MINERAL RESOURCES OF ALASKA, 1918.

By G. C. MARTIN AND OTHERS.

PREFACE.

By G. C. MARTIN.

This volume is the fifteenth of a series of annual bulletins[1] treating of the mining industry of Alaska and summarizing the results achieved during the year in the investigation of the mineral resources of the Territory. These reports are intended to give prompt publication of the more valuable economic results of the year. The time available for their preparation does not permit full office study of the field notes and specimens, and some of the statements made here may be subject to modification when the study has been completed. Those interested in any particular district should therefore procure a copy of the complete report on that district as soon as it is available.

This volume, like the others of the series, contains an account of the mining industry, including statistics of mineral production, and also preliminary statements on investigations made by the Geological Survey. It is intended that this series of reports shall serve as convenient reference works on the mining industry for the years which they cover. It is not possible for a member of the Survey to visit every mining district each year, and therefore the information used in preparing the summary on mining developments is in part obtained from other reliable sources. The number of important mining districts that were not visited by Survey geologists was larger in 1918 than usual, because the staff of the Alaska division of the Geological Survey had been depleted by the entrance of most of the geologists into the Army or into various activities connected with the prosecution of the war. The Geological Survey is consequently under even greater obligation than in past years to the residents of the Territory and others who have supplied valuable information. Those who have thus aided in the preparation of this report include

[1] The preceding volumes in this series are U. S. Geol. Survey Bulls. 259, 284, 314, 345, 379, 442, 480, 520, 542, 592, 622, 642, 662, and 692.

the many mine operators who have made reports on production and developments, especially those who responded to the appeal for advance information concerning their mining activities. The Director and the officers of the Mint, the officers of the Alaska customs service, the members and officers of the Alaska Engineering Commission, the officers of the American Railway Express Co., many other Federal and Territorial officials, the Seattle Chamber of Commerce, and many officers of transportation and commercial companies have contributed valuable data for this report. It is impossible to enumerate all the individuals and mining companies who have supplied the customary information concerning their own activities, but grateful acknowledgment must be made to those who have furnished other special information, among whom are the following: The late Hon. Charles A. Sulzer; P. R. Bradley and G. T. Jackson, of Juneau; George C. Hazelet, of Cordova; E. T. Stannard, of Kennicott; G. Howard Birch, of Dan Creek; F. LeRoy Thurmond, of Anchorage; the late U. G. Myers, of Eagle; J. A. Kemp, of Steel Creek; Thomas Hunter, of Circle; O. J. Nicholson, of White Eye; J. A. Fairborn, H. A. St. George, E. A. Suter, Volney Richmond, R. C. Wood, First National Bank, and Farmers' Bank of Fairbanks; Charles Zielke, of Nenana; Alexander Mitchell, of Kantishna; George L. Morrison, of Hot Springs; George Wesch, of Livengood; George W. Ledger, of Rampart; Frank Cook, of Ruby; C. A. Boerner, Charles Ross, and Miners and Merchants' Bank, of Iditarod; Henry Howard, of Flat; W. F. Green, of McGrath; Harry Madison, of Tolstoi; G. A. Stecker, of Quinhagak; E. W. Quigley, Alaska Banking & Safe Deposit Co., and Miners and Merchants' Bank, of Nome; and George L. Stanley, of Kiana.

ADMINISTRATIVE REPORT.

By G. C. MARTIN.

INTRODUCTION.

Ten parties were engaged during 1918 in Alaska surveys and investigations. The length of the field season ranged from 2 to 12 months, being determined by the character of the work and by the climatic conditions prevailing in different parts of the territory. The parties included 8 geologists, 1 topographer, 1 engineer, and 20 packers, cooks, and other auxiliaries. Eight of the parties were engaged in geologic surveys, one in topographic surveys, and one in stream gaging. The areas covered by reconnaissance geologic surveys on a scale of 1:250,000 (4 miles to an inch) amount to 3,500 square miles. Much of the time of the geologists was devoted to the investigation of special problems relating to the occurrence of minerals, the results of which can not be expressed in terms of area. About 1,200 square miles was covered by reconnaissance topographic surveys on a scale of 1:250,000 (4 miles to an inch). In cooperation with the Forest Service, stream gaging was continued in southeastern Alaska.

Of the parties whose work may be classified geographically, three parties worked in southeastern Alaska, three in the Cook Inlet-Susitna region, one in the Yukon basin, and two in Seward Peninsula.

The funds available for field and office work relating to the field season of 1918 included an appropriation of $75,000 and an allotment of a statutory salary of $2,000 for the fiscal year ending June 30, 1919, and the unexpended balance of the appropriation for the year ending June 30, 1918, of which about $15,800 was used in equipping parties for the season's field work. The following tables show the allotments, including both field and office work, of the total funds classified by regions, by kinds of surveys, and by kinds of expenditures. In the first table the general office expenses are apportioned to the several allotments, account being taken of variations in character of work. The results are expressed in round numbers. Salaries of the permanent staff, other fixed charges, and the total allotments

for the work of the office at Auchorage are included up to the end of the fiscal year 1919, but expenses other than these include only the cost of field and office work during 1918. The "general investigations" include, among other things, the cost of collecting mineral statistics, of office work relating to the field investigations of previous seasons, and of investigations under the direct administration of the geologic branch. A balance of about $16,500 from the appropriation for the year ending June 30, 1919, is available for equipping the field parties in 1919.

Approximate general distribution of appropriations for Alaska investigations, field season 1918.

	1917–18	1918–19
Southeastern Alaska	$3,000	$15,800
Copper River and Prince William Sound	.....	1,300
Cook Inlet and Susitna basin	4,400	19,700
Yukon basin	3,900	8,500
Seward Peninsula	4,500	7,300
General investigations	.....	7,900
To be allotted to field work, 1919	.....	16,500
	15,800	77,000

Approximate allotments to different kinds of surveys and investigations, field season 1918.

	1917–18	1918–19
Reconnaissance geologic surveys	$10,200	$13,000
Special geologic investigations	3,350	17,500
Reconnaissance topographic surveys	2,250	4,300
Investigation of water resources	.....	5,100
Collection of mineral statistics	.....	1,800
Miscellaneous, including administration, inspection, clerical salaries, office supplies and equipment, and map compilation	.....	18,800
To be allotted to field work, 1919	.....	16,500
	15,800	77,000

Allotments for salaries and field expenses, field season 1918.

	1917–18	1918–19
Scientific and technical salaries	.....	$26,328
Field expenses	$15,800	20,259
Clerical and administrative salaries and miscellaneous expenses	.....	13,913
To be allotted to field work, 1919	.....	16,500
	15,800	77,000

The following table exhibits the progress of investigations in Alaska and the annual grant of funds since systematic surveys were begun in 1898. It should be noted that a varying amount is spent each year on special investigations that yield results which can not be expressed in terms of area.

Progress of surveys in Alaska, 1898–1918.

Year.	Appropriation.	Areas covered by geologic surveys.			Areas covered by topographic surveys.[a]					Water resources investigations.	
		Exploratory (scale 1:625,000 or 1:1,000,000).	Reconnaissance (scale 1:250,000).	Detailed (scale 1:62,500).	Exploratory (scale 1:625,000 or 1:1,000,000).	Reconnaissance (scale 1:250,000; 200-foot contours).	Detailed (scale 1:62,500; 25, 50, or 100 foot contours).	Lines of levels.	Bench marks set.	Gaging stations maintained part of year.	Stream volume measurements.
		Sq. m.	*Sq. m.*	*Sq. m.*	*Sq. m.*	*Sq. m.*	*Sq. m.*	*Miles.*			
1898	$46,189	9,500	.....	.....	12,840	2,070	.....	.....	.....	.....	.....
1899	25,000	6,000	.....	.....	8,690	.....	.....	.....	.....	.....	.....
1900	60,000	3,300	6,700	.....	630	11,150	.....	.....	.....	.....	.....
1901	60,000	6,200	5,800	.....	10,200	5,450	.....	.....	.....	.....	.....
1902	60,000	6,950	10,050	.....	8,330	11,970	96	.....	.....	.....	.....
1903	60,000	5,000	8,000	96	.....	15,000	.....	.....	.....	.....	.....
1904	60,000	4,050	3,500	.....	800	6,480	480	86	19	.....	.....
1905	80,000	4,000	4,100	536	.....	4,880	787	202	28	.....	.....
1906	80,000	5,000	4,000	421	.....	13,500	40	.....	.....	14	286
1907	80,000	2,600	1,400	442	.....	6,120	501	95	16	48	457
1908	80,000	2,000	2,850	604	.....	3,980	427	76	9	53	556
1909	90,000	6,100	5,500	450	6,190	5,170	444	.....	.....	81	703
1910	90,000	.....	8,635	321	.....	13,815	36	.....	.....	69	429
1911	100,000	8,000	10,550	496	.....	14,460	246	.....	.....	68	309
1912	90,000	.....	[b]2,000	525	.....	.....	298	.....	.....	69	381
1913	100,000	3,500	2,950	180	3,400	2,535	287	.....	.....	.....	.....
1914	100,000	1,000	7,700	325	600	10,300	10	.....	.....	.....	.....
1915	100,000	.....	10,700	200	.....	10,400	12	3	2	9	.....
1916	100,000	.....	5,100	636	.....	9,700	67	.....	.....	20	.....
1917	100,000	.....	1,750	275	.....	1,050	.....	.....	.....	19	.....
1918	77,000	.....	3,500	.....	.....	1,200	.....	.....	.....	.....	.....
	1,638,189	73,200	104,785	5,507	51,680	149,230	3,731	462	74	.....	.....
Percentage of total area of Alaska	.....	12.48	17.87	0.94	8.81	25.45	0.64	.....	.....	.....	.....

[a] The Coast and Geodetic and International Boundary surveys and the General Land Office have also made topographic surveys in Alaska. The areas covered by these surveys are, of course, not included in these totals.

GEOGRAPHIC DISTRIBUTION OF INVESTIGATIONS.

GENERAL WORK.

Alfred H. Brooks, geologist in charge of the division of Alaskan mineral resources, now lieutenant colonel of the Corps of Engineers, United States Army, and chief geologist of the American Expeditionary Force, has been engaged in military duty in France throughout the year.

The writer was engaged in office work till July 26, when he started for Alaska. The time from August 12 to August 26 was devoted to a review of mining developments and the collection of statistics in the Fairbanks district. Some of the mines in the Chitina Valley were visited during the first week in September. He then spent one day in consultation with Mr. Chapin concerning the work of the office in Anchorage and returned to Washington on September 26.

In the office the writer devoted 66 days to the preparation of the progress, administrative, and statistical reports, 10 days to revision of papers and proof reading, 12 days to the preparation of the annual press bulletin, 10 days to field plans, and 141 days to administrative and miscellaneous duties.

During the writer's absence in Alaska F. H. Moffit was acting geologist in charge and devoted considerable time to executive work.

During the absence of Capt. E. M. Aten, who is still in military service, Miss Lucy M. Graves has continued as office assistant to the acting geologist in charge, and T. R. Burch has assisted in the collection and compilation of mineral statistics.

Maj. J. W. Bagley and Capt. C. E. Giffin have been engaged in military service throughout the year. George L. Harrington entered military service as first lieutenant on June 21.

SOUTHEASTERN ALASKA.

Field work in southeastern Alaska included special investigations of Carboniferous stratigraphy and paleontology, a geologic reconnaissance of parts of Chichagof and Admiralty islands, and a continuation of the investigation of water resources.

The investigation of the water resources of southeastern Alaska, begun in 1915 under a cooperative agreement with the Forest Service, was continued throughout 1918. G. H. Canfield, who had charge of this work, maintained automatic gages throughout the year. In addition to these gages, others were installed in cooperation with individuals and corporations. The results are briefly summarized in another section of this report. This work could not have been carried on without the cordial cooperation of the Forest Service, many members of which have given substantial aid; particular acknowledgment should be made to W. G. Weigle, special agent at Ketchikan, and to Philip H. Dater, district engineer at Portland, Oreg.

A reconnaissance of the geology and mineral deposits of Admiralty Island and of the eastern part of Chichagof Island was made by Edwin Kirk. Field work was begun on May 31 and continued till August 27. An area of about 1,500 square miles was mapped on the scale of 1:200,000.

A study of the Carboniferous rocks of southeastern Alaska was assigned to George H. Girty, who studied the stratigraphy and made large collections of fossils from June 1 to July 30.

COOK INLET AND SUSITNA REGIONS.

Because of the importance of the region tributary to the Government railroad, and the growing demand for information concerning it, a special effort is being made to complete the mapping of that

region. The surveys and investigations in the Cook Inlet and Susitna regions in 1918 included a topographic reconnaissance survey of an area between Talkeetna River and Broad Pass, detailed investigations at the coal mines in the Matanuska Valley, and investigations of the chromite deposits of Cook Inlet.

A topographic reconnaissance survey of an area adjacent to the Government railroad between Talkeetna River and Broad Pass was made by D. C. Witherspoon from June 20 to September 19. An area of about 1,200 square miles was mapped on a scale of 1:180,000.

A special investigation of the chromite deposits of Port Chatham and Red Mountain, on lower Cook Inlet, was made by Prof. A. C. Gill, of Cornell University, who was engaged in field work from July 1 to August 25.

YUKON REGION.

A geologic reconnaissance survey of the Tolovana placer district was made by R. M. Overbeck, who was engaged in this work from June 18 to September 25. An area of about 2,000 square miles was mapped on the scale of 1:250,000. Mr. Overbeck also collected data on the production of placer gold in the Tolovana and Rampart districts.

The placer and lode mines of the Fairbanks district were visited by G. C. Martin from August 11 to 26, for the purpose of obtaining information concerning recent mining conditions and developments.

SEWARD PENINSULA.

A special examination of the tin deposits of the York district was made by Edward Steidtmann and S. H. Cathcart, who devoted the time from July 5 to September 16 to this work. Studies were made of the extent, occurrence, and origin of the known tin deposits, and of the stratigraphy and structure of the rocks associated with them. An area of about 50 square miles was mapped geologically on the scale of 1:125,000, and the reconnaissance mapping of additional areas was revised.

