MINERAL RESOURCES OF ALASKA, 1927

MINERAL INDUSTRY OF ALASKA IN 1927

By PHILIP S. SMITH [1]

INTRODUCTION

For many years the mineral industry of Alaska has been one of the main contributors to the development of the Territory, if not the main industry. To assist in fostering this industry the Federal Government through the Geological Survey has for nearly 30 years paid considerable attention to many of the problems relating to the industry. Through its studies of the distribution, character, origin, and extent of ore deposits, the Geological Survey has been able to keep those interested in mining developments informed of the facts of significance to the prospector, the miner, or the business man. One of the phases of the investigations that has obvious value is the record of the kinds and quantity of mineral produced, as these furnish measures of the size and trend of the industry. It is to supply this information that the Geological Survey collects annually records of the production of all mineral commodities and makes these records available through annual reports, of which this one is the twenty-fourth.[2]

The collection of the data necessary for these annual statements is by no means a simple matter, because the great size of the Territory, the diversity of its mineral products, and the large numbers but small size of many of the enterprises make it impracticable to gather all the desired information at first hand. The information must therefore be obtained from many sources, which necessarily vary in reliability and completeness. Among the most reliable sources are the field engineers, geologists, and topographers of the Geological Survey engaged in Alaskan surveys, who acquire much accurate information regarding the mineral production of the regions in which

[1] The statistics in this chapter have been compiled largely by Miss L. M. Graves and Miss L. H. Stone.

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

they work or more general information by contact with miners and operators in the course of their travels to and from the field. Members of other Government organizations—for instance, the Bureau of Mines, the Bureau of the Mint, and the Customs Service—in the course of their regular duties collect many data which are extremely valuable in these studies and the use of which avoids unnecessary duplication in the collection of records. Most of the banks, express companies, and other business organizations in Alaska collect for their own use data regarding mineral commodities of their particular districts. Some of these data are extremely pertinent to the general inquiry conducted by the Geological Survey, and through the cordial cooperation of many of these companies important facts have been made available to the Geological Survey for its information but not for publication, as their disclosure would reveal confidential facts. Most of the larger Alaskan newspapers as well as certain papers published in the States that feature Alaskan matters are courteously sent by their publishers to the Geological Survey, and from these and the technical and scientific periodicals are gleaned many items regarding new developments. In addition to all these sources the Geological Survey each year sends out hundreds of schedules—one to every person or company known to be engaged in mining. On these schedules are a number of questions regarding the mining developments and production of each individual property during the year. These schedules when properly filled out by the operators of course constitute a most authoritative record. Unfortunately, however, not all of them are returned by the operators and even some of the operators who return them have not all the specific data desired or misunderstand the inquiries or reply in such a manner that the answers may not be correctly interpreted when the schedules are edited. It is a gratifying evidence of the general appreciation of the annual summaries published by the Geological Survey that so many of the operators cooperate fully and cordially with the Geological Survey by furnishing the information called for on the schedules as well as volunteering much other pertinent information.

It is evident that with such a mass of information available the resulting report should correctly and adequately reflect the actual conditions, and every effort is made to see that this result is attained so far as possible. Unfortunately, however, there are many causes of inaccuracy. For instance, the same term may be differently interpreted by different persons so that answers to the same question are not always made from the same viewpoint. To the lode miner the value of the production from his mine will probably mean tons of ore mined times the assay value of its metallic contents. To others knowing the inevitable loss that occurs in the

metallurgical or milling treatment of this ore the value of the production will probably mean value of the metal recovered. To still others it may mean the amount they received from the bank for their product after deducting assaying and handling charges, insurance, etc., or it may mean the amount the local trader paid for their gold, even though that amount may have a wholly fictitious relation to its mint value. So far as possible these various standards have been reconciled to the single one represented by the value of the metal recovered, as shown generally for placer or lode gold by bank assays or receipts without deductions. Many of the mineral products, however, are not disposed of during the year they are produced at the mine, so that for these the only accurate record available is the gross quantity produced and its approximate metal tenor. This condition is especially common for the larger lode mines, whose production of ore may continue up to the last day of the year but the ore thus produced may not reach the mill, smelter, or mint until many months later. This same condition also occurs to a lesser degree with some of the placer product. In fact, during the current canvass an example was found of a small lot of placer gold that had been produced during 1919 but did not reach a mint until 1927, and of course a considerable amount of nugget gold is annually diverted directly by the producer for jewelry or pocket pieces, never gets into the usual trade channels, and is not reported except in the Geological Survey estimates of production. It is readily evident that there will always be differences between the quantities of metals reported by different agencies, though on the whole many of these differences tend to offset one another. Thus for a mine that has been in operation for some time at approximately the same rate its production that did not reach the mill, smelter, or mint during the current year is usually about balanced by its similar production during the last part of the preceding year, which is reported by the mint or smelter during the current year.

Another element that enters into the problem and creates some inaccuracy or misconception is the fact that the price of all mineral commodities except gold fluctuates considerably during the year. All the reports do not give the value of the production on a single consistent basis, so that many must be edited to bring them to an approximately common standard. For this reason the average prices of the several mineral commodities for the year as determined by the Bureau of Mines are used instead of the prices actually received by the producer. Although it is recognized that this arbitrary method of computation results in obscuring the amount actually received by the individual mines, it probably does not introduce any considerable error in the totals, inasmuch as higher prices received by the more

shrewdly or efficiently administered mines are about balanced by the lower prices received by less fortunate ones.

It is the constant aim of the Geological Survey to make these annual summaries of mineral production as accurate and adequate as possible. The Geological Survey therefore bespeaks the continued cooperation of all persons concerned in the mineral industry and urges them to communicate any pertinent information that may lead to this desired end. It should be emphasized that all information regarding individual prospectors is regarded as strictly confidential. The Geological Survey will not use any data that are furnished in any way to disclose the production of individual plants nor allow access to its records in any way that will be disadvantageous to either the individuals who furnish the information or those to whom the data relate. So scrupulously is this policy followed that it has been necessary to combine or group together certain districts or products so that the production of an individual may not be disclosed. In order to fulfill this obligation it has even been necessary to adopt certain rather artificial and unnatural groups, as, for instance, the "miscellaneous mineral products," which include petroleum, quicksilver, stone, marble, tin, and other materials produced in small quantity or by only one producer, and whose output would otherwise be obvious.

ACKNOWLEDGMENTS

From the foregoing description of the way in which the data have been obtained for this report, it is evident that a great many persons have contributed information essential for its preparation. The list of contributors would include most of the mining men of the Territory and scores of others. The list, in fact, is so long that it is impracticable to distinguish by name all who may be regarded as collaborators in this work. A number, however, have given special assistance, and individual mention of these is gratefully given.

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MINERAL PRODUCTION

GENERAL FEATURES

The total value of the mineral production of Alaska in 1927 was $14,404,000. This was furnished by a number of mineral products, the most valuable of which were copper and gold. The total value was considerably less than in the preceding year, or, for that matter, for a number of years. This condition is interpreted as due not to a permanent waning in mining but to a temporary setback resulting from a number of causes, some of which were purely local, others were regional, and still others affected mining not only in Alaska but in the States. In other words, there is no indication that the curve of production has begun a permanently downward trend, but rather that it shows a sag which will undoubtedly be checked when the reports for 1928 become available.

One of the reasons for a widespread decline in mining was the low price at which most metals sold in 1927. This had the direct effect of reducing the value of Alaska's mineral production a few hundred thousand dollars, but its indirect effect in curbing production was probably many times greater. The average selling price of metals in 1927 as compared with the price for the same metals in 1926 affords convincing proof of this condition. For instance, according

to the Bureau of Mines, which computes the average price of metals for each year, copper brought 13.1 cents a pound in 1927, 14 cents in 1926; silver 56.7 cents an ounce in 1927, 62.4 cents in 1926; lead 6.3 cents a pound in 1927, 8 cents in 1926; platinum $85 an ounce in 1927, $111 in 1926. It is obvious that these low prices reduced the value of the mineral output, but it may not be so apparent that during a period of low prices it is only the part of wise management to reduce the quantity of output and to await more favorable markets. Of course certain output must be maintained to fulfill contracts or to carry fixed charges, but the general tendency during a time of low prices is to reduce operations to a minimum.

The foregoing explanation, of course, does not apply to gold mining, for, as is well known, the price of gold is constant. Even in the gold mines, however, the effect of the low price of some of the metals is recognized, because many of the gold lode mines recover also considerable quantities of silver and lead. As an example, the output of lead from the gold mines was about 460,000 pounds more in 1927 than in 1926, yet its value was only $2,600 greater. The decline in gold production is entirely attributable to decreased production from the gold placers, for there was an increase in the quantity and value of the gold output from the lode mines. The explanation of the decrease in placer gold production lies largely in the adverse climatic conditions that prevailed at almost all the placer camps throughout the Territory during 1927. The winter of 1926-27 had a light snowfall, so that the run-off from the snow when it melted furnished little water for mining. Moreover, the early part of the open season was exceptionally dry, so that at many camps water for mining was not available until August, and by that time many of the smaller plants had been closed up by their owners, who had become discouraged. Even at the large camps the shortage of water forced curtailment of work so that some of them were operating at only half their normal rate. In many of the districts the summer season opened unusually late, and as a result seasonal frost in places lasted until August, thus badly hampering mining. To round out the tale of misfortune, winter set in rather early at many of the districts and so further shortened the length of time that the mines were able to keep open.

In spite of this rather disappointing record for 1927, there were indications of a real and sound revival of interest in mining throughout the Territory. Some of the large projects that have been under way for several years are now finishing their preparatory stages and are about to become producers. As these enterprises have been carefully and thoroughly planned, their success can be predicted with certainty. It is, however, not only in their direct effect on increasing

the mineral output that these larger mines are having an influence on the development of the Territory, but also through affording places at which prospectors can obtain work and thus funds to go out and prospect on their own initiative, and through training and educating the prospector in sound mining methods, some of which can be applied to the problems that confront him on his own claims. The prospectors themselves are feeling the need of more study of mining and geologic matters and are availing themselves of the educational advantages afforded by the Alaska School of Mines in some of the fundamental aspects of the subject. The Territorial legislature is taking a hand in encouraging prospectors to search for new deposits or to develop old ones and during its last session passed measures to defray some of the cost of transportation for bona fide prospectors, under certain conditions. These things, even though they are rather small of themselves, give promise of revival of interest in mining in the Territory—not mining of the old type that was a wild stampeding orgy of staking claims, but a thoughtful, intelligent undertaking that assures development of a sound mining industry.

In the following table is stated the total value of the minerals produced from the Territory and of each of the minerals that contributed a considerable amount to this total. In addition, the production is shown for each year as far back as records are available. Of the total to the end of 1927 nearly 97 per cent was in gold and copper.

Value of total mineral production of Alaska, 1880–1927

By years				By substances	
1880–1890	$4,193,919	1910	$16,875,226	Gold	$366,235,000
1891	1,014,211	1911	20,720,480	Copper	194,913,000
1892	1,019,493	1912	22,581,943	Silver	11,220,000
1893	1,104,982	1913	19,547,292	Coal	5,552,000
1894	1,339,332	1914	19,109,731	Tin	1,007,000
1895	2,588,832	1915	32,790,344	Lead	1,322,000
1896	2,885,029	1916	48,386,508	Marble and other products (including platinum metals)	5,125,000
1897	2,539,294	1917	40,694,804		585,374,000
1898	2,329,016	1918	28,218,935		
1899	5,425,262	1919	19,626,824		
1900	7,995,209	1920	23,330,586		
1901	7,306,381	1921	16,994,302		
1902	8,475,813	1922	19,420,121		
1903	9,088,564	1923	20,330,643		
1904	9,627,495	1924	17,457,333		
1905	16,490,720	1925	18,220,692		
1906	23,501,770	1926	17,664,800		
1907	20,840,571	1927	14,404,000		
1908	20,092,501		585,374,000		
1909	21,140,810				

For comparison the production of minerals in 1927 and 1926 is given in somewhat greater detail in the following table, which shows that the largest change was a decrease in the quantity and value of copper and a somewhat smaller decrease in gold. On the other

hand, coal, tin, and lead showed an increase. Each of the different mineral products is discussed in more detail in the following pages, which record such facts as are available regarding the amount of each product and the districts from which it came.

Mineral output of Alaska, 1927 and 1926

	1927		1926		1927 (increase or decrease)	
	Quantity	Value	Quantity	Value	Quantity	Value
Gold.....fine ounces..	286,720	$5,927,000	324,450	$6,707,000	−37,730	−$780,000
Copper.....pounds..	55,343,000	7,250,000	67,778,000	9,489,000	−12,435,000	−2,239,000
Silver.....fine ounces..	627,800	356,000	690,000	430,500	−62,200	−74,500
Coal.....short tons..	104,300	548,000	87,300	459,000	+17,000	+89,000
Tin, metallic.....do....	26.7	34,000	8	10,400	+18.7	+23,600
Lead.....do....	1,008	127,000	778	124,400	+230	+2,600
Miscellaneous mineral products, including petroleum, platinum metals, marble, gypsum, etc.....	.....	162,000	.....	444,500	.....	−282,500
	.....	14,404,000	.....	17,664,800	.....	−3,260,800

GOLD

TOTAL PRODUCTION

The total value of the gold produced in Alaska in 1927 amounted to $5,927,000, which is about $780,000 less than was produced in 1926. The following table gives the record of the total production of gold from the Territory from the earliest days and the annual production for the last 12 years. By 1916, the earliest year for which the detailed analysis is given in the table, the period of bonanza mining that commenced in 1900 was decidedly on the wane, and decrease in gold production continued until 1923. The decrease during this period would have been even more marked had there not been a constant growth of production from mines of the less spectacular types through the introduction of more efficient and larger-scale mining methods. By 1924 the utilization of these methods had checked the decline, so that for the next few years there was successively a small but significant increase in production, and in spite of the decrease reported in 1927 there is good reason to believe that there will be a continued upward trend to the gold production from Alaska for many years to come, as mining enterprises already under way become increasingly remunerative and through their success induce the undertaking of other well-planned and adequately financed enterprises.

Gold and silver produced in Alaska, 1880–1927

Year	Gold		Silver		Value of gold by sources	
	Fine ounces	Value	Fine ounces	Value	Placer mines	Lode mines
1880–1915	12,592,121	$260,302,243	4,923,198	$2,821,911	$185,200,444	$75,101,799
1916	834,068	17,241,713	1,379,171	907,495	11,140,000	6,101,713
1917	709,049	14,657,353	1,239,150	1,021,060	9,810,000	4,847,353
1918	458,641	9,480,952	847,789	847,789	5,900,000	3,580,952
1919	455,984	9,426,032	629,708	705,708	4,970,000	4,456,032
1920	404,683	8,365,560	953,546	1,039,364	3,873,000	4,492,560
1921	390,558	8,073,540	761,085	761,085	4,226,000	3,847,540
1922	359,057	7,422,367	729,945	729,945	4,395,000	3,027,367
1923	289,539	5,985,314	814,649	668,012	3,608,500	2,376,814
1924	304,072	6,285,724	669,641	448,659	3,564,000	2,721,724
1925	307,679	6,360,281	698,259	482,495	3,223,000	3,137,281
1926	324,450	6,707,000	690,000	430,500	3,769,000	2,938,000
1927	286,720	5,927,000	627,800	356,000	2,982,000	2,945,000
	17,717,620	366,235,000	14,964,000	11,220,000	246,661,000	119,574,000

In the preceding table the source from which the gold was derived is indicated by separation into two main types of mines, placers and lodes. The placers are those deposits of sand and gravel which have been worn from the hard rocks in their general vicinity and in which the gold or other valuable minerals have been more or less concentrated by geologic processes that were effective because of some distinctive physical or chemical property of the material thus concentrated. The lodes, on the other hand, are the mineralized veins or masses of ore in the country rock that were formed in general through deep-seated geologic processes and represent material in place.

