UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary

GEOLOGICAL SURVEY
W. E. Wrather, Director

Bulletin 943

MINERAL RESOURCES OF ALASKA

REPORT ON PROGRESS OF INVESTIGATIONS IN 1941 and 1942

PAPERS BY
PHILIP S. SMITH, FRED H. MOFFIT,
JACK KINGSTON AND DON J. MILLER

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Mineral Resources of Alaska, 1941 and 1942
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By PHILIP S. SMITH

INTRODUCTION

For each of the 37 years prior to 1941 the Geological Survey has issued a report regarding the yearly production of minerals from Alaskan mines and prospects. In these reports have been recorded the statistics for each of the different kinds of minerals produced, notes as to any new mine developments in progress, and comments on events that were regarded as affecting the mining industry as a whole. On the declaration of war it was realized that the publication of this sort of information might be of value to our enemies by pointing out the places from which this country was deriving, or could derive, needed mineral products. This was especially true with respect to the groups of so-called strategic and critical minerals, of which the known domestic sources of supply were likely to be inadequate. Among mineral commodities of these classes that were being supplied, or might be supplied, from Alaskan deposits are platinum metals, quicksilver, tungsten, chromium, tin, nickel, and antimony. Suppression of information regarding these commodities would necessarily make a report covering the other mineral products so incomplete as a real presentation of the condition of the mining industry of the Territory that general publication of such a report did not then seem justified. However, the canvass of all the mineral producers was conducted as usual, the statistics were compiled for all of the mineral commodities, and the results were made available to the war agencies that were concerned.

With the passage of time, the danger that the information might be of military value to our enemies has greatly decreased. It therefore now seems desirable to make certain of the earlier records available where that can be done without harm to the Nation's war plan. The present report is therefore designed to furnish some information as to the Alaska mineral industry for the two calendar years 1941 and 1942. In carrying out this plan it is still necessary to omit details as to some of the commodities and to consolidate records of certain of them so that the quantities and sources are not specifically disclosed.

To obtain the information recorded in these annual statements the Geological Survey, in addition to its other investigations, conducts an annual canvass of the entire mineral industry of the Territory. This

consists of sending specific schedules to each of the known producers. In addition, more general inquiries are made to various governmental organizations, such as the Bureau of Mines, the Customs Service, and The Alaska Railroad, which in the course of their regular duties collect much data that are pertinent to these mineral studies. Most of the banks, express companies, and other business organizations in Alaska also collect for their own use data regarding certain mineral commodities in the districts in which they operate, and they have cooperated cordially in making the desired information available to the Geological Survey. Their cooperation is gratifying evidence of the general appreciation of these annual summaries.

It is readily apparent, however, that the facts collected from these different sources, although of themselves strictly accurate, are likely to be computed or stated on different bases. Reconciliation of these differences requires considerable editing and revision to bring them all to one standard. In these summaries the standard adopted is the value of the annual production computed at the average unit selling price of a commodity for the year without deductions for handling or transportation charges to the market. These limitations should be stressed, for although the statistics are comparable among themselves they differ from equally authoritative figures issued by other agencies because they are primarily records of production, whereas those issued by the Bureau of the Mint relate to receipts by 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 adoption of an average unit price for each of the different commodities is believed to afford a more useful representation of the industry as a whole than would have been afforded by using the price actually received by individual producers, which often takes into account market fluctuations and various deductions and charges that are made against individual shipments.

ACKNOWLEDGMENTS

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, the Mining World, Asa Baldwin, and Volney Richmond of the Northern Commercial Co., of Seattle, Wash., and the agents of this company, especially J. W. Farrell at Hot Springs; Dewey Goodrich at Ruby; Ralph and Carl Lomen, of Seattle and Nome; the Alaska Juneau Gold Mining Co., the Daily Alaska Empire, and J. J. Connors, of Juneau; Paul Sorensen of the Hirst-Chichagof Mining Co., of Kimshan Cove, and Jack Littlepage, of Chichagof; the Ketchikan Alaska Chronicle and the First National Bank, of Ketchi-

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MINERAL PRODUCTION

GENERAL FEATURES

Throughout the early part of 1941 conditions in the Alaska mineral industry were essentially the same as in the preceding year. By the early summer of 1941, however, the large construction programs that were started to provide airports and other facilities at numerous places throughout the Territory were under way, and the high wages paid for even unskilled workers on these projects began to lure away many of those customarily employed in the mines. This resulted in some retrenchment in the operations at a number of mines, a condition that was further intensified by labor difficulties, which caused the complete closing down for a considerable part of the operating season of several of the larger placer properties. The increasing tension and then the actual outbreak of war later in the year necessarily affected all of the Alaska enterprises, as it did those throughout the rest of the world. The actual occupation of part of Alaska by the enemy and the plans for the defense of the Territory led to the adoption of many restrictions on normal living and business procedures. Increased construction to meet war needs, and especially the building of the so-called Alcan, or Alaskan, Highway diverted much of the mobile

equipment, such as draglines, tractors, and grading machines, formerly used in mining operations and further depleted the supply of labor ordinarily employed in the mining industry. Finally, in October 1942 an order of the War Production Board declared that gold mining, with few exceptions, was no longer regarded as essential and called for the virtual closing down of all unessential mines as rapidly as possible and deprived them of further priorities for supplies and equipment. Following this mandate most of the larger gold mines throughout the Territory, except those specifically exempted, promptly suspended operations.

