of the gold production was $22,036,794. Although in value the gold produced in 1938 exceeded that of any other year, in quantity the production did not come up to that of any of the years between 1905 and 1917, when the price of gold was lower.

The general trend of gold mining in Alaska since 1880 is graphically represented by one of the curves in figure 2. From 1880 to 1884 only negligible amounts of gold were produced. Then the curve of production gradually steepened, until in 1895 the former production nearly doubled, and this remained fairly constant until 1900, when the great increase marking the discovery of the rich deposits near Nome carried the value of the annual output of gold to about $8,000,000, near which it remained until 1904. From 1880 to 1904 the curve of gold produced practically coincides with the curve for the value of the total mineral production of Alaska. 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, until in 1934 the rise in the unit price of gold, coupled with the stimulation of gold mining that had been in progress, so increased the value of the production that in 1938 it exceeded that of the boom days of gold production in the Territory.

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 39 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 also shown graphically in figure 2. Of the $512,657,000 in gold that has been produced from Alaska mines $332,016,000, or about 65 percent, has come from placers and $180,641,000, or about 35 percent, from lodes. The relation between the outputs from these two sources has varied widely. Thus

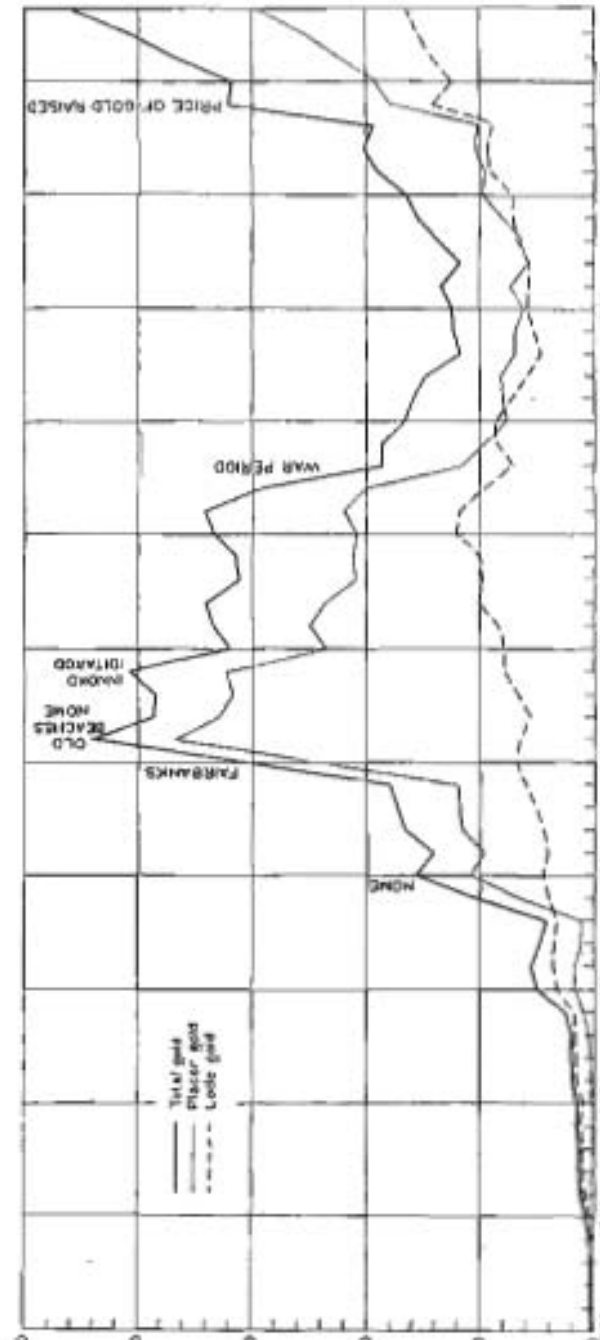

Figure 2.—Trend of value of gold production of Alaska, 1880–1938.

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. From 1919 to 1933 the production was about evenly distributed between the two sources. Since then, with the growth in the mining of extensive low-tenor placer deposits by highly mechanized plants, the production of gold from the placers has exceeded that from the lodes, so that for a number of years the ratio of production from these two sources has been about 3 to 2. There is reason to believe that the current rates of production are by no means rates that may not be maintained or exceeded in succeeding years. Although obviously the output of placer gold may be expected to lessen as time goes on, there is no evidence yet that such a point is near at hand, and increasing production from the lode mines may be predicted with all confidence.

Gold produced in Alaska, 1880–1938

Year	Fine ounces	Value		
		Total	Placer mines	Lode mines
1880–99	1,153,889	$23,853,000	$8,692,000	$15,161,000
1900	381,921	7,895,000	5,623,000	2,272,000
1901	348,300	7,200,000	4,980,000	2,220,000
1902	403,206	8,335,000	5,887,000	2,448,000
1903	423,185	8,748,000	6,010,090	2,738,000
1904	440,938	9,115,000	6,025,000	3,090,000
1905	766,550	15,846,000	12,340,000	3,506,000
1906	1,066,030	22,036,794	18,607,000	3,429,794
1907	936,043	19,349,743	16,491,000	2,858,743
1908	933,290	19,292,818	15,888,000	3,404,818
1909	987,417	20,411,716	16,252,638	4,159,078
1910	780,131	16,126,749	11,984,806	4,141,943
1911	815,276	16,853,256	12,540,000	4,313,256
1912	829,436	17,145,951	11,990,000	5,155,951
1913	755,947	15,626,813	10,680,000	4,946,813
1914	762,596	15,764,259	10,730,000	5,034,259
1915	807,966	16,702,144	10,480,000	6,222,144
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	9,426,029	4,970,000	4,456,029
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	7,422,235	4,395,000	3,027,235
1923	289,539	5,985,314	3,608,500	2,376,814
1924	304,072	6,285,724	3,564,000	2,721,724
1925	307,679	6,360,281	3,223,000	3,137,281
1926	324,450	6,707,000	3,769,000	2,938,000
1927	286,720	5,927,000	2,982,000	2,945,000
1928	331,140	6,845,000	3,347,000	3,498,000
1929	375,438	7,761,000	4,117,000	3,644,000
1930	410,020	8,476,000	4,837,000	3,639,000
1931	459,900	9,507,000	4,842,000	4,665,000
1932	493,860	10,209,000	5,522,000	4,687,000
1933	469,286	9,701,000	5,152,000	4,549,000
1934	457,343	16,007,000	8,955,000	7,052,000
1935	445,429	15,940,000	9,703,000	6,237,000
1936	526,660	18,433,000	11,328,000	7,105,000
1937	582,085	20,373,000	12,655,000	7,718,000
1938	661,000	23,170,000	14,897,000	8,273,000
Total	22,929,782	512,657,000	332,016,000	180,641,000

GOLD LODES

Alaska lode mines in 1938 yielded $8,273,000 in gold, or $555,000 more than in 1937, when the production was $7,718,000. The gold derived from the lodes was about 35.7 percent of the entire gold production of the Territory, or practically the same proportion as in 1937. The lode gold was recovered from widely distributed mines, but approximately 72 percent came from mines in southeastern Alaska, as shown in the following table:

Gold produced from gold-lode mines in Alaska in 1938, by districts

	Fine ounces	Value
Southeastern Alaska	170,171	$5,956,000
Willow Creek	33,229	1,163,000
Nabesna	14,532	508,650
Fairbanks	12,229	428,000
Other districts	6,210	217,350
Total	236,371	8,273,000

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 about five-eighths of the total lode-gold output of the Territory in 1938. The magnitude of the company's mining operations is set forth in its published report to its stockholders,[4] from which the following statements are abstracted: The total rock mined and trammed to the mill in 1938 was 4,663,880 tons. Of this amount 2,184,952 tons of coarse tailings were rejected and 2,478,928 tons were fine-milled. The average gold content of all the material mined during 1938 was 0.0398 ounce to the ton. The amount of gold in that part of the rock which was rejected was about 0.0071 ounce to the ton, and the gold content of the rock that was further treated was about 0.0686 ounce to the ton. Of this content 0.009 ounce to the ton was lost during the treatment, 0.0515 ounce was recovered as bullion, and 0.0081 ounce was recovered in the concentrates, which were subsequently smelted. The following table, compiled from the published reports of the Alaska Juneau Gold Mining Co., summarizes the mining record of this company since the beginning of its operations in 1893.

[4] Alaska Juneau Gold Mining Co. 24th Ann. Rept., for the year ended Dec. 31, 1938.

Production of Alaska Juneau mine, 1893–1938

Year	Ore (tons)			Metals recovered			
	Total	Fine milled	Coarse tailings rejected	Gold (ounces)	Silver (ounces)	Lead (pounds)	Total value [1]
1893-1913	507,254	330,278	176,976	34,240	(2)	(2)	$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	2,180,022	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	4,582,559
1935	3,729,660	2,091,475	1,638,185	118,998	77,787	1,455,167	4,281,110
1936	4,366,800	2,462,046	1,904,754	149,235	101,591	2,102,594	5,400,621
1937	4,442,760	2,251,079	2,191,681	151,671	120,691	1,980,405	5,516,414
1938	4,663,880	2,478,928	2,184,952	148,103	121,473	2,152,714	5,364,488
Total	70,117,638	37,530,918	32,586,720	2,386,838	1,533,861	33,601,862	62,771,215

[1] Based on company's valuation. [2] Lost in tailings.

The cost of mining in 1938 was stated by the company to have been 37.2 cents for each ton of ore trammed to the mill, the cost of milling was 23.0 cents, and all other marketing costs and expenses amounted to 12 cents, making the entire operating cost for each ton of ore trammed only 72.2 cents. This indicates the exceedingly efficient operation of a deposit of this low-grade type, 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.

The output of gold from this company's mine in 1938 was somewhat less than that of 1937, and there was some increase in operating and maintenance charges. As a result the profits, before deduction of depreciation and income taxes, were some $350,000 less in 1938 than in 1937. No interruptions due to labor conditions occurred during the year, and the company's report states that there was a very low turn-over of labor and that at all times there was an abundant supply available for necessary replacements. The superintendent reported that during 1938 more than 39,400 linear feet of underground openings were made, and more than 58,300 square feet of stope area was cut out. The development and preparatory work in opening up the extension of the property in the old Perseverance ground was continued with such good effect that during 1938 more than 18,400 linear feet of development work had been done on this

property and nearly 11,500 square feet of stope area had been cut out, so that this mine has now become a regular and important part of the company's holdings near Juneau. In the milling operations the installation of classifying cones and thickeners was continued and additional flotation equipment for the treatment of slimes was put into service. Further experiments were in progress to test the practicability of recovering additional values from the tailings from the concentrating tables. The company maintained its regular power plants and transmission lines, completed the power line through Sheep Creek tunnel to the Perseverance mine, and installed the necessary transformers.

At several places in the northern part of southeastern Alaska, which for convenience may here be considered extensions of the Juneau district, some lode mining and prospecting was in progress in 1938. The greatest amount of lode gold from these more remote areas came from the property of the Alaska Empire Gold Mining Co., a short distance north of Helm Bay, Admiralty Island. This mine is situated some 15 miles southwest of Juneau. It has long been productive on a small scale, and reports are common that attempts are being made to increase materially the scope of the operations. So far as reported to the Geological Survey, no productive lode mining was in progress on the property of the Admiralty-Alaska Gold Mining Co. on Funter Bay, Admiralty Island, a few miles farther north.

Rumors are common as to revival of mining activity at the many old properties that form an almost continuous chain from those near Sumdum, more than 40 miles south of Juneau, to and beyond Berners Bay, 40 miles north of Juneau. So far as known, however, none of these projects was advanced sufficiently during 1938 to have an appreciable effect on the production of lode gold during that year. That mining at some of these places will ultimately be revived seems certain. The past records plainly indicate that valuable mineralization occurred at several places in that stretch, and from these records it is equally certain that the early mining did not exhaust the then known deposits. The advances made in mining technique and equipment, as well as the reduced costs, give the present-day operator many advantages over his predecessor in developing a successful enterprise. Such an enterprise, however, cannot be lightly undertaken, for it will doubtless call for the outlay of heavy expenditure of funds and extremely critical planning, as success is likely to depend more on efficient handling of large quantities of low-grade material than on treating small amounts of high-grade ore.

The next most productive lode-gold mines in southeastern Alaska are situated on the west coast of Chichagof Island. In this district

are the properties of the Hirst-Chichagof Mining Co., near Kimshan Cove, some 65 miles northwest of Sitka, and the Chichagoff Mining Co., near Klag Bay, a few miles to the southeast. These mines have had long and successful histories, in the course of which they have yielded gold to the value of more than $16,000,000. So important are the developments in this district that during the field season of 1938 the Geological Survey maintained a geologic and topographic party in the district to study the ore occurrences and map the adjacent country. A comprehensive report setting forth the results of that study is now in course of publication by the Geological Survey, but a preliminary statement of some of the more significant structural features has already been issued.[5] The more general views expressed in that paper may be summarized as follows:

> The ore bodies are elongated quartz lenses in the faults * * * The emplacement of the ore bodies appears to have been structurally controlled in large part by the intersection of the faults with the bedding surfaces. Places where the faults split or are deflected appear to have been particularly favorable for ore deposition. There have been some postquartz movements along the faults * * * not extensive enough to greatly modify the original positions and shapes of the ore bodies.

The opinion is expressed that many places in the district where structural conditions that appear favorable for ore deposition have not been adequately tested, but Mr. Reed points out that such tests will probably require not only the maximum use of geologic information but also rather expensive underground exploration and development. During the year mining operations were especially active at the Hirst-Chichagof property, and a better than average production was reported, as well as the keeping up of considerable maintenance and prospecting work. At the Chichagoff mine operations were carried on at a somewhat reduced scale, and by the close of the year arrangements had been consummated for the undertaking of a new and extensive campaign of underground prospecting and new development.

The long and successful development of these two larger properties had led to extensive prospecting and some production from properties in the neighborhood as well as much farther afield. Of these other properties the most productive in 1938 was that of the Apex El Nido Mining Co., on Lisianski Inlet, near the northern tip of Chichagof Island. Considerable prospecting was done in 1938 under lease from this company, in the course of which work some ore was recovered and milled. The lease, however, was canceled late in the season and the company, itself, plans to carry on a program of further development.

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[5] Reed, J. C., Preliminary report on the ore deposits of the Chichagof mining district, Alaska: Am. Inst. Min. Eng. Tech. Pub. 1051, 20 pp., February 1939.

South of the larger operating companies on the west coast of Chichagof Island and between that point and Sitka, several camps were established to test local indications of minerals. Of this work probably the most extensive was that undertaken on Krestof Island, some 15 miles north of Sitka. At this place the Hirst-Chichagof Mining Co. and associates did a considerable amount of drilling on some small veins that were said to contain high values in gold. Although the work was prosecuted vigorously for several months, the findings were not such as to encourage hope of developing a deposit that could be successfully mined, and the work was discontinued early in the fall.

The Ketchikan district of southeastern Alaska, as the term is here used, embraces the entire southern and western part of the region. In the past it has contained scores of lode mining properties that in the aggregate have yielded gold to the value of more than a million and a quarter dollars. At the present time the most active mining in the district is being done in three principal areas, namely, near the east coast of Prince of Wales Island, some 40 miles or so west from Ketchikan; near Helm Bay, Cleveland Peninsula, some 25 miles north of Ketchikan; and a lesser amount on Revillagigedo Island, some 16 to 18 miles east of Ketchikan. According to the reports received by the Geological Survey, the largest production in the district came from the Nelson & Tift mine on McLean Arm, near the southern point of Prince of Wales Island. This mine has been developed mainly by open-cut methods, and as no reduction plant has been erected at the mine the product is shipped to a smelter in the States for treatment. The ore consists of mixed sulphides, from which some copper and a very small amount of lead is recovered in addition to the gold, which forms its principal valuable constituent. The second largest producing lode-gold mine on Prince of Wales Island is the Salt Chuck mine of the Alaska Gold & Metals Co., near the head of Kasaan Bay. The gold from this mine is in a basic rock, rather heavily impregnated with sulphides carrying considerable amounts of copper that is recovered by smelting. The particularly unique feature of this ore is that, in addition to the gold and copper, it carries considerable quantities of palladium, one of the group of platinum metals. In fact this is practically the only known source of lode palladium in commercial quantities in the United States. Further mention of this occurrence will be made under the subject "Platinum Metals," on page 81. Another property in the Prince of Wales area on which considerable work was in progress was that of the Flagstaff Mining Co., on Granite Mountain, Karta Bay. There extensive preparatory work, including the construction of roads, tramways, and surface plant, as well as opening up underground, was vigorously carried on; though not

completed during 1938 this work was advanced to such stages that the property should be in full operation in 1939.

The principal producing lode-gold mine in the Helm Bay area, north of Ketchikan, is the Gold Standard mine, now under lease to John Folwarzny. The ore is reported to be of rather low grade, and about half of the gold it contains is recovered by simple ore dressing and amalgamating at the mill on the property, the other half being recovered in the concentrates that are shipped to the States for smelting. Several other prospects in the vicinity of the Gold Standard mine are reported to have been the scene of some activity during 1938, and at one of them, locally known as the Blue Jay, work is said to have progressed sufficiently to have yielded enough ore that the owners were proposing to install considerable machinery and equipment during 1939.

In the area east of Ketchikan practically the only mining work in progress was on certain properties in the vicinity of Thorne Arm. Work here had been retarded in previous years by pending litigation, but that situation was cleared up during 1938 and resumption of preparatory work to unwater the mine and get it into shape for mining was reported to have been in progress.

In the Hyder district, which includes a considerable tract of country at the head of Portland Canal, in southeastern Alaska, no extensive lode development was in progress, and even the sudden increase of interest in prospecting that was earlier awakened by the great increase in the price of gold seems to have practically died out. So far as the Geological Survey is informed, only desultory prospecting was in progress at a few of the properties that a few years before had been active, and no significant amounts of ore or concentrates were shipped from any of them during 1938. It is true that many physical difficulties confront the prospector who tries to develop a mine in this area, for the country is notable for tumultuous streams and gnarled forests in its lowlands, with rocky precipitous slopes above, and snow fields and glaciers in all of its uplands, reaching down in places to only a few hundred feet above sea level, and a phenomenally heavy fall of snow covers everything from early fall to late spring. In spite of these handicaps the known geologic setting of this district, which lies along the eastern margin of the great Coast Range intrusive mass, seems favorable for the occurrence of mineralization that might have given rise to commercial ore bodies. The proved occurrence of bodies of this sort in comparable environment in contiguous parts of British Columbia seems to confirm this view. It is absurd that the international boundary line serves to mark also the line of separation between good and poor prospective mining territory. The conclusion seems almost inescapable, therefore, that intelligent and

thorough search for and following up of indications of mineralization might well 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 and has produced gold worth more than $10,370,000 since lode mining started there in 1909. Mining was in progress in 1938 at several camps scattered through the district, but the three largest producing mines were those of the Alaska-Pacific Consolidated Mining Co., near the head of Fishhook Creek; Willow Creek Mines, on Craigie Creek; and the Fern Gold Leasing Co., near Archangel Creek. In addition gold-lode production was reported from the Gold Cord, the Ready Bullion, and the Mabel mines, as well as from smaller properties where the season's work was little more than prospecting and the carrying on of preparatory examinations. The Alaska-Pacific Consolidated Mining Co.'s property embraced the former holdings of several independent companies in the neighborhood, which were being brought into a unified plan of development as rapidly as conditions permitted. Thorough consolidation had not been effected, and as a result the ore from some of the scattered sites was being treated temporarily in the old mills that had been acquired from the earlier companies and were not well designed for efficient or economical operation. Fortunately the owners have been content to delay making extensive changes and incurring heavy construction outlays until they have adequate basis for action, and they have given priority to developing their ore bodies rather than, as is so often the case, to elaborating surface plant. Now that progress in the mine is well advanced these other projects are being taken up. Already excellent housing accommodations have been built and the milling practice modernized and adapted to the ore that has been opened up. These improvements have already greatly stepped up the production of the property and will give increasing returns. During the year the management of the Willow Creek Mines changed hands, and as a result there was some falling-off in production, as the new management instituted a program of exploration and development rather than continuing operations under the former plan. At the time the Geological Survey representative was in the district this exploratory work was still in progress, and no announcement has been made public as to the results or as to any contemplated changes in operation. Work at the Fern mine was successfully carried on at an increased rate. The newly installed milling equipment proved well adapted for the ore, and the returns were so satisfactory that, according to local papers, the company declared its first dividend late in December. The opening up of the ore deposits underground also appears to have progressed satisfactorily, so that an adequate supply of ore for the mill for some time to come seems to be well assured.