All gold that occurs in nature contains some silver. It has therefore been convenient to show in one table all the silver that was produced from Alaska mines, though the detailed discussion of the mines whose ore is most valuable for some other metal is postponed to a later section. It is not always evident which is the most valuable mineral in an ore, for the value may be determined by the total mineral content. Thus certain mines could not be profitably worked except for the combined content of gold, silver, lead, and perhaps copper in their ore. It is therefore impossible, except by undesirably minute classification, to tabulate in detail the source of all the gold and silver bearing material that is produced in Alaska. In the following table all the ores from lode mines that yielded gold are segregated from the ores from lodes that carry principally copper, and the gold recovered from placers is stated separately. In some of these annual reports for earlier years the ores that were principally valuable for their silver content were separated from those that were principally valuable for their gold content, but in view of the relatively small production in 1927 of ores that were principally valuable for their silver content that separation has not seemed desirable in this report,

as it might disclose the operation of individual mines. No gold is attributed to the ores here classed as principally valuable for their copper content, though those ores are the source of most of the silver that is produced. The absence of any appreciable quantity of gold in the ores from which the bulk of the Alaska copper is produced is well known, though the reason for its absence is not understood. From this table it is evident that approximately equal amounts of gold were produced from the lodes and the placers. This relation differs from that in 1926, when the ratio between lode gold and placer gold was 44 to 56, because in 1927 there was a marked decrease in the amount of placer gold produced.

Gold and silver produced in Alaska, 1927, by sources

Source	Gold		Silver	
	Fine ounces	Value	Fine ounces	Value
Gold ores (4,352,000 tons)	142,465	$2,945,000	79,400	$45,000
Copper ores			525,100	297,800
Placers	144,255	2,982,000	23,300	13,200
	286,720	5,927,000	627,800	356,000

GOLD LODES

Approximately one-half of the gold produced in Alaska in 1927 came from lodes, which, though known in almost all parts of the Territory, have been most extensively developed in the southern part and most notably in southeastern Alaska.

Gold and silver produced from gold-lode mines in Alaska in 1927, by districts

District	Ore mined (short tons)	Gold		Silver	
		Fine ounces	Value	Fine ounces	Value
Southeastern Alaska	4,320,000	128,727	$2,661,000	76,720	$43,500
Willow Creek	18,000	7,643	158,000	570	300
Fairbanks district	6,000	2,467	51,000	880	500
Other districts	8,000	3,628	75,000	1,230	700
	4,352,000	142,465	2,945,000	79,400	45,000

As is readily apparent from this table, more than 90 per cent of the entire gold lode production in 1927 came from southeastern Alaska, and of this about seven-eighths was produced by the mines operated by the Alaska Juneau Gold Mining Co. The magnitude of this company's mining operations is set forth in its annual report,[3]

[3] Alaska Juneau Mining Co. Thirteenth Ann. Rept., for 1927, 14 pp., 1928.

from which the following statements are abstracted: The total rock mined and trammed to the mill in 1927 was 4,267,810 tons, or an average of practically 11,700 tons a day. Of this amount 2,428,115 tons of coarse tailings were rejected and 1,839,695 tons were fine milled. The average assay of all the material mined was 77 cents a ton. The amount of gold in the part of the rock that was rejected was about 19 cents a ton, and the value of the mineral content of the rock that was further treated was about $1.55 a ton. Of this value 28 cents a ton was lost in treatment, 97 cents was recovered as bullion, and 30 cents was recovered in galena and other concentrates which were later smelted. The following table has been compiled from the published reports of this company:

Production of Alaska Juneau mine, 1893–1927

Year	Ore (tons)			Metals recovered			
	Total	Fine milled	Coarse tailings rejected	Gold	Silver (ounces)	Lead (pounds)	Total value
1893–1913	507,254	330,278	176,976	$707,730	Lost in tailing.		$707,730
1914–1915	242,328	239,918	2,410	251,655	6,192	117,031	261,326
1916	180,113	180,113	----------	115,022	2,844	61,068	121,370
1917	677,410	677,410	----------	429,262	12,248	296,179	460,666
1918	592,218	574,285	17,933	430,124	11,828	273,297	459,445
1919	692,895	616,302	76,593	499,002	16,431	359,762	542,714
1920	942,870	637,321	305,549	732,870	23,348	487,574	791,300
1921	1,613,600	904,323	709,277	969,703	40,619	550,913	1,035,251
1922	2,310,550	1,108,559	1,201,991	1,296,157	49,404	687,315	1,388,679
1923	2,476,240	1,134,759	1,341,481	1,427,199	41,876	755,423	1,514,774
1924	3,068,190	1,367,528	1,700,662	1,907,374	63,191	1,256,857	2,055,782
1925	3,481,780	1,537,884	1,943,896	2,030,067	55,971	1,288,974	2,184,384
1926	3,829,700	1,649,678	2,180,022	1,931,052	51,004	1,300,915	2,067,836
1927	4,267,810	1,839,695	2,428,115	2,328,540	61,232	1,513,306	2,463,262
	24,882,958	12,798,053	12,094,905	15,055,757	436,188	8,948,614	15,054,618

This report shows an exceedingly creditable record, in that nearly 400,000 tons more rock was mined and 190,000 tons more milled in 1927 than in any year heretofore. In 1927 the recovery of gold in bullion from the ore milled was 5 cents a ton higher than the average for the whole period the mine has been in existence, and 5 cents a ton more was recovered from the concentrates than the average for that period. Hand in hand with this excellent showing, the losses in milling decreased, so that the loss in that part of the rock which was rejected was 1 cent a ton below the average for the whole period, and in that part which is fine milled 2 cents a ton below the average. At the same time the cost of milling was held down during the year to the exceedingly low average cost of 22.57 cents a ton of rock mined. An even better showing is predicted for next year by the management, as during most of 1927 the mill was supplied with ore of less than average grade, but developments that have been in progress began to yield better ore, the effects of which are already apparent.

In addition, plans have been completed to equip the mill with flotation apparatus whereby much of the zinc contained in the ore will be concentrated and shipped to the electrolytic zinc plant at Kellogg, Idaho, for recovery. This will result not only in yield of zinc but also of gold, as considerable gold is now carried away with the zinc minerals. The projected sale of the Alaska properties of the Alaska Treadwell [4] and Alaska Mexican Gold Mining Companies to the Alaska Juneau Gold Mining Co. is significant, although its effects may not soon result in increasing the actual mineral output of the Territory. This sale has been formally proposed to the stockholders of the former companies in the president's report, dated March 17, 1928.

The two next most productive gold mines in southeastern Alaska are those of the Hirst-Chichagof Mining Co. and the Apex-El Nido Mining Co., both in the northern part of Chichagof Island. No new developments of striking character have been reported at either of these properties during the year, but at both the work of mining and milling has been carried on actively with gratifying results. During the year the Hirst-Chichagof Mining Co. acquired several adjacent claims on which veins have long been known, thereby increasing its reserves. The Apex-El Nido mine produced enough to pay a substantial dividend, and though the mine was closed toward the last of the year owing to severe weather conditions, the operators report that an abundance of ore is in sight to supply the mill for the entire coming season. At the mine of the Chicagoff Development Co., which for several years has been among the large producers in the Chichagof district, productive work was largely suspended during the year, and most of the time was spent in development work only. Elsewhere on Chichagof Island are a number of small properties on which prospecting and development work is being continued, and at several of them promising leads have been found. At the property of the West Coast Development Co. exploration was in progress, and a small shipment of ore was made to a smelter in the States for a test.

Another of the productive mining districts in southeastern Alaska is that near the head of Portland Canal, known as the Salmon River or Hyder district. The ore from this district is principally valuable for its silver and lead content, but it also carries considerable amounts of gold and small amounts of copper. The largest and most productive mine in the district is that of the Riverside Mining & Milling Co., not far from the international boundary. Shipments of several hundred tons of concentrates have been made to the Selby smelter in San Francisco, and gold is also recovered in the company's mill near the mine. Many smaller companies and prospectors were active

[4] Treadwell-Yukon Co. Ann. Rept. for 1927, 14 pp., 1928.

in scouting and development work in the district, and several small test shipments of ore from the district have been sent to smelters in the States. Many of these have shown encouraging results, and there is every reason to believe that this district will continue to show an increasing production of minerals.

In the Ketchikan district gold lodes have long been known, and some of them have produced considerable gold in the past. At present the most productive mine is that of the Kassan Gold Mining Co., near Hollis. This mine has been undergoing development for some time and is now reported to have reached a stage where adequate reserves of ore have been blocked out and the mine put into shape to maintain all the production that can be handled by the company's mill. In fact, the principal difficulty at the present time is said to be to obtain sufficient power to operate the mill continuously. Because of inadequate power it was practicable to run the mill at most only one shift a day during 1927. In spite of this handicap, the company recovered considerable gold from the mill and from the concentrates which it shipped to one of the smelters in the States. A small amount of copper was also recovered from these concentrates. Development work at the mine of the Peerless Consolidated Mining Co., on Thorne Arm, is reported to have been brought to such a condition that the owners are contemplating the erection of a mill on the property at a not distant date. A test shipment of a few tons of ore is reported to have given encouraging returns.

The mine of the Alaska Palladium Co., in the Ketchikan district, which, as its name implies, was worked principally for the palladium content of its ore but nevertheless yielded also a good deal of gold and some copper, was not in operation during the year and, in fact, was finally sold for a trivial sum to cancel outstanding debts. Some of the ore which had been produced at this mine in 1926 and shipped to a smelter in the States was treated during the year, and this gave rise to the report that the mine was again active.

Near the head of Windham Bay, some 45 miles southeast of Juneau, development work was in active progress throughout the year on the mining properties of the Jacob Marty Mines. Efforts have been largely directed to construction of the surface plant of this company and starting such underground developments as were required to supply the mill with ore. This work occupied most of the summer, and it was late in the fall before the plant was in a condition to operate. The results of this preliminary work have continued to be encouraging, and the mine is said to be in condition to show a good production of gold next year.

Throughout southeastern Alaska, in addition to the mining already mentioned, are many small mining prospects which yielded

some gold during the year or at which renewed mining activity indicates that they may shortly become producers. Among these may be mentioned the properties in the vicinity of Funter Bay and Hawk Inlet, near the northern part of Admiralty Island. Plans for driving a long adit for prospecting the claims of the Lake Virginia Mining Co., near Wrangell, were also under discussion. The Inspiration Point Mining Co., whose property lies a short distance north of Skagway and whose ore, though containing principally silver-lead, carries also some gold, is reported to have continued prospecting and development work.

The Willow Creek district, north of the head of Cook Inlet, continued to be, as it has been so long, the largest of the Alaska gold-lode camps outside of southeastern Alaska. Its total production, however, showed a very marked decrease in 1927, being less than half as much as in 1926. The largest mines in the district are those of the Willow Creek Mines, the Fern Gold Mining Co., and the Marion-Twin Gold Mining Co., but there are a few other properties that produced a little ore and a number on which some development work was done. No new discoveries of economic significance were reported to have been made during the year. The principal mines operated by the Willow Creek Mines were the War Baby and Lucky Shot, but leases on other parts of the company's properties in this district have been given to small groups of miners, and this system is said to have been so satisfactory that more grants of this sort may be made in the future. The recent work at the Fern mine has been directed largely toward determining the extent of moderately good ore rather than restricting mining principally to rich shoots. It is expected that by increasing the volume of material handled costs can be reduced and at the same time the production boosted. To handle a larger quantity of ore will necessitate the development of more power, and plans are under consideration for installing a hydroelectric plant. The mine that is being developed by the Marion-Twin Mining Co. was formerly known as the Gold Mint or Hatcher property, on Little Susitna River, 5 or 6 miles northeast of Fishhook Inn. The mill of this company was run for one shift a day almost continuously throughout the open season. The results were so satisfactory to the owners that they propose putting in additional stamps before next season.

Gold-lode mining in the Fairbanks district continues to be centered more or less closely around Pedro Dome, northeast of Fairbanks, and around Ester Dome, west of the town. In the northeastern tract the principal work was mainly of a developmental or prospecting character. Small amounts of ore were recovered in the course of this work from the properties of Crites & Feldman, a short distance west of Fairbanks Creek; the McCarthy prospect, near the head of Fair-

banks Creek; the Wyoming and the old Rhoads-Hall mine, on Chatham Creek; and a property near Ridgetop. It is reported that renewed prospecting was carried on at the old Spaulding mine, on Dome Creek, and that plans are under consideration for continuing work there, as the indications appeared decidedly encouraging. In the area west of Fairbanks the most productive work was at the Elmes and Mohawk mines, on Happy and Ace Creeks, respectively, where much of the season was spent in development work, both on the surface and underground, and the shortage of water seriously handicapped the continuous operation of the mills. The great number and small size of the veins make them difficult to trace without actually following them by drifts, and as this is a slow and expensive process, the work has not made conspicuous progress, though it continues to give encouragement that profitable ore bodies may be developed. During the year negotiations for the purchase of the old Ryan lode, which lies between Eva and St. Patrick Creeks, have been in progress, and according to local reports an English company has acquired the property. This lode, unlike most of the others on Ester Dome, is a large body of low-grade quartz, so that, if it is to be successfully developed, the mining and milling of a large amount of material will be required. Developments at this place will be watched with interest, not only because the lode is well known and has been examined by numerous engineers in the past, but because this will be the first attempt to mine a large body of quartz in interior Alaska and thus will give facts from actual practice by which it will be possible to estimate more closely the tenor that ore in this part of Alaska must contain to be profitably mined. In addition to the main large lode on the Ryan property there is geologic evidence which indicates that some small richer veins similar to those that crop out at other places on Ester Dome may be discovered here also.

Grouped together under the heading " Other districts " in the table on page 10 are a number of widely scattered properties whose production can not be stated separately because to do so would disclose the output of individual mines. At most of these mines activities have been continued at about the same rate as heretofore, though in all there have been indications of increased interest in gold-lode prospecting and development. The three districts in which this increased activity was most marked appear to have been near Medfra, in the Nixon Fork section of the Kuskokwim Valley; the Nuka Bay district, near the southern extremity of Kenai Peninsula; and the Prince William Sound region, including the vicinity of Valdez, Tiekel, Port Wells, and the country adjacent to the Sound.

The old Pearson & Strand mine, on Ruby Creek, a tributary of Nixon Fork, had an especially good season, and although no new dis-

coveries at that place were reported, it is distinctly encouraging to list this region as one of the producers of lode gold. From earlier geologic investigations in this region [5] the ore in this district is known to contain considerable copper in additon to gold. Apparently, however, only the gold was recovered in the mill, as the Geological Survey has received no record of shipment of copper ore or concentrates from it during the year. At the Whalen mine, on Hidden Creek, which is about a mile south of the Pearson & Strand mine, prospecting was resumed after a discontinuance of about two years, but no production was reported. There was no new prospecting elsewhere in this district in 1927.

Prospecting and development work was carried on at many points in the vicinity of Nuka Bay, and several new leads were found. The principal producing mine is that of the Alaska Hills Mines on its Paystreak claim. Some discouragement has been expressed that this district has not more rapidly increased its production, but this is not at all surprising, even if its lodes are as good as the most optimistic partisans predict, for it is an expensive and time-consuming job to develop lode mines in a rather remote area unless undertaken by amply financed companies, and so far developments at Nuka Bay have been carried on by a small number of men with very meager capital. The returns so far seem entirely commensurate with the expenditures of time, effort, and money that have been made.