Throughout 1941 and 1942 there was a marked increase in the search for and development of Alaskan deposits of metals other than gold that were needed in the Nation's war plans. Several of these ventures were successful in disclosing deposits that appear likely to supply significant quantities of some of the mineral commodities that heretofore have been procured mainly from foreign countries, from which normal imports by long oversea routes may be seriously interfered with by the enemy. Recognition that Alaska does contain such deposits will doubtless have a pronounced effect on the development of the Territory even after the urgency for military purposes is passed and peace is established.

Growth of the mining industry, however, is not to be predicated alone on the increased production of these less common mineral materials. Already there has been a notable increase in the production of coal, and a still greater increase in the development of the coal resources of Alaska seems inevitable to meet the anticipated growth of population and industries in the Territory.

The unit prices for several of the mineral commodities that came from Alaskan mines showed an upward trend during 1941 and 1942. This trend in general, however, was moderate and not marked by sudden and sharp fluctuations. Comparison of the average unit prices for several of the mineral commodities during 1942 with those during 1941 showed an increase of less than 10 percent, but the prices of gold, silver, and tin were identical during the 2 years. Inasmuch as somewhat more than 90 percent of the value of the production of Alaskan minerals came from those metals in which there was no change in price during the period considered, it is evident that such upward trend as did take place had little real effect on the value of the total mineral production.

TOTAL MINERAL PRODUCTION

From the time of the earliest records of mining in Alaska to the end of 1942 minerals to the value of nearly $878,000,000 have been produced from Alaskan mines. The distribution of this large total by years is set forth in the following table.

Value of total mineral production of Alaska, by years, 1880–1942

1880	$6,826	1902	$8,475,813	1924	$17,457,333
1881	15,000	1903	9,088,564	1925	18,220,692
1882	23,000	1904	9,627,495	1926	17,664,800
1883	67,146	1905	16,490,720	1927	14,404,000
1884	72,000	1906	23,501,770	1928	14,061,000
1885	425,000	1907	20,840,571	1929	16,066,000
1886	540,000	1908	20,092,501	1930	13,812,000
1887	657,000	1909	21,140,810	1931	12,278,000
1888	667,181	1910	16,875,226	1932	11,638,000
1889	847,490	1911	20,720,480	1933	10,366,000
1890	873,276	1912	22,581,943	1934	16,721,000
1891	1,014,201	1913	19,547,292	1935	18,312,000
1892	1,019,493	1914	19,109,731	1936	23,594,000
1893	1,104,982	1915	32,790,344	1937	26,989,000
1894	1,339,332	1916	48,386,508	1938	28,607,000
1895	2,588,832	1917	40,694,804	1939	25,296,000
1896	2,885,029	1918	28,218,935	1940	28,470,000
1897	2,539,294	1919	19,626,824	1941	26,791,000
1898	2,329,016	1920	23,330,586	1942	19,342,000
1899	5,425,262	1921	16,994,302		
1900	7,995,209	1922	19,420,121	Total	877,717,000
1901	7,306,381	1923	20,330,643		

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 this table it will be seen that gold accounted for nearly 69 percent of the total value of the mineral production, and that gold and copper together accounted for nearly 95 percent.

Total value of mineral production of Alaska, by substances, 1880–1942

Gold	$603,413,000	Lead	2,826,600
Copper	227,438,300	Other mineral products	15,180,700
Silver	14,003,000		
Coal	14,855,400	Total	$877,717,000

GOLD

GENERAL FEATURES

Throughout 1941 and 1942 the price of gold remained fixed officially at $35 an ounce. This fact should be kept in mind when comparing any of the records for this period with those for years prior to 1934, as during those earlier years the standard price of gold was approximately $20.67 an ounce. The value of the gold produced from Alaskan mines during the years 1941 and 1942 was $41,299,000, of which, as shown by the following table, $24,231,000 was mined in 1941 and $17,068,000 in 1942. The value of the output during each of these years was below that for 1940. This comparison may, however, create a somewhat erroneous impression unless it is also realized that the value of the production in 1940 marked the all-time high record for the whole period during which gold mining has been in progress in the Territory. Explanations of some of the reasons for this decrease have already been offered on preceding pages, and additional ones are given on subsequent pages.

There are two principal types of deposits from which gold is recovered—lodes and placers. The lodes are the veins or mineralized masses of ore in place in country rock, which, in general, were formed

through deep-seated geologic processes. 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 are 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 entire period up to the end of 1942 that gold mining has been in progress in the Territory and the value of the gold derived from each of the two principal types of gold mines. From this record it will be seen that of the total $603,413,000 in gold that had been recovered from Alaskan deposits to the close of 1942 the placers had yielded gold to the value of $396,116,000, or a little more than 65.6 percent, whereas the lodes had yielded $207,297,000, or a little less than 34.4 percent. This is essentially the same ratio as has prevailed for a number of recent years.

Gold produced in Alaska, 1880–1942

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	493,866	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	662,000	23,170,000	14,897,000	8,273,000
1939	665,114	23,279,000	16,058,000	7,221,000
1940	747,943	26,178,000	18,852,000	7,326,000
1941	692,314	24,231,000	16,861,000	7,370,000
1942	487,657	17,068,000	12,329,000	4,739,000
Total	25,522,810	603,413,000	396,116,000	207,297,000

GOLD LODES

During the early part of 1941 lode-gold mining in Alaska proceeded at about the same rate and at most of the same places as it had during the immediately preceding years. As time went on, more and more difficulties were experienced in maintaining adequate crews, and longer and longer delays in getting needed materials and supplies ensued as the defense measures attracted the workers away from the mines, and the transportation of men and materials for these projects taxed more and more heavily and limited the facilities available. The actual outbreak of war late in 1941 caused most of the lode operators to realize that further restrictions and curtailments of their mining operations were inevitable, and early in 1942 many of them prepared to meet that situation either by reducing at once the scale of their undertakings or by switching some of their activities to the search for, or development of, minerals other than gold.