The third most productive Alaska lode-gold district is that in the valley of the Nabesna River. In this district, at the present time, there is only one producing mine, that of the Nabesna Mining Corporation. The Survey under its regular practice would not be permitted to disclose the production of a single mine, but as this company itself publishes for its stockholders a complete analysis of its operations, that restriction is removed. The following statements are, therefore, abstracted from the report of the company.[6] The principal results of the year were an increased tonnage of ore mined and milled and a much more continuous operation of the mill, as well as a much better recovery by it. As a result of this combination the gross production was more than twice as great as that for any preceding year. As to specific accomplishments during the year, 2,589 lineal feet of underground work was driven, 1,840 lineal feet of diamond-drill holes was bored, and 12,225 tons of ore and 5,801 tons of old tailings were delivered to the mill and treated. The average value of the ore treated was $42.65 and of the old tailings $14.69. The mill recovery was 91.57 percent. About 595 tons of concentrates was produced, of which nearly 517 tons was shipped to a smelter in the States for treatment. As a result of that treatment some silver and copper are recovered in addition to the gold that forms the principal valuable mineral in the ore. Some concern was felt for a time as to the effect that the closing down of the Copper River & Northwestern Railway might have on the operation of this mine. This fear seems to have been unwarranted, for the report cited states:

"While the permanent closing of the Copper River & Northwestern Railroad will shorten the season in which supplies can be freighted to Nabesna mine by about 2 months, it will otherwise cause no great inconvenience to the operation, as freight can be handled over the Valdez route at less cost than was formerly done via the railroad routing.

Plans for installing new equipment and for further exploration, as well as the excellent shape the property was in at the end of the year, give assurance of the continued successful operation of the property in 1939.

The fourth most productive lode-gold district in the Territory is that in the vicinity of Fairbanks. For a long time this district has stood third in the list of those whose records are disclosed, and the dropping to fourth place in 1938 is due to the fact that the Nabesna district has been separated out from the group included among the so-called Other districts. In fact the gold-lode production from the Fairbanks district in 1938 is estimated to have exceeded that of any

[6] Nabesna Mining Corporation. General manager's 9th Ann. Rept., year 1938, 7 pages, 1939.

of the 28 preceding years that lode mining has been in progress in the camp.

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 larger producing mines lie outside the borders of the quartz diorite mass that forms the higher parts of Pedro Dome, in the old metamorphic schists that have been intruded by that mass and affected by it. The three larger producing mines in this area are those of the Cleary Hill Mines Co., the McCarty Mining Co., and the Hi Yu Mining Co., but at a dozen smaller properties in the same general area some mining or prospecting was actively in progress.

At the Cleary Hill Mines a change in management that took place during the early months of 1938 led to a considerable modification of existing practice and the devotion of a considerable part of the season to extensive geologic and mining investigations so as to work out more thoroughly the factors that related to the occurrence of the ore bodies. The results of this work are said to have enabled the management to direct its developments so that adequate supplies of ore were made available and could be handled efficiently. The problems that have long proved vexatious, owing to the complex relations resulting from fault movements in the mine, are said to have been satisfactorily solved so that a more systemmatic plan of mining can be followed in the future. This should result not only in reducing the costs but also in enabling the management to keep the mill supplied with ore more continuously.

The McCarty property, which is situated near the divide at the head of Fairbanks Creek, was leased by the Fairbanks Department of the United States Smelting, Refining & Mining Co. early in the year, and exploration of the deposits prosecuted vigorously throughout most of the remainder of 1938. As a result, considerable openings were made underground, and the ore that was found was run through a small mill so as to get quantitative results that would be useful in determining the amount of valuable minerals that could reasonably be recovered under ordinary working conditions. The work was carefully supervised and carried out, but, according to current reports, the results did not encourage the continuation of the project, so that after the ore on hand has been cleaned up it is probable that the lease will be allowed to lapse. This action is to be regretted, as unquestionably some good ore occurs in the mine, but the complicated structure as well as other general considerations is such that the company is

not interested at this time in becoming involved in the heavy outlays that would be necessary before the property would be other than an exploratory venture.

The other principal mine in this eastern field is the Hi Yu mine on Too Much Gold Creek, a tributary of Fairbanks Creek. Some difficulty was experienced at this mine during much of the year, owing to faulting, which affected the ore body. As a result, much unproductive search was carried on which, so far as is shown by local reports, had not succeeded by the end of the year in entirely solving the situation.

In the Ester Dome area of the Fairbanks district the development of gold lodes continued at essentially the same places as heretofore, but the scale of operation at several of the mines underwent a marked increase. Probably the most noteworthy event in the area was the activity of prospecting by the Bartholomae Oil Co. at the head of St. Patrick Creek. This company earlier had been investigating the lode properties on the southwestern flanks of Ester Dome at the head of Ready Bullion Creek, a tributary of Ester Creek. The showings there, however, did not prove attractive, but, instead, the company was able to obtain options on the old Ryan lode, which is situated on the northern flanks of the dome. Development work was promptly started at this property in June, the old shaft cleared out to a depth of about 160 feet, and some 330 feet of drift and several hundred feet of crosscuts and raises driven. The ore produced during the course of this work was hauled to the old mill on Ready Bullion Creek, which thus served not only to recover the gold but also as a pilot mill to determine the factors required in the design for a proper new mill that will ultimately be built near the mine. The results of the development and tests already made seem to have been entirely satisfactory, so that the work will be continued another year and probably on a much larger scale. The management, however, is wisely making haste slowly by not being in a hurry to adopt any full program until it has obtained the necessary tests of the ore deposit so that it can make decisions with assurance. There are a dozen or more small mines and prospects widely scattered over adjacent parts of Ester Dome, and, while most of them individually yielded but a small amount of lode gold in 1938, in the aggregate they contributed considerable gold to swell the total from the district.

Among the lode-gold districts that are grouped together in the table on page 17 under the heading "Other districts," the most productive, named in the order of output, are 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; the Nixon Fork district, in the Kuskokwim region; and a few districts widely scattered through other parts of

central and western Alaska whose gross output totaled only a few thousand dollars in gold. In practically each of these districts the production in 1938 came from a single mine, so that to avoid disclosing the individual output it has been necessary to combine the statistics.

Few details regarding the lode-gold mining in progress in the Prince William Sound region in 1938 have been received by the Geological Survey direct from the operators there. From general sources of information, however, it appears that on the whole mining was carried on at about the same places as it has been in the last few years, though the total amount of lode gold recovered was somewhat less. So far as known, the largest producers in the region were the El Primero Mining & Milling Co., on the west side of Port Wells, north of Bettles Bay; a property formerly known as the Herman-Eaton prospect, now under the management of Ralph Merrill, situated on Culross Island south of the entrance of Port Wells; the Cliff Gold Mines, Inc., a few miles west of Valdez; the Portage Gold Mines, Ltd., 2 miles north of Portage Bay near Valdez; and the Alaskan Mayfield Mines, Inc., situated west of Shoup Glacier north of the pass between Anderson and Columbia Glaciers.

Perhaps one of the most interesting projects in the district was the unwatering of the old Cliff mine. This mine had become flooded by the sea some years ago, and various earlier attempts to pump it out had been unsuccessful. In fact, the present management, in its earlier work, had avoided the old mine and had opened veins to the hillside to the northwest. In 1938, however, an attempt was made to pump out the old mine, and it proved so simple that the work was carried through to completion and should enable the operators to recover much ore that was believed to have been irretrievably lost. New equipment for pumping and hoisting was ordered and is to be installed as rapidly as practicable. At the Alaskan Mayfield mines most of the season of 1938 was utilized in installing a 5-ton Gibson mill with accessory amalgamators and concentrating table. As a consequence of diversion of effort to this dead work, productive ore dressing was carried on for only a week and the returns were consequently small, but they should show marked increase in 1939. At the Portage Gold Mines, Ltd., considerable underground work was accomplished during the year, but the mill was running only about half the time during the period June to October.

The principal districts in the Kenai Peninsula region in which some lode-gold production was reported in 1938 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.

Little information is available on new lode-gold developments in any of these districts in the Kenai region, and it seems likely that no new developments of other than local significance occurred in any of them. In all the areas the mines are small, employing only a few men each, and most of the equipment is of a simple type. In the Nuka Bay district are perhaps half a dozen properties on which some work was done during the year, but the wave of interest that brought this camp to notice a few years ago seems to have subsided, so that many of the early comers have drifted away and mining activity has dropped to a low stage. At one of the principal properties, that of the Nukalaska Mining Co., a fire destroyed part of the buildings comprising its surface plant and disrupted productive mining.

Farther north on Kenai Peninsula in the Moose Pass-Hope district and, in fact, at intervals all the way between Seward and Moose Pass are small gold-lode properties at which more or less prospecting is kept up and from some of which small amounts of lode gold are obtained each year. Most of the operators of these properties fail to supply much information on their season's work, possibly feeling that it is too small to be of other than personal interest. This feeling is not warranted because it is significant that mineralization has been proved to be widespread throughout much of this area, and it is desirable to have a full record of the results of any work that has been done to discover workable deposits there and to open them up.

In the Girdwood district, north of Turnagain Arm, the principal area in which some development of gold lodes was in progress in 1938 was near the head of Crow Creek, a tributary of Glacier Creek. The only mine in this camp is the Monarch-Jewel mine of the Crow Creek Gold Corporation, under the management of H. I. Staser. No first-hand information has been received by the Geological Survey as to the year's progress at this property, but it is currently reported that work was carried on at about the same rate as during the immediately preceding years.

In the Kuskokwim Valley the only producing lode-mining area is in the vicinity of Nixon Fork, north of Berry Landing. The principal producing mines in this area are the Nixon Fork mine, operated by Mespelt & Co., and the Southern Cross mine of McGowan & Lind. Work at the Nixon Fork mine was continued throughout the year at about the same rate as heretofore, but the value of the output of gold recovered seems to have been considerably less. 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, but its capacity is limited by the small supply of water that is available in a normal season. The deposit is reached through a vertical shaft about 300 feet deep. During 1938 about 225 feet of underground drifting was done. The Southern Cross mine is about a mile from the Mespelt property, in the same general geologic setting with relation to the contact of the quartz monzonite intrusive and the limestone country rock. Only a very small crew was employed at this mine, and much time was employed in development work rather than in productive mining.

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. Among places of this sort the more significant were the Chulitna, Goodpaster, and Kantishna districts, Copper River region, and Seward Peninsula.

The main lode-gold development in the Chulitna district, on the southern slopes of the Alaska Range near Broad Pass, was that in progress under the direction of W. E. Dunkle. This property is situated on the West Fork of the Chulitna River some 10 miles west of the Colorado Station on the Alaska Railroad. Work of developing a large-tonnage low-grade mine was begun here by Dunkle in 1937 and has been pressed as rapidly as conditions permitted ever since, though the preparatory work has still not been completed, and much yet remains to be done before active continuous production is started. According to all accounts, however, the work is proceeding according to schedule and should begin to produce on a small scale by 1940. This property includes that formerly known as the Wells' prospect and often referred to as the Golden Zone mine.

Although the enterprise looking to the large development of gold lodes in the Goodpaster district, some 100 miles east of Fairbanks,

was discontinued in 1937, several small camps have continued explorations there and report encouraging results. The principal operator in the district is C. W. Tibbetts, who is reported to have had a mill on the Grizzly Bear lode on Johnson Creek for part of the season which later he moved to the Blue Lead claim on Summit Creek in the same general neighborhood. The ore appears to be comparable to some of that characteristic of the quartz veins of the general Yukon-Tanana region in that the gold is free in quartz, which carries only small amounts of sulphides. Some of the ore is said to be of high grade. The district is still difficult of access, but improvement of the trails so that they are readily traversable by tractors and the establishment of fields on which airplanes can land are steadily lessening this handicap.

The plans, forecast in the companion volume of this series—that for 1937—looking to early development of certain lode properties in the Kantishna district, were so delayed that no lode-gold production came from that district in 1938. The work, however, seems merely to have been delayed, and some progress in carrying out the plans was shown. As a result, a mill and accessory equipment were shipped in late in the season and speedily taken to the property near Eureka Creek, a few miles beyond the northern boundary of the Mount McKinley National Park. The property is that formerly known as the Quigley claims, and the new owners are Gustafson, Fransen, and Hawkins. The veins on which the first of the new developments will be done are called the Banjo and Red Top lodes. All of these new holders have had much experience in developing lode-gold mines in the Fairbanks district and so should be well prepared to solve the many problems that will arise in opening up new deposits in the Kantishna district where probably somewhat similar conditions will be found. It was expected that there was enough float ore on the hillside and on the old dumps to supply the mill almost as soon as it could be set up and running and that the mining of new ore would proceed as rapidly as practicable. If this plan can be carried out some production will likely begin to come from this mine in 1939.

Current lode-mining operations in the Bremner district were described rather fully by Moffit in the report on the mineral industry of Alaska for 1937.[7] Since that was written the principal property in the district changed hands, owing to the dissolution of the former company, and its acquisition by the Yellow Band Gold Mining Co. This property, formerly belonging to the Bremner Mining Co., is situated at the head of Golconda Creek and west of the pass from

[7] Moffit, F. H., in Smith, P. S., Mineral industry of Alaska in 1937, U. S. Geol. Survey Bull. 910–A, pp. 31–32, 1939.

Golconda Creek to Monahan Creek and the Chitina Valley. Additional claims have been acquired by the new company so that practically all of the land on which mineral showings have been found in the neighborhood have been consolidated as a single unit. Practically the whole open season of 1938 was spent by the company in getting its holdings into shape for active mining. Satisfactory progress was made, and it is expected that it may begin to show some production in 1939. Aerial trams will be built to bring the ore from the mine to the mill, which will probably be set up on Golconda Creek at a point where accurate records indicate that an adequate supply of water can be obtained for at least 9 months a year.

At several points in Seward Peninsula some development of the known gold lodes was undertaken. The only production reported came from small plants in the hills north of Nome in the vicinity of Goldbottom Creek, a stream that joins Snake River some 20 miles from the sea. At one of these properties somewhat more than 100 feet of drift was driven during the year, and the ore collected in the course of that work was treated in a small, temporary mill that was run only a small fraction of the time during the open season. Further activity looking toward the reopening and expansion of the lode-mining activity in the vicinity of Bluff, some 50 miles east of Nome, was shown by some work having been done late in the season by the Alaska Homestake Gold Mining Co. The work accomplished at this place in 1938 aimed at checking some of the earlier observations and enabling a competent mining engineer to formulate plans for future developments if the findings should warrant that step. It is understood that the outcome of these examinations was favorable for undertaking a much expanded program in 1939 at this property. Some work was in progress at the Silver prospect on the divide between Big Hurrah Creek and East Fork, in the Solomon district, and for a time negotiations were under way for starting considerable development work. Owing to conditions not related to the merits of the enterprise, this accelerated program was not undertaken. No recent steps looking toward the early reopening of the Big Hurrah mine near Solomon are known to have been taken, though certain litigation relating to ownership was settled by the court during the year.

GOLD PLACERS

GENERAL CONDITIONS

Placer mining in Alaska in 1938 yielded gold worth $14,897,000. This amount marks an increase in value as well as in quantity over the output of the preceding year of more than $2,240,000 and of more

than 64,000 ounces. In fact, the value of the placer production was larger than for any other year since 1909 and has been exceeded in only 4 years in the entire time that placer mining has been in progress in the Territory. The annual production of placer gold and certain other data relating to Alaska's gold production are represented graphically in figure 2 (p. 15). 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 1899 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 approximately $18,600,000. In 1918, after the entry of the United States into the World War, placer production dropped to about $6,000,000 and in the 15 years from that time to 1933 it fluctuated between that amount and $3,000,000. Since 1934, owing in part to the great increase in the price of gold and in part to the revived interest in placer mining, the value of the output has rapidly climbed each year until in 1938 it reached the high figure stated above.

The trend of placer mining in Alaska for the last few years has been toward the development of larger enterprises requiring the installation of expensive equipment, such as dredges, draglines, 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. As a consequence, while many small placer-gold operations sprang up almost at once after the announcement of the rise in the price of gold, only recently have any large undertakings that resulted from that stimulation become productive, and some of the larger ones have not yet come into full production. Conversely, when adverse factors arise they usually result first in shutting down the small operators, who can more readily curtail work at their properties because the unavoidable charges on their investment are less. It is too soon, therefore, to gage accurately the results that some of the recent acts relating to taxation, social security, and other matters

will have on the placer-mining industry of the Territory, but already some of the small operators have reported that they found the additional expenses so burdensome that they were curtailing their activities. Obviously, before new enterprises are undertaken these additional items of expense will have to be figured in any estimates of the probable returns from the projects.

The stimulus of the high price of gold and unemployment in many businesses in the States have led many to think about turning to prospecting in Alaska as a means of improving their condition. To such it may not be amiss to offer the following comments. The life of the prospector has much that is attractive 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. Prospecting is just as much a specialized business as farming or storekeeping, and outstanding success comes to few in any line of endeavor. Inevitably the life of the prospector is full of physical hardships and should not lightly be undertaken by the ordinary city dweller. It is believed, however, that Alaska still holds opportunities for the capable placer prospector to find tracts that, while not bonanzas, will well repay his best endeavors. It is still true that there are large tracts of Alaska that have not yet been thoroughly prospected or adequately examined, but it should not be forgotten that all the readily accessible parts of Alaska have been at least traversed by prospectors and hunters in the past, so that the newcomer, unless he possesses keener insight or some other qualities that these earlier searchers lacked, is not likely to have his quest for fortune rewarded by stumbling on rich deposits they missed. None of the open unworked areas appear to give promise of holding bonanza deposits that can be won easily and cheaply. Necessarily, the individual's experience, enterprise, and desire will determine the sort of search he can undertake most successfully, but it must not be forgotten that it is of prime importance that the newcomer should at least be provided with sufficient funds to defray his living expenses during the time required to obtain employment or find a deposit that will afford some income. It must be remembered, too, that all costs in most parts of Alaska are higher than they are in communities of similar size in the States proper; that the season when there is need for the employment of many persons in most places, does not last more than 3 or 4 months; that for one dependent on his current earnings sufficient income must be procured during the short working

season to tide over the 8 months or so when jobs are extremely scarce; and finally, should the venture not turn out as well as hoped, that return to the States necessitates a considerable outlay of money for transportation.

General conditions affecting placer-gold mining were on the whole normal throughout 1938, though obviously diverse conditions prevailed temporarily in different camps throughout the wide expanse of territory in which placer mining is done. Thus, for instance, in Seward Peninsula the early part of the season was marked by acute shortage of water for mining purposes, and many of the ditches were dry and out of commission for considerable periods, and even some of the dredges had to suspend operations for several weeks because of lack of water. This dry spell, however, was broken in August, and normal operations were resumed. The condition in Seward Peninsula was distinctly local. In some of the other districts the water supplies for much of the season were larger than normal. This, of course, does not mean that many of the miners were satisfied with the supplies available at their individual properties, for always there is the tendency of the operator not only to plan to use the entire available supply but also to overestimate that supply. Less dependence is now placed on the normal gravity supply of water by the larger operators and more and more reliance on the use of pumps to augment or even to replace that supply. Consequently, unless extremely adverse conditions arise, the total production of gold from the placers is increasingly less directly affected by shortage of precipitation than heretofore. This lessening dependence on climatic conditions holds true also as regards so-called freeze up and break up, because with increased transportation facilities many of the miners can get to their properties earlier and remain on them later and thus make a longer working season. Then too, the extensive use of thawing equipment at all of the larger properties enables lengthening the working season on both ends by starting earlier in the spring and closing later in the fall.

Labor conditions were on the whole satisfactory. There was usually an adequate supply of labor available, and except at individual properties no controversies arose that materially handicapped productive activity. The new laws regarding hours of work and related subjects did not go into effect until October 1938, by which time all but the larger placer mines had closed down for the season. There was, therefore, little direct evidence as to the effect of these laws on the placer-mining industry, but in general there seemed to be skepticism among the working men that they will be materially benefited by these acts, and there is almost a unanimity of opinion

among the operators that neither they nor their men will be as well off as at present.

PRODUCTION OF DISTRICTS

The description given on pages 3–4 of 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 mineral commodities. 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, or the gold may be carried personally by the producer or sent by mail or express to its ultimate destination. Thus records from one source may fully or partly duplicate those from other sources, whereas for other lots there may not be any definite records at all. Every reasonable effort has been made to check the information from different sources and to adjust recognized 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, unlike other tables in this volume that relate to production of gold in periods prior to 1934, all statements relating to the value of the gold 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. As has so long been the case, 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 1938 and 1937

Region	1938	1937
Southeastern Alaska	$4,000	$6,000
Copper River region	132,000	117,000
Cook Inlet-Susitna region and southwestern Alaska	348,000	459,000
Yukon Basin	10,123,000	8,201,000
Kuskokwim region	803,000	478,000
Seward Peninsula and northwestern Alaska	3,487,000	3,394,000
Total	14,897,000	12,655,000

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 in restricted tracts placers of value.

The entire placer production from southeastern Alaska in 1938 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—near Juneau, in the valley of the Porcupine River, and on the beaches between Lituya Bay and Yakataga. No placer mining is reported to have been in progress in the Juneau district in 1938, though a small amount of gold is said to have been

recovered in the course of casual one-man operations. None of the placer claims in the Porcupine district afforded a production worthy of note. The principal company that has long held claims in the district several years ago stopped productive work on its properties owing to litigation and internal dissension. These difficulties are apparently being cleared up, and it is currently reported, though no information on the subject has been received by the Geological Survey from the company, that some preparatory work was carried on at the property in 1938. In the Lituya–Yakataga district placer mining was continued on about the same scale as 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 only under suitable weather conditions can the placers be mined, and even then the use of extensive mechanical appliances is precluded by the necessity of removing them during times of storm.

COPPER RIVER REGION

In the Copper River Valley there are two principal areas and one minor area that have yielded placer gold, though a few small camps are widely scattered elsewhere 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 1938 was $132,000, an increase of about $15,000 over that from the same region in 1937.