Gold-lode mining or prospecting at a number of places in the vicinity of Prince William Sound was carried on at about the same scale as formerly, and though quantitatively the contribution from this region to the total gold production of Alaska was relatively small, it is significant as indicating that there are lodes here that invite examination and development. Among the more promising properties may be mentioned that of the Ethel Mining Co., on Mineral Creek, a short distance west of Valdez, where development work has now been carried to such a stage that the owners are said to feel justified in building a mill and will probably take steps to do so in 1928. Other claims in the same neighborhood are the Little Giant, Big Four, and Millionaire groups. Prospecting in the vicinity of Mineral Creek should be much facilitated by the new road that is being built up the creek by the Government. Some lode gold is said to have been produced at the old Ramsay-Rutherford mine, east of Valdez Glacier, but no details are available regarding the work at this place. Northeast of Valdez, in the Tiekel district, the search for quartz lodes has been carried on at several points, and it is locally reported that the claims formerly owned by Knowles & Backman

[5] Brown, J. S., The Nixon Fork Country: U. S. Geol. Survey Bull. 792, pp. 127–136, 1926.

on Stuart Creek were taken over, toward the end of the year, by an experienced mining engineer in the interests of eastern purchasers who propose to press development work on them.

In the Port Wells district of the Prince William Sound region the main item of interest is that late in the fall the Merrill Mining Co. completed the erection of a mill on its property on Bettles Bay, so that, although it made no noteworthy production this year, it should be in good condition for continuous operation next season. Several other properties in the Port Wells district were continuing work on the claims at about the same rate as heretofore.

Among the districts which produced a small amount of lode gold in 1927 or in which some new developments in the search for gold lodes were recorded may be mentioned the Copper River region, northern Kenai Peninsula, Valdez Creek, Seward Peninsula, and northern Alaska. In the Copper River region a number of lode claims formerly organized as the Lucky Six group are said to have been acquired by eastern people who propose to develop them as soon as plans are completed. Near the head of the Left Fork of Kotsina River a prospector found a large body of mineralized rock which carries some gold, though the tenor is low, so that it could not be mined unless it were handled on a large scale. In the Kenai Peninsula prospecting has been resumed at several places in the environs of Seward, which, though not yet yielding returns in gold, is a hopeful indication of renewed interest in this business. Still farther north, in the vicinity of Moose Pass, rumors of the finding of enormous bodies of low-grade quartz that, because of their proximity to the railroad, can be economically mined continue to crop up and are probably based more on sanguine hopes than on coldly analytical sampling. However, there are in this same general region a number of small properties, most of which have been known for some time but have lately been lying idle, at which some prospecting and development work was in progress during the year. No production is reported from the mines of the Alaska Minerals Co. in the Palmer Creek Valley. Farther north, in the Crow Creek Valley, the Monarch Mining Co. continued work on the lodes on its property near the head of the stream.

In the Valdez Creek region, near the head of Susitna River and about 50 miles east of Cantwell, on the Alaska Railroad, search for and the development of gold lodes have been continued with undiminished activity. In fact, during the year a number of the business men of Anchorage, together with the original locators of a number of claims, organized the Alaska Range Mining & Development Co., with a view to raising adequate capital to continue the

development of the known leads and really open them up, so that their true character and gold content may be satisfactorily determined.

At a number of places in Seward Peninsula lode prospecting still continues, but no significant production has been reported from any of them during the year, with the possible exception of the old lode claims near Bluff. The mineralization of the Bluff locality has long been known and described, but during 1927 the claims were visited by an outside consulting engineer, and a few tons was shipped to a smelter in the States as a sample for test. The main significance of this shipment lies in its indication of renewed interest in the search for minable lodes in this region. In northern Alaska the only prospecting for lodes during the year which has come to the attention of the Geological Survey consists of the reported find of quartz on the Noatak side of the divide northwest of Shungnak, about which there has been a little local excitement. No accurate details of the find are available, and the remoteness of the region and the attendant difficulties of development throw doubt on the possibility that the find may be of economic importance, even if the ore should prove to be somewhat richer than the ordinary run of good ore.

GOLD PLACERS

GENERAL CONDITIONS

Placer mining in Alaska returned much less gold in 1927 than in 1926. Much of this decrease is to be attributed to the exceptionally dry weather that prevailed in practically all the placer districts during the early part of the summer, whereby supplies of water for mining were very short. Not only was there little rainfall during the early part of the season but the snowfall during the preceding winter in many of the districts had been light, so that only a little water was produced by its melting. The shortage of water not only adversely affected the small operators but seriously hampered even the large companies. Thus in the Nome region during most of the early part of the season the Hammon Consolidated Gold Fields was able to operate only two of its three dredges for much of the time, and the loss from that source alone accounted for a decrease of several hundred thousand dollars in the value of the company's production. Furthermore, the weather was so cold during the early part of the season in many of the camps that the seasonal frost was unusually late in disappearing, and this hampered many of the smaller plants, especially dredges mining shallow-creek deposits like those in parts of the Solomon River Valley. The relatively low water in many of the streams and the setting in of cold weather again early in

the fall forced suspension of mining in many of the districts earlier than usual, thus further curtailing production.

When all these adverse conditions are taken into consideration the decline in production is seen to be due to temporary causes and therefore not indicative of a lasting decline in the industry. In fact, ability in the face of these handicaps to sustain the production at the amount recorded is clear evidence that the industry as a whole is in a healthy state and that there is every promise of its showing real advance when conditions are less adverse. Furthermore, it should be remembered that in comparing the placer production of 1927 with that of 1926 we are making a comparison with an unusually productive year rather than with an ordinary one, for in 1926 the recovery of placer gold was more than $540,000 in excess of that in 1925.

Confidence in the growth of the placer-mining industry is further warranted by the knowledge that several enterprises that were in process of development during the year are fast approaching the stage where they will become productive. The expectation that many of these enterprises will be successful is amply guaranteed by the careful planning and accurate determination of the several factors in advance, so that the uncertainties of speculative mining have been largely removed. This more businesslike method of approaching mining ventures is not only apparent in the undertakings of the larger companies but is noticeable in many of the smaller enterprises. Even the prospector is learning to test his optimistic dreams by more rigorous analysis of the available facts. It is true that in the main the larger areas in Alaska that have promise of placer wealth have already been roughly delimited, but there still remain in these tracts many places where profitable mining can be conducted on a large scale by companies able to put in the necessary equipment, to finance the necessary dead work that is required to put the ground into shape for mining, and to employ competent and careful technical management. Moreover, it is not only for the large companies that opportunities still remain, because there are many places where intelligent prospecting should handsomely repay the effort of the individual or small group of miners. It is true that these places do not promise fabulously rich bonanzas, such as were found in the boom days when the places where gold could be obtained easily in great quantity had not yet all been discovered. They do, however, still promise a better living than many enterprises in which people now slave to make both ends meet. It is discouraging to one interested in the development of the mineral resources of the Territory that so few prospectors are now in the hills engaged in searching for minerals. The cost of supplies is admittedly high in the more remote districts, but each year facilities are improving greatly over

those of the early days and knowledge of conditions is becoming more readily accessible, so that while the returns that may be expected are lower, there still remains a favorable balance that should be an incentive for the enterprising prospector, whether a large company or an individual.

From the description already given of the general methods used in collecting and interpreting the data that form the basis of this report, it is evident that the problem of obtaining accurate data regarding the production of placer gold is greater that that for any of the other items, owing to the great number of small producers, who are widely scattered, some in the most remote regions, and many of whom do not furnish complete information because they do not have the means of giving precise details. However, every effort has been made to check the information from various sources and to adjust discrepancies. As a result it is believed that the figures for the total placer production are as closely in accord with the actual facts as they can reasonably be made. The correct distribution of this total among the different districts may involve considerably greater errors, and although efforts have been made to guard against errors of this sort the quality of the data used does not justify estimates for the different districts closer than the nearest thousand dollars. It should be realized, however, that in spite of rounding off the figures in this way the computations that gave the ground work for the estimates were carried out wherever possible to the nearest dollar.

Statistics of placer mining in Alaska in 1926 and 1927

Region	Value of gold produced		
	1926	1927	Decrease or increase, 1927
Southeastern Alaska	$8,000	$20,000	+$12,000
Copper River Region	102,000	89,000	−13,000
Cook Inlet and Susitna region	126,000	66,000	−60,000
Yukon Basin	1,529,000	1,282,000	−247,000
Kuskokwim region	124,000	151,000	+27,000
Seward Peninsula	1,873,000	1,365,000	−508,000
Kobuk region	7,000	9,000	+2,000
	3,769,000	2,982,000	−787,000

SOUTHEASTERN ALASKA

Although the preceding table shows that southeastern Alaska made a very large proportionate increase in its placer production in 1927 over that for 1926, the amount of gold represented by that increase is actually very small and does not indicate any very marked change in the placer-mining activity of the region. As is well known, the physical character of most of southeastern Alaska is not such

as to hold much promise of extensive placers. The topography of most of the area is mountainous, with precipitous slopes leading down from the crests to the ocean waters or to the valley floors. In the "panhandle" there are almost no beaches along the coasts in which concentration by the sea has been effective, and the under-water slopes in most places prolong the steep above-water slopes to considerable depths. Even in the lowlands of the larger streams sorting action, which might have produced placers, has been relatively ineffective, because most of the valleys have been occupied so recently by glaciers that normal erosion processes have not long been at work, and any deposits that may have been formed long ago have been more or less thoroughly removed or distributed by the glaciers. The three principal districts in which placer gold is mined in southeastern Alaska are near Juneau, in the Porcupine district, and near Yakataga.

In the vicinity of Juneau practically the only placer mining in 1927 was in the Silver Bow Basin, where a little work has been in progress for several years.

In the Porcupine River district the most active placer mining was on claims of the Porcupine Mining Co. During the season the long flume which the company had started building the year before was completed, so that water was available for hydraulicking. Although this work was not finished until late in the season, the company should be in condition to make an early start in 1928 and demonstrate the placer possibilities of its claims. A few small developments were also under way on the Alaskan side of the boundary, and renewed activity is reported on the Canadian side.

Placer mining in the Yakataga district was confined to three small camps that were engaged in mining the beach deposits that extend along the coast. The returns from the individual properties were comparatively small, so far as the amount of gold was concerned, but large in view of the low cost of production. The exposure of these deposits to the waves of the Pacific precludes mining there on a large scale with extensive equipment, but for small camps of one or two men each they continue to yield several thousand dollars a year in gold.

COPPER RIVER REGION

Placer gold is produced in three principal districts in the Copper River region—the Nizina, Chistochina, and Nelchina districts. In the Nizina district practically the entire production came from properties of the Nicolai Placer Mines on Dan Creek, and the Chititu Mines, on Chititu and Rex Creeks. Work at both these camps was interrupted for many days during the later part of the season by heavy rains that started about the middle of August. Although the

equipment was not seriously damaged, most of the bridges were taken out and hydraulicking was suspended. As a result the production of placer gold was somewhat less than in 1926. In the Chistochina district the Slate Creek Mining Co., on Slate Creek, was the only operator that reported any noteworthy production, though production at that place was on a considerably smaller scale than in 1926, probably owing to the drought in the early part of the season and the heavy rains in the fall. In the Nelchina district all the mining operations were small and yielded a total of only a few thousand dollars. In addition to the larger mines already mentioned there were a number of one or two man parties on several of the streams engaged in prospecting or development work that yielded small amounts of gold. One party of this sort was prospecting and doing assessment work on the claims of the Alaska Middle Fork Mining Co. on the Middle Fork of Chistochina River.

COOK INLET AND SUSITNA REGION

In the Cook Inlet-Susitna region are included the placer camps in Kenai Peninsula and adjacent country, the Yentna-Cache Creek district and neighboring fields west of Susitna River, and the Valdez Creek district, near the head of Susitna River. Dry weather in the early part of the season and heavy rains in the fall hampered mining, so that the production from the region showed a considerable decrease from that of 1926. Another cause of lessened production was idleness of the dredge on Cache Creek, which had been damaged late in the summer of 1926, and which in the past has mined a great deal of gold.

In the Yentna-Cache Creek district no new discoveries were made or new mines opened up. The greatest amount of mining was done on Cache Creek and its tributaries, Nugget, Thunder, Falls, and Windy Creek, where about 35 men were mining more or less continuously throughout the season. On Peters Creek and its tributaries, Bird, Poorman, Willow, Gopher, and Cottonwood Creeks were a number of small camps, employing in all about 20 men in mining work. To the north, in the basin of Tokichitna River, three parties of a single man each produced a little gold from Bear, Ramsdyke, and Long Creeks, tributaries of the main stream from the west. To the southwest, in the Fairview district, the season was spent mainly in prospecting and development work which yielded only a small amount of gold. The only production that was reported to the Geological Survey from this district came from Mills Creek and Notobac Gulch.

All the placer mining in Kenai Peninsula in 1927 was done at a number of widely distributed small camps, none of which produced more than a few thousand dollars in gold and many of them only

a few hundred dollars. Probably not more than 20 men have been engaged in placer mining at any one time in 1927 in this whole region. The largest mines were on Crow Creek, near Girdwood, north of Turnagain Arm; on Resurrection River south of Hope; and on Lynx Creek, in the Sunrise district. All these placers have been known and mined more or less extensively for a number of years, so that their production, although encouraging to the owners, does not indicate any new strike.

In the Valdez Creek district, which lies some 125 miles north of Anchorage and near the head of Susitna River, about 40 miles in an air line east of the Alaska Railroad, prospecting for both lodes and placers has taken on new activity within the last two years. There is practically only one camp, however, which produced more than a few hundred dollars worth of placer gold during 1927. This larger camp employed at times as many as five men and was mining bench claims on the north side of Valdez Creek. The work was practically a continuation of that which has been in progress in this district for a number of years, and no noteworthy new discoveries have been reported.

YUKON VALLEY

The Yukon Valley embraces a tremendous extent of territory, and scattered through it from one end to the other are many camps that have produced some placer gold. These camps, for convenience of description, may be grouped into seventeen more or less distinct tracts whose boundaries in some places nearly overlap those of an adjacent tract or in other places lie far remote from their nearest neighbor. The boundaries of these tracts do not necessarily correspond with those of any of the legal subdivisions or recording districts, but have been adopted because of the related interests of the mining camps which are thus brought together. For instance, the mines in the western part of the Yukon Valley have been grouped together and described under the term Marshall district, because Marshall is the principal supply point for a large area, embracing all the mining activities in the Wade Hampton and adjacent recording districts.

The gross result of placer mining in all these districts was a production of gold worth $1,282,000, nearly $250,000 less than the production of the same region in 1926. This decrease is largely attributable to the adverse climatic conditions whereby in most of the districts there was an acute shortage of water during the early part of the season, and the rather early close of the season by cold weather in the fall. In the following table the several districts are arranged in the order of their placer production in 1927. It should be noted, however, that although the total placer production credited to the

Yukon Valley is believed to be correct as stated, there is some uncertainty as to the correctness of the distribution of this total among the districts, because of the large number of small producers, their widely scattered distribution, and the failure of many of them to supply essential data. Checks on the estimates for these districts are especially difficult to obtain, because the same gold may pass through several hands before it finally reaches a bank, assay office, or mint and thus may appear to come from a different district than the one that really produced it, or a man going out from one of the remote districts may take along with him the gold from many mines other than his own, though when an assay receipt is issued it appears that the gold came entirely from one property. In spite of these uncertainties, however, every reasonable precaution has been taken to guard against errors and to keep the estimates in accord with all the available facts.

In the following table two small districts, the Richardson and Chandalar, have been grouped with larger ones, the Fairbanks and Koyukuk, respectively, and two other small districts, the Kantishna and Bonnifield, have been combined, mainly to avoid disclosing individual production from some of the small districts where the bulk of the placer gold has been derived from one or two mines. None of these small districts, however, produced as much as $10,000 in placer gold, and some of them only a few thousand dollars. The combinations that have been made do not affect the relative standing of the larger districts to which the smaller ones have been added.