After the end of field work in the York district S. H. Cathcart made investigations of general mining developments in Seward Peninsula. He was engaged in this work till October 28.

ALASKA OFFICE.

A branch office of the Geological Survey was opened at Anchorage in June. This office is in charge of Theodore Chapin and will be his general headquarters throughout the year. The main purpose in opening this office is to provide the means of close cooperation between the Geological Survey and those in charge of the operation of the Government coal mines in the Matanuska Valley. It will

also be the purpose of the resident geologist to do everything possible to aid the mining industry in the region tributary to the Government railroad, to keep in close touch with all local developments in mining and prospecting, and to furnish whatever aid may be possible through the giving of information, advice, and publications to all who are engaged in mining and prospecting.

COLLECTION OF STATISTICS.

The collection of statistics of production of metals in Alaska, begun by the Alaska division in 1905, was continued as usual. Preliminary estimates of mineral production for the previous year were published on January 1.

PUBLICATIONS.

During 1918 the Survey published four bulletins and one professional paper relating to Alaska. In addition, one professional paper and five bulletins were in press, and eighteen reports, including this volume, were in preparation at the end of the year. Five topographic maps were published, and eight were in press at the end of the year.

REPORTS ISSUED.

Professional Paper 120–D. The structure and stratigraphy of Gravina and Revillagigedo islands, Alaska, by Theodore Chapin.

Bulletin 655. The Lake Clark-central Kuskokwim region, Alaska, by P. S. Smith.

Bulletin 662. Mineral resources of Alaska, 1916, by Alfred H. Brooks and others.

Bulletin 667. The Cosna-Nowitna region, Alaska, by H. M. Eakin.

Bulletin 675. The upper Chitina Valley, Alaska, by F. H. Moffit, with a description of the igneous rocks, by R. M. Overbeck.

REPORTS IN PRESS.

Professional Paper 109. The Canning River region, northern Alaska, by E. deK. Leffingwell. (Published Mar. 6, 1919.)

Bulletin 668. The Nelchina-Susitna region, Alaska, by Theodore Chapin. (Published Mar. 19, 1919.)

Bulletin 664. The Nenana coal field, Alaska, by G. C. Martin. (Published Apr. 22, 1919.)

Bulletin 683. The Anvik-Andreafski region, Alaska, by G. L. Harrington. (Published May 20, 1919.)

Bulletin 687. The Kantishna region, Alaska, by S. R. Capps. (Published June 21, 1919.)

Bulletin 692. Mineral resources of Alaska, 1917, by G. C. Martin and others.

REPORTS SUBMITTED FOR PUBLICATION.

Bulletin 682. The marble resources of southeastern Alaska, by E. F. Burchard.

Bulletin 699. The Porcupine district, Alaska, by H. M. Eakin.

A geologic reconnaissance in the northern part of the Yukon-Tanana region, Alaska, by Eliot Blackwelder.

REPORTS IN PREPARATION.

Geology of the Glacier Bay and Lituya region, Alaska, by F. E. Wright and C. W. Wright.

Geology of the region along the international boundary from Porcupine River to the Arctic Ocean, by A. G. Maddren.

The upper Matanuska basin, Alaska, by G. C. Martin.

The Yakataga district, Alaska, by A. G. Maddren.

The Mesozoic stratigraphy of Alaska, by G. C. Martin.

The Kotsina-Kuskulana district, Alaska, by F. H. Moffit.

The lower Kuskokwim region, Alaska, by A. G. Maddren.

The Ruby-Kuskokwim region, Alaska, by J. B. Mertie, jr., and G. L. Harrington.

The Cretaceous and Tertiary floras of Alaska, by Arthur Hollick.

The Juneau district, Alaska, by A. C. Spencer and H. M. Eakin.

The Ketchikan district, Alaska, by Theodore Chapin.

The geology and mineral resources of Latouche and Knight Island districts, Alaska, by B. L. Johnson.

The Port Valdez and Jack Bay district, Alaska, by B. L. Johnson.

The western Talkeetna Mountains, Alaska, by S. R. Capps.

TOPOGRAPHIC MAPS ISSUED.

Lower Matanuska Valley, by R. H. Sargent; scale, 1:62,500; contour interval, 50 feet. Sale edition.

Reconnaissance map of Cosna-Nowitna region, Alaska, by H. M. Eakin, C. E. Giffin, and R. B. Oliver; scale, 1:250,000; contour interval, 200 feet. (Plate I, Bulletin 667.)

Reconnaissance map of Lake Clark-central Kuskokwim region, Alaska, by R. H. Sargent, D. C. Witherspoon, and C. E. Giffin; scale 1:250,000; contour interval, 200 feet. (Plate I, Bulletin 655.)

Reconnaissance map of upper Chitina Valley, Alaska, by International Boundary Commission, F. H. Moffit, D. C. Witherspoon, and T. G. Gerdine; scale, 1:250,000; contour interval, 200 feet. (Plate I, Bulletin 675.)

Juneau and vicinity, Alaska, by D. C. Witherspoon; scale, 1:24,000; contour interval, 50 feet. Sale edition.

TOPOGRAPHIC MAPS IN PRESS.

Canning River region, by E. deK. Leffingwell; scale, 1:250,000; sketch contours. (Published Mar. 6, 1919, as Plate I, Professional Paper 109.)

North Arctic coast, by E. deK. Leffingwell; scale, 1:500,000; no contours. (Published Mar. 6, 1919, as Plate III, Professional Paper 109.)

Coast line between Challenge Entrance and Thetis Island, by E. deK. Leffingwell; scale, 1:125,000; no fixed contour interval. (Published Mar. 6, 1919, as Plate IV, Professional Paper 109.)

Coast line between Martin Point and Challenge Entrance, by E. deK. Leffingwell; scale, 1:125,000; no fixed contour interval. (Published Mar. 6, 1919, as Plate V, Professional Paper 109.)

Nelchina-Susitna region, by J. W. Bagley; scale, 1:250,000; contour interval, 200 feet. (Published Mar. 19, 1919, as Plate I, Bulletin 668.)

Anvik-Andreafski region, by R. H. Sargent; scale, 1:250,000; contour interval, 100 feet. (Published May 20, 1919, as Plate I, Bulletin 683.)

Marshall mining district, by R. H. Sargent; scale, 1:125,000; contour interval, 100 feet. (Published May 20, 1919, as Plate II, Bulletin 683.)

Kantishna region, by C. E. Giffin; scale, 1:250,000; contour interval, 200 feet. (Published May 20, 1919, as Plate I, Bulletin 687.)

TOPOGRAPHIC MAPS READY FOR ENGRAVING.

Kotsina-Kuskulana district, by D. C. Witherspoon; scale, 1:62,500; contour interval, 100 feet.

Lower Kuskokwim region, by A. G. Maddren; scale, 1:500,000; contour interval, 400 feet.

Ruby district, by C. E. Giffin and R. H. Sargent; scale, 1:250,000; contour interval, 200 feet.

TOPOGRAPHIC MAPS IN PREPARATION.

Innoko-Iditarod region, by R. H. Sargent and C. E. Giffin; scale, 1:250,000; contour interval, 200 feet.

Anchorage-Matanuska region, by J. W. Bagley and others; scale, 1:250,000; contour interval, 200 feet.

Yukon-Tanana Valley; compiled; scale, 1:500,000; contour interval, 400 feet.

Glacier Bay region; compiled; scale, 1:250,000; contour interval, 200 feet.

Port Wells region, by J. W. Bagley; scale, 1:250,000; contour interval, 200 feet.

Jack Bay district, by J. W. Bagley; scale, 1:62,500; contour interval, 50 feet.

Fidalgo-Gravina district, by D. C. Witherspoon; scale, 1:250,000; contour interval, 200 feet.

Susitna-Chulitna district, by D. C. Witherspoon; scale, 1:250,000; contour interval, 200 feet.

Seward-Fairbanks route; compiled; scale, 1:250,000; contour interval, 200 feet

THE ALASKAN MINING INDUSTRY IN 1918.

By G. C. MARTIN.

GENERAL FEATURES.

The mineral production of Alaska in 1918 was valued at $28,253,961. This output was almost $12,500,000 less than that for 1917 and was the smallest since 1914. The decrease was chiefly in copper, the production of which fell from 88,783,400 pounds, valued at $24,240,598, in 1917 to 69,224,951 pounds, valued at $17,098,563, in 1918. The reduction in the output of copper was due to shortage of labor and ships. The production of gold decreased from 709,050 ounces, valued at $14,657,353, in 1917 to 458,641 ounces, valued at $9,480,953, in 1918, and was the smallest since 1904. The reduction in the output of gold was due chiefly to curtailment of operations because of the scarcity of labor and the high cost of materials. There was a reduction in the output of silver and lead due to the decrease in gold and copper. The production of tin, tungsten, and antimony showed a considerable decrease, the production of antimony practically ceasing because of the inability of the producers in the interior of Alaska to compete with the cheaper foreign product. The production of coal increased from 53,955 tons, valued at $265,317, in 1917 to 75,606 tons, valued at $411,850, in 1918, and was the largest in the history of mining in Alaska. Petroleum continued to be produced from the single patented claim near Katalla, and the local refinery was operated on about the customary scale. The production of marble and gypsum in southeastern Alaska was somewhat less than in 1916. Chromite was mined in about the same amount as in 1917. The production of platinum, which was begun in 1916, continued on an increased scale, chiefly from the placers in Seward Peninsula. A considerable amount of palladium was recovered from copper ore from southeastern Alaska.

The statistics for the mineral production of Alaska for the last two years are given in the following table. The minor metallic and nonmetallic products are grouped, because a separate listing might reveal the production of individual properties.

Mineral output of Alaska, 1917 and 1918.

	1917		1918		Decrease or increase in 1918.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Copper.....pounds..	88,793,400	$24,240,598	69,224,951	$17,098,563	−19,568,449	−$7,142,033
Gold.....fine ounces..	709,050	14,657,353	458,641	9,480,952	− 250,409	− 5,176,401
Silver.....do....	1,239,150	1,021,060	847,789	847,789	− 391,361	− 173,266
Coal.....short tons..	53,955	265,317	75,606	411,850	+ 21,651	+ 146,533
Tin, metallic.....do....	100	123,300	68	118,000	− 32	− 5,300
Lead.....do....	852	146,584	564	80,088	− 288	− 66,496
Miscellaneous metallic products, including chrome ore, tungsten, antimony, platinum, and palladium.....	.....	[a] 118,500	.....	96,100	.....	− 22,400
Miscellaneous nonmetallic products, including petroleum, marble, gypsum, and lime.....	.....	[b] 137,500	.....	120,619	.....	− 16,881
	.....	40,710,212	.....	28,253,961	.....	12,456,244

[a] No palladium included. [b] Some graphite included.

Regular mining may be said to have begun in Alaska in 1880, when the Juneau gold placers were first exploited. It is estimated that since that time mineral wealth has been produced to the value of more than $418,000,000.

Value of total mineral production of Alaska, 1880–1918.

By years.				By substances.	
1880–1890	$4,686,714	1906	$23,378,428	Gold	$302,238,961
1891	916,920	1907	20,850,235	Copper	105,743,033
1892	1,098,400	1908	20,145,632	Silver	5,598,314
1893	1,051,610	1909	21,146,953	Coal	1,096,913
1894	1,312,567	1910	16,887,244	Tin	844,572
1895	2,388,042	1911	20,691,241	Lead	449,496
1896	2,981,877	1912	22,536,849	Antimony	237,500
1897	2,540,401	1913	19,476,356	Marble, gypsum, petroleum, etc.	2,331,303
1898	2,587,815	1914	19,065,666		418,540,092
1899	5,706,226	1915	32,854,229		
1900	8,241,734	1916	48,632,212		
1901	7,010,838	1917	40,700,205		
1902	8,403,153	1918	28,253,961		
1903	8,944,134				
1904	9,569,715		418,540,092		
1905	16,480,762				

GOLD AND SILVER.

The following table gives an estimate of the total production of gold and silver since the beginning of mining in 1880. For the earlier years the figures, especially for silver, are probably far from being correct, but they are based on the best information now available.

Gold and silver produced in Alaska, 1880–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Commercial value.
1880	967	$20,000		
1881	1,935	40,000		
1882	7,256	150,000		
1883	14,561	301,000		
1884	9,724	201,000	10,320	$11,146
1885	14,512	300,000		
1886	21,575	446,000		
1887	32,653	675,000		
1888	41,119	850,000	2,320	2,181
1889	43,538	900,000	8,000	7,490
1890	36,862	762,000	7,500	6,071
1891	43,538	900,000	8,000	7,920
1892	52,245	1,080,000	8,000	7,000
1893	50,213	1,038,000	8,400	6,570
1894	62,017	1,282,000	22,261	14,257
1895	112,642	2,328,500	67,200	44,222
1896	138,401	2,861,000	145,300	99,087
1897	118,011	2,439,500	116,400	70,741
1898	121,760	2,517,000	92,400	54,575
1899	270,997	5,602,000	140,100	84,276
1900	395,030	8,166,000	73,300	45,494
1901	335,369	6,932,700	47,900	28,598
1902	400,709	8,283,400	92,000	48,590
1903	420,069	8,683,600	143,600	77,843
1904	443,115	9,160,000	198,700	114,934
1905	756,101	15,630,000	132,174	80,165
1906	1,066,030	22,036,794	203,500	136,345
1907	936,043	19,349,743	149,784	98,857
1908	933,290	19,292,818	135,672	71,906
1909	987,417	20,411,716	147,950	76,934
1910	780,131	16,126,749	157,850	85,239
1911	815,276	16,853,256	460,231	243,923
1912	829,436	17,145,951	515,186	316,839
1913	755,947	15,626,813	362,563	218,988
1914	762,596	15,764,259	394,805	218,327
1915	807,966	16,702,144	1,071,782	583,393
1916	834,068	17,241,713	1,379,171	907,554
1917	709,050	14,657,353	1,239,150	1,021,060
1918	458,641	9,480,952	847,789	847,789
	14,620,810	302,238,961	8,389,308	5,598,314

The subjoined table gives an estimate, based on the best available data, of the gold and silver produced in Alaska from different sources since mining began in 1880. About $65,100,000 worth of gold, or about one-fifth of the total estimated output, was produced before 1905, and there is but scant information about its source. For the period since that time fairly complete statistical returns are available, and it is probable that the figures presented in the following table are sufficiently accurate to be valuable. The figures given for the silver recovered from placer gold and from siliceous ores are probably less accurate than those for the gold. Copper mining did not begin in Alaska until 1901, and the figures for gold and silver derived from this industry, as now presented, are therefore a close approximation to the actual output.