The greater part of the gold from placers in the Nizina district came from the properties of the Nicolai Placer Mines on Dan Creek and of the Andrus estate on Chititu and Rex Creeks.

These two properties were rather fully described by Moffit [8] in the preceding volume of this series. Two smaller camps were placer mining near the head of Rex Creek. These were the Rex Creek Mining Co. and two laymen on the Powell claims, which were under lease. The extensive development work accomplished during 1937 on the Dan Creek properties enabled the operators to handle an especially large amount of material during 1938, and the satisfactory supply of water that was available during most of the season resulted in an especially satisfactory production. No new developments were reported to have been undertaken at the Andrus property, and from the amount of gold recovered it seems evident that mining must have been carried on there at practically the same rate as has been done during recent years.

[8] Moffit, F. H., in Smith, P. S., Mineral industry of Alaska for 1937: U. S. Geol. Survey Bull. 910–A, pp. 38–39, 1939.

The Chistochina district embraces a rather indefinite large area on the southern flanks of the Alaska Range at the head of the Copper River, extending for some 50 miles eastward from the Richardson Highway. The principal placer mining activity in this district was that of the Slate Creek Placers, Inc., which, under the management of J. M. Elmer, is developing a large number of claims on Slate Creek. Smaller outfits were also reported to have been mining at other points on Slate Creek and its tributary Miller Gulch, on Middle Fork of Chistochina River, and on Ahtell Creek, a tributary of Slana River. A few prospectors were doubtless more widely scattered through the district but made no statements to the Geological Survey on the results of their work. The extensive work in progress on the property of the Slate Creek Mining Co. was devoted mainly to getting the project under way rather than directly to productive mining. In fact it is currently reported that, because of the large quantities of supplies that must be brought into this country which is without roads, the vast amount of dead work that must be done in starting an enterprise in a remote region of this sort, the heavy outlay of funds, and the managerial skill required to keep all the multifarious details moving smoothly, it may take several years before operations reach the full scale contemplated.

In the Nelchina district, which is in the extreme western part of the Copper River region and is most conveniently approached by way of the Matanuska Valley, tributary to Cook Inlet, all the placer mining was done by a few small camps, consisting of only two or three men each. The mining centered mainly around Albert Creek, and the total production amounted to only a few thousand dollars.

COOK INLET-SUSITNA REGION

The Cook Inlet-Susitna region, as the term is used in this report, includes 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. For convenience, the small placer production from southwestern Alaska has also been included with that of the Cook Inlet-Susitna region. In parts of this region were some of the earliest and most productive of the gold placer camps of this Territory. Many of these old camps have gradually played out and been superseded by camps that have sprung up in new areas, and many of these too have now waxed and waned. Of late years, however, there has been a marked increase in the placer gold production of some of the districts, though in 1938 the value of the gold production from the region seems to have fallen off more than $100,000 from that of 1937. In making this comparison it should be realized that the placer production in 1937 was unusually large, being in fact

nearly $200,000 greater than in 1936. Viewed in this light it will be recognized that the decline in 1938 does not mark an alarming situation in the industry and that the output in 1938 was still very large as compared with that of all other recent years except the immediately preceding one. In the relative order of their placer production in 1938 the districts in the Cook Inlet-Susitna region ranked as follows: Yentna-Cache Creek, Valdez Creek, Kenai Peninsula and vicinity, and other miscellaneous scattered small placer camps, including southwestern Alaska.

The most productive part of the Yentna-Cache Creek placer district centers around the Dutch and Peters Hills, which form part of the southern foothills of the Alaska Range and lie some 25 to 35 miles west of the stretch of the Alaska Railroad that lies between Talkeetna and Curry. In general the productive placer creeks flowing from these hills are tributaries of either Peters, Cache, or Granite Creeks, all of which ultimately join Kahiltna River. Peters Creek and its tributaries drain most of the eastern part of the area, and the main stream follows a circuitous course first southeastward, then south to its junction with Kahiltna River. Its principal tributaries on which placers were mined are Bird, Willow, and Poorman Creeks. The largest single operation in the entire district was that of the Peters Creek Mining Co. on Peters Creek. This and several smaller outfits on the main stream and on the three tributaries mentioned above made this one of the most active sections of the district. On Cache Creek and its tributaries Nugget, Thunder, Ruby, Dollar, and Falls Creeks, as well as several of the smaller gulches, about 25 camps, ranging in size from those employing a dozen men to those occupied by a single miner, were engaged in placer mining during 1938. The largest of these camps was that of the Cache Creek Mining Co. on Nugget Creek, which had the second largest output of gold in the entire district. On Dutch Creek and its tributary First Creek, which drain the northern slopes of the Dutch Hills and flow into Granite Creek, the principal placer operator was the Dutch Creek Mining Co. Westward across Kahiltna River on the eastern slopes of the mountain area in which Mount Fairview is one of the dominating peaks, are several other streams on which placer deposits occur. This tract, which is locally known as the Fairview area, is here considered as part of the Yentna-Cache Creek district. The largest production from the Fairview area came from the property under the management of Jack Devault on Pass Creek. Smaller operations were in progress on Mills, Notobac, and Boulder Creeks. No placer mining is reported to have been in progress in 1938 on the main Tokochitna River or on any of its tributaries that lie to the north of Peters Creek and in part traverse or rise in the same group of hills that form the highlands in which that stream also rises.

In the Valdez Creek district, 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, but in 1938 work had been discontinued on the lodes, and only four or five placer camps were active. In spite of the small number of outfits at work the production of placer gold was somewhat more in 1938 than in 1937, and the owners were confident that the rate of production could readily be maintained. The two principal mines are owned or operated by John Carlson and associates and are known as the Cora Bench on the right limit of Valdez Creek and the Folk Bench on the left limit of that stream. Both are closely associated geologically with the deposits of the famous Tammany Channel. The Cora Bench is being developed by drift mining whereas at the Folk Bench mining is done by hydraulicking. The shaft in the drift mine is about 180 feet deep through glacial detritus and stream wash. In the deposit being hydraulicked are many large boulders that appear to have served as natural obstructions behind which much coarse gold collected. Some of the nuggets weighed an ounce or more. Claim No. 4 above, on Valdez Creek, was also mined on a small scale during 1938, and there was one outfit each on Lucky Gulch and White Creek.

The producing placer camps in the Kenai Peninsula region are mainly in the vicinity of the settlements of Hope, Sunrise, and Girdwood. In the area near Hope and Sunrise there are more than a dozen properties on which some productive mining was in progress. Although perhaps some of these may have changed management they have been consistent though small producers for many years and seem still to return reasonable compensation for the work done on them. No notable new developments are reported to have been made in the area during 1938, and mining seems to have gone ahead at about the same rate as during recent years. Among the larger operators in the vicinity of Sixmile and its tributaries were the Moose Creek Placers on Mills Creek and Oscar Dahl. The Canyon Creek Placers was engaged mainly in drilling and other tests of ground with a view to determining its adaptability for the use of a dragline another year. No placer mining has been done on Lynx Creek since the disastrous snowslide of the year before wiped out the members of the camp on that stream. In the vicinity of Hope and Resurrection Creek the larger operations were two hydraulic plants on Resurrection Creek, a steam-shovel plant on that same stream, and smaller camps at other points farther up the valley of the main stream and on Palmer Creek, one of the eastern tributaries.

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. Farther upstream on Crow Creek some development work was in progress on the old Girdwood properties that for some years have lain dormant. This property was acquired by Axel Lindblad and associates late in July, who employed the rest of the season in laying pipe lines, building camp, and other dead work with the expectation that active mining would be under swing early in 1939. So far as reported to the Geological Survey no extensive placer mining was done on any of the streams west of Girdwood, though development work was said to have been in progress on Indian, Bird, and Rainbow Creeks.

A few small placer camps also occur at widely separated points in the Cook Inlet-Susitna region that at present have little effect on the output of gold from the region as a whole. Among the places of this sort may be mentioned the small placer operations on the outskirts of the Willow Creek lode district. For a number of years a small and irregular production of placer gold has been recovered from that area. These deposits occur principally in the valley of Little Willow and Grubstake Creeks, especially in those parts where the bedrock is schist, and south of and outside the area occupied by the main granitic intrusive mass that forms the bedrock throughout most of the Willow Creek lode district.

The small placer production from southwestern Alaska, which totaled less than $1,000, has been included with that of the general Cook Inlet-Susitna region. All the gold from southwestern Alaska came from deposits on Kodiak Island that are mined only sporadically by simple hand methods by a few persons temporarily not otherwise employed. For all practical purposes it may be considered that no serious attempts to develop any of the potential placers of the region have been made, but that the amount of gold recovered by the desultory work done indicates that placer gold occurs there in quantities which would warrant a more thorough search for deposits that might be mined at a profit.

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 17 more or less distinct tracts that are here called

districts. It should be noted that the boundaries of these districts are by no means well defined and do not necessarily correspond with any of the legal subdivisions, such as 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 1938 had a gross value of $10,123,000, which is $1,922,000 more than in 1937, when the value was $8,201,000. This very large increase is not to be attributed to any specially favorable condition but is largely due to the coming into full production of several new enterprises that have been in the course of development during preceding years and to the more extensive utilization at many of the older properties of modernized mechanical equipment capable of handling larger volumes of placer material more effectively. It cannot be viewed as a mere temporary spurt resulting from some spectacularly rich finds but marks rather a rate that, under reasonably expectable conditions, can be maintained, if not bettered, in the next several years.

In the following table the districts are arranged in order of their placer production in 1938, and for comparison the production from the same districts in 1937 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, 1938 and 1937, by districts

District	1938	1937	District	1938	1937
Fairbanks and Richardson	$5,653,000	$4,891,000	Koyukuk	$59,000	$39,000
Circle	1,477,000	937,000	Chisana	29,000	30,000
Iditarod	741,000	694,000	Eagle	21,000	20,000
Innoko	629,000	565,000	Fort Gibbon	16,000	9,500
Hot Springs	372,000	205,000	Rampart	8,000	12,000
Ruby	302,000	259,000	Kantishna	4,000	8,000
Marshall	263,000	132,000	Chandalar	3,000	5,500
Tolovana	241,000	184,000			
Fortymile	234,000	166,000	Total	10,123,000	8,201,000
Bonnifield	71,000	44,000			

The foregoing table presents in condensed form a comprehensive summary of the general placer-mining situation in the Yukon region in 1938 as contrasted with that in 1937. From this table it will be readily evident that the value of the output in 1938 was more than $1,920,000 larger than in the earlier year. The contribution of the individual districts to the total for the region varied greatly between one and another and also in the amount that the same district produced in the different years. On the whole, however, the increase was distributed among all of the large producing districts, and the only decreases recorded occurred in the smaller producing districts. Only four districts showed a falling off in their placer-gold production, and the total amount of their decrease was less than $12,000. Information as to the principal happenings for the year in each of the districts is given in more detail in the following pages. The order in which the districts are taken up corresponds with the order given in the above table—namely, in the order of the value of the placer-gold production in 1938.

The indefinite tract of country adjacent to Fairbanks, here called the Fairbanks district, has long been and still is the main placer district in Alaska. In 1938 it afforded nearly 56 percent of the placer gold produced from the entire Yukon region and slightly more than three-eighths of the entire placer gold produced from Alaska mines in that year. This is an especially good showing, because in that district during the early part of the season there was less than the normal supply of water available for mining. Furthermore, several of the projects that are in the course of development have not yet reached the stage of making any returns in placer gold for the outlays of work and money that have been put into them. On all sides there was evidence of work in progress that was only preliminary to increasing the production another year. This is especially the situation with regard to the most extensive development in progress in the district which has already been vigorously under way for several years and will probably not come into production for still another year or so.

The greatest amount of gold from the district was produced by the Fairbanks Exploration Department with its six dredges on Goldstream, Pedro, Cleary, and Ester Creeks, and its scattered small hydraulic plants. Considerable placer gold was also recovered by several smaller companies using hydraulic, open-cut, and drift mining methods. Placer gold recovered by the smaller operators, using other methods than dredging, came principally from Goldstream and its tributaries, Gilmore, First Chance, Nugget, Eldorado, and Happy Creeks; from Chatanika River and its side streams or their tributaries, Dome, Vault, Cleary, Wolf, Kokomo, Faith, and Sour-

dough Creeks; from Chena River and its side streams or their tributaries, Fairbanks, Pearl, Fish, and Palmer Creeks; and from Caribou Creek, a tributary of Salcha River. There were also smaller camps in the valleys of a number of the other streams, whose production, though individually only a few hundred or a few thousand dollars, in the aggregate swelled considerably the total production for the district.

The extensive mining project being carried on by the Fairbanks Exploration Department, embracing large tracts on Goldstream, Cleary, and Ester Creeks, continued to be the outstanding placer-mining enterprise not only in the Fairbanks district but throughout the Territory. The placer work of this company in 1938 is divisible into several more or less separate enterprises that are closely knit together in their broader aspects. Three of these enterprises embrace the dredge mining in progress by three dredges on Goldstream and Pedro Creeks, two dredges on Cleary Creek and Chatanika River, and one dredge in the headwater of Ester Creek. The work on Goldstream and Cleary Creeks was essentially a continuation of the dredging that had been in progress on these streams for several years. Two modern dredges were engaged in this work on Goldstream, one on Pedro, which was new and built during the early part of the year, and two in the Cleary Creek area. At both of these projects water for mining was supplied mainly by a long ditch line that picked up its water far up the Chatanika River and led it by ditches, flumes, and gigantic siphons to the areas where it was put to work. The dredging on Ester Creek was essentially a continuation of the work that had been started in 1937 near the head of the creek and carried downstream as far as conditions permitted during that year. A fourth enterprise of major significance, though not yet yielding gold, was the continuation of the preparatory work that has been in progress for 4 years in removing the overburden and thawing the underlying gold-bearing gravels of an enormous tract on Cripple Creek near its junction with Ester Creek. This project has required the removal of several million cubic yards of non-gold-bearing material and the installation of the devices requisite for supplying and distributing an adequate supply of water for the various hydraulic processes and the disposal of the waste products thereby created. Water for most of this development work is pumped from Chena Slough to a nearby high ditch line by which and through accessory siphons the water is distributed to the different parts of the area as needed. The stripping part of this program has already been practically completed, and the thawing of part of the area to be mined is well advanced. There are many technical problems, however, to be solved as to the best way of mining the deposit, so elaborate tests

were made to obtain the facts on which to base a wise decision. The problem is a difficult one because of the great depth of some of the gravels and the heavy load of overburden that endangers the stability of the slopes of some of the prospective excavations. Some of the gravel to be mined is in excess of 110 feet in thickness and in part of this area lies beneath an overburden of as much as 140 feet. As part of the tests the company erected near Cripple Creek an enormous dragline machine capable of handling a 12-yard bucket and having a boom 115 feet long. This dragline was completed in time to be used for part of the season. No public announcement has yet been made as to the precise plan that will be adopted for mining this deposit, but it likely will involve some novel methods of stabilizing the banks of the proposed cuts, a combination of dredge and dragline operations for the excavation, and disposal of waste by various means including mechanical conveyors. It will still be a year or more before this plant begins productive mining. Two other somewhat comparable pieces of preparatory work, although on a much smaller scale, were also in progress by the company at the junction of Fish and Fairbanks Creeks, and on Little Eldorado Creek. During the year the company acquired the dredge and other property of the old Fish Creek Mining Co., and its work on Fish and Fairbanks Creeks unified all its holdings in that neighborhood and was bringing that whole tract into shape for mining as rapidly as practicable. It involved extensive stripping operations and a start on thawing the placer gravels. Essentially similar work was done on the company's recently acquired property on Little Eldorado.

In emphasizing the preparatory work that is in progress by the Fairbanks Exploration Department in the Cripple, Eldorado, and Fairbanks Creek areas it should not be overlooked that a similar type of preparatory work, though by no means on as gigantic a scale, is also in progress in the so-called producing areas on Goldstream and Cleary and upper Ester Creeks. It takes the company at least 3 years to prepare a tract for dredging, as the surface vegetation must be taken off, the overburden thawed and disposed of, and the frost in the gold-bearing gravel thoroughly removed before it can be excavated. All these processes are going on simultaneously in different parts of these so-called producing areas, as an integral part of the dredging project, and therefore they have not been counted separately in listing the major undertakings of the year by this company.

At several points in the Fairbanks district the company's holdings, either because of the isolation of the tracts or because they could not be reached handily by the dredges in their regular course, have been mined by small hydraulic plants. The principal operation of this

sort is that near the junction of Goldstream and Gilmore Creeks, where a combination scraper and hydraulicking plant was mining throughout most of the open season on old gravels on the right side of the valley too high above the general grade of the valley floor to be reached by the dredges that have mined in the neighborhood. The experimental drift mine, opened by the company in the flats of Chatanika River for the purpose of testing the practicability of sluicing gravels underground, was abandoned during the year. No specific statement was made as to whether the discontinuance of the project was due to technical difficulties encountered in carrying out the process, to the tenor of the ground not being satisfactory, or to a combination of these or other causes.

In addition to these various enterprises that are now yielding placer gold or have definite assurance of returning gold in the immediate future, the company does an immense amount of drilling each year to test areas whose prospective values have not yet been determined. Many of these tests are carried on in places far removed from the Fairbanks district. In that district the principal place where prospecting work of this sort was done by the company in 1938 in areas not immediately adjacent to its older properties was in the western part of the Goldstream valley in the vicinity of Sheep and Little Nugget Creeks.

In naming the creeks in the Fairbanks district from the valleys of which most of the placer gold came, it may not have been evident that in the main the greater number of these lie within a radius of 10 to 20 miles from Fairbanks. The occurrence of placers, however, is not restricted to this small tract, but actually they are much more widespread thoroughout the district, and some of the isolated mining camps might be treated as separate districts or areas if it were not for the fact that such treatment would not have effected any useful results, because, owing to the small number of operators in some of these camps, it would not have been permissible to record their production separately. How widely some of these outlying camps are scattered through the district may be learned from the following notes on some of those that are more than 20 miles from Fairbanks. On Kokomo Creek, a tributary of the Chatanika River, some 25 miles in an air line northeast of Fairbanks, the hydraulic plant of A. A. Zimmerman and another outfit belonging to the same operator on Sourdough Creek, some 50 miles northeast of Fairbanks, had a successful season. Three other camps in the latter neighborhood, but on Faith Creek, were mining throughout the open season. About 65 miles east of Fairbanks in the valley of Chena River, placer mining was in progress near the head of the main stream and on Shamrock and Palmer Creeks. On Caribou Creek, a tribu-

tary of Salcha River, some 55 miles east of Fairbanks, the Caribou Mining Co. had been reported to have planned the installation of a dredge during 1938. However, the desirability of further tests before carrying out that plan led to spending the season in drilling and preparatory work. The outcome of these tests is said to have confirmed the earlier tests and made the company more determined to go ahead with its dredging project as soon as practicable. Even in so remote a camp as the old Tenderfoot or Richardson area, which lies some 75 miles east of Fairbanks, some placer mining was in process, though according to reports it was on only a very small scale and yielded little more than an extremely modest grubstake.

The fact that the Circle district showed the greatest increase in both quantity and percent of placer-gold output of any of the districts in the Yukon region in 1937 did not prevent that district from improving on the high record of its production in that year by a still greater production in 1938. True, the district was outstripped in 1938 in the value of its total gain in production by the Fairbanks district, but it bettered its own record of 1937 by $540,000, or more than 50 percent, and maintained its position in second place among the districts of the Yukon region. This great increase was not brought about by any one single cause, nor does it mark a temporary condition not likely to be soon duplicated. Instead, it seems to mark only a normal rate that can be maintained or even bettered for some time, even with the equipment and developments that are already available in the district, without much new equipment or the discovery of new deposits. Considerably more than half of the output of placer gold from the Circle district in 1938 came from four dredges on Coal and Woodchopper Creeks, in the extreme northeastern part of the district near Yukon River, and on Deadwood and Mammoth Creeks in that part of the district near Mastodon Dome. Most of the dredges reported an especially satisfactory season in which there had been rather better than average working conditions. At the dredge of the Deadwood Mining Co. on lower Deadwood Creek some difficulties with frozen ground slowed down operations and resulted in lost time to repair breakage. Operators mining with other equipment than dredges were working on almost every creek in the district. Many of these had installed draglines, bulldozers, and other mechanized equipment by which they were able to handle large quantities of placer material efficiently. Some effective work was also done with hydraulic plants. Even many of the smaller camps using little mechanical equipment had good returns on their season's work, though they were among those who received the greatest set-back from the lack of water during

170611—39——4

the early part of the season. Shortage of water was not felt at most of the properties for more than a few weeks, as the dry spell broke in July, and during August most of the water supplies were at a stage that was better than normal. It is impracticable at this place to record all the creeks in the Circle district on which placer mining was in progress or to name the various operators. A rough estimate of the number of men employed in the mines of the district places the figure at about 400. The greatest production other than that from the dredges came from mines on Mastodon, Deadwood, Independence, Eagle, Ketchem, Portage, and Porcupine Creeks, with smaller amounts from Switch, Bottom Dollar, Half Dollar, and Harrison Creeks. Considerable drilling for prospecting tracts not now being mined in the Circle district was in progress, but the results of most of that work have not yet been made public.