Value of placer gold produced in Yukon Basin, 1926 and 1927, by districts

District	1927	1926	District	1927	1926
Fairbanks and Richardson	$350,000	$468,000	Fortymile	$37,000	$60,000
Innoko	244,000	242,000	Eagle	19,000	28,000
Tolovana	151,000	148,000	Chisana	15,000	18,000
Iditarod	150,000	196,000	Kantishna and Bonnifield	12,000	14,000
Koyukuk and Chandalar	86,000	73,000	Rampart	10,000	12,000
Hot Springs	75,000	65,000	Marshall	9,000	7,000
Circle	72,000	162,000			
Ruby	52,000	36,000	Total	1,282,000	1,529,000

The region adjacent to Fairbanks has long been and still is the main placer district in the interior of Alaska, though it suffered the greatest decrease in placer production of all the districts in the Yukon Valley. Part of this decrease arises from the fact that in the records for 1926 the Nome Creek dredge was considered by the Geological Survey to be in the Fairbanks district, but as it more correctly belongs in the Tolovana district, it has been accredited to that district for 1927. The greater part of the decrease, however, must be attributed to adverse climatic conditions. In the Fairbanks district

the outstanding items of interest continue to relate to the prospecting being carried on by the Fairbanks Exploration Co. Many of the diverse lines of work that have been in progress by this company in getting ready to mine certain of its extensive holdings on Chatanika River and its tributaries approached completion during the year. The construction of most of the siphons on the big Chatanika ditch, the completion of a great powerhouse for generating electric power from coal for the operation of the dredges, and the thawing of extensive tracts of ground in Goldstream and Chatanika Valleys were among the major accomplishments of the year. The culmination of the first stage of a part of this enterprise may be considered to have been achieved when in December the materials for the first two of the great dredges that the company plans to use in mining its placer ground arrived in Alaska and were expeditiously carried by the Alaska Railroad to the sites at which they are to be assembled and start work. These dredges are equipped with buckets having a capacity of 10 cubic feet each and, in all parts that are subjected to severe strains, are more ruggedly constructed than is usual for dredges of 50 per cent greater capacity. The assembling of these dredges should be completed so that they will be in shape to run for several months during 1928 and greatly swell the production from the Fairbanks district. Although these first large dredges mark the culmination of one stage of the company's enterprise, it must be remembered that the entire project calls for the building of several more dredges and entails work lasting for more than a score of years. There still remains much preparatory work to be done before the entire project is in full swing, and even then it will take many years before all the placer ground that the company now owns has given up the last of its treasure of gold.

The greatest amount of placer gold received in the Fairbanks district in 1927 was produced by the dredges of the Fairbanks Creek Gold Dredging Co., the Tanana Valley Gold Dredge Co. on Fish Creek, and the Chatham Gold Dredging Co. on Chatham Creek. Most of the placer gold that was produced in the Fairbanks district by hydraulic or open-cut methods of mining or drifting came from Ester, Pedro, Twin, Dome, Smallwood, Big Chena, Chatanika, and Little Eldorado Creeks and their tributaries. Several thousand dollars' worth of gold in addition to the production from the dredges was also reported from Fairbanks Creek and Fish Creek. There were a number of smaller camps in the valleys of several other streams, whose production, though individually only a few hundred dollars or at most a few thousand dollars, yet in the aggregate equaled or exceeded the production from some of the creeks already named.

In the Richardson district five camps, comprising a total of eight men, were engaged in mining during the season of 1927. Two of these camps were on Democrat Gulch, a tributary of Banner Creek, two were on Tenderfoot Creek, and one was on Moore Creek, a tributary of Buckeye Creek. The total production from this district amounted to only a few thousand dollars, and the work was done on deposits which have long been known and on which there has been desultory mining for many years. Not far from Richardson and south of Tanana River two groups of prospectors have been prospecting placer ground on Savage Creek and its tributaries, in the Jarvis Creek basin, and on Rainy Creek and its tributaries, in the Big Delta River basin. East of Richardson in the valley of Goodpaster River two small groups of properties are reported to have been developing placer ground on Central Creek and Michigan Creek. This work was mainly of an exploratory type, and no reports of the results have been received by the Geological Survey.

In the Innoko district about 80 men were engaged in placer mining during 1927. The greater part of the gold recovered was mined by the two dredges belonging to the Flume Dredging Co. on Yankee and Little Creeks, and the dredge of the Innoko Dredging Co. on Ganes Creek, which was under lease to Frank Joaquin. All mining was much handicapped by the shortage of water during the early part of the mining season, which was followed by an early freeze-up. Next to dredging, the most productive placer mining was on Ophir Creek, where four separate companies were at work. Of these Collins & Hard and Meier & Berg were the most successful. On Little Creek the largest producer was N. J. Vibe, who mined with a slip-line scraper. On Spruce Creek were two active placer camps, and on Victor Gulch there was one. Little mining was in progress in the Tolstoi district, which lies to the north of the Innoko district. On the whole, there were no notable new mining developments during the year. The event that seems to have been regarded by the miners as of most significance to them was the partial completion of a good road between Ophir and Takotna on the Kuskokwim and a road up Little Creek. Both of these roads should assist in reducing the cost of transporting supplies and thus encourage new developments.

The shortage of water in the Tolovana district, which reduced the amount of gold that was won by open-cut or drifting methods of mining, was largely offset by the production by the Nome Creek dredge, which was built in 1926 and ran only a short period in that year but in 1927 mined for more than 150 days. This dredge, because of its proximity to Fairbanks, was counted among the Fairbanks dredges in the 1926 report, but as it really lies in the Tolovana drainage basin it has been counted in that district this year. Exclusive of the gold mined by the dredge, considerably more than half of the

placer output from the Tolovana district was recovered by drift mining, so that the camp is busy the year around. Most of the larger producing mines are on Livengood Creek, but a considerable amount came from some of its tributaries and a little from small northern tributaries to Tolovana River. Even under ordinary conditions the supply of water in this district is small, and with a dry season such as 1927 the miners have been hard put to it to get their dumps sluiced, and some of them report that they have only partly succeeded, so that some of the gravel that was mined during the winter of 1926–27 has not yet yielded up its gold content. Although this gold-bearing material was mined in 1927, only the amount of gold that was actually recovered from it is counted in the production recorded for that year.

The record for placer production in the Iditarod district shows that in 1927 the greater part of the gold was recovered by means of two dredges on Otter Creek in the vicinity of Flat, one operated by the J. E. Riley Investment Co. and the other by the North American Dredging Co. Records of the production from the individual claims in the district are exceptionally incomplete, so that reliable details concerning the different mines are not available. The markedly smaller production in 1927 than in 1926 is to be attributed to the dry season and the early freeze-up.

The Koyukuk district really consists of three rather distinct and widely separated placer areas namely, Hughes and vicinity, near the south-central part of the Koyukuk Valley; Hogatza and vicinity, a short distance to the north; and the northern part of the Koyukuk Valley from Bettles to the head. Mining in the two more southern placer camps was practically negligible, so that the record of their small output has been combined with that of the more productive northern tract. To this already extensive tract has been added the Chandalar region, as it is more or less closely tied geographically and geologically to the Koyukuk. The amount of gold produced in the Chandalar district is relatively but a small part of that produced from the tributaries of the upper Koyukuk, so that its inclusion has little effect on the total. In the northern part of the Koyukuk Basin there were between 15 and 20 camps that are reported to have recovered some gold. At some of these camps mining was in progress during both the winter and the summer, but at others the work was carried on only in one season or the other. Mining was most active on Nolan Creek, including Smith and Archibald Creeks. In this valley five separate parties of miners were employed in the winter and four during the summer. On Hammond River, including with it Vermont and Swift Creeks, three different camps were engaged in mining during the winter and two during the summer. The Detroit Mining Co., which for the last two years has been perfecting

plans for mining the deep ground at the mouth of the Hammond River, was further delayed this season by the low water, which prevented completion of the task of freighting supplies from Bettles to the claims. As a result of this delay no progress was made on opening up the company's ground at that place or in the construction of the projected ditch from the North Fork of Koyukuk River to the benches of Nolan Creek. Other creeks in the northern part of the Koyukuk Valley where some mining was in progress were Wake-up, Porcupine, Lake Creek (the one tributary to Bettles River), and Myrtle, and smaller prospecting parties reported having recovered a few hundred dollars in gold from placers on several other creeks. There are few mining districts in Alaska that are as inaccessible by regular means of transportation as the Koyukuk. It is not surprising, therefore, that many of the operators are finding that the hire of commercial airplanes to take them in to the camps in the spring and bring them out in the fall is a real economy.

The most noteworthy new development of the year in the Hot Springs district was the completion of the dredge of the American Creek Mining Co. and the beginning of mining with it. As it was not completed until late in August and as the season closed early in October, it was running only a short time, but all reports indicate that the tests under working conditions were satisfactory, and the owners look forward with assurance to a successful season in 1928. The greatest production from the Hot Springs district was reported from drift mines of the Mohawk Association on Woodchopper Creek. In addition to gold, considerable placer tin was recovered. There were 12 to 15 other mining camps scattered through the region. A few of these recovered several thousand dollars in gold, but in general the camps consisted of only one or two individuals each and their production of gold ranged in value from a few hundred to a few thousand dollars. Shortage of water for mining seriously curtailed the production of many of the small camps.

Next to the Fairbanks district the greatest decrease in placer-gold production was in the Circle district. The largest single cause of this decrease was the idleness of the dredge of the C. J. Berry Dredging Co., which has yielded so much gold in the past. The reason given was that the ground ahead of the dredge is too shallow for it to handle economically. All the mines using open-cut methods report an unusually dry season and consequent shortage of water for mining. The largest operating mines were those of the Berry Holding Co., on Eagle Creek; the hydraulic plant of the C. J. Berry Dredging Co., on Mastodon Creek; and the mine of John A. Anderson, on Mastodon Creek. Although there were nearly a score of

smaller placer camps, none of them produced more than a few thousand dollars in gold, and some of them not more than a few hundred dollars.

In the Ruby district the greatest amount of gold was mined on Poorman Creek, where three separate camps were drift mining during the winter and four camps were engaged in either drift or open-cut mining during the summer. Other creeks on which some productive mining was done during both the winter and the summer were Duncan, Greenstone, and Solomon. Winter mining only was done on Timber and Monument Creeks and Cox Pup, a tributary to Big Creek, and open-cut mining during the summer on Flat Creek. The occurrence of placer tin in many of the deposits of the Ruby district has long been known, and during the summer of 1927 a number of miners reported finding considerable placer tin in their concentrates. So much interest was thereby aroused that a mining engineer was engaged by private interests to look over part of the district with a view to determining its resources in both placer and lode tin and the possibility of working the deposits for this metal.

Lack of water for mining seriously handicapped all placer operations in the Fortymile district, but this shortage was especially keenly felt at the mine of the Walker Fork Corporation, which uses a drag-line scraper, and at the large hydraulic camp on Jack Wade Creek. Mining in the Fortymile district is conducted at many of the mines both winter and summer, but the winter production is not more than a fifth of the summer production. About 50 men are engaged in mining in the district, and most of the camps consist of only one or two miners. Thus 26 camps were reported to be producing in 1927, and one of these employed 18 men, so that the average of all the others was less than two men. In addition to the gold from the mines on Walker Fork and Jack Wade Creek, already mentioned, some was produced from camps on Chicken, Ingle, Canyon, and Franklin Creeks and Fortymile River and two other small camps on Jack Wade Creek.

Like the other camps in the eastern part of the Yukon Valley in Alaska those in the Eagle district were so short of water in the early part of the summer that mining was largely at a standstill for more than a month. Seventymile River and its tributaries saw most of the mining activity, and its mines yielded about two-thirds of the total placer-gold production for the district. On Fourth of July Creek three placer camps that together employed about 10 men did some work. One small camp of two men reported some production from American Creek. Elsewhere in the district a little prospecting and development work was done during 1927, but the yield of gold from these placers amounted at most to only a few thousand dollars.

No new discoveries of note were reported from any part of the district.

Little definite information has been received by the Geological Survey as to mining activities in the Chisana district (locally called Shushana) in 1927. From less authoritative sources it was estimated that the production from that district did not exceed $15,000 and possibly was several thousand dollars less. There were only a few small camps in the district, and they were all badly hampered by the extremely dry season, which seriously curtailed the amount of water available for mining.

Production of placer gold from the Rampart district in 1927 was about the same as in 1926. The principal mine was on Little Minook Creek, and the rest of the gold came from a number of small camps scattered through the district, none of which produced more than a few thousand dollars in gold and most of them only a few hundred.

Willow Creek was the source of most of the placer gold that was mined in the Marshall district in 1927. In the northern part of the valley of this stream are several small camps of one or more prospectors each, and farther south and east, a short distance below the point where the creek leaves the hills, is a larger camp that is mining with a special form of loose-line scraper. The ground that is being developed with the scraper is especially difficult to mine, as it contains many boulders of greenstone that are too large to be handled by the scraper and must be disposed of by hand labor. Much of the early part of the season was spent in construction work, so that this plant was in operation only a few months. Prospecting by two men, which yielded a small amount of gold, is reported to have been continued in the central part of Stuyahok Valley, about 50 miles northeast of Marshall, and one prospector did a little mining on Buster Creek.

Very little mining work was in progress in the Bonnifield and Kantishna districts in 1927, and almost no details are available regarding any of the individual projects. Slightly more gold appears to have been mined in the Kantishna than in the Bonnifield district, but it is evident from the smallness of the total production that the output from either district was, at most, worth only a few thousand dollars. This amount of gold was mined by a number of prospectors, few of whom recovered gold worth as much as a thousand dollars. Water for mining was extremely scanty at most of the claims throughout the first part of the summer, and some of the small creeks were absolutely dry through July and early August—a condition that has not happened before in the last 20 years.

KUSKOKWIM REGION

There are three principal districts included in the Kuskokwim region where gold placers were mined in 1927. These, for convenience, are here called the Mount McKinley district, the Georgetown-Tuluksak-Aniak district, and the Goodnews Bay district. The Mount McKinley district embraces all of the eastern part of the Kuskokwim Valley, but mining work in it was more or less localized around McGrath, Takotna, and Medfra. The Georgetown-Tuluksak-Aniak district embraces the west-central part of the Kuskokwim Valley: Georgetown is a small settlement on Kuskokwim River about 45 miles south of Iditarod, and Tuluksak and Aniak Rivers enter the Kuskokwim from the south about 30 and 80 miles, respectively, east of Bethel. Goodnews Bay is on the east side of Kuskokwim Bay about 40 miles north of Cape Newenham and about 125 miles in an air line south of Bethel.

The largest individual producer in these districts was the dredge of the New York-Alaska Gold Dredging Co. on Bear Creek, in the Tuluksak district. Details regarding work at this place are not available, but as the production was approximately the same as in 1926, it seems evident that no new noteworthy developments took place during the year, but that work was successfully carried on at about the same rate as during 1926. No other dredges were operated in the Kuskokwim region in 1927. The dredge of the Kuskokwim Dredging Co., which for several years has been mining on Candle Creek and in the vicinity of McGrath, was idle throughout the season, and no suggestion has been heard of its early resumption of mining.

In the Mount McKinley region the greatest amount of gold was produced by miners on Candle Creek and its tributaries, but several camps on streams adjacent to Medfra, farther up the Kuskokwim, report a larger production than heretofore. Among the streams on which gold placers were mined may be mentioned Hidden, Eagle, Ruby, and Birch Creeks. Some rumors of placer prospects in remote parts of the district have been heard, and several inquiries have been received regarding the possibility of finding placers in the southern parts of the Kuskokwim Basin that lie adjacent to the headwaters of streams draining south and westward into Bristol Bay. So far no reports of the production of any appreciable quantities of gold from those areas have been confirmed, though much of the unexplored area to the south of the Kuskokwim deserves intelligent prospecting.