Gold and silver produced in Alaska from different sources, 1880–1918.

Source.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
Siliceous ores [a]	4,234,054	$87,525,670	1,319,889	$931,396
Copper ores	80,800	1,670,299	5,327,852	3,666,820
Placers	10,305,956	213,042,992	1,741,657	1,000,098
	14,620,810	302,238,961	8,389,398	5,598,314

[a] Including small amounts of lead ore.

The above table shows that about 29 per cent of the total gold production of Alaska has been obtained from the auriferous lode mines (siliceous ores). In 1918 the lode-gold production was 36.6 per cent; in 1917, 31 per cent; in 1916, 38 per cent; in 1915, 37 per cent; in 1914, 32 per cent; in 1913, 31.6 per cent; and in 1912, 29 per cent. In the following table the production of precious metals in 1918 has been distributed as to sources:

Gold and silver produced in Alaska, 1918, by sources.

Source.	Ore (tons).	Gold.		Silver.	
		Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
Siliceous ores	2,095,577	168,021	$3,473,317	90,064	$90,064
Copper ores	722,047	5,207	107,635	719,391	719,391
Placers	.....	285,413	5,900,000	38,334	38,334
	2,817,624	458,641	9,480,952	847,789	847,789

Twenty-five gold-lode mines were operated in 1918. There was also a production from 7 prospects—abandoned mines or small mines that were not in regular operation. Thirty-one mines were operated in 1917. The value of the lode-gold output decreased from $4,581,453 in 1917 to $3,473,317 in 1918. The decrease was due partly to the disaster at the Treadwell mine in April, 1917, and partly to curtailment of operations, especially in the Juneau district, because of shortage of labor. Southeastern Alaska, especially the Juneau district, is still the only center of large quartz-mining operations in the Territory. Next in importance is the Willow Creek lode district. The production in the Fairbanks district decreased materially, as the lode-mine owners of Fairbanks are still awaiting the cheapening of operating costs, especially of fuel, which is expected on the completion of the Government railroad. Most of the gold mines on Prince William Sound have suspended operations. The mill and

cyanide plant of the North Midas mine, in the Chitina Valley, Copper River district, was completed and began operating late in the year. Of the producing mines 6 were in southeastern Alaska, 1 in the Copper River district, 3 on Prince William Sound, 4 on Kenai Peninsula, 5 in the Willow Creek district, and 6 in the Fairbanks district. In 1918 the average value of the gold and silver contents for all siliceous ores mined was $1.70 a ton; the average for 1917 was $1.37 a ton. These averages reflect the dominance in the total lode production of the large tonnage produced from the low-grade ores of the Juneau district.

The production by districts of gold and silver in 1918 from gold-lode mines, including small amounts from a lead-silver mine which can not be given separately without disclosing an individual production, is given in the following table:

Gold and silver produced from gold-lode mines in Alaska, 1918, by districts.

District.	Mines operated.	Ore mined (short tons).	Gold.		Silver.		Average value per ton of ore in gold and silver.
			Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.	
Southeastern Alaska	[a] 6	2,085,915	152,755	$3,157,732	88,053	$88,053	$1.56
Prince William Sound [b]	[c] 4	444	638	13,195	490	490	[d] 27.24
Kenai Peninsula	4	207	291	6,016	181	181	29.94
Willow Creek	5	7,976	13,043	269,624	724	724	33.90
Fairbanks district [e]	[f] 6	1,035	1,294	26,750	616	616	26.44
	25	2,095,577	168,021	3,473,317	90,064	90,064	1.70

[a] Also clean-up material from 2 abandoned mines and shipments from one prospect.
[b] Including 1 mine in Copper River district.
[c] Also one prospect.
[d] Prince William Sound only.
[e] Includes some lead ore.
[f] Also three prospects.

The value of the placer gold produced in Alaska in 1918 was about $5,900,000. The production in 1917 was $9,810,000. The decrease in 1918 was general throughout the Territory, except in the Copper River and Yentna districts and some of the smaller Yukon districts. The decrease was due mainly to curtailment of operations because of shortage of labor, high cost of supplies, and uncertainty as to future conditions. Local decreases were due also to unfavorable climatic conditions and to the depletion of some of the richer placers.

It is estimated that about 574 placer mines were operated in the summer of 1918 and 153 during the previous winter, but many for only a part of the season. About 3,000 men were engaged in productive placer mining in the summer and 613 in the winter. In addition several hundred men were engaged in prospecting or other nonproductive work relating to placer mining. No important new placer-

bearing areas were discovered in 1918. The output and operations of placer mines in 1918 are shown by regions in the following table:

Gold and silver produced from placer mines in Alaska, 1918, by regions.

Region.	Gold.		Silver.		Gravel handled (cubic yards).	Recovery per cubic yard.	Number of mines.		Number of miners.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.			Summer.	Winter.	Summer.	Winter.
Southeastern Alaska	483.750	$10,000	80	$80	10,000	$1.00	5	.....	12	.....
Copper River region	11,561.625	239,000	1,158	1,158	198,000	1.20	22	4	124	7
Cook Inlet and Susitna region	7,740,000	160,000	1,185	1,185	386,000	.41	24	.....	134	.....
Southwestern Alaska	145.125	3,000	23	23	2,000	1.50	5	.....	13	.....
Yukon Basin	206,271.000	4,264,000	28,831	28,831	2,197,000	1.94	355	121	1,965	490
Kuskokwim region	4,837.500	100,000	914	914	56,000	1.78	19	.....	87	.....
Seward Peninsula	53,599.500	1,108,000	6,022	6,022	2,076,000	.53	128	21	633	99
Norton Sound	48.375	1,000	9	9	.....	4.21	2	2	3	3
Kobuk region	725.625	15,000	112	112	6,000	2.50	14	5	35	14
	285,412.500	5,900,000	38,334	38,334	4,931,000	1.196	574	153	3,006	613

The following table shows approximately the total bulk of gravel mined annually since 1907 and the value of the gold recovered per cubic yard. The table is based in part on returns made by placer-mine operators and in part on known facts or assumptions concerning the richness of the gravels in the several districts. The figures for 1917, which differ somewhat from those previously published, are based on an assumption that the recoveries per cubic yard of the dredges in the Yukon region and Seward Peninsula, from which no reports were received, were the same as the average reported recoveries of the dredges in each region and that for the placer mines other than dredges the ratio of the recovery per cubic yard for the mines that supplied complete information as to the recovery per cubic yard for all mines was the same as in 1916. Although the table is thus only approximately correct, the amounts given are probably near the true figures.

Gravel sluiced in Alaskan placer mines and value of gold recovered, 1908–1918.

Year.	Total quantity of gravel (cubic yards).	Value of gold recovered per cubic yard.	Year.	Total quantity of gravel (cubic yards).	Value of gold recovered per cubic yard.
1908	4,275,000	$3.74	1914	8,500,000	$1.26
1909	4,418,000	3.66	1915	8,100,000	1.29
1910	4,036,000	2.97	1916	7,100,000	1.57
1911	5,790,000	2.17	1917	7,000,000	1.40
1912	7,050,000	1.70	1918	4,931,000	1.20
1913	6,800,000	1.57			

The table shows that from 1908 to 1914 there was a decline in the average gold content of the gravels mined. This decline reflects the improved methods of placer mining that have been introduced, more especially the increase in the use of dredges, which is brought out in the following table:

Relation of recovery of placer gold per cubic yard to proportion produced by dredges.

	Percentage of placer gold produced by dredges.	Recovery per cubic yard.		
		Dredges.	Mines.	All placers.
1911	12	$0.60	$3.36	$2.17
1912	18	.65	2.68	1.70
1913	21	.54	3.11	1.57
1914	22	.53	2.07	1.26
1915	22	.51	2.33	1.29
1916	24	.69	2.64	1.57
1917	26	.68	2.21	1.40
1918	24	.57	1.84	1.20

The rise of the average recovery from 1914 to 1916 was due largely to the facts that the dredges were for the most part working on far richer placers than in previous years, and that in 1916 a larger percentage of the placer gold came from the rich deposits of the newer districts. The decrease in the recovery per cubic yard from 1916 to 1918 is very striking. The yield per cubic yard for both the dredges and the other mines declined sharply, the proportionate output of the dredges remaining constant, and the recovery per cubic yard for both the mines other than dredges and for all the placers sank to its lowest record. It seems surprising at first sight that this condition should exist at a time when the costs have increased so much that many mines have been compelled to suspend operations and when the Alaskan placer industry has declined to about half its normal magnitude. It might be expected that at such a time the poorer mines would be closed, with a resulting increase in the average recovery. It is evident, however, that cost and not yield determines whether a mine shall continue in operation. Under adverse conditions the small-scale, high-cost operations succumb first, even though they are working on high-grade deposits. The larger plants, which for the most part are working on lower-grade deposits, continue in operation longer because they are using machinery and practicing economies that permit them to cope with the adverse conditions. Some of them are compelled to continue in operation, even at a loss, because they have rentals and other fixed charges which must be paid, machinery and other equipment which must be kept in con-

tinuous operation, or personal obligations to the community or to their employees which they can not ignore. The result is that under adverse conditions a larger proportion of the output of placer gold is derived from large expensive operations such as dredges and large hydraulic plants which are working on relatively low-grade deposits. Such was the case in Alaska in 1918, when the districts in which there are large hydraulic plants working on low-grade gravels, such as the Yentna, Nizina, Chistochina, and upper Yukon districts, alone maintained or increased their customary output. Other factors that contributed to the low average recovery for 1918 include the relatively low recovery of the dredges, which was due, in part, to the unusually large amount of frozen ground encountered by dredges in Seward Peninsula, and in part to the exhaustion of the relatively rich ground which had been dredged at Ruby in previous years, and the exhaustion of some of the richer placers, especially in the Tolovana district.

Twenty-eight gold dredges were operated in Alaska in 1918, compared with 36 in 1917. Twenty-one dredges were in Seward Peninsula, three in the Iditarod district, and one each in the Fairbanks, Circle, Yentna, and Kuskokwim districts. These dredges produced about $1,425,000 worth of gold and handled about 2,490,000 cubic yards of gravel. In 1917 the dredges handled about 3,700,000 cubic yards of gravel and recovered gold worth $2,500,000. The average recovery of gold per cubic yard was about 57 cents in 1918 and 68 cents in 1917. The gold dredges of Seward Peninsula produced gold worth $466,000 from 1,164,000 cubic yards of gravel, making an averages recovery of 40 cents a cubic yard in 1918, compared with 49 cents in 1917. The dredges of the Alaska Yukon districts produced gold worth $881,000 from 1,125,000 cubic yards of gravel, and the value of gold recovered per cubic yard was therefore about 78 cents, compared with 94 cents in 1917.

Though dredges were built for use in the Alaska Yukon as early as 1898 and at Nome in 1900, this method of placer mining did not reach a profitable stage until 1903, when two small dredges were successfully operated in Seward Peninsula. Dredging began in the Fortymile district in 1907; in the Iditarod, Birch Creek, and Fairbanks district in 1912; in the Yentna district in 1916; and in the Kuskokwim region in 1918. A new dredge was installed in the Fairbanks district in 1918 and may have begun operating late in the season. The new dredge on Candle Creek, in the Kuskokwim region, was completed in 1918 and operated for a short period. Up to the end of 1918 gold to the value of $19,035,000 had been mined by dredges. The distribution of this output by years is shown in the following table:

Gold produced from dredge mining in Alaska, 1903–1918.

Year.	Number of dredges operated.	Value of gold output.	Gravel handled (cubic yards).	Value of gold recovered per cubic yard.
1903	2	$20,000	.....	.....
1904	3	25,000	.....	.....
1905	3	40,000	.....	.....
1906	3	120,000	.....	.....
1907	4	250,000	.....	.....
1908	4	171,000	.....	.....
1909	14	425,000	.....	.....
1910	18	800,000	.....	.....
1911	27	1,500,000	2,500,000	$0.60
1912	38	2,200,000	3,400,000	.65
1913	35	2,200,000	4,100,000	.54
1914	42	2,350,000	4,450,000	.53
1915	35	2,330,000	4,600,000	.51
1916	34	2,679,000	3,900,000	.69
1917	36	2,500,000	3,700,000	.68
1918	[a] 28	1,425,000	2,490,000	.57
	.....	19,035,000	.....	.....

COPPER.

The copper production of Alaska in 1918 was 69,224,951 pounds, valued at $17,098,563. This is less than the production in 1917, which was 88,793,400 pounds, valued at $24,240,598. The reduction in output was due to shortage of labor and ships. During the year 17 copper mines were operated, the same number as in 1917. Of these mines, 7 are in the Ketchikan district, 5 in the Prince William Sound district, and 5 in the Chitina district.

Output of Alaska copper mines in 1918, by districts.

	Mines.	Ore (tons).	Copper.		Gold.		Silver.	
			Quantity (pounds).	Value.	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
Ketchikan district	7	21,683	1,372,347	$338,970	1,364.54	$28,207	9,745	$9,745
Chitina district [a]	5	264,338	52,541,014	12,977,630	.....	.....	591,317	591,317
Prince William Sound [b]	5	435,826	15,311,590	3,781,963	3,842.32	79,428	118,329	118,329
	17	722,047	69,224,951	17,098,563	5,206.86	107,635	719,391	719,391

[a] Also a small amount of placer copper.
[b] Including a small amount from Cook Inlet.

The average copper content of the ores mined in 1918 was 4.5 per cent. The ores also yielded an average of $0.139 in gold and $0.932 in silver to the ton. The average yield for 1917 was 6.4 per cent of copper, $0.382 to the ton in gold, and $1.233 to the ton in silver.

Copper produced in Alaska, 1890–1918.