Third place among the various placer districts of the Yukon region in 1938 continued to be held by the Iditarod district, which has yielded some $741,000 in gold as a result of the season's mining, or about $47,000 more than in 1937. A considerable part of this total came from the dredges of the North American Dredging Co. and J. E. Riley Investment Co., both of which were mining on Otter Creek not far from the town of Flat. Both of these dredges have been in service for a long time in this general area. In the early part of 1938 extensive repairs involving thorough reconditioning were made on the Riley Investment Co.'s dredge, and a new Diesel power plant was installed. These repairs delayed getting under way quite as early as usual and apparently caused a slight reduction in the amount of work the dredge accomplished during the season. Altogether between 300 and 350 men, including those employed by the dredging companies, were employed in the placer mines in the Iditarod district. Specific details regarding the work accomplished at many of the properties during the year have not been furnished the Geological Survey by the operators. It appears, however, that work was continued at most of the places where large camps had been established for some time. At most of these larger camps draglines, bulldozers, and other mechanical equipment enabled the miners to handle large amounts of placer material efficiently and economically. From general reports it was learned that climatic conditions that affect mining were especially favorable during 1938 in that the season opened early and throughout the greater part of the summer and fall the rainfall kept water supplies at or above normal stages. The early opening of the season enabled the miners to get in more than the customary number of days' work. In fact, at one of the mines on Otter Creek sluicing is reported to have been started by April 24, the earliest recorded date for starting this

sort of work in the history of the camp. As a result of this early start that outfit was able to get in a 175-day season before closing down for the winter. All the larger mines in the district are included within a radius of 6 to 8 miles of Flat, but some of the smaller one- and two-man camps are widely dispersed at various more remote points throughout the district. In addition to the productive work, search for new deposits was in progress by companies able to develop on a large scale any finds made. The most significant work of that sort which has been reported to the Geological Survey is the extensive drilling undertaken in the western part of the Otter Creek Valley under the management of the Strandbergs.

Reports from the Innoko district indicate that the output of placer gold from that district in 1938 was about $64,000 greater than in 1937 and that the miners feel well pleased with the showings made during the year. As usual, a large part of this gold recovered came from the four dredges that are mining in the district. Two of these were on Ganes Creek and one each on Yankee and Little Creeks. One of the dredges on Ganes Creek had only been acquired by its present owners, the Holky Dredging Co., late in the fall of 1937, and the ownership of the dredge on Yankee Creek passed to N. J. Vibe during the middle of the season of 1938. Possibly some of these changes in management may have called for delays while new operating procedure was formulated. Whether or not that may have been the cause, it is a fact that the production of the four dredges in 1938 was about $44,000 less than in 1937. A large amount of placer gold was recovered by dragline or power-scraper outfits, of which there were five in active operation in the district. These were in use by the following operators: the Cripple Creek Mining Co., on Cripple Creek, in the extreme northeastern part of the district; Vibe and Schwaesdall, on Spaulding Creek; Uotila and Hard, and Hard and Johnson, both situated near the head of Ophir Creek; and Three Miners, Inc., on Esperanto Creek and Keating Gulch, in the Tolstoi area. The last named is a new outfit shipped in and put into running condition during the year. It seems especially worthy of note because for a long time mining has been almost at a standstill in the Tolstoi area, and it is an extremely encouraging sign that a new organization is taking hold of its reopening with such success. In addition to these larger, more fully mechanized camps, there were several hydraulic outfits mining on a somewhat smaller scale but apparently having a highly successful season. There were also a number of very small camps using mainly hand methods and employing only one or two men each at widely scattered points throughout the entire district. In fact, it was apparent that mining and

prospecting was more active throughout the district in 1938 than it had been for several years immediately preceding.

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 area. This district, which held sixth place among the Yukon placer districts with reference to its placer production in 1937, advanced to fifth place in 1938, having produced about $167,000, or 80 percent more than in the earlier year. Much of this increase was brought about by the fact that the only dredge in the district was running in 1938, whereas it was idle in 1937. This, however, is only a part of the story because there were many changes in the rate of mining at the other properties, some of which offset each other and prevent any simple mathematical resolution of the sum into its component parts. The dredge mentioned was that of the American Creek Operating Co. on American Creek, in the extreme western part of the district. In the Tofty area the largest placer production, exclusive of that from the dredge, came from the properties of the Cleary Hill Mines, Inc., in the valley of Sullivan Creek, and of Adolph Bock, on Deep Creek. At the Cleary Hill claims mining is done with a dragline and bulldozer; at the Bock claims mining by drifting is the method used. Smaller production of placer gold was reported by other operators on Deep, Woodchopper, Boulder, and Cache Creeks and Miller Gulch in this area. In the Eureka area the largest production was reported by the Montana Mining Co., on Omega Creek, Brock and associates, on Pioneer Creek, and Johnson and Johnson, on Glen Gulch. Smaller producers were reported mining on Pioneer, Eureka, Rhode Island, and Cooney Creeks, on Gold Run, and at McCaskey and Shirley Bars. So far as known the Montana Mining Co. is the only one in the Eureka district mining with a dragline equipment. The rest of the operations are more or less evenly divided as to production between drift and hydraulic methods.

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 and including the settlement of Poorman and the various camps adjacent thereto. 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. The principal producing creek in the area near Long is Long Creek and its tributaries Flat and Greenstone Creeks. On tributaries to the Sulatna River, downstream from its junction with Long Creek

but within what may be considered the Long area, are placer camps on Spruce and Trail Creeks. According to local reports from the Ruby district, during the early part of the season the supply of water for mining was very deficient. In fact the storekeeper at Ruby is quoted as saying that the Yukon was 15 feet below its usual spring level, 30 feet below the comparable stage for 1937, and the lowest that he remembered in any of the 26 years since 1912, when stampeders built cabins on the river bar at Ruby. The largest producing company in the entire Ruby district is the Long Creek Mining Co., on Long Creek, some 20 miles south of the settlement of Ruby. This company has extensive equipment on the property and is operating with a dragline and two bulldozers. Of five other smaller outfits, mining by hydraulic methods or shoveling into the sluice boxes, three were on Long Creek proper and one each on Flat and Greenstone Creeks. For part of the season the claims on Greenstone Creek were being tested by the Long Creek Mining Co., but apparently the results did not prove attractive, and late in the season the options were allowed to lapse. On Trail Creek only a small production of placer gold is reported to have been taken out but apparently negotiations have been perfected whereby a dragline and other equipment is to be put on the ground next year and the property developed intensively. In the area adjacent to Poorman the principal producing creeks in the past have been the main Poorman Creek and its tributaries Duncan, Tenderfoot, and Timber Creeks, and somewhat farther downstream and to the west, Moose Creek, on which is the small settlement of Placerville. Many of the properties in the vicinity of Poorman are worked by drift methods during the winter and the resulting dumps sluiced during the succeeding summer. In 1938 there appear to have been four or five separate camps engaged in productive mining on Poorman Creek proper and one on Moose Creek, as well as smaller camps engaged mainly in prospecting on some of the other creeks. Little information as to the work in this area is available to the Geological Survey, and it is possible that some work was in progress on Solomon and Timber Creeks that did not come to the writer's attention.

An increase of nearly 100 percent over the previous year's production marked the production of placer gold from the Marshall district in 1938. This increase from $132,000 to $263,000 raised the Marshall district from ninth place in the list of districts in the Yukon region, rated on the basis of their current production in 1937, to seventh place in 1938. This makes the second successive approximate doubling of the production from this district, as in 1936 its placer gold production was only estimated to have been $72,000. 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 of relatively little placer mining or prospecting, activity was more or less localized at two points—one near Marshall and the other in the Stuyahok or Bonasila Valley. The greatest production in the immediate vicinity of the settlement of Marshall came from Willow and Wilson Creeks, 10 to 15 miles southeast of Marshall. The largest camp on Willow Creek was that of Johnson & Ostnes and on Wilson Creek that of the Wilson Creek Mining Co., A. S. Erickson, manager. The Erickson company, though long a producer in the Girdwood district of the Cook Inlet-Susitna region, was a new entry into this district. It mined with a dragline and elevated sluice boxes and employed an average of 13 men throughout the season. In the vicinity of Kako Creek, which joins the Yukon some 50 miles due east of Marshall, the Yukon Mining Co. was mining throughout 1938 on Bobtail Creek, a tributary that joins Kako Creek about 4 miles from the Yukon. This company, mining with a dragline and dumping into elevated sluice boxes, employed an average of 13 men. About 50 miles northeast of Marshall, but still in what is here considered within the Marshall district, in the valley of Flat Creek, a tributary of the Stuyahok River, itself a tributary of the Bonasila River, Vance Hitt and associates continued work on the property they had started to develop late in 1936. The mining is done with a dragline, and the enterprise has been so successful that the owners in 1938 added another larger dragline unit to the equipment. Some 23 men were employed on the property, and work did not close down until October 10.

The Tolovana district, as that name is used in this report, embraces a considerable tract of country lying north and northwest of Fairbanks. In it the greatest placer mining activity centers around the settlement of Livengood, which is about 80 miles by automobile road from Fairbanks. Reports indicate that during the early part of the season and even into August supplies of water for mining or even for domestic use were woefully deficient, but later the fall rains came, which at times and places were so heavy that some properties were handicapped by undesirably high water. In spite of these difficulties the district in 1938 produced about a third more placer gold than in 1937. The principal new item of mining interest in this district was the extensive development in progress on Livengood Creek by the Livengood Placers, which has acquired most of the claims near that stream. A large crew of men were putting up the necessary surface plant as well as doing the preparatory work for operating the property on a large scale. The plans for this future

mining work are said to contemplate the installation of a dredge and the driving of a long tunnel so as to divert water from the Hess Creek Valley and make it available on Livengood Creek. When this project is in full operation it will take in almost all the placer deposits in the valley of the main stream.

Mining on the tributaries of Livengood Creek and the Tolovana River will still continue to be in the hands of the smaller operators. All the important placer deposits on the side streams seem to occur in those valleys that radiate from a more or less common center near Amy Dome. These include Lillian, Gertrude, Ruth, and Amy Creeks, which flow into Livengood Creek, and Olive Creek, which flows directly into the Tolovana River. A lesser amount of placer gold comes from deposits near Wilbur Creek, a stream that is tributary to the Tolovana River from the south, not far from Livengood Creek. Producing placer camps were active on all these side streams during 1938. In the main these camps used hydraulic methods of mining, but several of them had added tractors and other mechanical devices to aid in the work either for handling tailings or other transportation work or for pumping, and at one property a dragline plant was in use. In former years much of the placer gold had been recovered by drifting methods, but in 1938, except at two camps on Livengood Creek, this method does not seem to have been used in the district.

In the Fortymile district the exceedingly good showing made in 1937 was considerably surpassed by the output of gold in 1938, when $234,000 was produced, as against $166,000 in the earlier year. By far the greater part of this production comes from the two dredges—those of the North American Mines, Inc., on Wade Creek and the Boundary Dredging Co. on Canyon Creek. The dredge on Canyon Creek was a new boat that was brought in and constructed during the year, so that it was not in operation for more than a part of the working season. The dredges of the Alaska Gold Dredging Co. on Mosquito Fork and of the Walker Fork Dredging Co. on Walker Fork that were mining in 1937 were idle in 1938. Both of these companies became involved in financial difficulties and their holdings were taken over by the Northern Commercial Co. in November and December 1938. While many of the other districts in the Yukon region were hampered by a deficient supply of water for mining in the early part of the season, many of the camps in the Fortymile district reported an undesirable oversupply. In fact, at times during June and July some of the valleys were flooded so that mining work was interrupted. In addition to the dredge production from Wade Creek, there were three or four other placer mines in operation on that creek. Other creeks on which considerable gold was recovered by hydraulicking or opencut methods

were Lost Chicken, Chicken, Myers Fork, and Dome Creeks, as well as a score of other creeks where one- and two-man camps made little more than modest grubstakes. The usual number of old-timers searched for gold at favorable localities along the bars of the Forty-mile River, especially during periods of low water.

The term "Bonnifield district" is applied in this report to a rather indefinite tract on the northern flanks of the Alaska Range lying between the Nenana River on the west and the Delta River on the east. Throughout much of the mining area the bedrock consists of highly metamorphosed schists cut by granitic intrusives. The camps in the district are widely scattered. The production in 1938 from this district showed an increase of somewhat more than 60 percent over that of the preceding year. The only large mine in the district is that of the Triple X Placers, on Moose Creek, a tributary of Nenana River, about 7 miles from the station of Ferry, on the Alaska Railroad. This property, under the management of E. W. Pringle, is being mined with a dragline dumping into a string of elevated sluice boxes. On an average 11 men were employed on the property. In addition to its regular mining work the company did considerable drilling to prospect the adjacent benches. In addition to this large camp, there was a smaller one on Moose Creek under the management of Z. P. Harris. Other producing camps in the district were situated on the Totatlanika River and Marguerite, Eva, and Portage Creeks. Portage Creek is a tributary of the West Fork of the Little Delta River. An item of considerable interest in the future development of the district is that late in the season an extensive tract on Rex Creek, a tributary of California Creek, was acquired by the Bartholomae Oil Corporation, which proposes to carry on the necessary development preparatory to getting the property into production as rapidly as practicable. Present plans contemplate that the mining will be done with a dragline outfit.

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 River-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. Much the larger part of the present placer production from the Koyukuk district now comes from the northern area. According to the United States Commissioner there were in this area more than a score of small camps working for at least part of the season. The largest of these camps employed only five men, and many

of them were merely lone operators who spent only part of their time mining. According to current reports during the early part of the season the supply of water for mining was deficient, and it was the middle of August before some of the camps were able to do much sluicing. Shortly afterwards high water ensued which flooded workings, destroyed ditches, and did other damage that for a time crippled mining. Among the outfits that have reported directly to the Geological Survey regarding their season's work the principal ones were working on streams tributary to the Middle Fork, including Slate Creek and its tributary, Myrtle Creek; Wiseman Creek and its tributaries Archibald and Nolan Creeks and Linda and Gold Creeks, as well as on several of the tributaries of the Bettles River, especially Wakeup Creek and Jim Pup. Two reports were also received regarding mining on Spring and Lake Creeks, tributaries of the Wild River, some 40 miles west of Wiseman, and a number of reports came from other small producers at points as remote as the Alatna River. Most of these camps are mining by simple hydraulic or hand methods, but reports indicate that a modern dragline plant will be installed on Myrtle Creek in 1939.

So far as the Geological Survey is informed no productive mining was in progress during 1938 in the Hogatza River area. Though direct information is lacking as to any mining in progress in the area including Hughes and the Indian River, it is understood that L. McGee and associates continued the development that has been in progress for the past 2 years on Utopia Creek, a small headwater tributary of Indian River. The placer ground being developed is about 15 miles due east of Hughes. It is understood that this property is being mined with a dragline and bulldozers.

The few reports of the season's activities in the Chisana district that have been received by the Geological Survey direct from the operators indicate that mining there was carried on during 1938 at very nearly the same rate as in the preceding year. As in the recent past, the principal camp in the district is that of the Nelson Mining Co. on Bonanza Creek, but there were smaller camps on that stream as well as on Little and Big Eldorado Creeks and Gold Run, a tributary of Glacier Creek. Probably not more than 20 men were mining in the district, and all of them used simple hydraulic or hand methods. As the district is one of the less accessible Alaska placer areas it attracts the casual seeker for gold less than many of the more easily reached parts of the Territory.

The placer gold production in the Eagle district for 1938, which came from essentially the same general area as in 1937, is estimated to have been worth $1,000 more than the production for the preceding year. No notable new events were reported. About a dozen

small camps were mining on different creeks in the district, but none of them employed more than five men and many of them consisted of a single operator. The largest enterprise was that under the management of Casper Ellingen, on Fourth of July Creek, which joins the Yukon some 30 miles northwest of Eagle. The second most productive area in the Eagle district was the valley of the Seventymile River, where there were a number of camps not only along the main river but also in the valleys of its tributary streams in Lucky Gulch and Fox, Crooked, Falls, Barney, and Alder Creeks. Smaller amounts of gold were recovered from placers in the valleys of American Creek and Discovery Fork.

North of the Yukon River, in a rather indefinite tract that extends some 30 miles both to the east and to the west of the settlement of Tanana, at the junction of the Tanana and Yukon Rivers, is a large area in which placer mining has been in progress from time to time at scattered camps. To avoid disclosing information regarding the individual producers in this area the entire tract is referred to here as the Fort Gibbon district, the name being taken from the old Army post that was long a familiar landmark near Tanana. Mining in this district in 1938 centered more or less closely around Grant Creek for that part of the district which lies west of Tanana and around Morelock Creek for that part of the district lying east of that settlement. The western area is often referred to as the Gold Hill area. In that area in 1938 the greatest productive work was at claims of Fisher & Fisher, which were being mined by a Diesel-powered dragline supplemented by hydraulic methods. The Diesel equipment was placed on the ground late in 1937, so that the current year was the first full season it has been in operation. In the area east of Tanana on Morelock Creek and its tributaries three or four small outfits were actively engaged during 1938 in simple open-cut mining.

Reports from the Rampart district indicate that placer mining there during 1938 was continued at a somewhat lesser rate but at about the same places as in the years immediately preceding. From the value of the total placer gold recovered from the mines of the district it is evident that at most of the camps the production had amounted to little more than exceedingly modest grubstakes. The largest amount of gold appears to have come from Minook Creek and its tributaries—Hunter, Little Minook, Hoosier, and Slate Creeks. Only about 20 persons are understood to have been mining in the district, and even the largest camps employed only a few men in addition to their owners. All the mines are being worked by simple hydraulicking or hand methods, and as yet no modern mechanized equipment has been introduced, though it is currently reported that plans are on foot for equipping one of the properties on Little

Minook with a modern dragline next year. Apparently the supply of water available for mining was deficient during the early part of the season but later somewhat more than made up for that shortage.

In the Kantishna district placer mining seems to have been carried on in 1938 at a rate much reduced from that of the years immediately preceding, but greatly increased production is likely to be shown as developments already in progress come to a producing stage. Among the places where placer mining or prospecting was in progress in 1938 may be mentioned camps on Moose Creek and its tributaries Eureka and Glen Creeks; in the valley of the Bearpaw River, on its tributary Caribou Creek, where two camps were located; and on Glacier Creek and its tributaries Twenty-two Gulch and Yellow Creek. On streams tributary to the Toklat River one small camp was prospecting on Crooked Creek. The large new project in contemplation is the reopening of an extensive tract on Caribou Creek by the Caribou Mines Co., under the direction of W. E. Dunkle. According to current reports dragline equipment will be freighted to the ground during the winter in preparation for an early start at mining in 1939.

In the past it has been the practice in these reports on the mineral industry of Alaska to include the production of the Chandalar district with that from the Koyukuk, because of the few operators in the Chandalar district. In recent years, however, placer production from this district increased to the point where that practice was no longer necessary. In 1938, however, mining activity in the district reached a point so low that return to the old methods was almost obligatory. As is evident from the total production for the year, only negligible amounts of placer gold are known to have come from the entire district. All the larger of the former mines, such as the property of the late A. L. Newton, on Big Creek, the drift mines of Manuel Mello, on Little Squaw Creek, and of Ellis Anderson, on Tobin Creek, reported that they were nonproducers in 1938. As a result the small amount of placer gold was essentially only that recovered in the course of prospecting by a mere handful of prospectors at widely separated points throughout the vast area included in this district.

KUSKOKWIM REGION

Included in the Kuskokwim region are four principal districts where gold placers were mined in 1938. For convenience of description they are here called the Mount McKinley, Georgetown, Tuluksak-Aniak, and Goodnews 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 dis-

trict 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 actually has closer affiliation with the Iditarod district, to which it has better transportation facilities than to many 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 district takes its name from Goodnews Bay, a small indentation of the coast on the east side of Kuskokwim Bay, about 125 miles in an air line south of Bethel.

The production of placer gold in the Kuskokwim region in 1938 is estimated at $803,000. This is $325,000, or 68 percent, more than the placer gold produced from the deposits in 1937. In view of the enormous area of the Kuskokwim region, the amount of the present production is extremely small, but when it is remembered that there are probably less than 150 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 so much. 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 in 1938, as in the past, there were three main areas in which placer mining was in progress. One of these is the Moore Creek area, which lies about 50 miles southwest of McGrath and is near the head of the Takotna River Valley. On Moore Creek the largest producing camp is that of the Moore Creek Mining Co. It is equipped with a dragline formerly used at a property on Slate Creek in the Iditarod district, and although details are lacking in the Geological Survey as to the results of the year's work, it appears that they were in line with those previously achieved by the company at this place and the production was at a comparable rate.

The second area in the Mount McKinley district includes Candle Creek, which is a tributary of the Takotna River lying just west of McGrath. There has long been a small amount of placer mining in the valley of Candle Creek, and at one time a small dredge was used for mining the deposits in the eastern part of this valley. In

1937 a new company, under the management of the Strandbergs, undertook the reopening of these deposits, using dragline equipment. This work was started so late and involved so much dead work that only a small part of that season was devoted to productive mining. The plant, however, was in good shape to take full advantage of the open season of 1938 and in that year turned in a record of large production. This company is mining almost alongside the old dredged area but is taking in a wider strip along the limits of the deposit. Some difficulty was experienced in the earlier part of the season owing to seasonal frost. A good deal of cinnabar is picked up in the concentrates from the sluice boxes, and in one of the pay-streaks the gold is in rather large pieces—chunks weighing as much as 1 or 2 ounces being not uncommon.