By midsummer of 1942 these handicaps had become so keenly recognized that when on October 8 an order was issued by the War Production Board declaring that henceforth most gold mining was to be classed as a nonessential industry, the impact of the order was not so drastic as might have been predicted. Fortunately, the order also provided for certain exceptions to the application of the general rule laid down, and a few of the larger Alaska lode producers that were eligible under its terms were able to avoid complete closure and to continue their operations on at least a reduced scale for the remainder of the year. Thus one of the large mines, which, in addition to gold, recovered considerable lead as a byproduct, was permitted to continue work at a lower rate, and certain other mines, at which accessory values in tungsten minerals might be recovered, were allowed to continue on a small scale throughout the rest of the year. The difficulties of obtaining sufficiently high priorities to enable even those mines to obtain necessary equipment and supplies, the shortage of transportation facilities to ship in those things that could be purchased in the States, and the increasing difficulty of retaining or recruiting adequate personnel presented handicaps to even such operations as were permissible under the order. Viewed from this standpoint the production of lode gold from Alaska mines in 1942 was much better than might have been expected, and, although marking a serious decline from the production from this type of mine during the preceding year, does not presage a permanent decline in the industry as a whole when normal peacetime conditions are restored.

Of the Alaska lode-gold mines, those in southeastern Alaska continued to furnish most of the lode gold mined in the Territory and accounted for about 70 percent of the lode output for 1941 and 1942.

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The lode-gold mines in the Willow Creek district and adjacent areas in the Cook Inlet-Susitna region stood second in the value of their lode-gold output and accounted for approximately 25 percent of the Territory's lode-gold production for the period. The remainder came from scattered mines in the Fairbanks district and from smaller mines in more remote parts of Alaska.

Of the Alaska lode mines, that of the Alaska Juneau Gold Mining Co., near Juneau in southeastern Alaska, is by far the largest. As that company publishes for its stockholders an annual analysis of its operations[1] it is permissible here to note some of the outstanding features recorded in those reports.

The total rock mined and trammed to the mill was 4,354,770 tons in 1941 and 2,765,190 tons in 1942. Of these amounts 2,143,559 tons of coarse tailings were rejected in 1941 and 1,140,585 tons in 1942. The quantity of ore that was fine-milled was 2,211,211 tons in 1941 and 1,624,601 tons in 1942. The average gold content of all of the material mined was 0.0347 ounce to the ton in 1941 and 0.0345 ounce to the ton in 1942. The amount of gold lost in that part of the rock

Production of Alaska Juneau mine, 1893–1942

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	781,390
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	4,001,600	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
1939	4,648,060	2,377,718	2,270,342	129,012	111,494	2,040,280	4,695,537
1940	4,739,790	2,308,397	2,431,393	122,470	100,633	1,666,016	4,447,171
1941	4,354,770	2,211,211	2,143,559	120,501	95,777	1,464,956	4,370,920
1942	2,765,190	1,624,601	1,140,589	75,537	62,298	938,117	2,749,118
Total	86,625,448	46,052,845	40,572,603	2,834,358	1,904,064	39,711,231	79,033,962

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

[1] Alaska Juneau Gold Mining Co., 27th Ann. Rept., for the year ended December 31, 1941, and 28th Ann. Rept., for the year ended December 31, 1942.

which was rejected was about 0.0063 ounce to the ton in 1941 and 0.0064 ounce to the ton in 1942, and the gold content of the ore that was further treated was 0.0543 ounce to the ton in 1941 and 0.0463 ounce to the ton in 1942. Of these contents somewhat more than 83 percent was recovered as bullion, and the rest was recovered in the concentrates, which were subsequently smelted. The preceding table, compiled from the published report of the Alaska Juneau Gold Mining Co., summarizes the record of that company since the beginning of its operations in 1893.

The cost of mining in 1941, as stated by the company, was 37.9 cents for each ton of ore trammed. The cost of milling was 23.1 cents, and all other marketing costs and expenses were 13 cents, making the entire cost for each ton of ore trammed 74 cents. Similar costs for 1942 were, respectively, 39.6 cents, 28.6 cents, 13.2 cents, and 81.4 cents.

GOLD PLACERS

GENERAL CONDITIONS

Placer mining in Alaska in 1941 yielded gold worth $16,841,000 and in 1942 worth $12,329,000. These figures indicate a considerable falling off from the alltime record set in 1940, when the value of the placer production was $18,854,000. The reduction in the output of placer gold during 1941 and 1942 was due to many of the same causes that have been mentioned as adversely affecting the general mineral industry during those years. In addition, during 1941 the mines of the largest operators in the Fairbanks and Nome districts were closed down completely for more than a month during part of the open season by strikes, and the interruption of work that resulted from unsettled labor conditions was felt throughout practically the whole season and at many of the smaller properties. During 1942 placer mining operations were somewhat more heavily handicapped than other types of mining by the heavy call made on the operators to release dirt-moving equipment for use on many construction projects that were in progress. The numerous airfields, both military and civil, that were being built, the Alaska military highway, formerly known as the Alcan Highway, and countless other projects in the vicinity of the military establishments created demands for draglines, bulldozers, tractors of all kinds, and power generators that customarily are used at the mines. Many of these new projects operating on a cost-plus basis were not restricted by price, and consequently their builders offered abnormally high prices for the acquisition of this equipment and urged its release for their purposes.