Year.	Ore mined (tons).	Copper produced.	
		Quantity (pounds).	Value.
1880		3,933	$826
1901		250,000	40,000
1902	a 40,000	360,000	41,400
1903		1,200,000	156,000
1904		2,043,586	275,676
1905	52,199	4,805,236	749,617
1906	105,729	5,871,811	1,133,260
1907	98,927	6,308,786	1,261,757
1908	51,509	4,585,362	605,267
1909	34,669	4,124,705	536,211
1910	39,365	4,241,689	538,695
1911	68,975	27,267,878	3,408,485
1912	93,452	29,230,491	4,853,031
1913	135,756	21,659,958	3,357,293
1914	153,605	21,450,628	2,852,934
1915	369,600	86,509,312	15,139,129
1916	617,264	119,854,839	29,484,291
1917	659,957	88,793,400	24,240,598
1918	722,047	69,224,951	17,098,563
	3,243,054	497,786,565	105,743,033

a Estimated.

The copper industry in the three developed copper fields of Alaska is described in the account of mining in those districts given on subsequent pages. The only shipment of copper ore in 1918 from outside these developed fields was a test shipment from Kamishak Bay, Cook Inlet. A copper prospect on the Alaska Peninsula is under development, and interest still continues in the copper deposits of the Talkeetna and Broad Pass districts. The copper deposits in the Alaska Range recently reported are still attracting attention, although little work has been done on them. The deposit of copper discovered in 1915 on Rainy Creek, a tributary of the South Fork of Delta River 7 miles above Miller's roadhouse, is said to be a large body of low-grade ore on which considerable crosscutting has been done. There is also a low-grade copper deposit in the gulch 1½ or 2 miles west of Paxson's roadhouse. A copper lode on McLaren River, tributary to the Susitna, is said to be 10 feet wide and of high grade. It was reported that an outfit was to be taken in on the snow in the winter of 1918–19 to prospect this deposit.

LEAD.

The production of lead in Alaska in 1918 is estimated at 564 tons, valued at $80,088. The production in 1917, which was larger than that of any previous year, was 852 tons, valued at $146,584. Lead in Alaska is still, as in past years, derived chiefly from the concentrates of the gold mines at Juneau, but in 1918 a small amount was derived from the galena ores of the Fairbanks district. Though silver-lead

ores are found in many parts of Alaska, most of the deposits have not yet been opened on a commercial basis. The following table shows the production of lead in Alaska, so far as it can be determined from available data:

Lead produced in Alaska, 1892–1918.

Year.	Quantity (tons).	Value.	Year.	Quantity (tons).	Value.
1892	30	$2,400	1907	30	$3,180
1893	40	3,040	1908	40	3,360
1894	35	2,310	1909	69	5,934
1895	20	1,320	1910	75	6,600
1896	30	1,800	1911	51	4,590
1897	30	2,160	1912	45	4,050
1898	30	2,240	1913	6	588
1899	35	3,150	1914	28	1,344
1900	40	3,440	1915	437	41,118
1901	40	3,440	1916	820	113,160
1902	30	2,460	1917	852	146,584
1903	30	2,520.	1918	564	80,088
1904	30	2,580			
1905	30	2,620		3,497	449,496
1906	30	3,420			

TIN.

The tin mines of Alaska produced 104½ tons of ore containing 136,000 pounds of tin, valued at $118,000, in 1918, compared with 171 tons of ore containing 200,000 pounds of tin, valued at $123,300, in 1917. The shipments from Alaska in 1918, according to the collector of customs, included 179 long tons of ore containing 232,933 pounds of tin. These shipments included ore mined in previous years. The decrease in output in 1918 was due to the fact that only one dredge was operated. The following table shows the production of tin in Alaska since mining began in 1902:

Tin produced in Alaska, 1902–1918.

Year.	Quantity (tons).		Value.	Year.	Quantity (tons).		Value.
	Ore.	Metal.			Ore.	Metal.	
1902	.....	15	$8,000	1912	194	130	$119,600
1903	.....	25	14,000	1913	98	50	44,103
1904	.....	14	8,000	1914	157.5	104	66,560
1905	.....	6	4,000	1915	167	102	78,846
1906	.....	34	38,640	1916	232	139	121,000
1907	.....	22	16,752	1917	171	100	123,300
1908	.....	25	15,180	1918	104.5	68	118,000
1909	.....	11	7,638				
1910	.....	10	8,335		.....	916	844,572
1911	92.6	61	52,798				

Most of the tin ore mined in 1918 came from the York district, Seward Peninsula, where one tin dredge was operated. Stream tin was also obtained by sluicing at one mine in the York district. Considerable work was done on the Lost River tin lodes, but no ore was

mined. A more extended account of the tin deposits of Seward Peninsula is given elsewhere in this volume.

The tin production of the Hot Springs district is estimated at about 44 tons of cassiterite, containing about 52,400 pounds of tin. It was mostly recovered by sluicing old placer dumps.

In the Ruby district a few thousand pounds of cassiterite was recovered in placer gold mining on Short Creek. This is the second recorded tin production in the Ruby district, the only previous production being in 1916.

A little cassiterite was recovered in mining placer gold on Mason Creek, in the Gold Hill district, near Fort Gibbon. This is the first recorded recovery of tin in this district.

The discovery of placer tin has been reported from Potato and Humboldt creeks, on Seward Peninsula, and from Moran Creek, a tributary of Melozi River, where the gravels are said to contain 2½ pounds of tin and 10 cents' worth of gold to the cubic yard. Moran Creek is a few miles north of Mason Creek, where, as mentioned above, there was a small output of placer tin in 1918.

TUNGSTEN.

The production of tungsten in Alaska in 1918 is estimated at 11½ tons of scheelite concentrates, valued at $22,000, compared with 28 tons, valued at $45,000, in 1917. The output for 1918 was derived wholly from the Fairbanks district and Seward Peninsula, except for a few pounds of scheelite that was saved at the placer mines of Bonanza Creek, near St. Michael. In the Fairbanks district one or two tungsten lode mines were operated part of the year, and it was reported that some old tailings were to be remilled.

In Seward Peninsula a few tons of scheelite was recovered at placer gold mines.

The only new development in the tungsten industry of Alaska in 1918 was the discovery of a vein of scheelite near Sitka.

ANTIMONY.

The production of antimony from Alaskan ores, which has fallen rapidly since 1916 because of the low price of the product, almost ceased in 1918, when only 36 tons of crude ore (stibnite), valued at $1,500, was mined. This includes the output of one mine in the Fairbanks district, some ore mined in the Broad Pass district but not shipped because of lack of facilities for transportation, and a small experimental shipment from a deposit near Nome. The shipments of ores of antimony from Alaska in 1918, according to the Bureau of Foreign and Domestic Commerce, contained 11,000 pounds of metallic antimony and were valued at $184.

Antimony produced in Alaska, 1915–1918.

Year.	Quantity of crude ore (tons).	Value.
1915	833	$74,000
1916	1,458	134,000
1917	165	28,000
1918	36	1,500
	2,492	237,500

PLATINUM METALS.

The output of platinum, palladium, and other metals of the platinum group in Alaska in 1918 is estimated at 284 fine ounces, valued at $36,600.

Platinum was recovered from the gold placers of Dime, Bear, and Sweepstakes creeks, in the Koyuk or Dime Creek district, Seward Peninsula, in larger amounts than last year, and production was reported from Boob Creek, in the Tolstoi (Yukon) district, and from Slate Creek, in the Chistochina (Copper River) district, but in lesser quantities than in 1917. The occurrence of platinum on Albert Creek, in the Nelchina district, has been reported, but no production has been made.

One of the most interesting events of the year in connection with Alaska mining is the recovery of substantial amounts of palladium and of some platinum from the copper ore of the Salt Chuck mine, near Ketchikan.

CHROMITE.

Chrome ore was mined at Port Chatham, Cook Inlet, on a somewhat larger scale than in 1917. A concentrating mill, tramway, wharf, and ore bins were installed in 1918. No material improvements have been made at the Red Mountain deposits, but plans for mining the ore and for transporting it to the coast have been under consideration. The chromite deposits at Port Chatham and Red Mountain were studied in detail by A. C. Gill, who has written a paper on the subject that appears elsewhere in this volume.

The discovery of chromite on Peters Creek southeast of Knik Arm and on the west fork of Chulitna River has been reported.

MOLYBDENUM.

No molybdenum has yet been produced in Alaska, but extensive operations preparatory to mining were continued in 1918 at the molybdenite-bearing lode near Shakan, on the west coast of Prince of Wales

Island. Work was carried on also at a molybdenite prospect on the Dry Delta, which comes out at Sullivan's roadhouse, in the Tanana Valley. The deposit has not been visited by any member of the Geological Survey, and no specimens have been seen, but it is said to include closely spaced veins from a few inches to 2 feet thick occurring in a zone 800 or 900 feet wide, which has been traced for about a mile along the creek. The country rock is granite. The veins are said to carry some gold. The deposit has been developed by an adit 100 feet long cutting across the veins. A few tons of ore has been mined in prospecting, but no ore has been shipped.

COAL.

The production of coal in Alaska in 1918 was 75,606 tons, valued at $411,850, compared with 53,955 tons, valued at $265,317, in 1917. This production was by far the largest in the history of coal mining in Alaska, being 40 per cent larger than the output for 1917, which was also greater than that of any previous year. It is believed that a substantial coal-mining industry has at last started in Alaska. The larger part of the output in 1918 came from the Matanuska field, which yielded 63,092 tons. The remainder came from eight or ten small mines in different parts of the Territory. All these mines, except those in the Matanuska and Bering River fields and at Port Graham, produced coal for local use under free-use permits. About 12 mines were operated, employing 239 men for an average period of 254 days.

In the Matanuska field the Eska Creek mines were operated regularly throughout the year by the Alaskan Engineering Commission, to supply fuel for railroad and other Government use. At the Chickaloon mine, also operated by the Alaskan Engineering Commission, the work has consisted primarily of exploration and development, and only a small amount of coal, won incidentally, has been produced. In 1918 for the first time Matanuska coal was shipped beyond Anchorage. Private operations preparatory to mining were continued by two lessees in the Matanuska field, and some coal was mined by one of them, but their mines are not yet regularly productive. A more complete account of mining in the Matanuska field is given elsewhere in this volume.

The lignite fields of the Cook Inlet and Susitna district rank next to the Matanuska coal fields in point of production for 1918. A considerable quantity of lignite that was mined near Bluff Point was shipped to towns and canneries on Cook Inlet. A lignite mine on Cache Creek in the Yentna district was operated during part of the

year to supply fuel for a gold dredge. The Little Susitna mine supplied part of the fuel for the town of Anchorage. It is reported that some coal was mined at Port Graham.

In the Nenana field no leases have yet been granted, but two small mines were opened under mining permits, and a small amount of lignite was mined for use in the construction of the railroad.

It is reported that in the Bering River field the railroad has been extended from its temporary terminus on Bering River to the mine of the Alaska Petroleum & Coal Co. in the eastern part of the field, and that small shipments of semianthracite coal were made late in the year. A lease was granted in 1918 to another company for a tract of semibituminous coal land in the western part of the field, and it is reported that extensive operations preparatory to mining are being undertaken.

In northern Alaska lignite mined near Unalaklik, on Norton Sound, was shipped to Nome and St. Michael, and lignite mined on Kobuk River was shipped to Kotzebue. It was reported that lignite would be mined on Kugruk River, Seward Peninsula, during the winter of 1918–19 for use at the placer mines on the Inmachuk.

The following table gives the estimated production of coal in Alaska since 1888. The figures for 1888 to 1896 are estimated from the best data available but are only approximate. The figures for 1897 to 1918 are based for the most part on data supplied by operators. Most of the coal mined before 1916 was lignite. There was a small production of bituminous coal from the west end of the Bering River field in 1906. The table does not include 855 tons of coal mined in the Bering River field in 1912 and 1,100 tons mined in the Matanuska field in 1913 for test by the United States Navy.

Coal produced in Alaska, 1888 to 1918.

Year.	Quantity (short tons).	Value.	Year.	Quantity (short tons).	Value.
1888-1896	6,000	$84,000	1908	3,107	14,810
1897	2,000	28,000	1909	2,800	12,300
1898	1,000	14,000	1910	1,000	15,000
1899	1,200	16,800	1911	900	9,300
1900	1,200	16,800	1912	355	2,840
1901	1,300	15,600	1913	2,300	13,800
1902	2,212	19,048	1914		
1903	1,447	9,782	1915	1,400	3,300
1904	1,694	7,225	1916	13,073	52,317
1905	3,774	13,250	1917	53,955	265,317
1906	5,541	17,974	1918	75,606	411,850
1907	10,139	53,600		192,003	1,096,913

The following table shows the coal consumption of Alaska, including both local production and imports, since 1899. Most of the coal shipped to Alaska was bituminous, but a little was anthracite:

Coal consumed in Alaska, 1899–1918, in short tons.

Year.	Produced in Alaska, chiefly subbituminous and lignite.	Imported from States, chiefly bituminous from Washington.	Total foreign coal, chiefly bituminous from British Columbia.	Total coal consumed.
1899	1,200	10,000	[a] 50,120	61,320
1900	1,200	15,048	[a] 56,623	72,871
1901	1,300	24,000	[a] 77,674	102,974
1902	2,212	40,000	[a] 68,363	110,575
1903	1,447	64,626	[a] 60,605	126,678
1904	1,694	36,689	[a] 76,815	115,198
1905	3,774	67,713	[a] 72,612	114,099
1906	5,541	69,493	[a] 47,590	122,624
1907	10,139	46,246	[a] 93,262	149,647
1908	3,107	23,893	[a] 86,404	113,404
1909	2,800	33,112	69,046	104,958
1910	1,000	32,098	58,420	91,518
1911	900	32,255	61,845	95,000
1912	355	27,767	68,316	96,438
1913	2,300	69,066	56,430	127,796
1914	.....	41,509	46,153	87,662
1915	1,400	46,329	29,457	77,186
1916	13,073	44,934	53,672	111,679
1917	53,955	58,116	56,589	168,660
1918	75,606	51,520	37,986	165,112
	183,003	834,414	1,227,982	2,245,399

[a] By fiscal year ending June 30.

PETROLEUM.