The third area in the Mount McKinley district lies east of McGrath and embraces the valleys of several small streams north of Medfra, including Hidden and Ruby Creeks and Holmes and Riddle Gulches. The information that has been received by the Geological Survey as to the mining in this area indicates that whereas all the operations are small they at least maintained or bettered their usual output. Less than a dozen men were employed on all the placer properties in the area north of Medfra.

Productive placer mining in the Georgetown district in 1938 appears to have been restricted to Donlin and Julian Creeks. Donlin Creek is a tributary of Crooked Creek, which joins the Kuskokwim a short distance downstream from Georgetown, and Julian Creek is a tributary of George River, which flows into the Kuskokwim immediately east of Georgetown. The mineralized areas on these streams lie only about 25 to 40 miles south and southeast 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 25 miles in an air line northwest and northeast of Georgetown, on the Kuskokwim. No details have been received by the Geological Survey as to the progress of the work in this district, but apparently the activity was on about the same scale as in 1937. It is understood that on Donlin Creek three or four small camps were mining but that on Julian Creek there was one rather large camp. South of Georgetown, in the valley of the Holitna River, repeated reports of finds of rich placer ground have frequently aroused a flurry of more than local interest. The remoteness of that area and the report that many of the deposits in the likely looking areas were too wet to be prospected by ordinary hand methods have discouraged adequate examination. It is reported, however, that during 1938 arrangements were entered into whereby in the coming season the Strandbergs propose to send

in to the area an adequate outfit to drill at some of the more promising places to determine the facts. That area has not been surveyed by the Geological Survey, so that any statement as to the likelihood of finding worth-while placer deposits in it must rest mainly on long-range speculation and conjecture. It seems likely, from what is known of the geologic character of adjacent areas, that whereas much of the bedrock in the region is sandstone and shale, there are parts of the country south of the Kuskokwim and including some of the valley of the Holitna River which contain intrusive rocks that may have induced mineralization. If this condition is found to obtain, it is likely that in the vicinity of the contacts with other rocks there are good places to prospect for stream concentrations that might yield workable placers.

In the Tuluksak-Aniak district the bulk of the placer gold produced in 1938 came from the property of the New York-Alaska Gold Dredging Corporation on Bear Creek, where two dredges were in operation during an especially long open season. In addition to its productive work the company carried on an extensive ditch-building program in connection with its proposed installation of a hydroelectric power plant in 1939. The power will be used mainly for the operation of the dredges and should materially reduce operating costs. At present fuel has to be transported to the mine from Bethel, on the Kuskokwim River. This involves a long circuitous route if the supplies are brought in by ordinary overland means or flying it in by plane if the more modern method of transportation is utilized. The latter method is the one that had proved most economical, but even by its use the cost of freight delivered from Bethel to the mine is about $40 a ton.

In addition to the dredging operations on Bear Creek there were several smaller mines in the general neighborhood. The largest of these seems to have been that of Alex Liska and associates on Granite Creek, a tributary of Tuluksak River from the north. Some 10 miles or so south of Bear Creek is Marvel Dome, a prominent landmark on the highland that forms the divide between the eastward-flowing streams that ultimately join the Aniak River and the westward-flowing streams that, like the Tuluksak, join the Kuskokwim not far from Akiak or Bethel. A number of the streams that flow outward from Marvel Dome have placer deposits in their valleys, and several small mining camps are busy on them each year. In 1938 the largest of these camps in the neighborhood of Marvel Dome was that of Kvamme & Co., under the management of Alfred Anderson, on Canyon Creek. Canyon Creek is a small tributary of the Kwethluk River, which joins the Kuskokwim a short distance west of the settlement of Akiak. Lease of the claims on Marvel Creek, formerly

mined by August Wilson and associates, was granted to the newly organized Marvel Creek Mining Co., which consists of Henry DuRand, Fritz Awe, Luther Hess, and associates, but the new organization did no productive mining on this ground in 1938. The company, however, did some preparatory work and acquired a dragline, tractor, bulldozer, and other equipment which were landed on the Kuskokwim at the mouth of the Aniak River before the season closed. It is expected that all the material will be hauled to the property during the winter and set up in time to take advantage of the full working season in 1939. Marvel Creek is a tributary of Salmon River, which flows northward and eastward into the Aniak River and that stream in turn joins the Kuskokwim about 75 miles in an air line northeast of Akiak. Several other small outfits of a few men each are reported to have been carrying on some mining in this same general area, but details regarding their work have not been furnished the Geological Survey, and apparently the total amount of gold they recovered was small.

Lately the interest of prospectors and miners in the Goodnews district of the Kuskokwim region has centered so closely on the search for and development of the platinum resources of the district that relatively little activity has been shown in hunting for or mining the gold deposits. The platinum deposits are described on pages 81–84 of this report. It will be noted in those descriptions that some gold is recovered in the course of the platinum mining, but it has in the past rarely formed as much as 1 percent of the noble metals recovered in the clean-up from these platinum placers, so that it has been worth not more than a few hundred dollars, even during the years of greatest platinum production. This condition will doubtless change as mining of the deposits of the Salmon River increases, for in these deposits the ratio of gold to platinum appears to be considerably higher. Perhaps the item of most general interest regarding placer gold mining in the Goodnews district in 1938 was the installation of a dredge on Wattamuse Creek by the Bristol Bay Mining Co. This dredge, which was shipped in by the first boat of the season, was hauled out to the mining site and erected as rapidly as conditions permitted, but it was after the middle of September before it was in running order. An unfortunate accident to the tumbler shaft, after a run of only little more than 2 weeks, necessitated discontinuance of its use during the rest of the season. Even in the short period it was running the dredge was able to make an exceedingly worthwhile recovery of gold. A little placer gold mining by ordinary hydraulicking and hand methods is said to have been done on Slate Creek, which is a tributary of Goodnews River. On streams tributary to Arolic River the greatest amount of placer gold is said to

have come from deposits on Kowkow Creek that were mined with dragline equipment. Other streams in this same watershed in whose valleys some placer gold was recovered were Butte Creek and Snow Gulch. Mining on Butte Creek was done under the management of John Huff, with a bulldozer, and that on Snow Gulch by Peter Mosness, using simple hydraulic methods.

Somewhat remote from the Goodnews district but closer to it than to any other mining area and served mainly from that district is the stretch of coast from the Togiak River to Cape Newenham. In 1937 reports of the finding of gold in workable amounts in some of the beach deposits northwest of Hagemeister Island and in the valley of the Slug River nearly started a mild stampede from Goodnews Bay into that area. The reports turned out to have been much more optimistic than the facts warranted, and in 1938, so far as the Geological Survey is informed, only prospecting work was in progress there, and it netted little more than such gold as was caught in the course of testing the various deposits.

SEWARD PENINSULA

The production of placer gold from Seward Peninsula in 1938, including the production from northwestern Alaska, is estimated at $3,487,000, or about $90,000 more than in 1937, itself a year of especially large production. This increase was especially unlooked for in view of the fact that much of the early part of the season was unusually dry, so that it was August before many of the properties had enough water for normal mining needs. The increase was therefore made in spite of drawbacks rather than through especially favorable conditions, and this portends well for the maintenance of the present rate of production for some time. In fact, to judge from the increased mining activity throughout the peninsula and the additional equipment being installed at many of the properties to replace the less effective and more costly manual labor that had hitherto been employed, it would seem entirely reasonable to expect that further increase in production is inevitable.

A large part of the gold recovered from Seward Peninsula placers is mined by dredges. In 1938 gold worth $2,792,000, or slightly more than 80 percent of the placer output of the peninsula and northwestern Alaska, was mined by 22 dredges, one or more of which was 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 72–77.

In the relative order of their output of placer gold in 1938, the mining districts of Seward Peninsula stood as follows: Nome, Kougarok, Fairhaven (including Candle, Inmachuk, and Bear Creek

areas), Council, Koyuk (including the areas adjacent to and east of the head of Norton Sound), Port Clarence, Solomon (including the Casadepaga River area), and Bluff. 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 estimates of 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 large company that is operating three dredges in the valley of the Snake River and tributaries near Nome and that has extensive ditches, some of which are more than 20 miles long, and other equipment for properly conducting its work. This work was done by the United States Smelting, Refining & Mining Co., Nome Department. Some notes on the operation of these dredges are given on page 74. The work of this company involves the dredging of extensive tracts of the coastal plain adjacent to Nome in which ancient beaches occur at intervals inland from the present beach to the foot of the rocky hills that rise steeply some 3 miles or more from the shores of Norton Sound. Much of the area to be mined is permanently frozen, so that considerable preparatory work has to be done in stripping and thawing it before it can be successfully mined by the company's dredges. The various steps must therefore all be carefully planned and coordinated so that they progress in orderly fashion without interference and at all times provide sufficient ground ahead of the dredges for uninterrupted work. Power for the operation of the dredges as well as for the many other purposes for which it is needed is provided by the generation of electricity at a central plant through the use of fuel oil that is shipped in by tankers from the States. The large amounts of water used in the thawing operations as well as for other purposes are mainly supplied by long ditches, some of which have their intake far up in the hills to the north of Nome. These supplies, however, are supplemented by power pumps utilizing nearer sources of water. The high engineering efficiency and smooth running of this complex undertaking give abundant proof of the efficiency of the staff who outlined the plans and of the personnel who are so ably carrying them out. Approximately 250 men were employed in various phases of the company's work.

Four other dredging companies were operating the Nome district in the season of 1938—the Alaska Sunset Mines Co., on Sunset Creek; the Dry Creek Dredging Co., on Dry Creek; the Casa De Paga Gold Co., on Monument Creek, a tributary of Snake River; and the Osborne Creek Dredging Co., near the junction of St. Michael and Osborne Creeks. The Sunset dredge was mining in the coastal plain

area some 7 miles west of Nome. Work at this place was considerably hampered by the shortage of water during the early part of the season and was compelled to discontinue mining entirely for a period of several weeks. The Dry Creek dredge was mining for most of the season on its property in the coastal plain area, slightly northeast of Nome, on about the same scale as that followed during recent years. The property of the Osborne Creek Dredging Co. is on Osborne Creek some 12 miles northeast of Nome. Although no company of this name has recently been mining in this area the new name merely reflects a change in ownership of the dredge that was formerly operated under the management of the Greenstone Mines, Inc. The new owners spent much of the season in renovations and in getting the property in shape for more active mining next season. In the course of this work it was necessary for the dredge to rehandle a large amount of tailings produced in the course of former mining.

In addition to the dredges there were a number of open-cut and hydraulic mines on many of the creeks in the Nome district. No exact count was obtained as to the number of these properties, but apparently within a radius of 20 miles or so of Nome there were at least a score that were active during the season. Some of these, it is true, consisted of only a single miner or a miner and his partner, and many of them were mining during only part of the season and their output was but a modest grubstake. In the aggregate, however, these smaller mines produced more gold than some of the dredges. Although the lack of water during the early part of the season caused some curtailment in the usual amount of employment offered in the Nome district, it does not seem to have worked serious hardship, because many utilized the enforced lay-off to undertake some prospecting of their own, and as a result there was more work of that sort done during 1938 than in any other recent year.

From being one of the smaller producing placer districts in Seward Peninsula the Kougarok has recently been increasing its output until lately it ranked second only to Nome in the value of gold recovered from its mines. Some of this growth must be attributed to the excellent showing of the two dredging companies that are now mining in the district. These are the Fox Bar Dredging Co., near the southern part of the Kougarok Valley and the Kougarok Consolidated Placers, Inc., whose ground is near the head of the valley. Both companies set a high record for accomplishment during 1938 and gave every indication that another year they could maintain or even better the pace they had set. It would be incorrect, however, to attribute the great increase in production of the Kougarok district to the dredges alone, because there was an even greater increase in the amount of gold produced by camps using other mining methods.

These other camps were widely scattered throughout the district from the southern part near Coffee Dome to Macklin Creek near the head of the Kougarok River, or even beyond the valley of the Kougarok River, on Dick Creek, a headwater tributary of the Serpentine River, and to the east into the valley of the Noxapaga. A few small camps operating by simple hydraulicking and hand methods are still mining in the district, but in general throughout the district well-equipped plants using modern up-to-date machinery are becoming common, and easy access to the district is being supplied, often several times a day, by plane service from Nome. At least 25 separate camps were established in the different parts of the district, employing probably upwards of 150 miners. Most of the operations are based not so much on the discovery of new bodies of placer ground as on handling more effectively the deposits that were not attractive to the pioneers with their inability to procure adequate supplies of water or to handle large yardages of material expeditiously and cheaply. The work on the placers in several of the streams that are tributary to the Noxapaga River is of rather a different type because many of the deposits now being worked mark real discoveries in areas where pay gravel had not hitherto been found. Some of these deposits, like those on Black, Buzzard, and Turner Gulches, are turning out to repay handsomely the operators who with a bulldozer tear off the tundra covering and with a small gasoline pump supply the necessary water for sluicing. The success of several of these enterprises should encourage the search farther afield for other deposits of like character.

South of what is locally known as the Kougarok district, but included in that district for statistical purposes in this report, in the vicinity of Iron Creek some hydraulic mining is reported to have been done during the year. According to the reports furnished the Geological Survey, the largest productive work was done by small camps on Benson Creek and on Iron Creek proper. The entire production of gold from the Iron Creek area, however, so far as known, was so small that it amounted to little more than wages for the few men concerned. Some testing of ground in the vicinity of Sherrette Creek, west of Iron Creek, and in the valley of American Creek is said to have disclosed placer material carrying sufficient gold to have induced a new company to go ahead with plans for putting a dredge on the property in 1939. This is among the least prospected areas in Seward Peninsula, and development there will therefore be watched with special interest.

The placer gold mined in the Fairhaven district comes from three main tracts—near Candle, the Inmachuk River, and Bear Creek. Altogether more than 200 men were employed on different mining

properties in this district in 1938. Candle Creek is a large tributary of the Kiwalik River from the west, close to the town of Candle. The principal mining operation in this part of the district is that of the Arctic Circle Exploration, Inc. This company has control of extensive tracts along Candle Creek, which include not only the lowlands along the creek but also bench gravel high on the valley slopes. The different types of deposits necessarily must be mined by different methods, so that both dredging and hydraulicking are resorted to, and an extensive mechanical equipment is utilized. For the part that can be dredged two dredges were used. The older of these was mining on claims Nos. 4 and 5 below, on Candle Creek, not far from the settlement of Candle, and the newer dredge, which was built in 1937, was on claim No. 17, farther up Candle Creek. Both dredges were somewhat handicapped during the early part of the season by being delayed while the ground ahead of them was being thawed. After this condition had been taken care of the dredges appear to have had an especially good season. In addition to production from its dredges, the company derives nearly a quarter of its output of placer gold from ground that is mined by hydraulicking and by the use of dragline and tractors. Most of the placer that is mined by the company by methods other than dredging is bench ground on the western slopes of Candle Creek.

A few small one- and two-man camps were also established on creeks adjacent to Candle. Of these may be mentioned those on Jump and Patterson Creeks. Farther south of Candle on Quartz Creek, which joins the Kiwalik River from the east, 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. According to reports, the miners on Quartz Creek had an especially good season in spite of deficient supplies of water during the early part of the season. A little prospecting was also reported to have been done on the Kugruk River southwest of Candle.

In the Inmachuk Valley, which lies some 30 to 40 miles west of Candle, one of the principal producers was the Forsgren Dredging Co., which is mining with a small dredge some distance southwest of the settlement of Deering. The production of placer gold by the dredge indicates that the company had an especially good season, though details as to the specific accomplishments are not available to the Geological Survey. During 1938 most of the work of the dredge was on the ground near the mouth of the Pinnell River. Several small hydraulic or open-cut plants were established at other points in the valleys of the main stream or of its tributaries. The largest of these was that of David Hoogendorn on Discovery Gulch, which employed five men for hydraulicking. Negotiations were

completed during the year for Belleview and associates of the Dry Creek Dredging Co., at Nome, to put a dredge on the southern part of the tract formerly held by the Cordovado Mining Co. on the Pinnell River. There is every reason to believe that this project will be carried through, and if this is done the long experience of its backers in dredging under the conditions that prevail in Seward Peninsula guarantees competent and skillful handling of the enterprise.

The third tract in which placers were mined in the Fairhaven district includes Bear Creek and adjacent areas on the eastern flank of hills that form the divide between the Buckland and Kiwalik Rivers. No reports as to recent mining developments in this area have been received by the Geological Survey, and it seems probable from their absence that the activity in the area was less than in 1937 and that presumably the production from it was also less. Even during the periods when the area is fairly active there are rarely more than three or four camps mining in it, and their gross production is usually valued at only a few thousand dollars.

The records received by the Geological Survey from the Council district in 1938 indicate that it was fourth among the districts of Seward Peninsula in point of its placer production and that it had somewhat increased the amount of placer gold that came from its mines. As usual by far the greater part of the production came from the four dredges that were active in the district. These were the property of the Council Dredging Co. and the North Star Dredging Co., both of which were mining in the flood-plain deposits of the Niukluk River at and above the valley of Ophir Creek; the Glass Dredging Co., on Melsing Creek; and the Inland Dredging Co., on Aggie Creek, a tributary of Fish River. The first three of these dredges were mining at essentially the same places as in previous years. Unfortunately, at the North Star dredge much of the season was lost owing to breakage and the resulting delays for repairs. The dredge of the Inland Dredging Co. was formerly mining on Spruce Creek in the Solomon district and had been dismantled and transported to its new site during the winter of 1937–38. Much of the open season of 1938 was lost from productive mining because of the time spent in rebuilding the dredge and doing the necessary preliminary work for its operation. The open season was largely past by the time all of this dead work was accomplished. The site at which the dredge was erected is near the mouth of Aggie Creek not far from its junction with the Fish River, which in this part of its course flows through a constricted, rather canyonlike valley. The deposits, which back up into Aggie Creek, contain many large boulders that are difficult to handle and that slow down

the dredging operations. Plans were also under way by the Council Dredging Co. to rehabilitate one of the other dredges that was formerly operating in the district. This work will not be carried out until the season of 1939. The site selected is in the lowlands of Niukluk River, near the mouth of Camp Creek some 12 miles northwest of the settlement of Council. In addition to these larger mining camps, several small camps employing simple hydraulic or hand methods were active at widely separate points throughout the district. Some of the smallest of these camps were little more than prospecting ventures and yielded only the small amount of placer gold that was afforded by panning or rocker tests.

The Koyuk district, as that term is used in this report, embraces all of southeastern Seward Peninsula as well as the adjacent region forming the country immediately east of Norton Bay. In this large tract are two more or less definite centers around which the present placer mines are situated. The northern of these has for its focus the settlement of Haycock, on Dime Creek. The southern may be briefly referred to as the Ungalik area. The placer production from the Koyuk district in 1938 showed an enormous increase over that of the preceding year. This was brought about largely by the successful completion of a new dredge on Ungalik River and the reerection of an old dredge that had been moved into the Ungalik area during the year, as well as the continued operation of the dredge that has long been mining in the vicinity of Haycock. The new dredge is that of the Ungalik Syndicate, under the management of T. W. Streeter. It has 3½-foot buckets and was erected in the flats of Ungalik River immediately at the mouth of Bonanza Creek. Remarkably quick time was made in getting the dredge built as the materials for it were not landed on the sea coast until July and were then hauled over the hill to the camp site. Yet the dredge was mining before the middle of August, and by August 24, when the Geological Survey representative visited the property, had made its first clean-up. The other dredge in the Ungalik area was that of Frank Shaw and associates. A new hull had been built, but the machinery and equipment were from the old Albion Creek dredge that formerly was mined on Ophir Creek in the Council district. Construction was not completed until nearly the first of September, and the necessary dead work that had to be done did not leave much time for productive mining before the season closed. Dredging by the Dime Creek Dredging Co. was at about the same place in the area north of Haycock as for several years past. Almost all of the placer mining in the Koyuk district that was done by methods other than dredging was in the Haycock area. Altogether in this part of the district there were, in addition to the dredge, three drift mines oper-

ated during the winter and several open-cut mines that were worked during the summer. The total number of men employed in productive mining was between 30 and 35. All the drift mines and most of the open-cut mines were on Dime Creek, but two open-cut mines were on Sweepstake Creek, a few miles to the west.

The production from mines in the Port Clarence district of Seward Peninsula was nearly three times as great as in the preceding year. This increase is attributable principally to the fact that the dredge of the Bartholomae Oil Corporation on Gold Run, which was running on a much reduced schedule in 1937, was in operation throughout the open months of 1938 and had an especially successful season. Ordinarily no thawing is done in advance of the dredge, but in 1938, in order to avoid losing time waiting for seasonal frost to disappear from some of the area, a small amount of cold-water thawing was done at the point that juts out into the valley floor. By far the greater part of the gold recovered by the dredge is chunky, even if it is in small pieces, and several nuggets weighing as much as an ounce or more were picked up in each clean-up. Many large boulders and blocks of greenstone occur in the deposits being mined by the dredge. Although a bulldozer and a small force of men are constantly busy removing as many of these as practicable from the river bed just ahead of the dredge, some of the larger ones that occur in the inaccessible parts of the deposit must be avoided in dredging even though rich concentrations of gold occur frequently in the lee of such obstructions. A second dredge, that of N. B. Tweet & Sons, was also mining in the Port Clarence district. This dredge was on Dese Creek, some 6 to 8 miles east of the settlement of Teller, and is readily reached from that town by means of an excellent automobile road. This small dredge experienced considerable loss of productive mining time owing to unfortunate breakdowns and to necessary thawing operations. A few small open-cut and hydraulic mines are also in operation in the district for part of the season. The largest of these appear to have been that of Martinson and associates near the head of Gold Run and camps on Offield and Sunset Creeks.