Placer mining is especially dependent on weather conditions, which control the length of the working season, and the amount of water available for use. At many of the placer camps the open season is

ordinarily limited to 120 days, so that any curtailment through late opening of the season in the spring or early closing in the fall because of the cold seriously affects production. The placer camps in both 1941 and 1942 enjoyed somewhat longer open seasons than usual, as the weather permitted a number of them to start work early in the spring and prolong it late in the fall. This advantageous condition, however, was somewhat offset during 1941 by the fact that owing to the exceedingly small rainfall, most of the placer camps suffered a severe shortage of water for many of the important mining processes. As a result, many of them were operated on a reduced scale during the open season, and some of them were so short of water that the operators stopped mining long before the season would have been closed by the cold. In 1942 the supplies of water for mining at most of the Alaska placer camps were larger than usual, and, indeed, many of the streams were at exceptionally high stages even late in the season, almost up to the time they became icebound.

PRODUCTION BY REGIONS

The great number of small placer mines widely scattered throughout the Territory and the resulting difficulty in obtaining records of their production at all, or on a uniform basis with more general records obtained from other sources, cause some uncertainties and possible errors in the preparation of the statistics here set down. Every reasonable precaution, however, has been taken to adjust or minimize any recognized discrepancies. As a result the figures given for the total placer-gold production are believed to be in close accord with the actual facts. The distribution of that total among the different regions, districts, and camps becomes progressively less certain the smaller the unit considered, because the gold, unless reported to the Survey by the original producer, may have been credited erroneously to some other area through which it passed in the course of trade.

In the following table the different regions have been arranged in the relative order of the value of their placer-gold production. This is the same relative order that has prevailed during recent years.

Value by regions of placer gold produced in Alaska in 1941 and 1942

Region	1941	1942
Yukon	$10,464,000	$9,128,000
Seward Peninsula	4,737,000	2,595,000
Kuskokwim	1,270,000	505,000
Miscellaneous	390,000	101,000
Total	16,861,000	12,329,000

YUKON REGION

From two-thirds to three-fourths of the annual placer-gold production comes from mines in the Yukon region. In this region the larger placer camps are grouped around a number of centers, which for convenience are here referred to as districts, though smaller camps are found widely dispersed even in the most remote parts of the area, and the limits of the individual districts are intentionally only vaguely defined. Of the various placer districts in the Yukon region the Fairbanks district has for many years been the most productive, with Circle, Iditarod, Innoko, and Ruby ordinarily following in that general order. The record of the output of the various districts of the Yukon region for the years 1941 and 1942 is set forth in the following table.

Value of placer gold produced in Yukon region, 1941 and 1942, by districts

District	1941	1942	District	1941	1942
Fairbanks	$5,102,000	$5,955,000	Marshall	$134.000	$150.000
Circle	1,254.000	775,000	Kantishna	87,000	125,000
Iditarod	814.000	582,000	Bonnifield	113.000	17 000
Innoko	882,000	510,000	Rampart	24.000	8,000
Ruby	365.000	350.000	Eagle	24 000	5.000
Tolovana	513.000	125,000	Chisana	14.000	8,000
Hot Springs and Tanana	389,000	227,000			
Fortymile	218,000	205,000	Total	10,464,000	9,128.000
Koyukuk and Chandalar	231.000	86.000			

SEWARD PENINSULA

The production of placer gold from Seward Penisula, as indicated in the table on page 10, was $4,737,000 in 1941 and $2,595,000 in 1942, as compared with $4,475,000 in 1940. The placer gold comes from a number of mines that for convenience have been grouped into seven more or less distinct districts. So much of the placer gold from some of these districts comes from only one or two mines that it has not seemed advisable to publish statements on the production of the separate districts, as to do so might reveal confidential information. In the relative order of their output of placer gold in 1942, which was also in fairly close accord with their standing in 1941, the mining districts of Seward Peninsula stood as follows: Nome, Kougarok, Fairhaven (including the Inmachuk), Council (including Bluff), Solomon (including Casadepaga), Port Clarence, and Koyuk.

KUSKOKWIM REGION

In the Kuskokwim region there are three principal districts in which placer-gold mining has been active. These are the Tuluksak-Aniak district, some 60 miles in an easterly direction from Bethel, the Goodnews district, near the southern limit of Kuskokwim Bay, and

the Mount McKinley-McGrath district, which embraces most of the eastern headwater area of the Kuskokwim Valley. Much of the region is relatively inaccessible and has been less extensively prospected than any other part of Alaska south of the Arctic Circle. The placer camps in the Kuskokwim region, because of their remoteness, have probably felt the impact of the wartime restrictions more than the camps in any of the other productive regions.