The petroleum produced in Alaska is still derived wholly from the single patented claim in the Katalla field. The old wells on this claim and the refinery were operated as usual, and two new productive wells were drilled. The total production in 1918 was somewhat larger than in 1917.

There has been a revival of interest in the potential Alaskan oil fields during the year in anticipation of the expected passage of a law providing for the leasing of the Alaskan oil lands. It is reported that investigations of the supposed oil lands on the Alaska Peninsula were made during the summer of 1918. No legal provision has yet been made for the leasing, and the Alaskan oil lands are still withdrawn from entry. There was some drilling for oil in the crystalline rocks near Cape Nome in the summer of 1918, but the results were unfavorable, as was to be expected. At Seward some interest was aroused over the discovery of inflammable gas issuing from the mud and water at several localities in the swamps along the railroad. The rocks near these localities, as described by Grant,[1] are slates that have been metamorphosed and folded to a degree which makes it impossible for accumulations of oil or gas to be retained in them.

[1] Grant, U. S., Geology and mineral resources of Kenai Peninsula, Alaska: U. S. Geol. Survey Bull. 587, pp. 211–212, 217, 1915.

The consumption of petroleum in Alaska is indicated approximately by the imports, which are shown in the following table:

Petroleum products shipped to Alaska from other parts of the United States, 1905–1918, in gallons.[a]

Year.	Oil used for fuel, including crude oil, gas oil, residuum, etc.	Gasoline, including all lighter products of distillation.	Illuminating oil.	Lubricating oil.
1905	2,715,974	713,496	627,391	83,319
1906	2,688,940	580,978	568,033	83,992
1907	9,104,300	636,881	510,145	100,145
1908	11,891,375	939,424	566,598	94,542
1909	14,119,102	746,930	531,727	85,687
1910	19,143,091	788,154	620,972	104,512
1911	20,878,843	1,238,865	423,750	100,141
1912	15,523,555	2,736,739	672,176	154,565
1913	15,682,412	1,735,658	661,656	150,918
1914	18,601,384	2,878,723	731,146	191,876
1915	16,910,012	2,413,962	513,075	271,981
1916	23,555,811	2,844,801	732,369	373,046
1917	23,971,114	3,256,870	750,238	465,693
1918	24,379,566	1,086,852	382,186	362,413
	219,165,479	22,598,333	8,291,462	2,622,830

[a] Compiled from Monthly Summary of Foreign Commerce of the United States, 1905 to 1918, Bureau of Foreign and Domestic Commerce.

STRUCTURAL MATERIAL.

Marble was produced from one quarry in southeastern Alaska but in a somewhat lesser amount than in 1917. The production of gypsum decreased, as the gypsum mine on Chichagof Island was not operated after March, when the mine buildings were burned. A small quantity of agricultural lime was dug from the marl deposits near Anchorage. There was no production in 1918 of bricks, quicklime, graphite, or barite.

REVIEW BY DISTRICTS.

The following review summarizes briefly the principal developments in all the districts. Many of the districts were not visited by members of the Geological Survey in 1918, and some operators failed to make reports, so that the information at hand about mining in some of the districts is incomplete and scanty. The space here devoted to any district is therefore not necessarily an indication of its relative importance. The arrangement of the discussion is geographic, from south to north.

SOUTHEASTERN ALASKA.

The mineral production of southeastern Alaska in 1918 was derived from 6 gold-lode mines, 7 copper mines, several small placer mines, 1 gypsum mine, and 1 marble quarry. The value of the mineral production fell from $5,407,902 in 1917 to $3,825,495 in 1918. The largest mining operations were, as in previous years, at the gold

mines in the Juneau district. All the productive copper mining was in the Ketchikan district. Placer mining was limited to the Porcupine district and to small beach operations at Lituya Bay and possibly at Yakataga.

Mineral production of southeastern Alaska, 1918.

	Ore mined (tons).	Gold.		Silver.		Copper.		Lead.		Palladium, marble, gypsum, etc. (value).
		Quantity (fine oz.).	Value.	Quantity (fine oz.).	Value.	Quantity (lbs.).	Value.	Quantity (lbs.).	Value.	
Gold-lode mines	2,085,915	152,755	$3,157,732	88,053	$88,053	.....	.....	1,121,894	$79,654	.....
Copper mines	21,683	1,365	28,207	9,745	9,745	1,372,347	338,970	.....	.....	(a)
Placer mines	.....	484	10,000	80	80	.....	.....	.....	.....	.....
	.....	154,604	3,195,939	97,878	97,878	1,372,347	338,970	1,121,894	79,654	$113,054

[a] Some palladium and platinum were derived from copper ore, but the amount and value are not given, as the output came from a single mine.

In the Ketchikan district the It, Jumbo, Rush & Brown, Mamie, Salt Chuck, and Rich Hill copper mines were operated, each for at least part of the year, producing about 1,372,347 pounds of copper and $37,952 worth of gold and silver. All the mines of the Ketchikan district were affected by shortage of labor and ships. The Dunton gold mine, at Hollis, was operated on the customary scale. The mill was run for the equivalent of about 150 days, and the mine was kept pumped out for the entire year. No important new developments were undertaken. Shipments of ore were made from the It and Mamie mines, a considerable amount of development work being done at the It mine, but operations at both mines were suspended before the end of the year. The Rush & Brown mine was operated through the year and made a somewhat larger production than in 1917. The Jumbo mine was operated most of the year but was handicapped by poor shipping facilities. The Salt Chuck mine was in active operation throughout the year. A 12,000-foot drift was being driven, and the mill was operated whenever water power was available. Several shipments of concentrates were made, which yielded a considerable amount of palladium and some platinum in addition to the copper, gold, and silver for which the mine has been worked in previous years. The Rich Hill mine made shipments of crude ore. A shaft and drifts were extended 20 feet and 42 feet, respectively. The Chacon prospect was stripped for about 1,000 feet along the strike, and a shaft was sunk on it to a depth of 60 feet, but the ore was found to be irregular and work was discontinued. At the Independence prospect about 300 feet of diamond drilling was done. At the Westlake mine the drifts were extended and experiments were made in the treatment of the ore.

In the Wrangell district there was no productive mining in 1918. A considerable amount of work preparatory to mining was done at the molybdenite deposit near Shakan, where about 350 feet of adit was driven. A wharf and a tramway leading from the wharf to the mine were built. Preparations are being made for producing ferromolybdenum from this ore at Treadwell. The marble quarry at Tokeen was operated, but at a reduced capacity because of the shortage of labor and of ships.

In the Juneau district the Alaska Gastineau, Alaska Juneau, and Ready Bullion mines were operated throughout the year but at a reduced capacity because of scarcity of labor, and the Peterson mine was operated during the summer as usual. Work preparatory to mining was undertaken at several nonproducing mines.

At the Alaska Gastineau (Perseverance mine) a scarcity of labor was felt early in the year, and in January the mill was operated on a basis of 6,000 tons a day. At this time there were 700 men on the pay roll. This number was gradually decreased until in October the total number of men on the pay roll was only 350. From about April 1 to November 30 the mill was operated for only one 8-hour shift a day, milling about 3,000 tons daily. Late in the year the supply of labor became more ample, but the total production of the mine throughout the year was less than half what it would have been under normal operating conditions. Because of the scarcity of skilled miners no new development work or prospecting was undertaken.

The Alaska Juneau mine and mill were operated throughout the year. The principal development work consisted of the construction of a stope above the Gold Creek tunnel level lying west of a large stope prepared above this level prior to 1917. All underground work was limited by the amount of labor available. The Alaska Juneau mill as originally constructed contained many experimental features that have turned out to be unsuitable for the ore, and the milling operations during 1918 have proved that the mill as it now stands has only half of its promised capacity. Plans are under way for altering the mill so as to reduce its operating costs and to bring its capacity up to 8,000 tons of ore a day, as was originally expected. During part of the year the 50-stamp pilot mill was operated instead of the new ball mills.

At the Ready Bullion mine during 1918 the stoping and other work necessary to supply waste for filling the worked-out portions of the mine below the 1,050-foot level were completed, and at the end of the year the work of filling with waste was being carried on actively. Pending the completion of this work, and also because of shortage of labor, the mill did not run at its normal capacity till September. Amalgamation has been discontinued in the mill, and the returns

are obtained from the iron concentrates, which are treated at the cyanide plant. The shaft has been sunk to a point somewhat below the 2,800-foot level, and a crosscut has been started. The small amount of work done toward the end of the year on the 2,800-foot level was in ore of normal value.

The Alaska Treadwell and Alaska Mexican mines and mills did not operate in 1918, but some gold was cleaned up around the old stamp batteries.

The Peterson mine, at Pearl Harbor, was operated on the customary scale throughout the summer.

The Ebner mine employed a small crew of men on development work throughout the year. At the Pekovich mine the driving of an adit has continued since May 1. At the Alaska Endicott mine an adit was driven for 26 feet, and 250 feet of drifts were driven on the vein. Some work was done during the summer by the Alaska Peerless Mining Co. at Windham Bay and by the Alaska Copper Co. at Sumdum. The Jualin, Kensington, Eagle River, Daisy Bell, and Auk Bay mines were idle throughout the year.

In the Sitka district the Chichagoff mine was operated throughout the year and made an unusually large production. Extensive developments were under way at the Hirst-Chichagoff property. Veins of tungsten ore (scheelite) have been discovered near Sitka.

The gypsum mine on Chichagoff Island made shipments during the early part of the year but has been shut down since March because of a fire.

COPPER RIVER REGION.

The productive mines of the Copper River region in 1918 included five copper mines and one gold lode mine in the Chitina Valley and about 22 gold placer mines in the Nizina, Chistochina, and Nelchina districts. The mineral output of the region included copper, silver, gold, and platinum having a total value of $13,811,135.

The Kennecott-Bonanza and Jumbo copper mines were in continuous operation except when the Bonanza mine was shut down for two weeks because the tram had been carried away by snowslides. Shipments from the Jumbo mine were curtailed for six weeks from the same cause. The production of both mines was reduced throughout the year by scarcity of labor, the mines being operated from March 1 to October 1 with approximately a 75 per cent crew. In October the crew was increased to about 90 per cent of the normal capacity of the mines. At the Jumbo mine a new double-compartment incline was begun and was extended to the 500 level. At the Bonanza mine the double-compartment incline was extended to the 800 level. The 700 level was the only new level opened during the year, but a large amount of development work

was done on the 600 level. Some work was done preparatory to increasing the capacity of the Bonanza tramway from 500 to 800 tons and of the Jumbo tramway from 450 to 650 tons a day. At the mill only minor changes and additions were made. The addition to the ammonia leaching plant was not entirely completed during the year, but it was so far advanced that the plant is now capable of treating all tailings coming from the concentrating mill. Material treated in the leaching plant for the year will assay approximately 0.85 per cent of copper in the form of carbonates. An extraction of about 75 per cent will be made, with a loss of a half pound of ammonia to the ton of material leached. The Erie mine was operated until August 10, when it was shut down for lack of labor.

The Mother Lode mine made shipments of ore during the winter. Developments at the Mother Lode mine include the continuation of the sinking of the shaft and the driving and development of the Rhodes level by about 2,500 feet of drifting and tunneling.

The Nugget Creek mine of the Alaska Copper Corporation was operated during part of the year, and some ore and concentrates were shipped from it. A concentrating plant with jaw crushers, jigs, and Wilfley and Card tables was installed in 1918. The ore and concentrates are hauled to the railroad at Strelna in motor trucks.

The Westover mine shipped some ore to the Ladysmith smelter in the winter of 1917–18. On the Green group, on the east side of McCarthy Creek, about 500 feet of tunnel was driven.

A lead prospect discovered in 1916 near the head of Chitina River, about 80 miles from McCarthy, attracted some attention, but no work was done on it in 1918. The deposit consists of lenses of lead-zinc ore in crystalline limestone.

The gold mine of the North Midas Copper Co., on Kuskulana River, was operated during part of the year, and a carload of ore from this mine was shipped during the winter. A mill and cyanide plant were installed during the summer and were reported to be in operation in November. The vein, which is from 1½ inches to 6 feet wide and averages 2 or 3 feet, is made up of quartz with pyrite and some chalcopyrite. A few stains of copper carbonate were seen. The ore contains a fraction of 1 per cent of copper, but is chiefly valuable for gold and silver. The vein, which strikes northeast and dips 45°–55° SE., cuts a mass of fine-grained epidotized porphyry that lies between coarse porphyry and limestone. Ore has hitherto been mined from tunnel No. 4. Tunnel No. 5, which will be the working tunnel, cuts the vein 570 feet in and 120 feet vertically below No. 4. The mill includes Blake and Wheeling crushers, a Denver engineering ball mill, a Dorr thickener, mechanical agitators, and an Oliver filter. The capacity is 25 tons a day. The cyanide plant uses an all-slime process with precipitation by zinc shavings.

The power plant includes a 14-inch to 8-inch pipe line 2,200 feet long, with 200-foot head and a 60-horsepower Castle wheel. A Roebling tram 4,600 feet long, with a 1,000-foot drop, 500-pound automatic loading and discharging buckets, and a capacity of 5 tons an hour will be installed.

The Nizina gold placers are still being worked on a large scale. Gold worth about $135,000 was recovered by seven mines operating in the summer and four mines operating in the winter. About 70 men were employed in the summer and 7 men in the winter. Some placer copper was recovered.

The Chistochina placer mines are said to have had a very successful season and to have produced gold worth $100,000 from the summer operations of about 14 mines employing about 50 men. A small amount of platinum was recovered.

PRINCE WILLIAM SOUND.

The value of the minerals produced on Prince William Sound in 1918 was $3,990,914, compared with $4,667,929 in 1917. This amount is the value of the product at five copper mines and four gold mines.

Mineral production of Prince William Sound, 1918.

	Ore (tons).	Gold.		Silver.		Copper.	
		Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.	Quantity (pounds).	Value.
Copper mines	434,825	3,842	$79,421	118,318	$118,318	15,311.216	$3,781,870
Gold mines	415	542	11,202	103	103	.....	.....
	436,240	4,384	90,623	118,421	118,421	15,311.216	3,781,870

By far the larger part of the copper output of Prince William Sound in 1918 came, as in previous years, from the Beatson-Bonanza mine, which, because of the increased capacity of the mechanical equipment, was operated throughout the year on a larger scale than ever before, although the supply of labor from March 1 to November 1 did not average more than 70 per cent of the normal capacity of the mine. The developments for the year include the completion of the new power plant, the extension of the double hoisting compartment vertical shaft to a depth of 300 feet below the main level, the enlargement of the mill to a capacity of 1,500 tons a day, and the increase of the capacity of the dock bunkers to 5,500 tons. A 500-ton pocket was cut and completed on the 200-foot level, and the development of that level was started.