In the Solomon district by far the greater part of the placer gold produced in 1938 came from the dredge of the Lee Bros. on the Solomon River, some 6 to 8 miles above the mouth of that stream. At this place a well-equipped surface plant, with all modern conveniences including an air field, has been established. The dredge is one that has long been used on the Solomon River but has been modernized and well-equipped by its present owners so that it has made an especially good showing. So successful has been this enterprise in the last two seasons that the company has enlarged its hold-

ings on the Solomon River and recently acquired extensive tracts on Shovel Creek, a nearby tributary of the Solomon River. The operators plan to put another dredge on their property next season. Probably this will be a new dredge, which will be shipped in from outside Alaska as early in the spring as practicable and erected in time to accomplish some productive work before cold weather causes a suspension of mining. The dredge formerly active in the Casadepaga area to the north of the Solomon River Valley was moved from that site during the winter of 1937-38 and rebuilt at a new site west of Nome. This is the dredge referred to on page 63 as operating under the name of the Casa De Paga Gold Co. Some open-cut mining by small outfits was also in progress in various parts of the valleys of these two main streams. None of them, however, employed more than two or three men, and many of them were mere individual workers. The aggregate production from all this simpler type of mining probably did not exceed a few thousand dollars, and few of the miners made more than a modest grubstake.

For several years the area near Bluff has been a large producer of placer gold, mainly through the work of the unique scraper plant installed by J. J. Sullivan near the mouth of Daniels Creek. The notable feature of this plant is that it is essentially a scraper outfit set up on the sea ice off the coast in the winter. The scraper operates through a trench kept open in the ice to excavate the placer material on the sea floor and bring it inland, where it is heaped into a stock pile that is sluiced up during the summer, after the offshore work has had to be discontinued owing to the sea ice having moved away. No specific report as to the operations of this company during the winter of 1937–38 has been received by the Geological Survey, but it is understood that it was not in operation during that period. There were, however, a few small one- or two-man camps using simple hydraulic or hand methods of mining on several of the creeks in the Bluff district, but apparently the results of their work was the production of only a small amount of placer gold.

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 1938. In this valley there are two principal areas where placer mining is being done. The western area is near Kiana, and the principal placer tract is in the valley of the Squirrel River and especially in the valley of its tributary, Klery Creek. The eastern area is in the vicinity of Shungnak, a small settlement about midway between the head and mouth of the Kobuk River. Kiana is about 50 miles in an air line above the mouth of the Kobuk, and Shungnak is about 90 to 100 miles in an air line east of Kiana. Both of these tracts are so re-

mote 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.

So large a part of the production of placer gold from northwestern Alaska came from one mine that it has not been considered desirable to list the report from the region separately, as to do so would divulge the individual output. As a consequence, the production of placer gold for northwestern Alaska has been consolidated with that from Seward Peninsula in the table on page 36.

In the Kiana area the principal operator is the Klery Placers, Inc., which has extensive property holdings and a well-equipped modern dragline mining plant. This company reports that during 1938 it devoted its efforts largely to the installation of a hydraulic plant and the building of surface facilities for an enlarged program of mining in 1939. The hydraulic plant called for the installation of a ditch system about 2 miles long, capable of delivering 3,000 miner's inches of water with a head of 210 feet. This water will be distributed to supply three giants. Among the accessory betterments made during the season may be mentioned the completion of a more adequate airfield to serve the mine and the graveling and extending of the roads around the camp and to the boat landing. Owing to the amount of construction work in progress the company accomplished far less productive work than it customarily does. This falling off, however, is obviously only a temporary condition that will give place another year to a marked increase.

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 the gold is rough and shows little evidence of having been transported far. This conclusion is further supported by the occurrence of many quartz veins carrying free gold in the metamorphic rocks that form the hills in which these streams rise or which they traverse. In 1938 seven or eight small camps, some of which accomplished little more than panning tests, employed a total of about 12 to 15 men, some of whom were natives, on streams in the vicinity of Shungnak—4 on Dahl Creek, 2 on the Shungnak River, and 1 each on Boulder, Riley, and Lynx Creeks. Lynx, 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. One man was prospecting on Agnes Creek, a tributary of the Ambler River northwest of Shungnak, but no details as to the results of that work have been received.

DREDGING[*]

About 66 percent of all the placer gold produced in Alaska in 1938 was mined by dredges. The total value of the gold thus recoverd was $9,845,400, of which the greater part came from 19 dredges in the Yukon region and the rest from 22 dredges in Seward Peninsula and 3 in the Kuskokwim region. This total, which is a little more than 12½ percent greater than the value of the gold recovered by dredges in 1937, represents increases of about $1,100,000 in value and nearly 31,500 fine ounces in quantity. The accompanying table gives the value of the gold output and the yardage handled by Alaska dredges from the earliest year for which records are available to the end of 1938.

Gold produced by dredge mining in Alaska, 1903–38

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	1,760,000	77
1920	22	1,129,932	1,633,861	69
1921	24	1,582,520	2,799,519	57
1922	23	1,767,753	3,186,343	55
1923	25	1,848,596	4,645,053	40
1924	27	1,563,361	4,342,667	36
1925	27	1,572,312	3,144,624	50
1926	32	2,291,000	5,730,000	40
1927	28	1,740,000	6,084,000	29
1928	27	2,185,000	6,371,000	34
1929	30	2,932,000	8,709,000	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
1935	37	7,701,000	12,930,000	59.6
1936	39	8,905,000	14,632,000	60.9
1937	41	8,743,000	16,684,000	52.4
1938	44	9,845,400	20,052,000	49.1
Total		97,021,400	172,559,000	49

The total value of the gold produced by dredges since 1903 is more than 29 percent of the total value of gold produced from all kinds of placer mining since 1880, and in some of the recent years the value of the gold recovered by dredging has been as high as 80 percent of the total placer production. In 1938 the percentage of gold recovered by dredging, as already stated, was only 66 percent in comparison with 69 percent for 1937. This by no means indicates that dredging is on the wane, because the value of the gold recovered by this type of mining in 1938 was far above that in 1937. The explanation lies in the fact that the other types of mining are greatly on the increase.

[*] Records regarding the dredge operating in 1938 in the Kuskokwim region to mine principally the placer platinum deposits are not included in any of the statements given in this section of the report.

The extensive use of relatively mobile lower priced mechanized equipment, such as dragline scrapers and bulldozers, is obviously far more expedient at many of the placer properties suitable for such kinds of equipment than the installation of dredges, which cost more initially and therefore require a longer assured life of the property on which they are to be used, especially if the physical characters of the deposits do not lend themselves well to dredge mining. It seems certain, however, that whether or not the percentage of gold recovered by dredges increases or decreases with respect to the total output of placer gold, there will be in the near future little diminution in the quantity of gold that annually comes from this type of mining. Indeed, all signs seem to indicate that for a number of years an increase in the quantity of gold recovered by dredging is to be expected.

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 $9,117,524 in gold, or somewhat more than 92½ percent of the total mined by dredges, report that that amount came from 18,571,609 yards of gravel. The average yield thus shown is about 49.1 cents in gold to the cubic yard. By applying this average to determine the unreported yardage a total of approximately 20,052,000 cubic yards is obtained, 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 14 years, so that the quantities and values given for 1938 were computed on the same basis as those reported for the recent preceding years. In comparing the actual values, however, attention should be called to the fact that, as in all the tables in this volume, the price of gold prior to 1934 has been computed at the recognized official figure of $20.67 an ounce, whereas after 1933 a price of $35 an ounce has been adopted. If the production of gold from dredges in 1938 had been computed at the old standard price the average value per cubic yard would have been practically 29 cents a yard or essentially the same as that for 1927, the lowest that heretofore had been recorded since dredging began in the Territory.

The length of time that the different dredge companies operated varied widely. The longest season reported for 1938 was 279 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 1938 but marks also an all-time record for Alaska; as the longest season hitherto reported was 275 days, in 1934, which was also set by the Fairbanks Exploration Department. The longest season reported for any of the Seward Peninsula dredge companies in 1938 was 176 days for the United States Smelting, Refining & Mining Co., Nome Department, operating in the Nome district. The earliest date for beginning work in the spring of 1938 and the latest date for ending work in the fall were reported by the Fairbanks Exploration Department, which began mining March 10 and did not stop its last dredge until December 13. The earliest and latest dates in 1938 on Seward Peninsula were May 23 and November 14, both reported by the Nome Department. It may be of interest to note that the dredge in the Goodnews district, engaged in mining placer platinum deposits, started dredging on May 1 and shut down November 12, thus having had a working season of 196 days. The average length of the season in 1938 of the 24 companies who reported dates of beginning and ending work, irrespective of how many dredges they operated, was 132 days. Obviously the shortness of this average season, as compared with the record of 279 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 fact that is demonstrated by these dredging records is that at practically any of the productive placer camps throughout 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 considerably extended 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 1938:

Yukon region:	
Circle district:	
Gold Placers, Inc	Coal Creek.
Alluvial Golds, Inc	Woodchopper Creek.
C. J. Berry Dredging Co	Mammoth Creek.
Deadwood Mining Co	Deadwood Creek.
Fairbanks district:	
United States Smelting, Refining & Mining Co., Fairbanks Exploration Department (6)	Goldstream, Cleary, Ester, and Pedro Creeks.

Yukon region—Continued.	
Fortymile district:	
North American Mines, Inc	Wade Creek.
Boundary Dredging Co	Canyon Creek.
Hot Springs district:	
American Creek Operating Co	American Creek.
Iditarod district:	
North American Dredging Co	Otter Creek.
J. E. Riley Investment Co	Do.
Innoko district:	
Waino F. Puntila	Little Creek.
Savage & Matheson	Ganes Creek.
Holky Dredging Co	Do.
N. J. Vibe (formerly Felder & Gale)	Yankee Creek.
Kuskokwim region:	
Tuluksak-Aniak district:	
New York-Alaska Gold Dredging Corporation (2)	Bear Creek.
Goodnews district:	
Bristol Bay Mining Co	Wattamuse Creek.
Seward Peninsula region:	
Council district:	
North Star Dredging Co	Ophir Creek.
Council Dredging Co	Niukluk River.
Inland Dredging Co	Mouth of Aggie Creek.
Glass Dredging Co	Melsing Creek.
Fairhaven district:	
Arctic Circle Exploration Co. (2)	Candle Creek.
Forsgren Dredging Co	Inmachuk River.
Kougarok district:	
Fox Bar Dredging Co	Kougarok River.
Kougarok Consolidated Placers, Inc	Do.
Koyuk district:	
Dime Creek Dredging Co	Dime Creek.
Ungalik Syndicate	Ungalik River and Bonanza Creek.
Shaw & Cook	Ungalik River.
Nome district:	
United States Smelting, Refining & Mining Co., Nome Department (3)	Snake River area.
Dry Creek Dredging Co	Dry Creek.
Alaska Sunset Mines Co	Sunset Creek.
Osborne Dredging Co	Osborne Creek.
Casa De Paga Gold Co	Monument Creek.
Port Clarence district:	
N. B. Tweet & Sons	Dese Creek.
Bartholomae Oil Corporation	Gold Run.
Solomon district:	
Lee Bros. Dredging Co	Solomon River.

The dredges that were active in 1937 but not in 1938 were those of the Walker Fork Gold Corporation, on Walker Fork, and the Alaska Gold Dredging Co., on Mosquito Fork, in the Fortymile district, Yukon region; the Ophir Gold Dredging Co., on Ophir

Creek, in the Council district; and the Spruce Creek Dredging Co., on Spruce Creek, in the Solomon district, Seward Peninsula region. The Casa Dé Paga Gold Co., which in 1937 operated on Casadepaga River, was moved to Monument Creek, in the Nome district, where it dredged in 1938.

Seven dredges that were not in operation in 1937 were mining in 1938; in the Yukon region, one dredge of the United States Smelting, Refining & Mining Co., Fairbanks Exploration Department, on Pedro Creek, in the Fairbanks district, the Boundary Dredging Co., on Canyon Creek, in the Fortymile district, and the American Creek Operating Co., in the Hot Springs district; in the Kuskokwim region, the Bristol Bay Mining Co., on Wattamuse Creek, in the Goodnews district; and in Seward Peninsula, the Inland Dredging Co., at the mouth of Aggie Creek, in the Council district, and the Ungalik Syndicate, on Ungalik River and Bonanza Creek, and Shaw & Cook, on Ungalik River, in the Norton Sound area. Of these dredges that were operating in 1938 and not in 1937, four were newly constructed, one was idle only during 1937, and two were old dredges that had been acquired by new organizations, moved to new locations, and rebuilt and otherwise reconditioned.

So far as the Geological Survey is informed, no new dredges were in actual process of construction on the ground that were not completed and in operation before the close of the year. Many projects involving the construction of new dredges or the removal of old dredges to new sites were in contemplation, and some of these have been mentioned in preceding pages of this report. Doubtless some of them may have reached the "blueprint" or "shop construction" stage; but as they did not affect the mineral output of the Territory in 1938, they may be dismissed without further mention here.

Much of the placer ground at practically all the places where gold 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 stops 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 operations, 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. As a result of this continuing high cost of maintenance, many of the camps where transportation is not too difficult are turning to or considering the practicability of obtaining the necessary water by means of pumps. Supplying large quantities of water by pumping is already in successful operation at the large mines in the Fairbanks district, and the procedure is by no means uncommon at small mines in many other parts in the Territory.

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 almost 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 undertaking some of the projects or investing in them. The amount of money needed to finance the building of even a small dredge and furnish the necessary equipment is so great that the cost of a thorough 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. Obviously, for the preparation of a reliable report, considerable prospecting and testing of the ground must be done to determine the quantity and tenor of the materials to be handled. Necessarily, these examinations are costly, and the penny-wise or get-rich-quick investor may regard them as items on which to economize. Adoption of such a policy almost inevitably in the long run leads to unnecessary loss, and adequate prospecting in advance well repays the outlay; because, in addition to preventing unwise commitments, it enables the competent manager to effect savings throughout the life of the project by wise planning in advance.

SILVER

None of the materials that are now being 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 or byproduct in ores whose principal value lies in some other metal. As is evident from the following table, nearly 70 percent of the silver that has been produced from Alaska in the past has been

derived from 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 it is seldom 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. For 1938 it is estimated that 245,000 ounces of silver was derived from the copper ores and was recovered in the course of treatment at smelters in the States.

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 121,473 fine ounces of silver in 1938, 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 2,478,928 tons of rock that was fine-milled—in other words, the quantity of silver recovered was only little more than 0.049 ounce to the ton. The silver from all the gold-lode mines amounted to 156,300 ounces and was worth $101,000. Some silver is also contained in all the gold that is recovered from Alaska placer mines. This silver is not recognizable in the crude gold dust or nuggets received from these mines, 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 73,640 ounces, worth $47,600.

Data regarding the production of silver have been referred to in several places in the preceding pages and included in some of the tables that cover the production of other metals. For convenience the sources, quantity, and value of the production from each source in 1938 as well as for the earlier years are set forth in the following table:

Silver produced in Alaska, 1880–1938, 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
1935	286,600	206,000	134,400	96,600	106,600	76,600	45,600	32,800
1936	475,700	369,000	304,600	236,000	119,800	93,000	51,300	40,000
1937	495,000	384,000	285,000	221,000	156,000	121,000	54,000	42,000
1938	474,940	307,000	245,000	158,400	156,300	101,000	73,640	47,600
Total	18,930,331	13,483,937	12,916,613	9,480,660	3,614,788	2,557,676	2,398,930	1,445,600

From the foregoing table it is readily apparent that since about 1923 there was a gradual diminution in the output of silver until in 1934 the low point of 154,700 ounces was reached. Since that time there has been a marked increase until in 1938 the output was more than three times that for 1934. The reason for these marked changes is not hard to discover for, as has been stated, by far the larger part of the Alaska silver comes from the copper ores, so that the two fluctuate more or less together. As will be seen from the table the copper mines yielded no silver in 1933 and 1934, and it might be added parenthetically that this was because the larger mines had suspended operations. As these variations are so closely tied to the rise and fall in the activity of copper mining it is perhaps significant to point out here what is discussed more fully on pages 86–87, namely that production from the group of large copper mines was discontinued late in 1938, so that a marked downward trend in the output of silver from Alaska mines will inevitably take place in the immediate future.

In thus attributing much of the variation in the quantity of silver produced to the rise and decline of copper mining it must not be overlooked that the fluctuations in the price for which silver sold has played a large part in determining the value of the Alaska silver output. Thus in the period 1919–22 the average selling price of silver was $1 or more an ounce, whereas in 1931–32 it was less than 30 cents. Since 1933 the selling price has advanced considerably, partly through natural causes and partly through the action of the Government in setting the price it would pay for newly mined silver from American sources. Throughout 1938 the price, set by the President by Executive order on December 30, 1937, and to remain in force until December 31, 1938, was $1.2929 a fine ounce subject to a deduction of 50 percent for seigniorage and services by the Government. As a result of this order the price paid throughout the year for silver that qualified under the law was approximately 64.64 cents a fine ounce. According to the Engineering and Mining Journal, the average price during this period for silver that did not so qualify was approximately 43.2 cents an ounce. On the assumption that all the silver produced from Alaska mines in 1938 qualified as eligible for purchase at the Government price, its value, as stated in this report, has been calculated at that price.

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The striking fluctuation in the average selling price of silver is clearly shown by the following table:

Average selling price of silver, 1880–1938

Year	Cents an ounce	Year	Cents an ounce	Year	Cents an ounce
1880–1918	66.7	1926	62.4	1934	64.6
1919	112.0	1927	56.7	1935	71.9
1920	108.0	1928	58.5	1936	77.57
1921	100.0	1929	53.2	1937	77.57
1922	100.0	1930	38.5	1938	64.64
1923	82.0	1931	29.0		
1924	67.0	1932	28.2	Average for period since 1918	67.7
1925	69.1	1933	35.0		

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 Alaska, few of them have appeared sufficiently attractive to induce persons with money to have the necessary examinations made and to undertake exploitation.

The Alaska districts that in the past have received most attention as possible sources of commercial silver mineralization were the Kantishna district, north of the Alaska Range in central Alaska, and the Hyder district, at the head of Portland Canal, in southeastern Alaska, and shipments of ore from both these places have been made to smelters in the States. It is believed that both of these districts would repay further exploration for workable silver ores, but while that search might be rewarded by success it is believed that any notable increase in production of silver in the near future is most likely to come from stimulation of mining some of the lodes carrying silver mixed with other metals, such as gold, copper, and lead. This belief arises not through any skepticism that deposits of silver minerals occur in the Territory but rather through the knowledge that the mining of lodes of mixed sulphides is already making handsome returns in many places and confidence that some of the deposits of this kind that are not now being mined might also, under capable handling, be brought into profitable condition.

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, iridium, osmium, ruthenium, and rhodium—all members of this group—have been recognized in the product from some of the lodes and placers in Alaska.

The spectacular increase of production of platinum metals from Alaska mines in 1938 marks one of the outstanding features of the mineral industry of the year and has a significance in the economics of the whole nation. According to the records of the Geological Survey the production of platinum metals in Alaska in 1938 was 34,420 fine ounces, valued at $1,229,300, as compared with 8,131 ounces, valued at $397,600 in 1937. This marks an increase of more than 3⅛ times in value and nearly 4¼ times in quantity and puts Alaska in fourth or fifth place among the countries of the world in production of platinum metals in that year. The foregoing statistics, so far as they relate to quantity, are believed to have a high degree of accuracy but as regards the values stated they are to be given much less dependence. The lesser claims for accuracy of the value of the product is due to several causes mainly arising through a rather unstable market for platinum metals and the wide fluctuations that are shown in the sales of each individual shipment. The shipments of placer platinum metals from Alaska show a constantly varying relation among the half dozen specific platinum metals they contain and in the impurities and dross associated with them. The records collected by the Survey are not sufficiently detailed to show the exact composition of each lot of metal produced. This being the case it is evident that to try to arrive at an average price per ounce of material composed of widely variable elements that range as greatly in selling price as platinum, which, for a time in 1938 sold at about $35 an ounce, iridium, $60 an ounce, rhodium, $125 an ounce, and palladium, $24 an ounce, leads to confusion that obscures rather than clarifies the main objective. The main part of the platinum metals derived from Alaska lodes is palladium, and a fairly well-established record of the price of that metal is quoted at frequent intervals by the Engineering and Mining Journal. Utilizing this record of the price of palladium and the average price of the group of platinum metals, as derived from that same source, a composite figure has been arrived at for the average value of the Alaska production of composite platinum metals as $35.71 a fine ounce in

1938. This compares with the average price of platinum metals for the year as given by the Engineering and Mining Journal, which was $35.90 a fine ounce. As an indication of the approximate reliability of the figure used for the unit price in 1938 it may be noted that the comparable figure used in 1937 was $48.90, when the average price of platinum metals as stated by the Engineering and Mining Journal was $51.77 a fine ounce. In 1937 the amount of the high-priced platinum metals in relation to the low-priced one (palladium) was not so great. Even if the unit price that has been adopted should not prove to be strictly correct it is probably sufficiently close to the fact to serve the useful purpose of correctly reflecting the magnitude of the industry in the Territory.