MISCELLANEOUS

Grouped together on page 10 as "Miscellaneous" are a number of small placer camps in areas that extend from southeastern Alaska to northern Alaska. Between these extremes are other small camps in the Copper River and Cook Inlet-Susitna regions. In southeastern Alaska the only camps that have reported their placer production during 1941 and 1942 to the Geological Survey are near Yakataga. In the Copper River region the principal placer mining was in the vicinity of Nizina. In the Cook Inlet-Susitna region some placer gold was mined at camps in the Kenai Peninsula, in the Yentna-Cache Creek district and in the Valdez Creek district. In northern Alaska the only placer gold reported to have been recovered was from deposits at two widely separated areas in the valley of the Kobuk River.

DREDGING

In 1941 gold to the value of $10,474,000, or about 62 percent of the entire placer-gold production of that year, was mined by dredges. In 1942 gold valued at $9,240,000, or about 74 percent of the placer output of that year, was recovered by dredges. These amounts bring the total value of the gold recovered by dredges since 1903, when dredging was started in the Territory, to $139,600,000, which is a little more than 35 percent of the total value of the gold produced from all kinds of placer mining since 1880.[2]

It is significant to note that until the orders of the War Production Board closed most of the gold mines as "unessential" dredging appears to have been less affected by war conditions than other types of placer mining. This trend is indicated by the fact that in 1942 the ratio of gold recovered by dredging to the total placer production was greater than in 1941. The low rate of dredge production in 1941 seems largely attributable to the effects of the labor strikes during that year, which led to complete cessation of mining by the two largest producers for a period of more than a month. Probably the ability of the dredging companies to withstand better some of the handicaps to which companies carrying on other forms of mining early succumbed was due to

[2] Records regarding the operations of the dredge in the Kuskokwin region that is engaged primarily in mining the placer platinum deposits are not included in any of the statements given in this section of the report.

their operating on a larger scale and maintaining more extensive stocks of supplies and replacement parts.

During 1941 there were 47 gold dredges in operation in various parts of Alaska. Of these, 22 were mining in districts in the Yukon region, 3 in the Kuskokwim region, and 22 in Seward Peninsula. Of the dredges in the Yukon region, 10 were in the Fairbanks district, 4 in the Innoko district, 3 in the Circle district, 2 each in the Fortymile and Iditarod districts, and 1 in the Tolovana district. Two of the 3 dredges in the Kuskokwim region were in the Tuluksak-Aniak district, and the other one was in the Goodnews district. The number and distribution by districts of the dredges operating in Seward Peninsula in 1941 were as follows: 6 near Nome, 5 near Council, 4 each in the Kougarok and Fairhaven districts, 2 near Solomon, and 1 in the Koyuk district.

During 1942 there were 38 dredges in operation in various parts of Alaska. Of these, 19 were in the Yukon region, 2 in the Kuskokwim region, and 17 in Seward Peninsula. Of the dredges in the Yukon region, 9 were in the Fairbanks district, 3 each in the Circle and Innoko districts, and 2 each in the Iditarod and Fortymile districts. The only dredges operating in the Kuskokwim region in 1942 were in the Tuluksak-Aniak district. Four dredges were mining in each of the following districts in Seward Peninsula: Nome, Council, Fairhaven, and Kougarok. The only other dredge operating in 1942 in the Seward Peninsula was one near Solomon.

For a number of years it has been possible for the Geological Survey to furnish close estimates of the amount of gravel handled annually by the dredges. This cannot be done for the years 1941 and 1942, owing to the incompleteness of the available records. It may be pertinent to point out that for the period from 1916 to the close of 1940 dredges had handled 214,239,000 yards of gravel, from which gold to the value of $107,453,000 had been recovered, indicating an average tenor of gold worth 50 cents a cubic yard. In this connection it should be noted that the records of the years prior to 1934 were based on the price of gold at $20.67 an ounce, whereas on and after that date the statistics were computed for gold at $35 an ounce. As a consequence of that increased price of gold the current rate of about 55 cents a yard for the gold tenor would have been about 33 cents a yard if the former rate had held.

SILVER

None of the materials that are now being mined in Alaska are valuable primarily for the silver they contain, and the silver that is recovered occurs as a relatively minor constituent or byproduct of ores or bullion, the principal value of which lies in some other metal.

In the past the great bulk of the silver from Alaska was carried as an accessory metal in the copper ores, but since 1938, with the complete cessation of copper mining as such, there has been no output of silver from that source. As is probably well known, all gold as it occurs in nature is alloyed with other metals. Silver in varying amounts is commonly the principal accessory component of such alloys. Usually this silver cannot be seen as a distinct component but is recognized by chemical tests and is recovered in the course of smelting and refining to which the material is subjected. In much of the Alaska placer gold the proportion is about 120 parts of silver to 870 parts of gold. In the gold from the lode mines the ratio of silver to gold in the bullion is usually somewhat higher than for the placer gold, and in most of the concentrates from lode mines there are accessory amounts of silver carried in some of the other minerals in the ore, notably galena or lead sulfide. In some of the lode mines the value of the silver recovered from these two sources becomes of considerable commercial significance. Thus, at the mine of the Alaska Juneau Gold Mining Co. the silver recovered in 1942 was valued at more than $44,000, though as computed from the published statistics of that company it amounted to only a little more than 0.038 ounce of silver to the ton of rock that was fine-milled.

The silver recovered from all Alaskan sources in 1941 amounted to 199,700 fine ounces, worth $142,000; in 1942 the production was 135,200 ounces, worth $96,000. The value stated in the foregoing estimates are based on the assumption that all of the silver qualified for purchase under the advanced price allowed by the Government for silver derived from domestic ores. The unit price for such silver was approximately 71 cents an ounce. This was about double the price allowed for silver that did not qualify for purchase under the Government's terms.