In the Georgetown district practically the only mining that furnished any appreciable amount of placer gold in 1927 was on Donlin

Creek. In the Aniak-Tuluksak district, in addition to the dredge, a fairly large production was reported from Marvel Creek, tributary to Solomon River, which in turn flows into Aniak, and from Canyon Creek, to Kwethluk River on the west slopes of the Kuskokwim Mountains east of Bethel. Small amounts of placer gold were reported to have been recovered in the course of prospecting in the vicinity of Marvel Dome and at a few points in the Bear Creek Valley east of the dredge.

In the Goodnews Bay region the placer-gold production came from five camps, one each on Watermuse, Kowkow, Olympic, Bear, and Butte Creeks. In addition to these small producing camps, one man spent practically all summer in prospecting with a hand drill on Arolik River and its tributaries. Much of the tract that was drilled is said to have had about 20 feet of gravel overlying bedrock and to have yielded encouraging prospects of gold. The Goodnews Bay district is practically the only one in Alaska in which the miners report that there was an "abundance" of water in 1927. A short distance south of Goodnews Bay there has been considerable interest shown in prospecting for platinum. Further statements regarding this work are given in a later section of this report which treats of platinum. The fact of significance so far as the production of placer gold is concerned, is that almost no gold is associated with the platinum, only a few colors of gold being found with more than 3 ounces of platinum.

SEWARD PENINSULA

The production of placer gold in Seward Peninsula in 1927 was about $500,000 less than in 1926. This bald statement at first is decidedly disquieting to anyone concerned with continuity of placer production in this region. When, however, the decline is analyzed more closely, it is seen to be a regrettable incident rather than an ominous sign of the waning of the industry. In the first place, it should be remembered that in comparing the production of 1927 with that of 1926 we are using a very high standard, because in 1926 the placer-gold production from Seward Peninsula was $784,000 greater than in 1925. Furthermore, the opening of the season in 1927 was exceptionally late. Thus it was almost the last of June before the first boats reached Nome from the States. On these boats were many of the miners and mine officials who had spent the winter in the States and whose return was essential to putting some of the properties into full operation. In many places the seasonal frost remained much longer than usual and therefore delayed the beginning of some of the projects or reduced the amount of work that could be accomplished. At several of the small dredges, where the seasonal

frost lasted even into August, the buckets would be hoisted up only partly filled or the dredge would have to leave the more solidly frozen material and keep trying to find thawed spots, thus consuming time and reducing the amount of yardage handled. Coupled with the late season was an unusual shortage of water for mining, and this continued into August. This still further hampered production, and many of the smaller camps simply discontinued mining, so that when more plentiful rains came, later in the season, they had closed up their plants and were not in condition to take advantage of the water during the short time remaining. The dearth of water was not only felt acutely by the smaller mines but was also extremely hard on the largest mines. For instance, the Hammon Consolidated Gold Fields was not able to supply sufficient water to maintain its three dredges and the attendant thawing and so was forced to keep one dredge idle for many weeks. This item alone would account for a very appreciable part of the total decrease.

More than 83 per cent of the total placer production of Seward Peninsula is mined by 17 dredges, 1 or more of which were active in practically every one of the larger districts of the peninsula. Additional data regarding dredge mining in Seward Peninsula, as well as in other parts of Alaska, are given in a later section of this report. In the relative order of their output of placer gold in 1927 the districts of Seward Peninsula stood as follows: Nome, Fairhaven, including the Inmachuk, Solomon, Council, Kougarok, Koyuk, Port Clarence, Casadepaga, and Bluff. So much of the placer gold from certain of the districts came from only one or two producers that it has not been deemed advisable to publish the amount of placer gold produced by the individual districts. The total placer-gold production from mines throughout the peninsula was worth $1,365,000. Of this amount $1,136,000 was mined by dredges and $229,000 was recovered by all other forms of placer mining.

The outstanding mining enterprise in the Nome district continues to be that of the Hammon Consolidated Gold Fields, with its three dredges between Little and Wonder Creeks, its scores of claims, and its extensive ditch lines and other necessary equipment. Not only through its direct development of the resources of the region, however, is this company making itself a force in the district, but also through the studies of its engineers to solve the problems of mining under northern conditions. Experiments by the company on the application of cold-water thawing to preparing ground in advance of dredging are yielding data that will be of importance to all engineers and miners engaged in placer mining, not only in Alaska but throughout the Northern Hemisphere where frozen ground must be mined. In fact, the practical demonstration by this company of the value of reducing mining to a sound engineering

basis, which is being taught unconsciously by the way its affairs are handled, is one of the lessons that is of inestimable value for the whole mining world to learn. The two other dredges in the Nome district made a very favorable showing, and were active throughout the season on Dry and Anvil Creeks. Ordinary open-cut mining or underground drifting on any considerable scale were carried on at only a few places in the more remote parts of the field. The only mining that was in progress was by camps of one or two prospectors, whose production of gold was often less than would have been won by working for wages.

Mining is carried on in the Fairhaven district at three principal centers—Candle Creek, Inmachuk River, and Bear Creek. On Candle Creek and its tributaries, Patterson and Jump Creeks, the greatest amount of gold was mined by the dredges of the Golden Center Mines (Inc.). Although this company operates two dredges only one was mining for more than a few days in 1927, and even that dredge was closed down for the season by the middle of September. Three open-cut placer mines employing a total of 8 to 10 men were at work on Patterson Creek, and camps of 2 men each were on Jump Creek and in the main valley of Candle Creek. In the Inmachuk Valley the principal producer was a hydraulic mine on the main river near the mouth of Arizona Creek. At this mine the average number of men employed during the season was 22. A little placer mining was also done at other points in the valley of Inmachuk River and by one prospector on Cunningham Gulch, a tributary of Hannum Creek, which in turn, is a tributary of Inmachuk River. On Bear Creek, which is a tributary of Buckland River and lies some 30 miles in an air line southeast of the town of Candle, three camps of placer miners employing a total of about 12 men were active during the season. In addition to these three principal centers of mining activity, small camps reporting production of placer gold ranging in value from a few hundred to a few thousand dollars each were mining on Alder, Quartz, Glacier, and Goldrun Creeks, and Kugruk and Koopuk Rivers. The Koopuk is a tributary to the Buckland, east of Candle.

Almost all the placer gold that was mined in the Solomon region in 1927 came from the three dredges on the main river operated by the Goldsmith Dredging Co. near the mouth of Coal Creek and the Eskimo Dredging Co. (name later changed to Lomen Reindeer & Trading Corporation) and Solomon River Dredging Co. a short distance south of the mouth of Jerome Creek, and from the one dredge operated by the Shovel Creek Gold Dredging Co. on Shovel Creek, a tributary of Solomon River from the west. To these might be added the dredge of the Casadepaga Mining Co. that mined in the main valley of Casadepaga River near the mouth of Canyon

Creek and was practically the only producer of any appreciable amount of gold in the entire Casadepaga region in 1927. In the Bluff region, which lies east of Solomon, and, for convenience of description, is here treated as part of the Solomon district, only a few thousand dollars in placer gold was produced in 1927. There were less than six small camps in that entire region, and the largest was a scraping plant which has been built near the mouth of Daniels Creek to mine the beach deposits along the shore. This plant was not put into commission until late in the season, owing to delay in the arrival of the operators.

By far the greater part of the placer gold produced in the Council district came from four dredges. All of them were much handicapped by shortage of water, and one encountered an unsually large amount of frozen ground, which reduced its production. Everywhere in the Council district open-cut mining was retarded by the shortage of water, and many of the miners who would have been busy became discouraged waiting and stopped all operations early in the season.

No dredging was in progress in the Kougarok district in 1927, and the old dredge that had so long been active had sunk south of the mouth of Henry Creek and been allowed to go more or less to ruin. On the whole such work as was in progress on the placer deposits in this district was mainly of a prospecting type, and there were few camps that produced more than a thousand dollars each. In the southern part of the district two small camps of one or two men each had been established on the benches near Coffee Creek and three small mines were running on Dahl Creek above the roadhouse. No mining was in progress in the main Kougarok Valley, but a small amount of mining or prospecting was being done on some of the side streams, by two small camps on Harris Creek about a mile or so above the mouth, one at the mouth of North Fork, three on Henry Creek and its tributary Merritt Gulch, one near the mouth of Homestake Creek, three men on Macklin Creek about a mile above its mouth, and one prospector near the head of Kougarok River. To the north of Kougarok Valley the most active mining in the district was in progress on the claims of the Dick Creek Mining Co. on Dick Creek, a tributary of a stream flowing into Serpentine River. Here seven men were engaged most of the summer in hydraulicking, though their supply of water was so scanty that several hours was required to accumulate enough to allow piping for even half an hour. Work under these conditions would have been practically impossible had it not been for the use of an ingenious stacker, driven by a gasoline engine, that piled the waste from the sluice on both sides of the cut and thus obviated the necessity of keeping the discharge drain open by constant hand labor. Northeast of the head

of Kougarok River a camp of three men was reported to have been fairly successful in mining placer deposits in the upper part of the valley of Humboldt Creek, which is a tributary of Goodhope River. West of the Kougarok in the valley of American River three camps were engaged in mining and development work.

In the Koyuk district the production of placer gold was about equally divided between that mined by the dredge and that produced by other methods. Most of the gold produced by other methods than dredging came from open-cut mines that were worked only during the summer. One drift mine, however, was active during the winter and reported a fair return to the miners. Dime and Sweepstake Creeks are the only streams in the district from which any production was reported, and on them only five camps, in addition to the dredge and the drift mines, yielded gold worth as much as a thousands dollars each.

In the Port Clarence district a little placer gold was mined on Bluestone River and some of its tributaries, especially Windy and Gold Run Creeks. On Coyote and Dese Creeks, which enter Grantley Harbor from the south 2 and 6 miles east of Teller, respectively, and on Canyon Creek, which empties into Imuruk Basin about 18 miles southeast of Teller, productive mining was done by a single camp on each stream, though the work on Canyon Creek was essentially only prospecting. North of Grantley a camp of three men mined on Allene Creek, which is a tributary of Agiapuk River. There has recently been a move on foot by a company that claims to have acquired more than 5,000 acres of placer ground lying along Bluestone River and certain of its tributaries to build a dredge and construct a hydraulic plant to mine its property. No construction work on this project has yet been started.

Lying southeast of Seward Peninsula but more or less closely related to it is the Bonanza district, so named from the small stream in it which has long been known to carry placer gold. Prospecting has been carried on at a number of places in this general area and for the last few years has been especially active on deposits lying in the narrow strip of country east of Norton Bay and west of the low hills that bound the coastal plain at that place. The results of the earlier prospecting have been so encouraging that during the summer of 1927 a mining engineer made an examination of the properties in that field with a view to extensive developments if the showings were favorable. No announcement of the findings has yet been made public.

NORTHWESTERN ALASKA

The Kobuk is the only valley in northwestern Alaska that is reported to have been the site of any placer mining in 1927. There

are two principal areas in the valley of the Kobuk and its tributaries in which placer mining is being done. The western area is near Kiana, especially in the valley of Squirrel River and its tributary Klery Creek. The eastern area is in the vicinity of Shungnak, which is about midway between the mouth and the head of Kobuk River. Kiana is about 60 miles in an air line east of the mouth of the Kobuk, and Shungnak is about 90 miles in an air line east of Kiana. Both of these tracts are so remote and so poorly equipped with any means of transportation or communication that their development is much retarded by high costs, unavoidable delays, and short working seasons.

In the area near Kiana prospecting and development work were most active on Klery Creek and in near-by parts of Squirrel River. Four individual miners spent part of the winter looking over and prospecting different tracts in the region, and during the summer some productive work was done on five separate claims. Although the total output was relatively small, the revival of interest in mining in this region is encouraging.

In the vicinity of Shungnak the placer deposits occur in the lowland of the Kobuk close to the places where the small side streams debouch from the hills to the north or along the courses of the streams that traverse the hills. Small veins of quartz carrying in places free gold clearly indicate a source for much of the placer gold. During 1927 there were four camps in this district, three on Dahl Creek consisting of only one miner each and one on California Creek that employed six men. At the large mine a hydraulic plant was used, but the smaller ones were worked simply by pick and shovel. No new developments of other than local interest are reported from these camps.

Information of considerable economic importance, though, unfortunately, discouraging to the searcher for placer gold, was obtained by a prospector, J. C. Cross, who spent much of the summer examining parts of Salmon River, a stream that lies about midway between Kiana and Shungnak. As practically no information has been available heretofore regarding the northern part of this stream, the following rather full abstract of Mr. Cross's statements is given. He writes that the conglomerate belt shown at the mouth of Salmon River on the Geological Survey maps continues for about 20 miles upstream and then gives place to schist, which forms very sharp crested hills and occupies a belt of country about 50 miles wide. No limestone was observed in place, and only a little limestone and greenstone were found as pebbles in the creek deposits. Near the head of the stream the hills give way to more rolling country, which extends all the way to the Noatak divide. Although Mr. Cross made repeated tests of the gravel of the side streams within the tract where schist is

the country rock, he was unable to find colors of gold; and even in the deposits of the main Salmon River he found only a few very fine colors, even though the tests were made at places where exposed reefs of bedrock cutting across the river appeared to make especially favorable natural riffles that would produce concentration of gold near them.

Another item that may have some bearing on the development of the mineral resources of this region is the report that several prospectors are proposing to unite and by the use of an airplane to undertake the prospecting of some of the more inaccessible parts of the headwater regions of Noatak and Kobuk Rivers. Although the project will necessitate a considerable outlay of funds, it seems entirely practicable; in fact, in the long run, if the men's time is counted as worth even the lowest customary daily wage, it would probably cost less than any other means of putting men and equipment into remote parts of the region.

DREDGING

Over 58 per cent of the placer gold produced in Alaska in 1927 was mined by dredges. The total gold recovered by dredges was $1,740,000, of which about two-thirds came from 17 dredges on Seward Peninsula and the rest from 11 dredges in other parts of Alaska. This total was about $550,000 less than the dredge output in 1926. The accompanying table gives the records back to 1903, the earliest year in which records of dredge production are available.

Gold produced by dredge mining in Alaska, 1903–1927

Year	Number of dredges operated	Value of gold output	Gravel handled (cubic yards)	Value of gold recovered per cubic yard
1903–1915		$12,431,000		
1916	34	2,679,000	3,900,000	$0.69
1917	36	2,500,000	3,700,000	.68
1918	28	1,425,000	2,490,000	.57
1919	28	1,360,000	1,760,000	.77
1920	22	1,129,932	1,633,861	.69
1921	24	1,582,520	2,799,519	.57
1922	23	1,767,753	3,186,343	.55
1923	25	1,848,596	4,645,053	.40
1924	27	1,563,361	4,342,667	.36
1925	27	1,572,312	3,144,624	.50
1926	32	2,291,000	5,730,000	.40
1927	28	1,740,000	6,084,000	.29
		33,891,000		

The total amount of gold produced by dredges since 1903 is about 16 per cent of the total amount of gold from all other kinds of placer mining since 1880, but with the constant increase in the proportion of gold mined by dredges during the last few years the difference between the two totals is constantly becoming smaller.

In the foregoing table the yardage mined and the value of gold recovered per cubic yard as stated are open to some question, because several of the dredge operators have not furnished specific information on that subject for their individual properties, and the figures for these properties have therefore had to be estimated. In making these estimates the following procedure was adopted to determine the unknown factors: Operators of dredges that produced approximately $1,216,652 in gold, or a little less than 70 per cent of the total mined by dredges, report that that amount came from 4,249,606 cubic yards of gravel. The average yield thus shown is about 28.6 cents in gold to the cubic yard. Applying this average to the unknown quantities indicates that the total amount of material mined by dredges, if worth 28.6 cents a yard, was 6,084,000 cubic yards, and this figure has been adopted in the table. This procedure is open to criticism because the companies which report fully the amount of ground mined were the larger ones, and doubtless they worked lower-grade ground than the smaller companies. As a result the average value adopted may be too low and consequently give too large an amount of gravel mined. This method, however, has been followed for the last four years, so that the quantities and values given for 1927 are comparable with those reported before and are therefore for practical purposes essentially correct.