The outstanding development in the platinum-mining industry in Alaska, as well as in the United States proper, continued to be the placer-mining operations in the vicinity of Goodnews Bay, in the extreme western part of the Kuskokwim region in southwestern Alaska. In this field the two principal mines are those of the Goodnews Bay Mining Co. and the Clara Creek Mining Co. These properties, as well as the adjoining country, were examined in considerable detail in 1937 by a Geological Survey party in charge of J. B. Mertie, Jr., and a comprehensive and a summary report by him on the district are now in course of publication.[10] At the property of the Goodnews Bay Mining Co., mining is done with both a dredge and dragline equipment. The dredge was completed only late in 1937 so that its first full season's work was in 1938. During that season it was in continuous operation during the open season, and the remarkable increase shown in the output of platinum metals is largely due to its effectiveness. Operating conditions that affect the material handled by the dredge are more favorable than in many of the other parts of Alaska where gold dredging is in progress. For instance, permanently frozen ground, the mining of which in more northern parts of Alaska causes so much additional difficulty and expense, is absent in the tract to be dredged in the Goodnews district. The placer area to be mined has been thoroughly tested in advance so that the project could be laid out to take advantage of all favorable factors and to avoid hazards that might otherwise be met. In stressing the excellent showing made by the dredge of this company the fact should not be overlooked that a considerable part of the company's production is still afforded by its dragline plants operating at its claims on Platinum and Fox Creeks. Work on these

[10] Mertie, J. B., Jr., Platinum deposits of the Goodnews Bay district, Alaska: U. S. Geol. Survey Bull. 910–B (in press); The Goodnews platinum deposits, Alaska: U. S. Geol. Survey Bull. 918 (in preparation).

claims was continued during 1938 at a somewhat more accelerated rate than in 1937, when many of the company's activities were bent on getting the dredge into operation. Altogether, about 45 men on an average were employed by the company. At the property of the Clara Creek Mining Co. on Clara Creek mining is done by means of a dragline, and about 27 men on an average are employed on the claims. Work is reported to have been carried on at a somewhat more reduced rate than during the preceding years, and the production was less. In addition to these operating companies a few small camps of prospectors or miners in nearby tracts produced small quantities of platinum metals.

Another significant contributor to the output of platinum metals from Alaska in 1938 was one of the lode mines on Kasaan Peninsula, in the Ketchikan district of southeastern Alaska. The principal platinum metal recovered at this mine is palladium, which, as already noted, sells for a much lower price than most of the other platinum metals, and which in 1938 rarely sold for more than $24 an ounce. The development at this mine was being carried on by the Alaska Gold & Metals Co., which has successfully operated the property since 1935. The ore is a basic sulphide, carrying in addition to the palladium considerable amounts of gold, copper, and silver, all of which are recovered from the concentrates shipped to the Tacoma Smelter for treatment. From the mine the crude ore is delivered to the mill, where it is passed through various crushers and subjected to concentration processes, including flotation. The property is in operation continuously during the year, though during the winter it is run on a reduced schedule.

The only other region in Alaska where some platinum metals are reported to have been recovered in 1938 is Seward Peninsula. In that region small amounts of platinum metals were recovered from gold placers on Dime Creek, a tributary of the Koyuk River, Quartz Creek, a tributary of the Kiwalik River, in the Fairhaven 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. The bedrock source of the platinum metals has not yet been determined, though some ultrabasic igneous rocks have been recognized in proximity to the placers.

Although no other operators in Alaska are known to have produced and sold platinum metals in 1938 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.

COPPER

The production of copper from Alaska mines in 1938 is estimated as 29,760,000 pounds, valued at $2,976,000. This is a decrease in quantity of more than 6,200,000 pounds, and a decrease in value of more than $1,760,000, from production in 1937. The value of the copper produced from Alaska ores in 1938 has been computed on the basis of the average selling price for the year as determined by the Engineering and Mining Journal. This price for domestic copper was 10 cents a pound, or about 3 1/6 cents lower than in 1937. According to the Engineering and Mining Journal the price of copper fluctuated considerably during the year. The price stood at an average of about 10.2 cents in January, declined to an average of 9.77 cents in February, and remained stationary at that figure through March and April, but gradually declined, until in June it had dropped to an average of about 8.77 cents. With the threat of war and increased demand for copper the price rather rapidly rose until in November and December the average price was 11.025 cents a pound. It is on the basis of the average price of copper for the year of 10 cents that the total value of the Alaska production in 1938 is estimated to have been $2,976,000.

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:

Copper produced by Alaska mines, 1880, 1900–1938

Year	Ore mined (tons)	Copper		Year	Ore mined (tons)	Copper	
		Pounds	Value			Pounds	Value
1880		3,933	$826	1928	579,500	41,421,000	$5,965,000
1900–1915	1,232,396	220,773,969	35,031,225	1929	590,400	40,510,000	7,130,000
1916	617,264	119,654,839	29,484,291	1930	531,000	32,651,000	4,244,600
1917	659,957	88,793,400	24,240,598	1931	88,000	22,614,000	1,877,000
1918	722,047	69,224,951	17,098,563	1932	56,900	8,738,500	550,500
1919	492,644	47,220,771	8,783,063	1933		29,000	1,900
1920	766,095	70,435,363	12,960,106	1934		121,000	9,700
1921	477,121	57,011,597	7,354,496	1935		15,056,000	1,249,700
1922	581,384	77,967,819	10,525,655	1936		39,267,000	3,720,000
1923	731,168	85,920,645	12,630,335	1937		36,007,000	4,741,000
1924	761,779	74,074,207	9,703,721	1938		29,760,000	2,976,000
1925	860,023	73,855,298	10,361,336				
1926	670,000	67,778,000	9,489,000	Total		1,374,232,500	227,378,400
1927	645,000	55,343,000	7,250,000				

In the foregoing table no quantity of ore mined is shown in the appropriate column for the years subsequent to 1932. This has been omitted for the years 1933 and 1934 because the copper produced in those years was but a minor byproduct 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, and for the years since 1934 the amounts were omitted because the large copper-producing companies no longer publish that information.

The general trend of the copper-mining industry in Alaska is graphically indicated by one of the curves in figure 3, which shows the output of copper for each year from 1900 to 1938. 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 meager 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 and then turned sharply upward.

Practically all of the Alaska copper comes from mines that have been developed primarily for the copper content of their ores, but there is a small amount of copper that is recovered as a byproduct through the treatment of ores principally valuable for their content of gold or of some other metal. The ore mined primarily for its copper content came from mines in the Copper River region near Kennecott, owned by the Kennecott Copper Corporation and the Mother Lode

Coalition Mines Co. and operated as a more or less single unit, except for accounting purposes. The ore at these mines consists mainly of high-grade copper sulphide and carbonate containing considerable silver but no gold. The ore deposits lie near the contact of a thick limestone formation and an effusive greenstone. The deposits are of a unique type and have yielded hundreds of millions of pounds of copper in the 26 years that they have been actively mined.

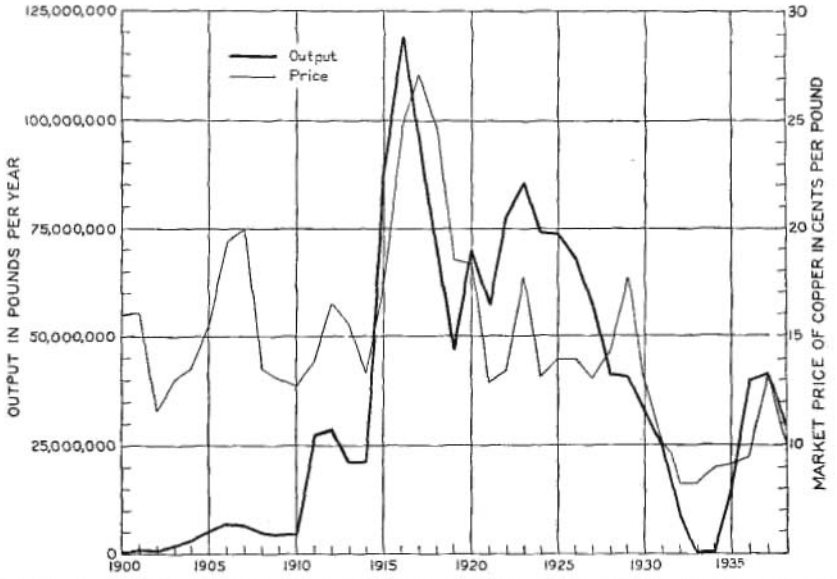

FIGURE 3.—Copper produced from Alaska mines, 1900–1938, and fluctuations in the price of copper during that period.

Unfortunately ore deposits are exhaustible, and there comes a time when even the largest mines must close down because they can no longer find ore that will pay for extraction. During the season of 1938 this situation was reached at those famous mines near Kennecott. According to the annual report to its stockholders the Mother Lode Coalition Mines Co. announced the facts regarding its property in the following terms:

> In the midyear statement you were advised that operations at the mine were terminated on July 31, 1938, because of the exhaustion of the ore body * * * no new ore body was found during 1938. After the termination of mining operations the mine was closed down, all equipment having any net salvage value was removed from the mine and shipped out for sale * * *. The mining property is now carried on the balance sheet as $1.00.

The situation at the Kennecott Copper Corporation's Alaska property is thus stated in the company's annual report to its stockholders:

> The Alaska property was operated until the latter part of October, when all ore of commercial value was exhausted and the property closed down.

It should be realized that the production from its Alaska property formed but a minor part of that from its many holdings scattered widely through the western United States and foreign countries so that the closing of the Alaska mine, an event that had long been expected, had little real effect on the general operations of the company.

Besides the direct effects resulting from the closing of these mines there were many important related changes brought about by this action. Of these perhaps the most significant was the suspension of operation of the Copper River & Northwestern Railway that served the whole Copper River region lying between Cordova and Kennecott. As the main revenue of this railroad was derived through the traffic afforded by these mines, it could not afford to keep running when that income ceased. The result of this situation is thus summarized in the report of the Kennecott Copper Corporation:

> Accordingly train service was discontinued on November 14 following the completion of all mining in October and the operating force was reduced to 20 men by the end of the year. Application was made to the Interstate Commerce Commission for permission permanently to abandon the road and a public hearing was held on January 16, 1939.

The records of these great mines mark a series of brilliant achievements in the history of Alaska mining, and their closing forms a distinct loss not only to the mining industry but also to the development of the whole Territory.

Among the mines whose principal mineral content of value was some metal other than copper, but which furnished concentrates from which copper was obtained, were those of the Nabesna Mining Corporation 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, and the Alaska Gold & Metals Co., on Prince of Wales Island, in the Ketchikan district of southeastern Alaska. 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.

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, however, 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 through such measures can be looked for in the near future. Indeed, the cessation of copper mining at the large mines points inexorably to the conclusion that hereafter the output of copper from Alaska mines will come only from the mines in which it is recovered as a byproduct of ores of gold or some other metal more sought as the principal object of mining. Some increase from this source is expected with considerable confidence.

LEAD

The lead produced from Alaska ores in 1938 is estimated to have been 2,224,000 pounds, or about 220,000 pounds more than in 1937. This increase is attributable to the greater production of ore from certain of the lode mines that are principally valuable for their gold, because all the lead is recovered as a byproduct from the concentrates of the gold ores. These concentrates are shipped to smelters in the States for treatment to recover all the valuable metals they contain. The average market price of lead in 1938, according to the Engineering and Mining Journal, was 4.74 cents a pound, which was about 1¼ cents lower than the price that prevailed in 1937. At this price, the value of the Alaska lead production was $105,400, which while greater than for any other year since 1931 with the single exception of 1937, was much less than for some of the preceding years when the quantity produced was very much less.

Lead produced in Alaska, 1892–1938

Year	Pounds	Value	Year	Pounds	Value	Year	Pounds	Value
1892	60,000	$2,400	1909	138,000	$5,934	1926	1,556,000	$124,400
1893	80,000	3,040	1910	150,000	6,600	1927	2,016,000	127,000
1894	70,000	2,310	1911	102,000	4,590	1928	2,038,000	118,000
1895	40,000	1,320	1912	90,000	4,050	1929	2,630,000	166,000
1896	60,000	1,800	1913	12,000	528	1930	2,730,000	136,500
1897	60,000	2,160	1914	56,000	1,344	1931	3,320,000	126,000
1898	60,000	2,240	1915	874,000	41,118	1932	2,522,000	75,600
1899	70,000	3,150	1916	1,640,000	113,160	1933	2,314,000	85,600
1900	80,000	3,440	1917	1,704,000	146,584	1934	1,680,000	62,100
1901	80,000	3,440	1918	1,128,000	80,088	1935	1,630,000	65,200
1902	60,000	2,460	1919	1,374,000	72,822	1936	2,116,000	99,500
1903	60,000	2,520	1920	1,750,000	140,000	1937	2,004,000	120,400
1904	60,000	2,580	1921	1,518,000	68,279	1938	2,224,000	105,400
1905	60,000	2,620	1922	754,000	41,477			
1906	60,000	3,420	1923	820,000	57,400	Total	44,830,000	2,482,600
1907	60,000	3,180	1924	1,262,000	100,899			
1908	80,000	3,360	1925	1,578,000	140,571			

Practically all of the lead that is reported in the foregoing table as produced in 1938 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 less than half a pound of lead from each ton of ore that it mined and trammed to the mill, or less than 0.87 pound of lead from each ton of ore that is fine-milled. From the table on page 18, showing the recovery of metals at the Alaska Juneau mine, it is evident that the total quantity of lead recovered from the total quantity of ore that was fine-milled has remained practically constant, as the average for the entire period of the mine's operation since 1914 is 0.90 pound of lead to the ton of ore that is fine-milled.

Ores containing greater or lesser quantities of lead minerals 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 that requires rather elaborate treatment to produce in readily salable metallic form, and these drawbacks, coupled with the 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 the production of lead as a by-product. 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 now lying idle will be opened up again seems almost equally certain. As general business conditions throughout the world improve and as development and transportation facilities in Alaska improve an increase in the output of lead from Alaska ores is looked for with considerable assurance.

TIN

For many years Alaska has been a small but regular producer of tin, and in the course of the more than a third of a century since tin minerals were discovered in Seward Peninsula and later elsewhere in the Territory, it has shipped tin worth more than $1,500,000. During 1938 the production of tin from Alaska mines is estimated to have been 210,640 pounds of metallic tin valued at $89,100. This marks a considerable decrease in both quantity and value as compared with the preceding year but is still by far the largest amount of tin that is produced anywhere within the limits of the United States or its possessions. All the Alaska tin was derived from the mineral cassiterite (SnO_2; tin 78.6 percent, oxygen 21.4 percent),

which occurs in placers mixed with gravel and rock detritus and is recovered by processes that are essentially the same as those used in placer-gold mining. The tin is then obtained in metallic form from the cassiterite by smelting, which is done outside Alaska.

The principal producing tin properties in Alaska lie in the extreme western part of Alaska near the western tip of Seward Peninsula. In addition to a few small one- and two-man camps that are fairly widely distributed in this general region the main tin-mining activity is on the property of the American Tinfields, Inc., near Tin City. The tin-bearing placers occur around the eastern border of Cape Mountain, a granite mass that forms the westernmost limit of the North American continent and has been intruded into a country rock consisting of limestones and slates that had been much metamorphosed even before the intrusion of the granite. The tin minerals have been found in place in the contact zone of the granite, and attempts have been made in the past to develop some of the richer areas as lode mines. At the main operating property the general methods that have been adopted consist in excavating with a steam shovel the tin-bearing material as it occurs in the natural placer deposit. The shovel dumps directly into automobile trucks which traverse the mile or more of excellent road that connects the digging area with the ore-dressing plant near the shore of Bering Sea. The trucks dump their loads onto a steeply inclined grizzly over which a jet of water from a small hydraulic nozzle is directed. In this way the larger rock masses are washed and then turned aside and the finer material that passes through the openings is fed by a flume leading to a series of sluice boxes. The boxes are arranged in three separate lines so that only one at a time is receiving the feed of undersize from the grizzly. In the sluice boxes are riffles to allow the heavy minerals to collect, the lighter worthless materials being discharged from the lower end of the string of boxes. At frequent intervals, as required, the flow is diverted from one to another of the strings of boxes and the line that had been receiving the flow "cleaned up" by removing the riffles and sweeping out the accumulation of concentrates. The concentrates then pass through a small crusher to break up the larger pieces and from there pass into a series of jigs whereby more critical separation is effected. For a while it was the practice to pass the waste material from the last of the jig chambers over a concentrating table, but the operators were by no means convinced that the extra recovery in tin ore paid the cost of that extra step in the process. When the material has been adequately concentrated it is dried and sacked, ready for shipment. The large quantities of water required at several stages in the concentration of the material is readily available during the open

season regardless of climatic conditions because the company pumps it from the Bering Sea, which is less than a stone's throw from the mill. Gasoline for use in engines, as well as all other necessary supplies, is handily delivered at the property because ocean-going vessels can bring freight practically to the door of the mill.

Although they contributed only a small amount of tin to the total output from Alaska mines in 1938, mention should be made of the placer deposits in the Hot Springs and Circle districts of the Yukon-Tanana region, which, while mined mainly for their gold content, afford a small but rather constant amount of tin minerals each year. None of the tin minerals now mined from either of these smaller deposits or from those of Seward Peninsula are now reduced in smelters in the United States. The metallurgy of their reduction, however, involves no great difficulty, so that if a sufficient and constant supply were available it would be entirely practicable to smelt it in the States.

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

Tin produced in Alaska, 1902–38

Year	Ore (tons)	Metal (pounds)	Value	Year	Ore (tons)	Metal (pounds)	Value
1902	25	30,000	$8,000	1922	2.3	2,800	$912
1903	42	50,000	14,000	1923	3	3,800	1,623
1904	23	28,000	8,000	1924	11	14,000	7,028
1905	10	12,000	4,000	1925	22.2	27,600	15,980
1906	57	68,000	38,640	1926	12.85	16,000	10,400
1907	37.5	44,000	16,752	1927	37.5	53,400	34,000
1908	42.5	50,000	15,180	1928	58.6	82,000	41,000
1909	19	22,000	7,638	1929	51.6	77,200	35,000
1910	16.5	20,000	8,335	1930	21	29,400	9,300
1911	92.5	122,000	52,798	1931	5.6	8,200	2,000
1912	194	260,000	119,600	1932			
1913	98	100,000	44,103	1933		5,800	2,300
1914	157.5	208,000	66,560	1934		8,280	4,300
1915	167	204,000	78,846	1935		98,800	49,800
1916	232	278,000	121,000	1936		226,000	105,000
1917	171	200,000	123,300	1937		372,000	202,300
1918	104.5	136,000	118,000	1938		210,640	89,100
1919	86	112,000	73,400				
1920	26	32,000	16,112	Total		3,219,920	1,546,500
1921	7	8,000	2,400				

The importance of tin in our national economy and the dearth of workable tin deposits throughout most of the States makes the future of the Alaska deposits a matter of special significance. The facts are not yet in hand to warrant expressing any fixed conclusion as to the quantity of tin these deposits may supply under hypothetical conditions. The showings already made do, however, justify certain tentative opinions. Some of these facts may be summarized as follows: (1) Tin minerals in considerable quantities have already been recovered from certain areas in Seward Peninsula; (2) other nearby areas as yet not equally developed appear to have similar geologic

setting and presumably may contain deposits of equal value; (3) certain areas adjacent to those containing workable placers or that are likely to contain such placers have been subjected to geologic processes that are capable of producing placers of other types than those now receiving attention—for instance, old beach concentrations; (4) the angularity of much of the tin ore in the placers and the size of many of the fragments showing the short distance which the material has probably been transported—all point to a rather local source for the mineralization and suggest the possibility of discovering lode deposits of commercial value. As yet none of the inferences that may be drawn from the foregoing facts have been tested critically by being confronted with the practical problem of furnishing quantitative information as to the amount of tin there is in various deposits. Obviously answers to these questions cannot readily be obtained without the outlay of considerable time and money under expert technical supervision. Complete answers to all the questions involved would go beyond what the Government could reasonably undertake. As a start and to show whether further work along those lines is justified the Geological Survey is sending a party into the tin fields of western Seward Peninsula during the season of 1939 to gather additional information that will contribute to an understanding of the real potentialities of this area as a source of tin for national needs.

In focusing the foregoing discussion of the possibilities of the development of tin on the area in western Seward Peninsula, it should not be forgotten that the occurrence of tin minerals in other parts of Alaska has been amply demonstrated. That further intensive examination of some of these other deposits is highly desirable is obvious, but their geologic settings are more obscure and their physical surroundings are such that determination of their real merits is likely to present difficulties that cannot easily be solved.