The Ellamar mine was operated throughout the year but at a reduced capacity, owing to the shortage of labor and shipping. Underground developments in 1918 included 200 feet of drifting. No important changes were made.

The Fidalgo or Schlosser mine, on Fidalgo Bay, was operated throughout the year on about the same scale as in 1917. A lower tunnel was started, a small compressor plant was installed, and about 690 linear feet of new work was done in the ore zone.

At the Midas mine, near Valdez, mining was suspended during the winter, but a small force was retained to carry on development operations. In April the force was again enlarged, and regular mining was carried on until September, when all the work except diamond drilling was indefinitely suspended because it was impossible to ship ore.

At the Blackbird group of the Latouche Copper Mining Co., on Latouche Island, operations were much hampered by shortage of men, power, and cargo space. Early in the year some ore was shipped, and later ore was mined but not shipped. The property has passed into the hands of the Ladysmith Smelting Corporation, which is proceeding with the development. At the property of the Threeman Mining Co., on Landlocked Bay, some ore was mined but not shipped. At the Fidalgo or Mackintosh mine of the Fidalgo Mining Co. underground developments were continued, but no ore was shipped.

Gold mining on Prince William Sound was confined to the operations of four mines in the Valdez and Port Wells districts, which yielded only a small production. Some ore was mined and milled at the Gold King mine, but no extensive developments were undertaken. It is reported that the Cliff mine was operated by three men under a lease for a short time. The Alaska Homestake mine, in the Port Wells district, was leased to the Alaska Free Gold Co., of Valdez. The mine was operated for part of the year, a compressor and a 7-foot Lane Chilean mill obtained from the Granite mine were installed, and one small mill run was made. The Big Four property, on Mineral Creek, was operated in a small way, and it was reported that a stamp mill was being installed. At the Capitol Hill mine, on the north shore of Barry Arm, a 40-foot tunnel was driven in ore carrying gold, silver, and copper, but no ore was shipped. At the Q. & Q. property, on College Fiord, a 150-foot tunnel was driven in 1918.

KENAI PENINSULA.

The mineral production of Kenai Peninsula in 1918 included about $8,000 in placer gold, $6,016 in lode gold, a small amount of silver obtained incidentally to the mining of the gold, a considerable amount

of chromite, which was mined at Port Chatham, and some lignite mined at Bluff Point and possibly at Port Graham.

There was very little activity in lode-gold mining and no extensive developments are reported. Four small gold mines produced gold worth $6,016 and silver worth $181 from 207 tons of ore. A quartz lode carrying free gold discovered on Nuka Bay in 1917 has attracted some attention, and it is reported that this lode was being developed in 1918.

Placer mining continued on a small scale at several localities in Kenai Peninsula, and it is estimated that gold worth about $8,000 was thus produced.

The chromite mine at Port Chatham was operated throughout the season, making a somewhat larger production than in 1917. The developments for the year included the construction of a wharf and tram road and the installation of a stamp mill. Prospecting for chrome ore continued in the Port Chatham and Red Mountain areas. The discovery of chrome ore on Peters Creek, southeast of Knik Arm, is reported. The chromite deposits of Kenai Peninsula are described by Prof. Gill in another chapter of this report.

Some work was done at a graphite prospect at Seldovia.

MATANUSKA, COOK INLET, AND SUSITNA COAL FIELDS.

The coal mines of the Matanuska field supplied the larger part of the Alaskan coal output in 1918, yielding about 63,092 tons of coal, valued at $368,465. A more complete account of mining in the Matanuska field is given by Mr. Chapin in another chapter of this volume. A lignite mine on Little Susitna River was operated much of the year and produced fuel that was shipped to Anchorage. The mine at Bluff Point and possibly that at Port Graham supplied lignite to the towns and canneries on Cook Inlet. Lignite was mined on Cache Creek, in the Yentna district, to furnish power for a gold dredge. It is reported that lignite has been discovered at several localities along the route of the railroad as far north as Broad Pass. It is also reported that large coal or lignite beds have been discovered on Hyas River, which is tributary to Skwentna River, and at other localities on streams tributary to the Yentna and Skwentna. A further statement on coal mining is given on pages 24–25.

WILLOW CREEK DISTRICT.

The gold-lode mines of the Willow Creek district report a very successful season. The Gold Bullion, Gold Cord, Alaska Free Gold, Mabel, and Talkeetna mines were operated, producing an aggregate amount of gold worth $269,624 and silver worth $724 from 7,976 tons of ore. Development work was carried on and a small mill erected

at the War Baby mine, on Craigie Creek. A more complete account of mining in the Willow Creek district is given by Mr. Chapin elsewhere in this volume.

YENTNA DISTRICT.

The Cache Creek placers, in the Yentna district, are estimated to have produced in 1918 gold worth $150,000 from the operation of 16 mines and one dredge. About 120 men were employed in productive mining. There were also a few outfits doing dead work. Mining was curtailed during part of the season by shortage of water, but on the whole a favorable season is reported. The dredge on Cache Creek operated successfully in 1918, but it was reported that the dredge would not operate during part of the season of 1919, while electric power was being installed on it. Lignite was mined in 1918 for use in the operation of the dredge.

UPPER SUSITNA REGION.

The only known mineral production in the upper Susitna region in 1918 was a small amount of placer gold in the Valdez Creek district and some antimony ore (stibnite) that was mined but not shipped in the Broad Pass district. Interest in the gold, copper, and antimony lodes of the Kashwitna, Iron Creek, upper Chulitna, and Broad Pass districts still continues, but active work on them has for the most part been suspended pending the extension of the railroad and in the hope of cheaper and more abundant labor and supplies. The discovery of beds of lignite has been reported from several localities along the railroad route.

SOUTHWESTERN ALASKA.

There was very little mining activity in southwestern Alaska in 1918. A little placer gold was recovered from the beaches of Kodiak Island, from a creek near Katmai, and from Portage Creek, tributary to Clark Lake. Development work was continued in a small way at the McNeil property or Reward-Ridgway group near Kamishak Bay, and a test shipment of copper ore was made. Work was continued at the copper prospect of the Shelikof Mining Co., near Kukak Bay, on the Alaska Peninsula, but no ore has been shipped. It is reported that operations preparatory to mining were continued at some of the sulphur deposits of the Aleutian Islands and that a test shipment of sulphur from Akun Island was made. A deposit of iron ore (magnetite) is said to have been found at Tuxedni Bay, on the west shore of Cook Inlet.

YUKON BASIN.

GENERAL FEATURES.

The value of the mineral output of the Alaska part of the Yukon Valley in 1918 was $4,390,237, compared with $6,747,835 in 1917. The output was derived by substances and by methods of mining as follows:

Mineral production of the Yukon Basin, Alaska, 1918.

	Placer mines.		Lode mines.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold.....fine ounces..	206,271	$4,264,000	1,294	$26,750	207,565	$4,290,750
Silver.....do....	28,831	28,831	616	616	29,447	29,447
Tin, metal.....pounds..	56,000	48,500	.....	.....	56,000	48,500
Tungsten, antimony, and lead.....	.....	.....	.....	15,915	.....	15,915
Coal.....short tons..	.....	.....	969	4,325	969	4,325
Platinum.....	.....	1,300	.....	.....	.....	1,300
	.....	4,342,631	.....	47,606	.....	4,390,237

Of the products listed above the lode gold and silver and the tungsten, antimony, and lead were mined in the Fairbanks district. The tin was obtained chiefly from gold placers in the Hot Springs district, though small amounts were recovered in the gold placers of the Gold Hill and Ruby districts. The coal was mined in the Nenana field and comprises the first shipments from that field. Platinum was recovered in mining placer gold in the Tolstoi district. The derivation of the placer gold and silver will be indicated below.

Since mining began in 1886 the Alaska Yukon has produced minerals to the value of $127,829,607, of which $126,205,776 was obtained from the placers, and of this $125,447,000 was placer gold. The derivation of this output by substances and by kinds of mines is shown in the following table:

Total mineral production of the Yukon basin, Alaska, 1886–1918.

	Placer mines.		Lode mines.		All mines.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold.....fine ounces..	6,068,578.51	$125,447,000	57,751.81	$1,193,836	6,126,330.32	$126,640,836
Silver.....do....	1,051,081	620,526	13,376	8,498	1,064,457	629,024
Antimony (crude ore)tons..	.....	.....	2,251	218,500	2,251	218,500
Tin (metal).....pounds..	280,400	135,150	.....	.....	280,400	135,150
Tungsten (crude ore) tons..	.....	.....	.....	107,000	.....	107,000
Coal.....short tons..	.....	.....	10,969	94,325	10,969	94,325
Platinum (crude)..ounces..	45	3,100	.....	.....	45	3,100
Lead.....tons..	.....	.....	10	1,672	10	1,672
	.....	126,205,776	.....	1,623,831	.....	127,829,607

The value of the gold produced by the placer mines of the Alaska Yukon districts in 1918 is estimated to have been $4,264,000, com-

pared with $6,583,000 in 1917. The production in 1918 is the smallest recorded since 1904. The decrease was general throughout the region, except in some of the upper Yukon districts, and was due to the high cost of operating, the scarcity of labor, and a general hesitation to undertake ventures in the face of future uncertainties. About 355 placer mines were operated in the summer of 1918, giving employment to about 1,965 men, and about 121 placer mines were operated in the winter of 1917–18, employing about 490 men.

Estimated value of gold produced from principal placers of Yukon basin, 1918.

Iditarod	$1,240,000	Marshall	$150,000
Tolovana	875,000	Koyukuk	150,000
Fairbanks	800,000	Innoko and Tolstoi	120,000
Ruby	400,000	All others	204,000
Circle	175,000		4,264,000
Hot Springs	150,000		

The placer mines of the Yukon region in Alaska are estimated to have produced gold and silver to the value of $125,447,000 and $620,526, respectively, since mining began in 1886. The derivation of this output by districts is shown in the following table. The production of the several districts by years will be given in the descriptions of the districts.

Placer gold and silver produced in Yukon basin, Alaska, by districts.

District.	Period.	Gold.		Silver.	
		Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
Fairbanks	1903–1918	3,357,225.00	$69,400,000	626,211	$348,290
Iditarod	1910–1918	830,115.00	17,160,000	116,020	73,532
Circle	1894–1918	307,906.87	6,365,000	74,838	45,980
Fortymile	1886–1918	304,278.73	6,290,000	48,058	33,532
Hot Springs	1902–1918	291,623.86	6,028,400	46,150	27,963
Ruby	1907–1918	232,006.51	4,796,000	32,278	21,593
Koyukuk	1909–1918	210,218.39	4,345,600	29,884	18,263
Tolovana	1915–1918	135,691.87	2,805,000	15,624	13,020
Innoko and Tolstoi	1907–1918	117,793.12	2,435,000	12,712	7,612
Salchaket-Tenderfoot	1905–1918	82,607.73	1,706,000	16,864	9,923
Rampart	1896–1918	72,901.11	1,507,000	11,167	6,818
Marshall	1914–1918	42,811.86	885,000	6,176	4,899
Chisana	1913–1918	26,364.38	545,000	6,282	3,645
Kantishna	1903–1918	20,559.36	425,000	3,226	2,024
Eagle	1908–1918	13,157.99	272,000	2,085	1,278
Bonnifield	1903–1918	11,803.49	244,000	1,858	1,110
Indian River and Gold Hill	1911–1918	6,071.07	125,500	862	520
Chandalar	1906–1918	5,442.18	112,500	786	524
		6,068,578.51	125,447,000	1,051,081	620,526

FAIRBANKS DISTRICT.

The mineral production of the Fairbanks district in 1918 included placer gold worth $800,000, lode gold worth $26,750, placer silver worth $5,708, lode silver worth $616, and lead, tungsten, and antimony worth $15,915. The total value was $848,989.

The production of the placer mines was about $510,000 less than in 1917. A large number of operators did not undertake any work, and others shut down during the summer. It is estimated that about 68 mines, employing about 390 men, were operated for at least part of the summer of 1918, and about 35 mines, employing about 170 men, in the winter of 1917–18. The old dredge of the Fairbanks Gold Mining Co., on claim "No. 6 above," Fairbanks Creek, was operated throughout the season. A Bucyrus dredge, with a capacity of 3,000 yards per day, equipped with 4-foot buckets, a Neil jig, and two 120-horsepower Diesel engines, which was installed by the same company on "No. 1 below," Fairbanks Creek, was completed, and was expected to begin operations late in the summer. Some interest was aroused by the discovery of pay gravel in shallow bench deposits on Ophir Creek, tributary to Beaver Creek. Preparations were being made late in the summer to determine the extent of the pay gravel. No authentic information as to what may have been found has been received since the summer.

The aggregate value of the mineral output of the Fairbanks district up to the close of 1918 is $71,266,680. Much the larger part of this amount represents the value of the placer gold, the production of which is shown by years in the subjoined table. In addition to the actual production of the district, about $1,000,000 worth of gold mined in tributary areas passes through Fairbanks each year.

Placer gold and silver produced in the Fairbanks district, 1903–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1903	1,935.00	$40,000	348	$188
1904	29,025.00	600,000	5,225	2,821
1905	290,250.00	6,000,000	52,245	28,212
1906	435,375.00	9,000,000	78,367	42,318
1907	387,000.00	8,000,000	69,660	37,616
1908	445,050.00	9,200,000	79,909	43,151
1909	466,818.75	9,650,000	84,027	45,375
1910	295,087.50	6,100,000	53,116	28,683
1911	217,687.50	4,500,000	52,245	27,690
1912	200,756.25	4,150,000	48,182	29,632
1913	159,637.50	3,300,000	20,274	12,245
1914	120,937.50	2,500,000	29,024	16,050
1915	118,518.75	2,450,000	28,444	14,421
1916	87,075.00	1,800,000	11,058	7,276
1917	63,371.25	1,310,000	8,379	6,904
1918	38,700.00	800,000	5,708	5,708
	3,357,225.00	69,400,000	626,211	348,290

The available information as to the source of the gold by creeks is not very accurate. An attempt has been made in the following table, however, to distribute the total placer-gold production of the Fairbanks district by the creeks on which the mines are located:

Approximate distribution of gold produced in Fairbanks district, 1903–1918.