The development 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 usually are required to recover the silver in a readily salable metallic state than to recover gold. These factors exercise especially strong controls on the development of Alaskan deposits of silver ores. As a result there is little inducement 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 their exploitation.

LEAD

The lead produced from Alaska ores is estimated to have been 1,485,000 pounds in 1941 and 1,047,000 pounds in 1942. Both of these amounts were considerably less than the production of 1,680,000 pounds recorded for 1940, itself a year of rather less than normal output. The decreases are attributable to the marked falling off in the activities at the lode-gold mines of the Territory, because all of the lead is recovered as a byproduct from the concentrates of their ores. These concentrates are shipped to smelters in the States for treatment to recover the valuable metals they contain.

By far the greater part of the lead that was recovered either in 1941 or in 1942, as well as in a number of the preceding years, came from the treatment of ores of the Alaska Juneau Gold Mining Co. in southeastern Alaska. According to the published reports of this company, it recovered about one-third of a pound of lead from each ton of ore that was mined and trammed to the mill, or about four-sevenths of a pound of lead from each ton of ore that was fine-milled. From the table on page 8, which shows the recovery of metals from the Alaska Juneau mine, it is evident that the amount of lead recovered from the ore treated was considerably below the average for the period of the mine's operation since 1914, which is slightly more than 0.86 pounds of lead to the ton of ore that is fine-milled.

Lead is a heavy, relatively low-priced commodity that requires rather elaborate treatment to produce, and these draw-backs act as deterrents to the developing of lead deposits in remote parts of Alaska. The outlook for any notable increase in the production of this metal seems to depend mainly on the stimulation of the mining of other metals and the consequent increase in the production of lead as a byproduct. Such increase cannot be anticipated under the existing stress of war, but it seems likely to occur after the establishment of peace, when, with the attention of business throughout the world directed toward repairing the ravages of war, general development and improvement in transportation facilities in Alaska will inevitably follow.

COAL

For the 5 years immediately preceding 1941 the annual output of coal from Alaskan mines was approximately 150,000 tons. To meet the domestic needs this local coal was supplemented annually by imports of 15,000 to 30,000 tons of coal from mines in the United States and Canada. The total Alaskan consumption of coal was therefore usually between 175,000 and 200,000 tons a year. With war threatening, and finally becoming a reality, the need for additional sources of power became urgent, and steps were taken, both by the Government and by private individuals and companies, to open up new properties

or to put the already operating mines in condition to produce more coal. The steps so far taken have been effective, as is shown by the increased output already made by the coal mines, the total reported output being 241,250 tons in 1941 and 246,600 tons in 1942. These increases were made in spite of certain adverse conditions, among them a serious fire within one of the largest mines, which caused a loss of at least 2 months' normal production, and intermittent stoppage of work for several periods at another of the large mines because of labor and management difficulties. In fact, as equipped at the end of 1942, practically all of the operating mines could increase their output at least 25 percent if operated full time and if skilled miners were available.

A value has been placed on the production of coal during these 2 years of $965,000 and $986,000, respectively. These values, however, should be regarded as only fair approximations, because records are not available for precise determination of the actual value of the coal at the mine without inclusion of charges for handling and transportation. Much of the coal is produced from the mine owned by The Alaska Railroad or is purchased under contract for large quantities, so that the price at which the railroad gets its coal is not a suitable index for that of the coal delivered on small orders, and the price of neither bears much relation to the prices paid in town for coal that has been handled by several middlemen and bears considerable charges for transportation and delivery. Considering all the available information and weighting the resulting estimate as closely as practicable, it appears that the average price of coal mined in Alaska may be taken as $4 a ton for both 1941 and 1942. This is the same as the estimated price in 1940 and is about $1 a ton less than the average price that has prevailed during the period 1880 to 1940. Based on this unit price the Alaska coal production in 1941 was $965,000 and in 1942 $986,000.

The coals now being mined in Alaska come from two principal fields and include both bituminous coals and high-grade lignites. For a long time the production of lignite was about twice that of bituminous coal. Recently, however, the demand for bituminous coal has increased so greatly that for 1941 the two were more nearly equal, and in 1942 the order had become reversed and the ratio of bituminous coal to lignite was about 57 to 43. The 1942 ratio probably will not prevail for long, because the output of lignite in that year was curtailed by the serious fire at the principal mine, and now a number of new enterprises are being set in motion in the lignite area to develop additional properties.

In spite of the greatly increased rate of coal production that has taken place recently, the output has not yet reached the point where all military and civilian needs have been fully met. Indeed, there

has been such a shortage that many residents of the towns like Fairbanks and Anchorage are reported to have had great difficulty in getting sufficient coal for their household needs. Plans for greatly increased use of coal for the production of power at the large military and civilian installations are being formulated, which, if carried out, might make it necessary to double the present capacity of the producing mines. Fortunately, Alaska is well supplied with deposits of coal, so that if an actual market were developed there should be little difficulty in finding sufficient coal to supply it. The trouble in the past has been, and probably for some time will continue to be, to keep a reasonably balanced relation between consumption and production of coal. Obviously, many potential consumers are unwilling to enter into firm contracts unless they have definite evidence of the producer's ability to furnish the coal of the desired quality at a set price. On the other hand, the producers are loath to commit themselves to installing plants of large capacity unless they can be reasonably assured of a sufficient volume of business to repay their outlay. Under these conditions a stalemate ensues, or it becomes necessary for both sides to accept certain risks that cannot be closely forecast in advance. Many of the competitive conditions, however, are changing rapidly, so that the situation must be subjected to constant review. Of course as Alaska becomes more settled and develops, its people and industries will call for more and more coal. That growth after the immediate military exigency passes will probably be relatively slow, though nonetheless sure.