The length of time that different dredges were operated varied widely. The longest season reported was 176 days for one of the dredges of the Hammon Consolidated Gold Fields in the Nome district. The shortest season reported was only a few days for one of the dredges of the Golden Center mines in the Fairhaven district. The length of the working season was not determined wholly by climate or other similar conditions beyond human control, however, but in part by breakage or purely personal reasons. Therefore, the dates of earliest and latest closing for any or all the dredges may be more significant than the record of any single dredge. In 1927, the earliest date for commencing dredging was June 1, by a dredge of the Hammon Consolidated Gold Fields, and the latest date for closing dredge work was November 24, by the dredge of the New York Alaska Gold Dredging Co. on Bear Creek, in the Kuskokwim region. It should be noted, however, that 1927 was an unusually late season in opening and that it closed unusually early in the fall, so that the operating records noted above were made under relatively adverse conditions. That the records do not represent an uncommon length of working season is shown by the fact that in 1926 a dredge in the Yentna district began work on May 5 and a dredge of the Hammon Consolidated Gold Fields did not shut down until December 4. In other words, a dredging season of 160 to 175 days may

be counted on with a high degree of assurance in any of the larger placer camps in Alaska, for well-equipped dredges of moderate size when skillfully handled. However, the record of the 14 dredges that reported in detail the length of time worked in 1927 shows that they averaged only 112 days each. For practically all these dredges the difference is believed to be due to some cause that prevented taking full advantage of the entire available season or to the small size of the dredge or the shallowness of the placer that was being mined.

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

Yukon Basin:
- Fairbanks district—
  - Chatham Gold Dredging Co—Chatham Creek.
  - Fairbanks Gold Dredging Co—Fairbanks Creek.
  - Tanana Valley Gold Dredging Co. (Ltd.)—Fish Creek.
- Hot Springs district—
  - American Creek Dredging Co—American Creek.
- Iditarod district—
  - J. E. Riley Investment Co—Otter Creek.
  - North American Dredge Co—Otter Creek.
- Innoko district—
  - Flume Dredge Co. (2)—Yankee Creek, Little Creek.
  - Innoko Dredge Co—Ganes Creek.
- Tolovana district—
  - Nome Creek Dredging Co—Nome Creek

Kuskokwim region:
- Tuluksak-Aniak district—
  - New York Alaska Gold Dredging Co—Bear Creek.

Seward Peninsula:
- Casadepaga district—
  - Casadepaga Mining Co—Casadepaga River.
- Council district—
  - Crooked Creek Dredging Co—Albion Creek.
  - Melsing Creek Dredge—Basin Creek.
  - Northern Light Mining Co—Ophir Creek.
  - Ophir Gold Dredging Co—Ophir Creek.
- Fairhaven district—
  - Golden Centre Mines (Inc.) (2)—Candle Creek.
- Koyuk district—
  - Dime Creek Dredging Co—Dime Creek.
- Nome district—
  - Bangor Dredging Co—Anvil Creek.
  - Dry Creek Dredging Co—Dry Creek.
  - Hammon Consolidated Gold Fields (3)—Old beach line.
- Solomon district—
  - Goldsmith Dredging Co—Solomon River.
  - Lomen Reindeer & Trading Corporation—Solomon River.
  - Shovel Creek Dredge Co—Shovel Creek.
  - Solomon Valley Dredge—Solomon River.

During the year several dredges that had formerly been active were idle, and only one new dredge was built and commenced operations. The dredges that had been active in 1926 but were not operated during 1927 were those of the Cache Creek Dredging Co. on Cache Creek, in the Yentna district of the Susitna Valley; the C. J. Berry Dredging Co. on Mastodon Creek, in the Circle district; the Guinan & Ames Dredging Corporation on Ganes Creek, in the Innoko district; the Kuskokwim Dredging Co. on Candle Creek, in the Mount McKinley district of the Kuskokwim Valley; and the Behring Dredging Corporation on Kougarok River, in the Kougarok district of Seward Peninsula. The new dredge that was completed in 1927 and commenced mining was that of the American Creek Dredging Co. on American Creek, in the Hot Springs district of the Yukon region.

The success of some of the good dredges already built has induced many individuals and companies to reexamine formerly known extensive deposits that were too low in tenor to be worked by any of the methods that require less capital. As a result rumors are heard regarding dredging projects to be undertaken on placer ground from one end of interior Alaska to the other. Unquestionably all these projects deserve most careful consideration, and some of them will doubtless be successfully carried through, but there is such a tendency to regard the dredge as the magic method by which even worthless deposits may be mined at a profit that a word of caution may not be amiss to those who are considering investment in some of the projects that are being talked about. Fortunately, however, the amount of money needed to finance the building of a dredge is so great that the cost of a report by a competent engineer is a relatively insignificant amount, and such a report should be obtained before any further step is taken. Even the most eminent engineer is not able to reach a sound decision from ordinary surface inspection, and therefore adequate tests by drilling or test pits must be made, so that his judgment may be firmly based on facts. All of this costs money, but unless it is done the enterprise is a pure gamble and not a mining enterprise that warrants confidence. There is no offhand or short-cut method of ascertaining the value of a mining enterprise, so that the cost of collecting the significant facts is as much a justifiable and unavoidable item of expense in the preliminary stage as the cost of power when the enterprise is in successful operation. Mining is a business and not a game of chance, and although it is subject to uncertainties, like every other business, these uncertainties can be approximated within definite limits, so that their effect on the success or failure of the enterprise may be relatively closely predicted. A full discussion of many of the problems of dredging and

some of the methods by which they have been solved or handled is given in a recent publication of the Bureau of Mines. In this report [6] among other things is given a description of the mechanical features of all the Alaskan dredges that had been built prior to 1925, as well as valuable information on the cost and methods of all kinds of placer mining.

The largest and practically the only new dredging enterprise on which marked progress was made is that of the Fairbanks Exploration Co., which has already been mentioned. The preliminary work of part of the project has been completed, so that by the end of the year material for two of the dredges was beginning to be delivered on the ground, and the dredges should be ready to start in productive work by the middle of the season of 1928. None of the other projects has yet reached a stage where the certainty of its being carried out can be predicted with any degree of assurance, and further discussion of them may be omitted here, though a few of them have been mentioned in the notes given in earlier sections of this report which treat of the different districts.

COPPER

Deposits containing some copper minerals are found throughout most of the length and breadth of Alaska. Copper, however, is a relatively cheap metal, being worth only about one eighteen-hundredth of an equal amount of gold. A ton of pure copper at the price that prevailed in 1927 would be worth only about $260, or about as much as a pound of gold. Furthermore, only a negligible amount of the copper from Alaska occurs as metallic copper but instead is in chemical combination with a number of other elements, and these valuable minerals are associated with more or less worthless material. To separate the copper minerals from the worthless ones and then to extract the copper in a metallic state requires extensive milling and metallurgical treatment and more or less expensive transportation. It is for these reasons that copper deposits, unless of exceptionally high grade or especially advantageously situated with regard to transportation, can not be mined at a profit in the more remote parts of Alaska under present conditions. Even the search for copper deposits in these remote areas is hardly justified under existing conditions, and it will probably be many years before conditions change enough to permit profitable exploitation of any of the small deposits now known in the remote parts of the Territory away from developed lines of transportation.

[6] Wimmler, N. L., Placer Mining Methods and Costs in Alaska: Bur. Mines. Bull. 259, 236 pp., 1927. Price 55 cents from Superintendent of Documents, Government Printing Office, Washington, D. C.

At present practically all of the Alaska copper comes from two mines in the Copper River region that are operated practically as a single unit, though owned by different companies, and one mine on Latouche Island that is owned and operated by the same company that operates the two mines in the Copper River region. In addition, a very small amount of copper is reported to have been recovered by smelters in the States from the concentrates sent in by miners in the Ketchikan, Hyder, Juneau, and Willow Creek districts. One of the smelters also reports the recovery of several tons of copper from concentrates sent in by one of the mines in the Ketchikan district that is known to have been idle during 1927. Undoubtedly, therefore, the ore must have been mined in 1926 but did not reach the smelter in that year, and the copper it contained was not recovered until 1927. This copper has therefore not been included in the amount of copper produced from the Alaska mines in 1927 as given in this report.

A bare statement of the quantity of copper produced from any region is practically meaningless unless the basis to which it refers is stated, because in all the processes that the ore undergoes, from the time it is broken out of the vein in the mine until all of the metallic copper that can be recovered from it is finally placed on sale, there are inevitable losses, so that at no two stages is the amount of copper the same. Even though the losses may be small compared with the quantity saved, the Alaska copper production amounts to more than 50,000,000 pounds, and a difference of only 1 per cent is equal to more than 500,000 pounds. It is therefore obviously important to state just what stage in the process of converting ore into metal is represented by the figures given. As an illustration of this condition the following facts, taken from the report of the Mother Lode Coalition Mines Co.,[7] are significant. This company in 1927 mined 104,444 tons of ore that assayed on the average 10.57 per cent of copper, which would be equivalent to 22,079,462 pounds of copper. Shipments to the smelter from this mine, however, contained only 20,588,160 pounds of copper. Evidently over 1,490,000 pounds of copper was lost during the processes of handling and milling by which the valuable copper minerals were separated from part of the worthless material with which they were associated. This at first sight seems an enormous loss, but when it is realized that this represents a loss of only about 6¾ per cent it is evident that the mill recovery is really very high and represents exceptionally good practice.

[7] Mother Lode Coalition Mines Co. Ninth Ann. Rept., for 1927, 7 pp., 1928.

The total copper-bearing ore mined in Alaska in 1927 is estimated to have been 645,000 tons, which contained 58,670,000 pounds of copper. When this ore had been concentrated and was ready for shipment to the smelter it had been reduced to approximately 94,500 tons, having a copper content of 55,343,000 pounds, which represents a recovery of over 94 per cent of the original copper content. For the purposes of the present report this quantity of copper is taken as being the output of the Alaska mines during the year.

In attempting to set a value for this copper many different methods may be employed, and the results obtained from them will vary widely. Obviously, the copper in the ore as it comes from the mines is not of itself worth the current market price of the metal, inasmuch as all of it can not be recovered, and even that part which is recovered will require the expenditure of considerable money before it is available as metal. Although the same conditions in a measure are true of the ore and concentrates that are shipped to the smelters, the losses that they undergo are generally much less. Consequently, the value of the copper is computed on the assumption that the copper in the ore or concentrates that are shipped is worth the average market price at which metallic copper sold during the year. The average price of all copper sold in 1927 in the United States, according to computations of the Bureau of Mines, was 13.1 cents a pound. The total value of the copper in the ore and concentrates shipped from Alaska during the year is therefore regarded as $7,250,000. It is recognized that this method of calculating the value does not take any account of the fact that an efficient or fortunate selling agent would probably be able to take advantage of fluctuations in the price of copper and thus dispose of the copper from his mine, as far as possible, during periods of high prices. That both the Kennecott Copper Corporation and the Mother Lode Coalition Mines Co. maintain very efficient selling organizations is shown by the statements in their annual reports that they disposed of their copper at average prices of 13.289 and 13.248 cents, respectively, or more than 0.15 cent higher than the average price of the year. If the actual prices reported by the companies had been used, the value of the total production would have been increased nearly $100,000. The figures relating to value can not therefore be regarded as representing the amounts received by the companies that produced the copper nor the amounts received for specific lots of copper. They do, however, serve to indicate within reasonable limits the approximate magnitude of the industry and allow a fair degree of comparison with the production of earlier years. The Alaska copper-mining industry is thus seen to have produced about 12,435,000 pounds less copper in 1927 than in 1926, and the total value was

about $2,240,000 less. The difference in the average prices of copper in 1927 and 1926 alone accounts for nearly $500,000 of the decrease in the total value.

Copper, silver, and gold produced at Alaska copper mines, 1880, 1900–1927

Year	Ore mined (tons)	Copper		Silver	
		Pounds	Value	Fine ounces	Value
1880		3,933	$826		
1900–1915	1,232,396	220,773,969	35,031,225	2,351,726	$1,297,756
1916	617,264	119,654,839	29,484,291	1,207,121	794,286
1917	659,957	88,793,400	24,240,598	1,041,153	857,911
1918	722,047	69,224,951	17,098,563	719,391	719,391
1919	492,644	47,220,771	8,783,063	488,034	546,598
1920	766,095	70,435,363	12,960,106	682,033	743,416
1921	477,121	57,011,597	7,354,496	544,311	544,311
1922	581,384	77,967,819	10,525,655	623,518	623,518
1923	731,168	85,920,645	12,630,335	715,040	586,333
1924	761,779	74,074,207	9,703,721	572,078	383,292
1925	860,023	73,855,298	10,361,336	596,607	412,131
1926	670,000	67,778,000	9,489,000	605,190	377,600
1927	645,000	55,343,000	7,250,000	525,100	297,800
	9,217,300	1,108,058,000	194,913,000	10,671,100	8,184,800

No new developments of note were reported at the mines of the Kennecott Copper Corporation at Kennecott, in the Copper River region, during 1927. The ore from this property, as in the past, was largely high-grade copper sulphide and carbonate containing considerable silver but no gold. The highest-grade ore is sacked and shipped directly to the smelters, but the lower-grade ores are concentrated before shipment. According to the published statements of this company [8] 90,393 tons of ore was mined during the year, which was estimated to have an average content of 12.44 per cent of copper and 2.10 ounces of silver to the ton. At the mine of the Mother Lode Coalition Mines Co., which is contiguous to the properties of the Kennecott Copper Corporation and is operated by that company, although the accounting and bookkeeping are conducted separately, the ore is essentially the same, being a high-grade copper sulphide and carbonate containing considerable silver. The report of this company [9] shows that during the year 104,444 tons of ore was mined, which had an estimated content of 10.57 per cent of copper and 1.67 ounces of silver to the ton.

The ore of the Beatson mine of the Kennecott Corporation, on Latouche Island, is entirely different from that of the mines in the Copper River region, just described. The ore produced is a low-grade copper-iron sulphide and is mined by a system of caving. All the ore is concentrated at mills near the mine, and only the concentrates are shipped to the smelter in the States. According to the pub-

[8] Kennecott Copper Corporation Thirteenth Ann. Rept., for 1927, p. 6, 1928.
[9] Mother Lode Coalition Mines Co. Ninth Ann. Rept., p. 3, 1928.

lished report of this company [10] 448,200 tons of ore was produced in 1927, which had an estimated content of 1.571 per cent of copper and 0.307 ounce of silver to the ton.

At all three of these large mines prospecting is constantly under way in order to find any new ore bodies that may lie on the properties. During the summer of 1927 extensive tests by modern methods of geophysical prospecting were carried on at all three properties. These tests are said to have been made by experienced engineers, using the most up-to-date instruments and with every opportunity to do the necessary work thoroughly. No authoritative statement has been given out regarding the outcome of this work, but it is currently said to have given, on the whole, negative results. No new ore bodies are reported to have been discovered during the year, so that the production has come entirely from the bodies already known. Fortunately, however, the original estimates of the volume of the ore bodies from which this ore was taken had been so conservative that the known reserves were not depleted to the full extent of the amount of ore taken out. Thus, at the mine of the Mother Lode Coalition Mines Co. the reserves were depleted to an extent of only about 80 per cent of the quantity trammed.[11] This in effect is equivalent to finding new ore bodies of a size equal to the difference.

The quantity of copper produced by mines other than those already mentioned was practically negligible, amounting to little more than 10,000 pounds. The largest part of this copper was derived from concentrates from the Riverside mine, in the Hyder district of southeastern Alaska, but three other prospects in that same district shipped concentrates that yielded a little copper. The Chichagof Development Co., and the Willow Creek Mines, in the Cook Inlet-Susitna region, are also credited with having shipped concentrates containing some copper. All these mines are more truly gold mines than copper mines and are so counted in this report. Therefore, to avoid duplication, though their copper is included in the table on page 45, their silver content is not included in that table but is carried in the table of gold-lode mines on page 10 and in the table of silver production on page 48.