Cleary Creek and tributaries	$22,980,000
Goldstream Creek and tributaries	14,080,000
Ester Creek and tributaries	11,280,000
Dome Creek and tributaries	8,020,000
Fairbanks Creek and tributaries	7,500,000
Vault Creek and tributaries	2,660,000
Little Eldorado Creek	2,220,000
All other creeks	660,000
	69,400,000

Lode mining in the Fairbanks district included the operation of six small gold mines, whose combined output of gold and silver, including that of three additional prospects, or mines that were not in regular operation, was worth about $27,376, compared with $49,557 in 1917. A little lead was also produced in 1918, and there were small outputs from one antimony mine and one or two tungsten mines. The following table shows the production of gold and silver from the lode mines of the Fairbanks district since lode mining began in 1910:

Lode gold and silver produced in the Fairbanks district, 1910–1918.

Year.	Crude ore (short tons).	Gold.		Silver.	
		Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1910	148	841.19	$17,389	106	$57
1911	875	3,103.02	64,145	582	308
1912	4,708	9,416.54	194,657	1,578	971
1913	12,237	16,904.98	349,457	4,124	2,491
1914	6,526	10,904.75	225,421	2,209	1,222
1915	5,845	10,534.91	217,776	1,796	910
1916	1,111	1,904.81	39,376	140	92
1917	1,200	2,311.38	47,781	2,217	1,826
1918	1,035	1,294.04	26,750	616	616
	33,685	57,215.62	1,182,752	13,368	8,493

On Fairbanks Creek productive mining was carried on at the Mizpah, Crites & Feldman, and Rob-Rye mines. At the Mizpah mine the workings include an inclined shaft 200 feet deep and drifts 100 feet long. The mine is equipped with a 5-stamp Allis-Chalmers mill, which was operated in 1918 whenever a sufficient supply of ore accumulated. The driving of an adit on the Gilmore & Stevens property, which will cut the Mizpah lode near the present lower workings, was continued and was nearing completion in 1918. At the Crites & Feldman mine the driving of the upper tunnel on the Hi Yu claim was continued, and ore was mined and milled during much of the year. At the Rob-Rye mine some ore was hoisted and milled early in the year, but operations were suspended because of water.

The David mine, on Skoogy Gulch, was operated by Roth & Maddocks. A 250-foot adit was driven, a Johnson vanner was added to the standard 2-stamp mill, and ore was mined and milled. Work at the North Star claim, Skoogy Gulch, consisted of the driving of an adit intended to cut a ledge exposed on the top of the hill.

At the Creighton & Heilig mine, on Little Eldorado Dome, work was continued at a shaft sunk in 1912 on the Rose claim, and ore was being mined and milled.

On Eva Creek the Smith & McGlone and Tyndall & Finn mines and the St. Paul mill were operated during part of the year. The Smith & McGlone mine, on the Billy Sunday (formerly Leah fraction) claim, was operated from May 1 to October 1, and two mill runs were made. The Tyndall & Finn mine, on the Bondholder group, was operated during part of the year, and some ore was milled. At the St. Paul mine 150 feet of tunnel was driven and some ore was mined but not milled. The St. Paul mill was operated on ore for Smith & McGlone and Tyndall & Finn. At the Ohio claim of John Rogach, at the head of Spruce Creek, a small amount of ore was mined and milled, but the work was more in the nature of prospecting than of regular mining. The Ohio claim is developed by a vertical shaft 25 feet deep and 25 feet of drift.

Small amounts of lead-silver ore from the Fairbanks district were treated in 1918 at the experiment station of the Bureau of Mines in Fairbanks and at the smelter in Tacoma, Wash.

At the tungsten mines some work was done in 1918 on the Spruce Hen group and on the Scheelite claim, and it was reported that some tailings would be remilled at the Scheelite locality in 1918. Shipments of tungsten ore in 1918 have been reported from only one property in the Fairbanks district.

Antimony ore was produced in 1918 from only one mine in the Fairbanks district, and no special interest is being shown in the local antimony deposits.

HOT SPRINGS DISTRICT.

The placer mines of the Hot Springs district are estimated to have produced gold worth $150,000 in 1918, compared with $450,000 in 1917. The production of placer tin in 1918 is estimated at 44 tons of concentrates, containing about 52,400 pounds of metallic tin, worth $45,500, practically all of which was recovered by sluicing old tailings and dumps. There was a general suspension of gold and tin mining because of shortage of labor and high cost of mining. Construction of a large ditch has been started by Howell & Cleveland, preparatory to hydraulic mining on the benches of Sullivan Creek. The gravels on lower Patterson Creek are said to have been extensively prospected by drilling, with encouraging results. The gold

and silver output of the placer mines of the Hot Springs district since the beginning of mining are given below. The placers of the Hot Springs district have also produced, since 1911, 232 tons of tin ore, estimated to contain about 276,260 pounds of tin, valued at $131,900.

Placer gold and silver produced in the Hot Springs district, 1902–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1902–1903	12,717.79	$262,900	1,818	$964
1904	7,038.56	145,500	1,007	584
1905	5,805.00	120,000	831	507
1906	8,707.50	180,000	1,245	843
1907	8,465.63	175,000	1,210	798
1908	7,256.25	150,000	1,038	550
1909	15,721.88	325,000	2,248	1,169
1910	15,721.88	325,000	2,248	1,169
1911	37,974.37	785,000	5,430	2,932
1912	19,350.00	400,000	3,267	2,009
1913	19,350.00	400,000	3,267	1,973
1914	33,281.25	750,000	6,125	3,387
1915	29,508.75	610,000	4,982	2,526
1916	38,700.00	800,000	6,534	4,299
1917	21,768.75	450,000	3,675	3,028
1918	7,256.25	150,000	1,225	1,225
	291,623.86	6,028,400	46,150	27,963

TOLOVANA DISTRICT.

The gold production of the placers of the Tolovana district in 1918 is estimated to be about $875,000, compared with $1,150,000 in 1917. This falling off in production is due largely to the working out of a number of claims but also to the exceptional dryness of the summer and to the scarcity of labor. Unless a strike is made in the district a further decrease may be expected in 1919.

A little placer work was done on Gunnison Creek and on Quail Creek, in the western part of the district. Some claims were staked on the benches along the west fork of Tolovana River, and it is expected that prospecting will be carried on there this winter. Several gold-lode prospects have been staked near Livengood, but nothing more than a little development work has been done on them.

Practically the total output of the district comes from Tolovana and vicinity, and the principal producing creeks are Tolovana, Amy, Lillian, Olive, Lucky, Ruth, and Gertrude. About 35 mines were operated in 1918, against 50 in 1917, and about 270 men were engaged in mining. Three or four of the plants employed more than 25 men each. About 8 of the mines were worked out during the season, or the deposits were found to be of too low grade to be worked next year. Three mines cleaned up the previous winter's dumps and then ceased to do further work. About 29 mines were expected to be in operation in 1919. Twenty-two mines had under-

ground workings. Pay ground at Livengood averages only about 75 cents to $1 a bedrock foot, the gravels averaging about 1½ feet in thickness, but the mines enjoy the advantage of hard, frozen ground that requires almost no timbering. The total gold and silver output of the Tolovana district is shown below, and a further statement on mining in the Tolovana district is given by Mr. Overbeck in another chapter of this report.

Placer gold and silver produced in the Tolovana district, 1915–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1915	3,870.00	$80,000	321	$163
1916	33,862.50	700,000	2,813	1,851
1917	55,631.25	1,150,000	8,430	6,946
1918	42,328.12	875,000	4,060	4,060
	135,691.87	2,805,000	15,624	13,020

RAMPART DISTRICT.

The production of placer gold in the Rampart district in 1918 was about $24,000, derived from the operation of 9 mines, employing 24 men, in the summer of 1918, and 2 mines, employing 4 men, in the winter of 1917–18. The most extensive operations were on Hunter Creek, where two hydraulicking plants have been installed. With the rest of Alaska, the Rampart district suffered from the scarcity of labor. Cassiterite is found in the concentrates of some of the mines, but none of it is being saved. The following table shows the total production of the district:

Placer gold and silver produced in the Rampart district, 1896–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1896–1903	29,799.00	$616,000	4,440	$2,664
1904	4,353.75	90,000	649	376
1905	3,870.00	80,000	576	351
1906	5,805.00	120,000	865	588
1907	6,046.87	125,000	901	595
1908	3,628.12	75,000	540	286
1909	4,837.50	100,000	721	375
1910	2,080.12	43,000	310	167
1911	1,548.00	32,000	231	125
1912	1,548.00	32,000	274	169
1913	1,548.00	32,000	274	165
1914	1,451.25	30,000	257	142
1915	1,693.13	35,000	300	152
1916	1,935.00	40,000	343	226
1917	1,596.37	33,000	280	231
1918	1,161.00	24,000	206	206
	72,901.11	1,507,000	11,167	6,818

SALCHAKET-TENDERFOOT DISTRICT.

The Tenderfoot district, which in past years, as the following table shows, yielded a considerable amount of gold, has practically ceased to produce. The output for 1918 probably did not exceed $6,000.

There were reported discoveries of gold in 1918, as in previous years, at several localities in the Salchaket and Goodpaster districts, but none of them have yet proved of importance.

Placer gold and silver produced in Salchaket-Tenderfoot district, 1905–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1905	(a)	(a)	(a)	(a)
1906	4,837.50	$100,000	989	$673
1907	18,140.62	375,000	3,707	2,447
1908	18,140.62	375,000	3,707	1,965
1909	7,256.25	150,000	1,483	771
1910	4,837.50	100,000	989	534
1911	4,837.50	100,000	989	524
1912	4,837.50	100,000	989	608
1913	4,837.50	100,000	989	597
1914	4,837.50	100,000	989	547
1915	4,595.62	95,000	939	476
1916	3,870.00	80,000	790	520
1917	1,289.37	25,000	245	202
1918	290.25	6,000	59	59
	82,607.73	1,706,000	16,864	9,923

a Prospects only.

CHISANA DISTRICT.

Very little authentic information concerning mining in the Chisana district in 1918 has been received. It is believed that mining was curtailed, as in most other Alaskan districts, and that the gold output was probably not worth more than $15,000. The total production of the district to date is shown below.

Placer gold and silver produced in the Chisana district, 1913–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1913	1,935.00	$40,000	465	$280
1914	12,093.75	250,000	2,910	1,609
1915	7,740.00	160,000	1,862	944
1916	1,935.00	40,000	465	306
1917	1,935.00	40,000	420	346
1918	725.63	15,000	160	160
	26,364.38	545,000	6,282	3,645

KANTISHNA DISTRICT.

The mineral production of the Kantishna district in 1918 consisted of placer gold worth about $30,000. About 25 or 30 men were engaged in mining. Preparations were made for mining silver-lead ore and antimony ore.

Placer gold and silver produced in the Kantishna district, 1903–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1903–1906	8,465.62	$175,000	1,325	$795
1907	725.62	15,000	114	75
1908	725.62	15,000	114	60
1909	241.87	5,000	38	20
1910	483.75	10,000	76	41
1911	1,451.25	30,000	227	120
1912	1,451.25	30,000	227	140
1913	1,451.25	30,000	227	137
1914	967.50	20,000	152	84
1915	967.50	20,000	152	77
1916	1,451.25	30,000	227	149
1917	725.63	15,000	120	99
1918	1,451.25	30,000	227	227
	20,559.36	425,000	3,226	2,024

BONNIFIELD DISTRICT.

The placer mines of the Bonnifield district produced gold worth about $8,000 in 1918. About five mines, employing 12 men, were operated on Moose, Daniels, and Healy creeks. Some work was done at the lode prospects on the divide between Moose and Eva creeks. No information has been received concerning the placers in the eastern part of the Bonnifield region, and it is believed that little mining was done there. One man was engaged in placer mining in a small way on Rainy Creek, tributary to Delta River. Some work was done on the molybdenite lodes on the Dry Delta. The placer production of the Bonnifield district since the beginning of mining is shown below.

Placer gold and silver produced in the Bonnifield district, 1903–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1903–1906	1,451.25	$30,000	227	$136
1907	241.87	5,000	38	25
1908	241.87	5,000	38	20
1909	2,418.75	50,000	379	197
1910	483.75	10,000	76	41
1911	967.50	20,000	152	81
1912	967.50	20,000	152	93
1913	967.50	20,000	152	92
1914	1,451.25	30,000	227	126
1915	967.50	20,000	152	77
1916	483.75	10,000	76	50
1917	580.50	12,000	98	81
1918	580.50	12,000	91	91
	11,803.49	244,000	1,858	1,110

NENANA COAL FIELD.

Mining of coal for shipment began in the Nenana field in 1918, when two small mines were opened under mining permits to supply coal for the railroad and other local use. This was the first production of coal from this field except a little that has been taken from time to time to supply fuel for some of the placer mines on Totatlanika Creek. No coal leases have yet been granted in the Nenana field.

CIRCLE DISTRICT.

Mining in the Circle district in 1918 was confined as usual to the gold placers, which produced gold worth $175,000. About 35 mines, employing 93 men, were operated in the summer of 1918 and 15 mines, employing 28 men, in the winter of 1917–18. The dredge on Mastodon Creek was operated as usual. The supply of water was reported to be ample throughout the district. No new discoveries were made, and no important new projects were undertaken. The output of the placers of the Circle district, since mining began in 1894, is shown below.