OTHER MINERAL PRODUCTS

In addition to the various mineral products discussed in preceding pages, Alaskan mines yielded other minerals to the value of $1,367,000 in 1941 and $1,124,000 in 1942. These materials, whose total value is given under "Other mineral products" on p. 5, were platinum metals, tungsten, mercury, antimony, tin, copper, and limerock. The list of miscellaneous mineral commodities produced in 1942 includes most of these same materials, though limerock dropped out and chrome was added.

In the interests of national security it has been considered not expedient to disseminate detailed information at this time regarding these various commodities. However, certain general statements that may be useful regarding them may be made.

Platinum is one of a group of several metals which because they are closely related in physical and chemical characters 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 platinum metals, or even more loosely as "platinum." Platinum, palladium, iridium, osmium, ruthenium, and rhodium, all members of this group, have

been recognized in commercial quantities in the product from some of the lodes and placers in Alaska. Lately all of the production of platinum metals from Alaskan deposits has come from placers in the western part of the Territory. At the principal camp these placers are mined by dredging the unfrozen sands and gravels in which the platinum metals occur. These deposits are the principal domestic source of platinum metals in the United States or in its possessions. Production has been maintained at a rather uniform rate, and the reserves so far blocked out indicate that at that rate they can be counted on to support the industry for a number of years. No lode deposits carrying significant amounts of platinum metals have been discovered in the vicinity of the richest platinum fields, but certain lode deposits in southeastern Alaska in the past have been mined for the composite value of their content of metals, among which were platinum metals, and doubtless mining of these lode deposits will be revived in the future.

The recent demand for tungsten, used in the production of certain high-quality steels required in cutting tools and similar articles, has revived interest in the search for and development of some of the Alaskan deposits that might supply this needed war material. As a result, mining has been in progress at a number of widely scattered points, and prospecting for additional sources has been carried on even more extensively. At present the principal tungsten mineral sought is scheelite, a calcium tungstate, whose chemical formula is $CaWO_4$ and whose content of tungsten trioxide is about 80 percent. It is a relatively heavy white mineral that is often recognized among the concentrates from placer-gold gravels. The principal deposits that are being mined for their tungsten content are veins and lodes generally associated with intrusions of acidic rock, such as granite, or quartz diorite. As rocks of this type are fairly widely distributed throughout Alaska, search for them and the tungsten minerals they may contain is not confined to a restricted area.

Arrangements have recently been made by the Metals Reserve Corporation to purchase locally small lots of tungsten and other ores at selected points in Alaska. This should do much to aid prospectors, who thus have a ready market at hand for such ore as they find and prompt payment, which they can utilize in outfitting themselves for continuing their search. As yet the developments are all small, and the present indications suggest that the scheelite is irregularly distributed in the gangue materials, so that the tenor of the veins varies greatly, both along the strike and the dip. In few places have large pockets of high-grade ore been found, but the areas adjacent to some of the known occurrences of tungsten in which that kind of mineralization has been recognized are so extensive that they may afford considerable merchantable ore.

Recent investigations have shown that the occurrences of mercury ores in the Kuskokwim region of western Alaska are much more extensive and of higher grade than had been indicated by earlier examinations. Active development of some of the more accessible deposits has been in progress, and as a result considerable shipments of mercury were made during 1941 and 1942. Further developments are in progress, which, if successfully carried out, should lead to a further expansion of the industry. The deposits occur in one of the least accessible parts of Alaska, so that costs are high and the operators have had to overcome the many difficulties that arise in getting enterprises under way in pioneer areas where normal facilities are almost entirely lacking. Fortunately, the high price at present prevailing for mercury provides a sufficient margin to offset the high initial expenditures that are required in opening up some of the deposits. The principal mercury mineral in all of the deposits so far explored is cinnabar, the sulfide of mercury (HgS), which when pure contains about 86 percent of mercury. With it at many places are subordinate amounts of stibnite, the sulfide of antimony, which is itself valuable, though its current price is too low to allow it to be shipped profitably from such a remote region. The ore is found in veins and stringers that are more or less closely associated with intrusive dikes and sills of andesite or related igneous rocks that traverse irregularly the sandstones and shales that form country rock throughout most of the area in which mercury mineralization occurs. Cinnabar has also been recognized in the concentrates from the placer deposits in many other parts of the Territory, but in most of these other places the bedrock source either has not been discovered or the lodes from which the cinnabar originally came are small stringers that appear unlikely to afford ore that can be mined commercially under present conditions.

High-grade chrome ore with a ratio of more than three parts of chromium to one part of iron has long been known to occur in the Kenai Peninsula, in the central part of southern Alaska. The need for ore of this type for military purposes has caused a recent revival of mining at the better showings. During 1941 the operators were busy testing the deposits and constructing the necessary roads and other facilities for developing their properties without producing any significant amount of ore. These efforts led during 1942 to getting out some ore and stock piling it at the beach where it would be readily available for shipment to some point where it would be milled and put into shape for use. For a time it was expected that this ore dressing would be done at one of the gold-milling plants in southeastern Alaska, which could be made available because of curtailment of its normal use for the treatment of gold ores. This part of the project, however, was not carried out, and so far as known no shipments of chrome ore from

Alaska were made during the year though, as noted, some ore was produced and is on hand awaiting shipment. The chrome deposits are contained in masses of ultrabasic rocks, which are intrusive into a complex series of graywackes, slates, and cherts. The predominant intrusive is classified as a dunite. Chromite grains are distributed widely in small quantities throughout the dunite, and the ore bodies are masses in which the chromite has been concentrated by magmatic segregation.