Prospecting for copper lodes or further development of the lodes already known has been active during the year at only a few places in the Copper River and Prince William Sound regions. Probably the most active work that was in progress on any of the properties that are in a developmental stage was at the Copper Creek mines, in the Kotsina district, where, under the trusteeship of George H. Hur-

[10] Kennecott Copper Corporation Thirteenth Ann. Rept., p. 6, 1928.
[11] Mother Lode Coalition Mines Co. Ninth Ann. Rept., for 1927, p. 4, 1928.

lock, several men were employed for part of the season in prospecting, constructing the necessary buildings, and installing machinery. In the valley of Nabesna River the Alaska Nabesna Corporation was more or less continuously engaged in drilling certain parts of its holdings with a view to determining the extent and tenor of the ore. This work was interrupted by the extremely dry season, which made water for drilling scarce. The company has made no announcement of the results of its tests or of its plans for the future, evidently wisely preferring to wait until facts are in hand on which it can base a sound policy. No productive work was in progress on the old Green Butte mine, on McCarthy Creek a short distance east of the Kennecott group of mines. The ore at this property resembles the high-grade sulphide and carbonate ores of the mines near Kennecott and seems to occur under relatively similar geologic conditions. This property has been opened up by an inclined shaft that reaches a depth of 700 feet and has in the past produced a considerable amount of good ore. The present is not, however, a time to stimulate renewal of copper mining in that region, though doubtless, with a higher price for copper, it would open up again.

Little new prospecting for copper lodes is reported anywhere within the Prince William Sound region. At several of the deposits formerly discovered, some prospecting and development work was done, but at all these camps 1927 was relatively a period of marking time, and no new discoveries were reported. As almost all the properties are patented to their owners, prospecting simply to fulfill certain legal requirements is not necessary, so that the owners of many properties have preferred to allow them to lie absolutely idle rather than waste their time and money in engaging in futile activities. It was currently reported early in the summer that renewed interest was being shown in certain of the copper claims south of Iliamna Bay, on the west side of Cook Inlet, and that engineers of one of the large copper companies examined the properties with a view to their purchase. Although no authoritative statement has been made regarding the results of this examination, the fact that no action has been taken indicates that either it was impossible for the parties to reach an agreement on terms of sale or that the results of the tests did not indicate that the deposits carried as much copper as the prospective purchaser thought desirable. In any event, no further developments have been reported at that place.

SILVER

None of the ores that are mined in Alaska are valuable solely for their silver content, and there is only a relatively small tonnage of ore produced that is valuable principally for its silver. By far

the greater part of the silver that is produced occurs as a relatively minor constituent of ores whose principal value lies in some other constituent. Thus, as shown by the table below, silver worth nearly $300,000 was recovered in 1927 from the ores that are valuable principally for the copper they contain. This source alone accounts for more than 83 per cent of all the silver that was produced in Alaska in 1927. The amount of silver in this copper ore is really relatively small, as shown by the fact that the average content of the ore mined at the mine of the Kennecott Copper Corporation, which had the highest average of all the large mines, was only 2.1 ounces of silver to the ton.

For several reasons it has been impracticable to state separately the quantity of silver that was produced from the ores that are principally valuable for their silver content. The most cogent of the reasons is that practically all the ore of this sort comes from a single mine, and to state it separately would disclose rather closely the production of this mine. All the Alaska ores whose value lies principally in their silver content also carry considerable gold, so that in this report they have been included with the gold lode mines. Much silver is produced from gold mines in which the value of the silver is but a minor item. Thus, the mine of the Alaska Juneau Gold Mining Co., though worked principally for its gold, yielded 61,232 ounces of silver in 1927.[12] Even though silver may not be apparent nor occur as any recognizable distinctly separate mineral in gold, it is never entirely absent, so that all native gold, whether it is derived from lodes or placers, carries some silver.

Data regarding the production of silver have been referred to at several places in the preceding pages and set down in a number of the tables which cover the production of other metals. For convenience the sources and the quantity and value of the production from each source in 1926 and 1927 are set forth in the following table:

Silver produced in Alaska in 1926 and 1927

Source	1926		1927	
	Ounces	Value	Ounces	Value
Gold lodes	59,940	$37,400	79,400	$45,000
Gold placers	24,870	15,500	23,300	13,200
Copper lodes	605,190	377,600	525,100	297,800
	690,000	430,500	627,800	356,000

It is evident from this table that the output of silver in 1927 was worth about $75,000 less than the output in 1926. It should be re-

[12] Alaska Juneau Gold Mining Co. Thirteenth Ann. Rept., p. 13, 1928.

membered, however, that the silver in the copper lodes and gold placers is not produced for itself alone, so that the quantity produced from those sources merely fluctuates with the production of the principal metals. As already pointed out, the production of copper fell off more than 12,000,000 pounds and the value of the gold produced from placers nearly $800,000, so that naturally there was a corresponding decrease in the silver that was mined with those metals. Although there was some slight increase in the amount of lode gold produced in 1927 over that produced from the same source in 1926 and although this might account for some slight increase in the silver from that same source, the table shows a much larger increase than could be attributed to that cause. The explanation lies in large measure in the greater production of ores that are valuable principally for their silver, and the increase is an encouraging sign pointing toward still greater production from this source in the future.

The principal region that is now producing ore valuable largely for its silver is the Hyder district, at the head of Portland Canal in southeastern Alaska. Prospecting and development of the silver-lead ores in this district was going on throughout the year somewhat more energetically than heretofore. Although several small lots of ore and concentrates were sent out to the States for testing from properties in the Hyder district, the largest production still comes from the Riverside mine, a short distance northwest of Hyder. The company that operates this mine also operates its own concentrating mill from which it ships the product to a smelter in the States. In addition to the silver and lead the ore carries considerable gold, a good deal of which is recovered in the course of the milling operations but part of which is recovered in smelting. In many of the veins in the Hyder district silver minerals are found, and in some of the smaller veins in adjacent parts of British Columbia these minerals form important constituents of the ore. No startling new developments in this region have been reported during the year, but the general impression gained is that progress is being made in its development and that sincere and earnest efforts are being made to prospect it adequately. This must necessarily take time, much effort, and considerable capital, but the geologic conditions are favorable, and the proved occurences of ore on both sides of the international boundary support the belief that other profitable ore bodies exist in the region.

In the notes on the gold lodes mention has been made of the scattered occurrences of lead-silver ores in some of the districts. Obviously the difficulty and cost of treatment of ore of this type in remote districts are too great to make such ventures profitable at this

time. Some of the deposits of this sort that were formerly mined in southeastern Alaska and are relatively close to deep-water transportation, if carefully and skillfully managed, might well pay for reopening. The experience that was gained by trying to develop the silver-lead deposits in the Kantishna district seems to prove fairly conclusively that under existing conditions, unless the ores are phenomenally rich, the cost of getting them to market is so great as to discourage development. These conditions, however, are being modified as the country becomes better opened up, so that the alert engineer or capitalist might well review at intervals the then existing conditions to determine whether or not they had changed enough to warrant trying to mine some of the more promising deposits.

At the Mint mine, which is about 9 miles east of Chulitna station on the Alaska Railroad, is a unique silver prospect in which the value of the ore depends on the presence of ruby silver, a complex sulphide mineral containing silver. Work at this place during 1927 consisted mainly in surface developments, the driving of about 150 feet of tunnel, and the starting of three stopes. Some differences having arisen over the handling of the property, work was discontinued, but the operator is so well satisfied with the general indications of ore that he does not propose to let the property lie idle long but will continue the development work.

LEAD

The lead produced from Alaska ores in 1927 amounted to 2,016,000 pounds, an increase over the production in 1926 of 460,000 pounds. This output stands as the greatest quantity of lead that Alaska has ever produced in a single year. The value of the lead produced in 1927, at 6.3 cents a pound, which was the average market price for the year as determined by the Bureau of Mines, was $127,000, only $2,600 more than the value of the lead produced in 1926. That there was not a much more marked increase in value was due to the fact that on the average lead sold for 1.7 cents a pound less in 1927 than in 1926.

Lead produced in Alaska, 1892–1927

Year	Tons	Value	Year	Tons	Value	Year	Tons	Value
1892	20	$2,400	1905	30	$2,620	1918	564	$80,088
1893	40	3,040	1906	30	3,420	1919	687	72,822
1894	35	2,310	1907	30	3,180	1920	875	140,000
1895	20	1,320	1908	40	3,360	1921	759	68,279
1896	30	1,800	1909	69	5,934	1922	877	41,477
1897	30	2,160	1910	75	6,600	1923	410	57,400
1898	30	2,240	1911	51	4,590	1924	631	100,899
1899	35	3,150	1912	45	4,050	1925	789	140,571
1900	40	3,440	1913	6	528	1926	778	124,400
1901	40	3,440	1914	28	1,344	1927	1,008	127,000
1902	30	2,460	1915	437	41,118			
1903	30	2,520	1916	820	113,160		9,811	1,322,000
1904	30	2,580	1917	852	146,584			

By far the larger part of the lead was recovered in connection with the mining of the gold ores of the Alaska Juneau mine, in southeastern Alaska. According to the published reports of this company, it produced 1,513,306 pounds of lead in addition to other metals in 1927. This represents a recovery of a little less than five-sixths of a pound of lead from each ton of ore milled. The remainder of the lead came principally from the silver-lead mines in the Hyder district, of which the Riverside mine was by far the largest. A little lead was also recovered from concentrates shipped to a smelter in the States by the Kassan Gold Mining Co., whose mine is near Hollis, on Prince of Wales Island, in the Ketchikan district.

The statements relating to certain of the gold ores and to the silver-lead ores in the preceding section on silver give all the available data regarding lead mining in 1927. None of the deposits contain enough lead to be developed for their lead content alone. Although several deposits that are now lying idle or undeveloped seem to be nearly high enough in their combined lead, silver, and gold content to be mined at a profit, there does not seem to be any indication that in the near future any considerable increase in the production of lead is to be expected, except as a result of increased mining in the Hyder district and increased milling of the gold ores of the type represented by those now being mined at the Alaska Juneau mine. Both of these contingencies, however, seem very likely to happen, and an increase in the yield of lead from these sources is looked for with considerable assurance.

PLATINUM METALS

Platinum is one of a group of several metals which, because they are closely related in physical and chemical character, are often not differentiated by name or are not even identified specifically in the usual forms of assay or analysis but are spoken of as the platinum metals or, even more loosely, as platinum. Platinum, palladium, osmium, and iridium are some of the individual members of this group. Some of these metals have been found both in lodes and in placers in Alaska. The only occurrence in a lode that has produced any appreciable quantity of metal was at the mine of the Alaska Palladium Co. on Kasaan Peninsula, Prince of Wales Island, about 30 miles west of Ketchikan. The principal platinum metal found at this mine was palladium. Unfortunately, decrease in the price paid for palladium and some internal difficulties resulted in the closing of this mine in the fall of 1926. It was not reopened in 1927 and, according to local reports, was put up for sale to satisfy certain judgments and had been bid in for $15,000, and this offer was under consideration by the courts. As this mine while it was running pro-

duced several hundred thousand dollars' worth of platinum metals a year and in addition a good deal of gold and some copper, its cessation of production has not only made a very decided drop in the Alaskan output of platinum metals but has been felt in the total mineral production of the Territory.

The only platinum metals that were mined in Alaska in 1927 were recovered from placers, but no detailed reports are available as to the precise quantities obtained. However, from more general sources of information, which are believed to be reliable, it has been learned that the total production of crude platinum metals was about 21 ounces. This amount is probably equivalent to 17.5 fine ounces, which, at the average price of platinum for the year, was worth $1,500. The platinum came entirely from placers in the Dime Creek district, of Seward Peninsula, and in the Goodnews Bay region, south of the mouth of Kuskokwim River. The Seward Peninsula deposits have been known for a long time and have been more or less continuous producers in the past. Although the occurrence of platinum in the Goodnews Bay region has been known before, interest in the deposits at that place was especially keen during 1927, and for a time it appeared that a small stampede was in progress. Rumors of the richness of these claims seem to have become more glowing the farther they traveled away from their sources. However, in spite of the exaggeration of certain reports from this district, it is true that placer deposits containing platinum worth continued careful prospecting occur in the district and that about 10 men were engaged during the summer in the search for places where concentration had been great enough to form deposits that could be mined at a profit. The most extensive prospecting is reported to have been done in the vicinity of Salmon Creek, a stream about 9 miles long that drains the country lying about midway between Goodnews Bay on the north and Chagvan Bay on the south and enters Bering Sea about 2 miles north of the native village of Kiniginagimut. The country rock is a dark basic igneous rock allied to pyroxenite. Black sand from the pannings seems to consist mainly of magnetite without any chromite, though usually in platinum deposits chromite is common. Curiously, the concentrates from this region are said to carry almost no gold, a clean-up that yielded 3½ ounces of platinum having shown only a very few small colors of gold.

In the valley of Arolik River, which is considered part of the Goodnews Bay district but is 25 to 30 miles north of Goodnews Bay itself, a small amount of platinum was recovered in connection with placer gold mining on Kowkow and Butte Creeks. On these streams the association of platinum with gold is very different from that in the tracts south of Goodnews Bay, in that the platinum is many

times less abundant than the gold, the ratio between the two metals being almost the reverse of the ratio of the deposits south of Goodnews Bay.

Although no other places are known to have produced platinum metals that were sold in 1927, it is not unlikely that small amounts were produced elsewhere but are held by the owners, for the occurrence of platinum in many of the placer deposits throughout the Territory has been demonstrated in the past. Thus, some platinum metals have at one time or another been recovered from placers in the Chistochina district, of the Copper River region; from Metal Creek, in the Kenai district; from the Kahiltna and other streams, in the Yentna and near-by districts of the Susitna region; from Boob Creek, in the Tolstoi district, and Granite Creek, in the Ruby district, both of which are in the central part of the Yukon Valley; from streams in the Marshall district, in the western part of the Yukon Valley; and from some of the beach placers of Kodiak Island.

TIN

Alaskan tin production showed a noteworthy increase in 1927, though the amount of metal recovered was far below that of the period from 1911 to 1919, when the industry was at its height. The increase, however, is regarded as indicating that the production of tin ore in Alaska is on the upward trend. Tin minerals have been found in the veins and mineralized country rock of the York and Port Clarence districts, Seward Peninsula, and at one time were extensively mined. The tin produced in 1927, however, did not come from lodes but from placer deposits, principally in the York district, of Seward Peninsula, and the Hot Springs district, of the Yukon Valley. In the York district the placer tin, or cassiterite, is mined principally for itself, though some placer gold is also found with it. In the Hot Springs district the tin ore is a by-product obtained from deposits that are mined primarily for their gold. In the York district the tin ore was mined by two small camps, the larger of which is on Goodwin Gulch. In the Hot Springs district the tin ore was mined at three small camps in the vicinity of Tofty. The largest of these was on Woodchopper Creek. The tin ore shipped from the York region is said to have had a content of 72 per cent of metallic tin; that from the Hot Springs district carried about 65 per cent.

The production of tin ore in Alaska in 1927 was 37.5 tons, which contained 26.7 tons of metallic tin. The average price of metallic tin for the year as computed by the Bureau of Mines was 64.37 cents a pound, so that the value of the Alaska production was $34,000. Practically all of this tin ore was shipped out of Alaska for treatment, only a few hundred pounds remaining unsold in the hands of

the producer. Almost all the ore shipped is sent to Singapore for reduction.