COAL

The coal produced from Alaska mines in 1938 is estimated to have been 159,230 tons, an amount that has not been exceeded in any year since coal mining began in the Territory. This is an astonishing record when the fact is taken into consideration that one of the principal producing mines was completely closed down for almost three months as a result of a serious explosion that had occurred in the preceding year. In addition to the coal mined in Alaska, 35,098 tons was imported from fields outside Alaska, and no Alaska coal was exported. The consumption of coal in Alaska in 1938 was thus 194,328 tons, or about 27,400 tons more than in 1937. The local con-

sumption of coal is being supplied more and more by increased output of the domestic mines. A comparison of coal production and consumption in Alaska for the entire period for which records are available is afforded by the table following.

In this table the total value of the coal produced in Alaska in 1938 is stated to have been $620,900. The 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, or produced by that organization for its own use, so that the price paid by the railroad or charged on its books is not a suitable index of the price paid for the lots sold to the smaller consumers, who in the aggregate buy a rather 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 1938 may be taken as $3.90 a ton. This is 30 cents a ton less than the estimated price in 1937 and is about $1.22 a ton less than the average price that prevailed during the period 1880 to 1937.

Coal produced and consumed in Alaska, 1880–1938

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
1935	119,425	501,600	26,554	15,707	161,686
1936	136,600	573,700	27,643	11,806	176,049
1937	131,600	552,700	24,561	10,781	166,942
1938	159,230	620,900	23,465	11,633	194,328
Total	2,292,409	11,624,400	1,485,174	1,784,826	5,562,409

[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 1938 came from three mines—two in the Matanuska field and one in the Nenana or Healy River field. The principal mine in the Healy River field was that of the Healy River Coal Corporation and in the Matanuska field that of the Evan Jones Coal Co., at Jonesville. The next largest amount of coal from the Matanuska field was produced by the Government's own mine at Eska. Still smaller amounts of coal came from the Wishbone Hill coal mine, operated by the New Black Diamond Coal Co., later the Moose Creek Coal Co., in the valley of Moose Creek, and the mine of the Houston Fuel Co., near Houston, which is situated not far west of the developed portions of the Matanuska field.

The largest coal mine in the Territory is that of the Healy River Coal Corporation in the Nenana field. The mine is situated in the valley of 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 between 300 and 400 tons a day. The coal beds which are being mined are of Tertiary age, comparable with those in the Matanuska field, but the individual beds are much thicker and the measures have suffered much less deformation through mountain building than those in the southern area. Probably owing to the lesser amount of folding that the beds have undergone, the coal of the Nenana field has a somewhat lower heating value than that from the Matanuska and nearby fields and as a consequence is not used in the railroad locomotives, but the shorter haul makes its use more economical in many parts of the interior. This mine was in continuous operation throughout 1938 and yielded considerably more than half the coal mined in Alaska during that year. 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, and constantly growing demands by that company for more power are calling for an increasing quantity of coal. The Healy River coal is also extensively used for power and domestic fuel at other points in Alaska, even as far distant from the mine as Cordova. The general equipment and operation of the plant is thoroughly modern and well fitted for the work required. Indeed, every effort has been made to make the property in all ways a model of its kind, and these efforts have been extremely successful.

The mine of the Evan Jones Coal Co. in the Matanuska field is situated on a spur of the former Chickaloon Branch of The Alaska

Railroad about 16 miles in an air line northeast of the settlement of Matanuska. Its coal is of bituminous rank and in steam sizes has been practically the only fuel used in locomotives or for power purposes by The Alaska Railroad. The larger sizes are extensively used for domestic purposes, and much of the product finds a ready market throughout western and central coastal portions of Alaska, especially in the schools under the direction of the Office of Indian Affairs and in some of the canneries. The damage caused by the unfortunate accident that led to the closing of the mine in the fall of 1937 was not repaired until several months of 1938 had passed, so that it was April before the mine resumed its normal production. In the course of making the needed repairs many improvements were also made that have materially increased the safety and efficiency of the mine, so that the property is now in better operating condition than at any other time in recent years. The contract with The Alaska Railroad was renewed, and from April to the end of the year the mine was in constant operation.

For many years The Alaska Railroad has maintained in a standby condition its own mine at Eska, a mile or so east of Jonesville, which had been opened on the same general series of coal beds as those mined by the Evan Jones Coal Co. It was fortunate that the policy had been adopted of keeping this property in condition to supply coal for the railroad on short notice if the emergency should arise, because with the cessation of production from Jonesville it became necessary for the railroad quickly to open up its mine and furnish its own coal. In fact, for a time, when it appeared doubtful whether mining would be resumed at Jonesville, it seemed likely that the railroad might be forced into producing coal to sell in the commercial market as otherwise no domestic bituminous coal would be available. Before that step became necessary, arrangements had been made for the Jonesville mine to reopen, take on the contract for railroad coal, and supply the domestic market. During the course of operation of the Eska mine nearly 21,000 tons of coal was mined and delivered. With the termination of the emergency the Eska mine was closed down after being put into a standby condition to meet any new emergency that might arise.

At the Wishbone Hill mine, formerly known as the Rawson mine, that for part of the season was under the management of the New Black Diamond Coal Co. but in August became the Moose Creek Coal Co., the main work has been of a prospecting or developing type, in the course of which a small amount of coal has been mined and delivered under contract to The Alaska Railroad. The

coal beds belong to the same general series as those at Eska and Jonesville, though definite correlation between the individual beds has not yet been established. Only a small crew has been employed on this property, and some financial and operating difficulties have arisen. The mine is connected with the standard-gage branch of The Alaska Railroad at Premier by a narrow-gage track, on which the coal cars are handled by a small engine leased to the operators of the mine. At the Premier terminus of this narrow-gage line an elevated siding has been constructed from which the cars can dump directly into the standard-gage cars without rehandling the coal.

Small amounts of coal were reported to have been mined or prospecting for coal was in progress during the year near Houston, a station on The Alaska Railroad some 20 miles west of Matanuska, and at two or three 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 of coal ranging in composition from bituminous to anthracite have long been known, prospecting or other development work relating to the coal resources continued apparently at a standstill in 1938. 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 neared 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 necessarily uncertain 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 present local demands are fairly well supplied by existing mines, and to attempt to enter a larger field would require not only large outlays for developing mines but also perhaps even greater difficulties in establishing profitable markets. 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 certain great competitive advantages over those from outside sources. That growth, however, probably will be relatively slow but none the less sure.

PETROLEUM

No petroleum was produced from any Alaska deposits in 1938, although for a number of years prior to 1934 a small but significant production of petroleum had come from wells of the Chilkat Oil Co. in the Katalla district, east of the mouth of the Copper River. Even during the period that this company was active the supply of petroleum products from that source was by no means adequate to meet the constantly increasing demand for fuel and lubricants created by the increasing use of machinery. This lack of a local supply was met in 1938, as it had been in earlier years, by imports from the States. The accompanying table shows the amount of petroleum products that were imported into Alaska during 1938 as well as during the preceding years.

Petroleum products shipped to Alaska from other parts of the United States, 1905–38, in gallons[1]

Year	Heavy oils, including crude oil, gas oil, etc.	Gasoline, including 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	740,930	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
1935	29,254,008	7,890,750	375,816	549,696
1936	43,840,062	7,786,548	297,444	731,419
1937	43,656,900	9,179,557	383,586	677,223
1938	45,785,418	9,441,726	326,970	697,620
Total	623,830,649	137,097,448	23,567,354	14,076,547

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

From the foregoing table the great change in the types of different petroleum products imported and the amounts of each type during the period of record are readily apparent. Thus the illuminating oils, which in the period from 1919 to 1922 formed a considerable part of the imports, have dropped to less significant amounts since 1922. Importations of heavy oils, which have always formed the bulk of the petroleum imports to Alaska, increased in the last few years, until in 1938 they amounted to more than three times the average for the period from 1921 to 1932. This great increase undoubtedly reflects the growing use of Diesel-equipped apparatus at many of the mines, on tractors, and on vessels of the fishing fleet. It should also be noted that, whereas in 1920 the importation of gasoline was about 1,764,000 gallons, in 1938 it was practically 9,440,000 gallons, or more than five times that of the earlier year. This increase is in considerable measure in direct response to the increasing mileage of roads available and the attendant increase in the number of motor vehicles that use them, as well as the increased mechanization of mining equipment in general.

Search for new oil fields in Alaska, which after numerous hectic booms in the past had practically ceased, began in 1936 to be re-

vived and in 1938 was attracting considerable attention, even though at only two places had the new search reached the stage of drilling test wells. This drilling work was carried on by the Iniskin Drilling Co., which had extensive holdings in the Iniskin-Chinitna district on the west coast of Cook Inlet in the Alaska Peninsula region, and by a combination of oil companies that had united in their efforts to test part of the known geologic structure in the vicinity of Bear Creek, northeast of the settlement of Kanatak on Cold Bay. Drilling in the Iniskin area was a continuation of the work started on a structure near Fitz Creek in 1936 and carried to a depth of 5,050 feet in 1937. Work was resumed in May 1938 and before the end of August had been carried to a depth of 7,156 feet, when drilling was discontinued for the season. According to the operators extremely high gas pressures were experienced in the course of the work, necessitating use of mud weighing as much as 100 pounds to the cubic foot to withstand the pressures. Below 4,250 feet the hole originally had not been cased, and as some showings of oil had been found at various depths below that level and as trouble was being had through caving, it was finally decided, when a depth of 7,156 feet had been reached, to set a string of pipes and cement through perforations at 5,500 feet. On test the well flowed once or twice and then died. Subsequent swabbing caused minor flow of oil and gas with some mud, and the operators concluded that the permeability of the formation was so low that the oil and gas could not escape into the drill hole readily. The oil obtained through these tests was of high gravity with low sulphur content. Correlations made by the company's geologists indicate that the bottom of the hole may have reached the Kialagvik formation of Middle Jurassic age. At the base of this formation is a sandstone member some 800 feet thick which the company was anxious to reach, as its permeability is such that it should be capable of forming a good reservoir in which oil could collect. Although disappointed at not having succeeded in bringing in a productive oil field, the company is optimistic over the results already obtained and another season, if funds can be secured, proposes to continue the tests to at least the base of the Kialagvik formation.

The drilling in the vicinity of Kanatak was done by a joint organization representing the Standard Oil Co. of California, the Tide Water Associated Oil Co., and the Union Oil Co. of California. The site selected is in the Bear Creek Unit area at the head of Salmon Creek about 4 miles from Jute Bay. The surface rocks at the drill site are correlated by the company's geologist with Middle Jurassic formations. Active work on this project began in February 1938, when supplies and equipment were landed on the beach at Jute Bay, and a start was made immediately on putting up the necessary

camps, building a road, and hauling the gear to the well site. A steel derrick was erected and drilling was begun and carried to a depth of 2,430 feet before the inclement weather of early winter made it desirable to suspend further work for the season. Some showings of gas are reported to have been encountered in the course of drilling. The general results so far obtained are fully as good as were expected, and the company proposes to resume drilling in 1939 as early as practicable.

In addition to its active drilling campaign the associated three companies mentioned above in 1938 continued geologic investigations in some of the prospective oil areas in southern Alaska, notably in the vicinity of Controller Bay and Yakataga. Oil seepages have long been known in these areas, and attempts have been made to interest capitalists to put up the funds necessary to make drilling tests. Doubtless these latest investigations were undertaken to determine whether or not the fields appeared attractive and whether satisfactory deals could be made with the property holders. Even if these matters could be arranged it is doubtful whether the companies would be inclined to go far with a new large enterprise until the results of their drilling work on the Alaska Peninsula had reached a stage at which the outcome could be predicted with more certainty.

In connection with the general development of oil claims in both 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 prospective 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 of 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 at one time or another have 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 1938 in the broadest sense of that word, but none of them, with the exception of antimony, limestone, and quicksilver, are known to have been produced and sold in quantities valued at as much as a few hundred dollars. In the following table, as well as in some of the other tables in this report, all of these minerals that were produced by a single operator only or in quantities so small that to list them separately would disclose the production of individual operators have been grouped together under the collective term "miscellaneous mineral products." Included in this table among the miscellaneous mineral products are the platinum metals, although they have also been described elsewhere in this report. The inclusion of the value of the 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 several producers of platinum metals, inclusion of that group among the miscellaneous mineral products is no longer necessary or desirable from certain points of view, 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 1938, it has been considered desirable still to include the value of the platinum metals in this table. In other words, for 1938 the item shown in this table as $1,338,600 may be broken down into miscellaneous mineral products other than platinum, $109,300, and platinum metals, $1,229,300.

Value of output of miscellaneous mineral products of Alaska, including platinum, petroleum, quicksilver, stone, antimony, gypsum, marble, and other products, 1901–38 [1]

Year	Value	Year	Value	Year	Value
1901	$500	1915	$205,061	1929	$194,000
1902	255	1916	326,737	1930	157,300
1903	389	1917	203,971	1931	108,000
1904	2,710	1918	171,452	1932	223,400
1905	710	1919	214,040	1933	39,200
1906	19,965	1920	372,599	1934	86,400
1907	54,512	1921	235,438	1935	299,700
1908	81,305	1922	266,296	1936	293,800
1909	86,027	1923	229,486	1937	615,600
1910	96,408	1924	348,728	1938	1,338,600
1911	141,739	1925	454,207		
1912	165,342	1926	444,500	Total	8,645,100
1913	286,277	1927	162,000		
1914	199,767	1928	164,000		

[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.

The only significant production of antimony ore from Alaska mines in 1938 came from the property of Morris P. Kirk & Sons, Inc., on Stampede Creek in the Kantishna district, on the northern foothills of the Alaska Range. Antimony ore has long been known to occur at that locality, but prior to 1936 no systematic mining of the deposit had been attempted. Since 1936 the present company has been active in developing its property and has shipped out considerable ore. The mine is developed by a vertical shaft and adit from which openings have been made into the ore body. During 1938 more than 300 feet of winzes were sunk, and several hundred feet of cuts were made on the surface with a bulldozer. The principal valuable mineral in the ore is stibnite, an antimony sulphide, and the ore as shipped will assay between 50 and 55 percent of antimony. In general the plan of operation calls for freighting the ore to the railroad, a haul of some 60 miles during the winter only, when sledding conditions for cross-country travel are especially favorable. At present only crude ore that has been beneficiated by hand sorting is shipped, but equipment for a mill has been acquired and will be erected at the mine during 1939. This should result in materially increasing the output of antimony, as it will recover much of the antimony from the ore that is now of too low grade to ship. The ore is transported to a smelter in Los Angeles where it is treated and the product distributed for use mainly in plants of the National Lead Co. The company was so unfortunate during 1938 as to have a fire at the mine destroy the buildings that housed the compressor and other mechanical equipment. The average price of antimony, according to the quotations given by the Engineering and Mining Journal, was 12.35 cents a pound in 1938 as compared with 15⅓ cents a pound in 1937.

The investigation by this company of certain antimony showings in the Bonnifield district, east of the Alaska Railroad, that were noted in the volume of this series for 1937, as in prospect, were apparently carried out as planned. The findings, however, do not seem to have proved attractive, for nothing was done about opening the deposits, and it is understood that the company has discontinued examinations in that vicinity.

The quarrying of limestone as an ingredient of cement afforded a considerable part of the amount credited here to miscellaneous minerals in 1938. This enterprise is conducted by Superior Portland Cement, Inc., of Seattle, operating under lease from the Pacific Coast Cement Co. The quarries at which this high-grade limestone is mined are on Dall Island, in the Ketchikan district of southeastern Alaska. From the quarries at this locality the rough stone is shipped in barges to Seattle, where it is treated and mixed with the other constituents of the cement. This property has been productive for

several years, but ordinarily it is possible to supply all the limerock needed by the company by keeping the quarries in operation only part of the year. In accordance with this practice, the quarries in 1938 were in operation only from June to September, inclusive. The records showed a somewhat smaller quantity of limestone shipped from the property than was quarried during the year. The quantity mined in 1938 was less than in 1937.

Cinnabar, the principal ore of quicksilver or mercury, has been recognized in the concentrates from the placer deposits in many parts of the Territory, but in most of these places the lodes from which the cinnabar originally came were apparently small stringers that appear unlikely to afford ore that can be mined under present conditions. In the central and western parts of the Kuskokwim Valley, however, extensive areas of cinnabar in bedrock have long been known 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. One of the better known of these areas is in the vicinity of the settlement of Sleitmut on the Kuskokwim near the mouth of the Holitna River. Unconfirmed reports from this area indicated that during the year a few old-timers had gotten out a little ore, but that owing to the fact that no suitable furnaces were available for treating the ore, they had been unable to extract the mercury in a metallic state. The part of the Kuskokwim region where most of these showings of quicksilver ore occur is so remote that it is difficult and expensive to test out thoroughly the various places where mineralization has been recognized. The exceedingly rich specimens of mercury ore that have been found occasionally in the course of such prospecting as has been done encourages further search for deposits of commercial value, but it has not yet been demonstrated whether these pieces come from small rich stringers, possibly too narrow and too scarce to mine, or from offshoots from a workable body of ore.

Although the foregoing notes cover all the mineral products that contributed to swell the total output from Alaska during the year, they by no means have given account of all the significant prospecting that has been in progress or of the deposits that are temporarily lying dormant. As an example of the latter class may be mentioned the temporary cessation of production at the well-known quarries of the Vermont Marble Co. in southeastern Alaska. These quarries are on the west coast of Prince of Wales Island, not far from the small settlements of Tokeen and Calder. No productive mining was done there during 1938, though the property was kept in condition so that work could be resumed promptly when required. The general practice of this company has been to operate these quarries actively at

intervals and supply all the stone needed for the ensuing 2 or 3 years, during which time the quarries are kept only in a stand-by condition. The stone from these quarries is used in many 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,[11] 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.

One of the mineral developments started in 1937 that for a while was watched with special interest concerned the prospecting for molybdenum on claims in the Copper River region. The site of this work was on Rock Creek, a small stream that heads in the mountains between the main valley of the Copper River and the upper part of Suslota Creek. At this place the Kennecott Copper Corporation had let a contract for driving 150 feet of tunnel to test the mineralized contact between certain older altered igneous rocks and younger granitic or dioritic intrusives. The tests proved disappointing, as no worth-while amounts of molybdenum or other valuable metals were disclosed, and work was discontinued.

In southeastern Alaska a little prospecting is said to have been continued and a revival of interest was shown in the search for workable deposits of nickel-bearing ore. In 1936 a skilled geologist representing moneyed interests spent some weeks in a critical examination of certain properties in the Bohemia Basin on Yakobi Island, a small island off the extreme northwest coast of Chichagof Island. The field work that was done as part of that investigation was completed in August 1938, but as yet no public announcement has been made as to whether or not the geologic findings were such as to encourage the principals to continue their interest in the project or whether some other factors must be determined before a decision will be reached. The occurrence of nickel minerals in a belt that

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

passes through Baranof and Chichagof Islands and in a more or less parallel belt farther east, on Admiralty Island, has long been known. The desirability, for purposes of both commercial utility and national defense, of developing a domestic source of nickel is obvious, and encouragement should be given to determine more fully the resources of any areas in Alaska that are likely to contain nickel-bearing minerals. As part of its duties in supplying information of this kind the Geological Survey, as already noted, sent one of its geologists, J. C. Reed, in 1937 to study, among other things the occurrence of nickel on Admiralty Island. A report of those findings has now been published.[12] In 1938 further work in this general area on Chichagof Island was carried on by Mr. Reed with the expectation that while those studies would not relate directly to the potential nickel deposits, they would furnish a ground work that would be extremely useful in interpreting the geology of the area in which nickel deposits occur, if, as it was hoped, it became possible to take up an intensive study of that area in the near future. It was with this idea in mind, as well as to obtain other desired information, that the work of Mr. Reed was continued northward along the west coast of Chichagof Island in 1939.

So far as the Geological Survey is informed, no noteworthy new developments took place during 1938 leading toward opening up any of the deposits of chromium ore that in the past have attracted attention. Chromium is one of the elements entering into many phases of modern commercial processes and at the present time is one of the metallic elements that the United States does not produce in sufficient quantities to meet its domestic needs. The possibility that this lack could be supplied from Alaska deposits is sufficientaly attractive to make it desirable that all the potential sources should be thoroughly investigated. The principal known Alaska deposits are situated near the southern tip of Kenai Peninsula, and in the past shipments of ore have been made from some of them. These deposits, especially those in the vicinity of Red Mountain, were studied and reported on by the Geological Survey.[13] Other less well known deposits have been reported to occur in southeastern Alaska.

Little new development is reported to have taken place in 1938 in mining the many kinds of nonmetallic mineral products that occur at various places in Alaska. Extensive use was made of the widespread gravel and rock deposits for railroad ballast and road construction, and with sand they entered largely into the concrete mix-

[12] Reed, J. C., Nickel content of an Alaskan basic rock: U. S. Geol. Survey Bull. 897–D, pp. 263–268, 1939.

[13] Gill, A. C., Chromite of Kenai Peninsula, Alaska: U. S. Geol. Survey Bull. 742, 52 pp., 1922.

tures required in the more permanent structures that are beginning to be built in many parts of the Territory. In estimating the value of Alaska's mineral output in 1938 no value has been set on these materials, though if a price of only a few cents a ton had been placed on them, the output of mineral products would have been worth many thousand dollars more than the value stated. Necessarily many of these common materials are becoming of increasing importance as the development of the Territory progresses, and Alaska is fortunate in having widely scattered through its extent deposits of materials that can fill most of these needs as they arise.

INDEX