Antimony is another of the mineral commodities that has been in demand for war purposes. Antimony minerals are widely distributed throughout many of the mineralized areas in Alaska, and at a few of them they occur in sufficient quantities to be mined commercially under existing conditions. The principal antimony ore mineral is stibnite, an antimony sulfide with the chemical formula Sb_2S_3. There was notable production of antimony ore in 1941 from a mine situated in the northern foothills of the Alaska range, but during 1942 production had dropped off greatly. All of the antimony ores produced in Alaskan mines are shipped to smelters in the States for treatment. This entails considerable overland haulage to the railroad, transportation by rail to a port from which it can be shipped, ocean carriage to the States, and further handling before it reaches the smelter. As a rule the antimony occurs in veins and kidneys, some of which consist of almost pure stibnite. At most localities the stibnite veins occur in areas of quartzitic schist—Birch Creek schist or schist of nearly the same age. The deposits have been subjected to some postmineral faulting, but ordinarily the amount of displacement is small. Very little ore has been blocked out at any of the mines, as the cost of such work would use up considerable capital that can be better utilized in mining work that makes more immediate return in money. As noted in an earlier paragraph, considerable stibnite is associated with the deposits of mercury ore that are being mined, and if antimony had a higher unit selling price some of it might be recovered from these ores.

For many years Alaska has been a small but fairly regular producer of tin, and in the more than 40 years since tin minerals were discovered in Seward Peninsula, and later elsewhere in the Territory, it has shipped tin worth nearly $1,700,000. It may be significant to point out that the Alaskan deposits have furnished far more tin than has come from any other deposits elsewhere within the limits of the United States or its possessions. A small amount of tin has been derived from lodes in Seward Peninsula, but by far the greater part has been recovered from placers, and of late years all of the tin has been derived from deposits of that sort. The principal tin mineral is cassiterite, an oxide of tin (SnO_2) containing about 78 percent of metallic tin. It is recovered from the sand and gravel of the placers by processes

that are essentially the same as those used in gold mining. The tin is recovered in metallic form from the cassiterite by smelting, which is done outside Alaska. The principal productive area is in western Seward Peninsula, but small amounts of cassiterite are recovered at a number of the gold mining camps in the Yukon region in the course of placer gold operations. During 1941 the Alaska production of tin ore was maintained at about the customary rate, but in 1942 the principal operator had discontinued work and the production accordingly fell off sharply. The more extensive of the known richer placer deposits have been rather completely mined out, but there has been a decided revival of interest in opening up some of the lode properties that have long lain idle. It is doubtful, however, whether any of these will actually be brought into production by private enterprise while war conditions prevail.

In the past the copper production from Alaskan mines has ranked second in value only to the gold production of the Territory. In 1938, however, the famous copper deposits that had been the main support of the industry for many years were so nearly worked out that late in that year they were definitely closed down. In the span of years from 1900 to 1938, inclusive, these and the other copper-producing properties in Alaska had furnished over 1,374,000,000 pounds of copper valued at nearly $227,400,000. Since that date the only copper produced from Alaskan mines has been that recovered as a byproduct from ores that are principally valuable for some other metal. The quantity and value of the copper production has therefore fallen off, so that the annual output is now valued at only a few thousand dollars. No considerable change in the amount of copper derived from ores of this sort is to be expected in the near future unless the operators greatly alter the size of their general mining and milling operations. That there are many places in Alaska where copper minerals occur has been amply demonstrated. It is highly doubtful whether any of the known deposits not now being mined can be worked at a profit under present conditions. 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 now willing to take the gamble.

The quarrying of limestone as an ingredient for cement has been one of the principal activities involving nonmetallic mineral commodities other than coal during the past 15 years. The quarries from which this high-grade limestone is obtained are in southeastern Alaska. From the quarries at this locality the rough stone is shipped in barges through the inland chain of fiords to Seattle, where it is treated and mixed with other constituents of the cement. The company has found it practicable to supply itself adequately with all of

the limestone needed by keeping its quarries in operation for only part of the year when weather conditions are most favorable. As a result the property usually lies idle from September to April. During 1941 the quarry was in operation from May to October, but during 1942 it was not in operation at all and no shipments were made from it.

The list of other minerals of value that have been found in Alaska is long. In addition to those mentioned in preceding pages, others which have been found in sufficient quantity to have perhaps more than local interest and some of which have been the basis of profitable mining industries include among metallic products arsenic, bismuth, cobalt, iron, molybdenum, nickel, and zinc, and among the nonmetallic products asbestos, barite, building stone, clay, garnet, graphite, gypsum, jade, marble, petroleum, and sulfur. Without doubt small quantities of practically all of these minerals may have been "produced" in 1941 and 1942 in the broadest sense of that word, but none were known to have been sold commercially during those years. Extensive use was made of such widespread local earth materials as sand, gravel, and broken rock in the construction of roads and maintenance of the railroads. Such materials also entered largely into the concrete mixtures 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 no price has been set on these materials, though if even 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.

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