Placer gold and silver produced in the Circle district, 1894–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1894	483.75	$10,000	123	$77
1895	7,256.25	150,000	1,886	1,226
1896	33,862.50	700,000	8,794	6,080
1897	24,187.50	500,000	6,289	3,773
1898	19,350.00	400,000	5,031	2,968
1899	12,093.75	250,000	3,144	1,886
1900	12,093.75	250,000	3,144	1,886
1901	9,675.00	200,000	2,512	1,507
1902	9,675.00	200,000	2,512	1,331
1903	9,675.00	200,000	3,144	1,698
1904	9,675.00	200,000	3,144	1,823
1905	9,675.00	200,000	3,144	1,918
1906	14,512.50	300,000	3,773	2,565
1907	9,675.00	200,000	3,144	2,075
1908	8,465.63	175,000	2,212	1,166
1909	10,884.37	225,000	2,830	1,472
1910	10,884.37	225,000	2,830	1,528
1911	16,931.25	350,000	4,402	2,333
1912	15,721.87	325,000	2,439	1,500
1913	8,465.63	175,000	1,314	794
1914	10,884.37	225,000	1,689	934
1915	11,126.25	230,000	1,727	875
1916	14,512.50	300,000	2,252	1,482
1917	9,675.00	200,000	1,561	1,285
1918	8,465.63	175,000	1,798	1,798
	307,906.87	6,365,000	74,838	45,980

FORTYMILE DISTRICT.

The gold output of the Fortymile district in 1918 was valued at $75,000 and was derived from the operation of about 60 mines, employing 93 men, in the summer of 1918, and 29 mines, employing 48

men, in the winter of 1917–18. There was no dredging in 1918, it being reported that the dredge that was previously operated was not suitable for the ground. The high benches near the mouth of Dennison Fork were prospected extensively, and it is said that plans are under consideration for the construction in 1919 of a ditch 21 miles long on the bank of Dennison Fork.

Placer gold and silver produced in the Fortymile district, 1886–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1886–1903	193,500.00	$4,000,000	30,553	$22,915
1904	14,851.12	307,000	2,345	1,360
1905	12,384.00	256,000	1,955	1,193
1906	9,868.50	204,000	1,558	1,059
1907	6,772.50	140,000	1,069	706
1908	6,772.50	140,000	1,069	567
1909	10,884.37	225,000	1,719	894
1910	9,675.00	200,000	1,528	825
1911	9,575.00	200,000	1,528	810
1912	10,303.87	213,000	1,627	1,000
1913	4,837.50	100,000	764	461
1914	2,418.75	50,000	382	211
1915	2,418.75	50,000	382	194
1916	2,418.75	50,000	382	251
1917	3,870.00	80,000	624	513
1918	3,628.12	75,000	573	573
	304,278.73	6,290,000	48,058	33,532

EAGLE DISTRICT.

The production of placer gold in the Eagle district in 1918 was about $25,000, or nearly double that of 1917. The increase was due to the operation of two new hydraulic plants. About 14 mines, employing 40 men, were operated in the summer of 1918, and 1 mine, employing 2 men, in the winter of 1917–18.

Placer gold and silver produced in the Eagle and Seventymile districts, 1908–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1908	483.75	$10,000	76	$40
1909	1,209.37	25,000	191	99
1910	483.75	10,000	76	41
1911	580.50	12,000	92	49
1912	967.50	20,000	164	100
1913	2,418.75	50,000	382	231
1914	2,418.75	50,000	382	211
1915	1,935.00	40,000	305	155
1916	822.37	17,000	130	86
1917	628.88	13,000	96	75
1918	1,209.37	25,000	191	191
	13,157.99	272,000	2,085	1,278

CHANDALAR DISTRICT.

Little information has been received concerning mining in the Chandalar district. The placers were apparently worked on about the customary scale, 4 summer mines and 3 winter mines, employing 10 and 6 men, respectively, producing gold worth about $13,000.

Placer gold and silver produced in the Chandalar district, 1906–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1906–1912	2,902.50	$60,000	416	$241
1913	266.06	5,500	38	23
1914	241.87	5,000	35	19
1915	241.87	5,000	35	18
1916	435.37	9,000	62	41
1917	725.63	15,000	104	86
1918	628.88	13,000	96	96
	5,442.18	112,500	786	524

KOYUKUK DISTRICT.

The gold placers of the Koyukuk district are believed to have produced gold worth about $150,000 in 1918. About 20 mines, employing 150 men, are reported as having operated in the summer of 1918, and 3 mines, employing 10 men, in the winter of 1917–18.

Placer gold and silver produced in the Koyukuk district, 1900–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1900–1909	106,454.02	$2,200,600	15,242	$8,993
1910	7,740.00	160,000	1,108	598
1911	6,772.50	140,000	970	514
1912	9,675.00	200,000	1,385	852
1913	19,350.00	400,000	2,770	1,673
1914	12,577.50	260,000	1,800	995
1915	13,303.12	275,000	1,902	964
1916	14,996.25	310,000	2,147	1,413
1917	12,093.75	250,000	1,700	1,401
1918	7,256.25	150,000	860	860
	210,218.39	4,345,600	29,884	18,263

INDIAN RIVER AND GOLD HILL DISTRICTS.

The production of gold from the Indian River and Gold Hill placers in 1918 was probably not more than $4,000. Only 2 mines, employing 8 men, were known to have operated in the Indian River district, and 1 mine in the Gold Hill district. A small amount of placer tin was saved at a placer gold mine on Mason Creek, in the

Gold Hill district, and gravels said to contain 2½ pounds of stream tin to the cubic yard were discovered on Moran Creek, a tributary of the Melozi. About 6 men were prospecting and digging a ditch on Moran Creek.

Placer gold and silver produced in the Indian River and Gold Hill[a] districts, 1911–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1911	483.75	$10,000	69	$37
1912	1,185.19	24,500	170	105
1913	1,548.00	32,000	221	133
1914	1,209.37	25,000	173	96
1915	725.63	15,000	104	53
1916	483.75	10,000	69	45
1917	241.88	5,000	27	22
1918	193.50	4,000	29	29
	6,071.07	125,500	862	520

[a] Gold Hill placers included in 1918 only.

IDITAROD DISTRICT.

The placer mines of the Iditarod district are believed to have yielded, in 1918, gold worth about $1,240,000, compared with $1,500,000 in 1917. Three dredges were operated, yielding about $750,000 in gold. It is reported that a claim on a hill at the head of Flat Creek yielded $84,000. About half the people of the Iditarod district are said to have left for the States.

Placer gold and silver produced in the Iditarod district, 1910–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1910	24,187.50	$500,000	4,254	$2,297
1911	120,937.50	2,500,000	21,270	11,273
1912	169,312.50	3,500,000	29,778	18,313
1913	89,977.50	1,860,000	9,551	5,769
1914	99,652.50	2,060,000	10,578	5,849
1915	99,168.75	2,050,000	10,526	5,337
1916	94,331.25	1,950,000	10,013	6,589
1917	72,562.50	1,500,000	11,050	9,105
1918	59,985.00	1,240,000	9,000	9,000
	830,115.00	17,160,000	116,020	73,532

RUBY DISTRICT.

The production of gold in the Ruby district in 1918 is reported to be about $400,000, which is only about half that of 1917. The decrease is due largely to the fact that the Greenstone dredge did not

operate, its ground having been worked out in 1917. Some of the smaller operators suspended work on account of high prices of supplies and material. A small amount of cassiterite was saved in mining for placer gold.

Placer gold and silver produced in the Ruby district, 1907–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1907–8	48.38	$1,000	7	$4
1909				
1910				
1911				
1912	8,465.63	175,000	1,157	712
1913	37,974.37	785,000	5,188	3,134
1914	48,375.00	1,000,000	6,609	3,655
1915	33,862.50	700,000	4,626	2,345
1916	41,118.75	850,000	5,618	3,697
1917	42,811.88	885,000	6,073	5,046
1918	19,350.00	400,000	3,000	3,000
	232,006.51	4,796,000	32,278	21,593

INNOKO AND TOLSTOI DISTRICTS.

The production of placer gold in the Innoko and Tolstoi districts in 1918 was probably about $120,000. The output of the Tolstoi district decreased considerably, only one mine being reported as productive in 1918, but it is said that encouraging new discoveries have been made.

Placer gold and silver produced in the Innoko and Tolstoi districts, 1907–1918.[a]

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1907	628.87	$13,000	67	$44
1908	3,483.00	72,000	370	196
1909	16,447.50	340,000	1,746	908
1910	15,721.87	325,000	1,669	901
1911	12,093.75	250,000	1,284	681
1912	12,093.75	250,000	1,284	681
1913	13,545.00	280,000	1,438	869
1914	9,675.00	200,000	1,027	568
1915	9,191.25	190,000	976	495
1916	10,642.50	220,000	1,130	744
1917	8,465.63	175,000	1,113	917
1918	5,805.00	120,000	608	608
	117,793.12	2,435,000	12,712	7,612

[a] Includes Tolstoi district in 1917 and 1918.

MARSHALL DISTRICT.

The output of placer gold in the Marshall district in 1918 is estimated at about $150,000. Since mining began in 1914 the Marshall placers have yielded gold worth about $885,000.

Placer gold and silver produced in the Marshall district, 1914–1918.

Year.	Gold.		Silver.	
	Quantity (fine ounces).	Value.	Quantity (fine ounces).	Value.
1914	725.62	$15,000	94	$52
1915	1,209.37	25,000	156	79
1916	13,061.25	270,000	1,686	1,109
1917	20,559.37	425,000	3,300	2,719
1918	7,256.25	150,000	940	940
	42,811.86	885,000	6,176	4,899

STUYAHOK RIVER.

Some interest was aroused on the lower Yukon in the fall of 1918 by the report that valuable gold placers had been located on Stuyahok River, about 6 miles north of Tucker's fish camp. The Stuyahok is tributary from the south to Bonasila River, which enters the Yukon about 10 miles below Anvik. It has been known[1] that gold exists on the Stuyahok, but no mining has hitherto been done. No detailed information has been received concerning the discovery, but it has recently been reported that the excitement is subsiding.

KUSKOKWIM REGION.

The production of gold in the Kuskokwim region in 1918, according to such scanty information as is available, was about $100,000. The greater part of the output came from the Mount McKinley precinct, where a dredge that was shipped to the locality several years ago began working on Candle Creek. The operation of the dredge has not thus far been satisfactory, as there has been repeated trouble with part of the machinery. In the Goodnews Bay or Quinhagak district about 6 mines were operated, employing about 30 men, and producing gold worth about $30,000. The discoveries reported from the Goodnews Bay district in 1917 have not yet proved to be of great importance. Placer mining still continues in a small way in the Georgetown and Tuluksak-Aniak districts.

NORTON SOUND.

A little placer gold was produced in 1918, as in previous years, from Bonanza Creek, in the St. Michael district, where the operations of 2 small mines were reported. The placer mines of Bonanza Creek also yielded a few pounds of scheelite concentrates in 1918. This is the first recorded production of tungsten from this district. Lignite was mined in the summer of 1918 near Unalaklik for shipment to Nome and St. Michael.

[1] Harrington, G. L., The Anvik-Andreafski region, Alaska: U. S. Geol. Survey Bull. 683, p. 56, 1918.

SEWARD PENINSULA.

The value of the mineral production of Seward Peninsula in 1918 was about $1,195,172, compared with $2,747,000 in 1917. Of the output in 1918, $1,108,000 represents the value of the placer gold and $87,172 the value of the miscellaneous products, including tin, tungsten, silver, and platinum.

The production of placer gold was less than half that of 1917 and was the smallest since 1898. The decrease was due to labor difficulties, to the high cost of operating, and to unfavorable climatic conditions, including deep frost, scanty water, and a short season.

Placer gold produced in Seward Peninsula, 1918, by districts.

Nome	$447,000
Solomon	49,000
Council	307,000
Fairhaven	113,000
Koyuk	135,000
Kougarok	50,000
Port Clarence	7,000

Twenty-one gold dredges operated during the season of 1918, seven less than in 1917. The dredges employed 152 men and produced gold worth about $466,000, or 42.1 per cent of the total production of Seward Peninsula. Of the dredges six were in the Nome district, seven in the Council district, five in the Solomon district, two in the Fairhaven district, and one in the Kougarok district.

Twenty-eight underground mines, employing about 177 men, operated in 1918, producing gold worth about $279,000, or 25.2 per cent of the total production of the peninsula. Of the underground mines 21 were in the Nome district, 4 in the Fairhaven district, and 3 in the Koyuk district.

Twenty-four hydraulic mines employed about 170 men and produced gold worth $259,500, or 23.4 per cent of the total production. Of the hydraulic mines 10 were in the Nome district, 1 in the Solomon district, 4 in the Council district, 5 in the Fairhaven district, 3 in the Koyuk district, and 1 in the Kougarok district.

Fifty-five open-cut mines, other than hydraulic, employed 134 men and produced gold worth $103,500, or 9.3 per cent of the total production. Of the open-cut mines 13 were in the Nome district, 6 in the Council district, 11 in the Fairhaven district, 15 in the Kougarok district, 4 in the Koyuk district, and 6 in the Port Clarence district.

The only new strike of the season was made on Poorman bench, Monument Creek, in the Nome district, where gravels carrying about $32 to the cubic yard were discovered.

The total production of tin was much less than in 1917. Only one tin dredge on Buck Creek, in the York district, operated in 1918. A

small amount of tin concentrates was also produced by sluicing. Placer tin has been discovered on Potato Creek, which flows northwestward from Potato Mountain, and also on Humboldt Creek, tributary to Goodhope River, in the Fairhaven district.

The production of tungsten was less than in 1917. It was wholly incidental to the mining of placer gold, no operations being conducted in 1918 for the recovery of scheelite alone.

About 56 ounces of platinum was recovered from the gold placers of Seward Peninsula. Most of this came from Dime Creek, in the Koyuk district, but a small amount was obtained from Bear Creek, in the Fairhaven district.

Little work was done on the lodes of Seward Peninsula in 1918, and no ore was shipped. Considerable work preparatory to mining was done on the Lost River tin lodes and on a silver-lead lode on Kougarok River, where some ore was mined. A further statement on mining in Seward Peninsula is given in another chapter of this report.

KOBUK RIVER.

The gold production of Kobuk River for 1918 is estimated at $15,000. About 35 men were engaged in mining operations. It is reported that favorable prospects were discovered on California Creek, a tributary of the Kugaluktuk. About 150 tons of coal is said to have been mined on the Kobuk about 25 miles above Squirrel River.