Considerable interest was shown in the reported discoveries of tin ores in the Ruby district that might justify further exploration. Late in the season a mining engineer spent several days examining three of the deposits, but the results have not yet been made public. That there is cassiterite in the district has been abundantly demonstrated by the placer miners, who find it in small quantities in most of their clean-ups. Whether it is sufficiently abundant to warrant placer miners in regarding it as more than a by-product can not, of course, be determined without further tests, and whether it may be found in the Ruby district in lodes of sufficiently high grade to be mined can be ascertained only by a great deal of prospecting and development work. The stream in the Ruby district on which prospecting for placer tin was most active seems to have been Cox Gulch, a tributary of Big Creek.

Tin produced in Alaska, 1902–1927

Year	Ore (tons)	Metal (tons)	Value	Year	Ore (tons)	Metal (tons)	Value
1902	25	15	$8,000	1916	232	139	$121,000
1903	42	25	14,000	1917	171	100	123,300
1904	23	14	8,000	1918	104.5	68	118,000
1905	10	6	4,000	1919	86	56	73,400
1906	57	34	38,640	1920	26	16	16,112
1907	37.5	22	16,752	1921	7	4	2,400
1908	42.5	25	15,180	1922	2.3	1.4	912
1909	19	11	7,638	1923	3	1.9	1,623
1910	16.5	10	8,335	1924	11	7	7,028
1911	92.5	61	52,798	1925	22.2	13.8	15,980
1912	194	130	119,600	1926	12.85	8	10,400
1913	98	50	44,103	1927	37.5	26.7	34,000
1914	157.5	104	66,560				
1915	167	102	78,846		1,696.0	1,051.0	1,007,000

COAL

More coal was produced from Alaska fields in 1927 than in any other year since coal mining began in the Territory with the single exception of 1923. Although this record is an encouraging sign, it must be remembered that the coal-mining industry of Alaska is still relatively small, as it entails a production of only about 100,000 tons a year, practically all of which is produced by two mines in the Matanuska field and one in the Nenana or Healy River field. The local output does not at all indicate the real size of the Alaskan market for coal, because each year 60,000 tons or more is imported into Alaska from fields in western United States and Canada. Thus, the total consumption of coal in Alaska in 1927 was 166,700 tons, only 62.5 per cent of which was supplied from Alaskan sources. The following table sets forth some of the significant facts regarding coal in Alaska as far back as records are available.

Coal produced and consumed in Alaska, 1880–1927

Year	Produced in Alaska, chiefly subbituminous and lignite		Imported from States, chiefly bituminous coal from Washington [a] (short tons)	Imported from foreign countries, chiefly bituminous coal from British Columbia [a] (short tons)	Total coal consumed (short tons)
	Short tons	Value			
1880–1915	71,633	$456,993	679,844	1,079,735	1,814,047
1916	12,676	57,412	44,934	53,672	111,282
1917	54,275	268,438	58,116	56,589	168,980
1918	75,816	413,870	51,520	37,986	165,322
1919	60,894	345,617	57,166	48,708	166,768
1920	61,111	355,668	38,128	45,264	144,503
1921	76,817	496,394	24,278	33,776	134,871
1922	79,275	430,639	28,457	34,251	141,983
1923	119,826	755,469	34,082	43,205	197,113
1924	99,663	559,980	40,161	41,980	181,804
1925	82,868	404,617	37,324	57,230	177,422
1926	87,300	459,000	35,620	34,254	157,174
1927	104,300	548,000	35,212	27,225	166,700
	986,454	5,552,000	1,164,842	1,593,875	3,732,000

[a] Compiled from Monthly Summary of Foreign Commerce of the United States, 1905–1927, Bureau of Foreign and Domestic Commerce. No figures on imports before 1899 are available.

Although the foregoing table accurately portrays the history of the coal industry in the Territory, it is a record of past accomplishment and must be viewed in that light and not given too great weight in forecasting the future. It is self-evident that as the country becomes more settled and large-scale enterprises, such as mining, develop, the use of coal must eventually increase. Even during 1927 the completion of the large power house of the Fairbanks Exploration Co. has made a new outlet for large quantities of coal, and this market alone will absorb increasing amounts as the placer-mining project which the power plant was designed to serve comes into active operation. Other power or heat users, such as canneries and even domestic consumers, many of whom are now using petroleum products or imported coal, could doubtless be induced to buy Alaska coal if they were assured of good coal at a reasonable price. That some of the Alaska coals are of at least as high grade as any of the foreign coals has been abundantly proved by careful comparisons. The preparation of the Alaska coals has not always received proper care, and in the past there have been shipments of dirty, poorly prepared coal that have lost rather than made customers for the coal producer. This condition arose mainly through inexperience and lack of business foresight and has now been practically eliminated, so that purchasers may feel assured of getting what they order in the form of a reliable, uniform product.

In attempting to forecast the future of the Alaska coal industry it must constantly be borne in mind that all the early developments were made by small groups of operators, many of whom were entirely inexperienced in handling business projects, especially those

involving so many difficulties and technical problems as coal mining; and all of them were short of capital, so that programs of systematic development had to give way to getting out coal that would bring in cash. Under such conditions loss of effectiveness, here and there failures, and generally doing things in the way that will get by rather than the best way has been the price paid for gaining experience. The full price of this education has not yet been paid, and financial, labor, marketing, and other problems still beset some of the operators and make adequate development of their properties difficult.

In the foregoing table the total value of the coal produced in Alaska in 1927 is stated as $548,000. This value is only approximately correct, because the selling price of much of the output could not be determined exactly, and the average price paid by the railroad for the large quantities it purchased was abnormally low because of the size of the contracts. From all the available information and by weighting the resulting estimate as closely as practicable it appears that the average price of all the coal mined in Alaska in 1927 was approximately $5.25 a ton, which was the same as the average price of the coal produced in 1926 and about 50 cents a ton less than the average for the entire period shown in the table on page 55.

The two mines in the Matanuska field that produced the most coal in 1927 are those of the Evan Jones Coal Co. and the Premier Coal Mining Co. The Evan Jones mine is at Jonesville, on the Eska spur of the Chickaloon branch of the Alaska Railroad. This mine was closed during January and February and part of March, 1927, but from April to November it maintained a rather uniform output of coal. In December, however, it was closed again for the rest of the year. The Premier mine is in the Moose Creek Valley section of the Matanuska region and is reached by a narrow-gage railroad that connects with a short spur from the Chickaloon branch of the Alaska Railroad. This mine was in constant operation throughout the year, though in July its production dropped to only a small part of the monthly rate which it maintained during the rest of the year. Some complex faulting conditions were beginning to be disclosed in some of the workings of this mine, but the amount of dislocation appears to be relatively slight. Farther up Moose Creek Valley, at the mine of the Alaska-Matanuska Coal Co., mining was active during January, February, and the early part of March, but it was then discontinued. The mine produced no more coal during the year, and no suggestion that it is to be reopened in the near future has been heard. A little coal was also produced during the first three months of the year from the Rawson property, also in Moose Creek Valley, but the work was then discontinued, and during the rest of the year

it has remained practically idle. The only other place in the Matanuska Valley where coal prospecting was reported was at the Heckey prospect, on Coal Creek south of Chickaloon. The work there was essentially of a prospecting character, though a few hundred tons of coal was produced. The old Government-owned mine at Eska was maintained in a more or less stand-by condition throughout the year, so that if anything should happen which might endanger the supply of coal needed for the railroad it could be quickly reopened and furnish coal. This necessitated considerable retimbering in the main passageways and other needed upkeep.

In the Nenana coal field the only producing property was the Suntrana mine of the Healy River Coal Corporation, on Healy River about 4 miles east of its junction with Nenana River. The mine is connected with the main line of the Alaska Railroad by a standard-gage spur track, which forks a short distance north of Healy station. There was a serious fire at the property in May which destroyed the tipple and was kept out of the mine only by good fortune and most strenuous exertions. Fortunately, the mine had enough coal ahead, so that it was able to supply coal uninterruptedly in spite of the fire. At once plans for the construction of a new tipple were prepared, and construction of a more adequate plant was begun. The facilities of the whole surface plant were rearranged to enable better handling of the coal, and as a result the owners came to look upon the losses caused by the fire as being in a measure offset by the great improvements brought about by the new equipment and layout. The new building and the reorganized railroad yards were completed in September, and the coal production from the property decidedly increased, attaining in December an average rate of over 200 tons for each working day. This mine has the contract for supplying coal for the power plant of the Fairbanks Exploration Co.

About 5 miles east of the Suntrana mine is a coal property that has created considerable local interest. By the end of 1926 negotiations had been entered into whereby the Alaska Railroad was to build a spur to the property if its cost were defrayed by the property owners. Attempts to interest outside capitalists in participating in the enterprise apparently were not successful, as no active work either on the construction of the spur or at the property was reported, though it was rumored at one time that a California shipping man was considering putting money into the project and that, if his decision was favorable, he would put on a fleet of colliers to carry the coal to San Francisco. The coal is of good quality, and as it lies nearly flat the owners believe that much of it can be mined by steam shovels.

A very little coal is reported to have been taken from the old mine on Chicago Creek, in northeastern Seward Peninsula. The coal is said to have been used locally by some of the placer miners,

especially those of Candle Creek. This is the coal deposit to which it was proposed that the Government should extend the tram line that now runs from Nome to the vicinity of Shelton. This project was much discussed about a year ago, and a bill to put it into effect was introduced into Congress. The bill failed, and the agitation for the tram seems to have died down. From the chemical composition and physical character of this coal it is not likely to have more than local value, as most people who have used it report that they much prefer imported coal, even at a much higher price.

On Admiralty Island, in southeastern Alaska, considerable activity has been shown during the year in reopening some of the coal beds that have long been known there. Work is said to have been in progress throughout the open season, so that by the end of the year, the mine was almost in shape to begin production. According to reports the coal will be sold mainly in the local markets of Juneau and near-by districts. Analyses indicate that the coal is of good quality and of bituminous rank.

A small amount of coal is mined each year in extreme northern Alaska on Kuk Inlet, about 20 miles south of the settlement of Wainwright. This coal is dug from the beds that are exposed in the face of a cliff, sacked, and carried to Wainwright in skin boats and used locally by the white traders and natives. The customary charge is 50 cents for a sack weighing 100 pounds or less, which is at the rate of more than $10 a ton. Because of the poor conditions under which the coal is mined and subsequently handled, the coal is only moderately satisfactory, though a chemical analysis shows that it is a subbituminous coal of good quality.

No productive coal mining has been in progress in other parts of Alaska in 1927. A little prospecting is said to have been done on the coal exposures that lie north of the Yukon a short distance east of Tanana. Inquiries regarding the coal in the vicinity of Kaltag indicate that interest in these deposits still continues, but no steps looking toward their development have been taken. Reports from the Bering River coal field indicate that no new activities were in progress there during 1927. Several requests for extension of time in which to comply with certain of the Government's requirements regarding the permits it has issued for coal lands in this field indicate that some of the companies still contemplate the development of their projects if the necessary arrangements can be perfected.

PETROLEUM

The only petroleum produced in Alaska comes from the wells of the Chilkat Oil Co., in the Katalla field. This company obtains oil from a number of relatively shallow wells, few of which are more

than 1,000 feet deep and none more than 2,000 feet. A small refinery is operated at Katalla by the company, and the products—gasoline and distillate—find a ready market near at hand, especially for use by boats of the fishing fleet near Cordova. The production from these wells was maintained at approximately the same rate as heretofore, and its value was also about the same. No new developments are reported to have taken place in this field during the year.

The small domestic production of petroleum from the Katalla field is not at all adequate to supply even local needs, and the demand for large quantities of petroleum products throughout the Territory is met principally by imports from the States. The most notable feature that is brought out by the data of the subjoined table is the constant increase since the war in the amount of gasoline and related lighter products of distillation imported. This increase is called for by the growing use of power in fishing boats and other water craft, in the canneries, in many mining developments, and in the operation of means of transportation such as automobiles and gas cars or engines on practically all the railroads.

Petroleum products shipped to Alaska, from other parts of the United States, 1905–1927, in gallons [a]

Year	Heavy oils, including crude oil, gas oil, residuum, etc.	Gasoline, including all lighter products of distillation	Illuminating oil	Lubricating oil
1905	2,715,974	713,496	627,391	83,319
1906	2,688,940	580,978	568,033	83,992
1907	9,104,300	636,881	510,145	100,145
1908	11,891,375	939,424	566,598	94,542
1909	14,119,102	746,930	531,727	85,687
1910	19,143,091	788,154	620,972	104,512
1911	20,878,843	1,238,865	423,750	100,141
1912	15,523,555	2,736,739	672,176	154,565
1913	15,682,412	1,735,658	661,656	150,918
1914	18,601,384	2,878,723	731,146	191,876
1915	16,910,012	2,413,962	513,075	271,981
1916	23,555,811	2,844,801	732,369	373,046
1917	23,971,114	3,256,870	750,238	465,693
1918	24,379,566	1,086,852	382,186	362,413
1919	18,784,013	1,007,073	3,515,746	977,703
1920	21,981,569	1,764,302	887,942	412,107
1921	9,209,102	1,403,683	2,021,033	232,784
1922	15,441,542	1,436,050	2,095,675	345,400
1923	12,285,808	4,882,015	473,826	454,090
1924	14,412,120	5,554,859	566,431	506,364
1925	16,270,746	6,993,560	562,844	580,321
1926	14,000,664	5,069,584	328,615	730,924
1927	17,628,744	8,141,574	516,306	320,450
	359,179,787	58,850,973	19,259,880	7,482,973

[a] Compiled from Monthly Summary of Foreign Commerce of the United States, 1905 to 1927, Bureau of Foreign and Domestic Commerce.

Search for new oil fields in Alaska has not been vigorously carried on during the year. At only two places was any drilling done, and at one of these the work was suspended before the end of the year, and early in 1928 formal notice was given of the company's intention

to abandon the well that had been started. The property on which this well was drilled was in the Yakataga field, on the south coast of Alaska, on Johnson Creek near a seepage that had been known for some time. Work at this well was started by the General Petroleum Corporation of California in 1925, but active drilling was not begun until the summer of 1926. By the end of that year the well, known as Sullivan No. 1, had been sunk to a depth of 865 feet. During 1927 drilling was resumed and carried on uninterruptedly until about the middle of October, when a depth of 2,005 feet was reached and work suspended. The geologic formations encountered in this well were dominantly hard sandstone and sandy shale with minor amounts of limy beds. Small showings of gas were encountered at various depths from the surface to a depth of 232 feet and again at 1,643 feet. The size of casing used in different sections of this well was as follows: From surface to 60 feet 15½ inches, from 60 to 192 feet 12½ inches, from 192 to 555 feet 10 inches, from 555 to 2,005 feet 6 inches. This casing was left in the well when the company abandoned work on it.

The only other place at which drilling for oil was in progress during the year was in the Matanuska Valley a few miles west of Chickaloon, on the property of the Peterson Oil Association. Work at this place started in 1926 but was discontinued throughout the winter and renewed in 1927. Except for the deposit of glacial till and outwash material about 180 feet thick that formed a mantle covering bedrock at the place where drilling was started, the beds penetrated have been sandstone and shale of the coal series that is the general country rock of that region. Several beds of coal have been cut by the drill and evidently represent some of the coals that are characteristic of the Chickaloon formation. The rock formations in the vicinity of the well have a strong dip, so that the drill does not cut directly through them but angles across, thus making the thicknesses appear much greater than they actually are. For this reason identification of individual beds by their thickness is almost impossible without more data than are available. At a depth of about 225 feet considerable gas was struck in the well. This could be ignited readily with a match and burned with a yellowish flame. The presence of a coal bed in the well at about this same depth strongly indicated that the gas may have been evolved from the coal rather than from an accumulation of oil. To get information on this point a sample of the gas was collected and shipped to the Bureau of Mines laboratory in Pittsburgh for analysis, as the composition of the gas may shed light on its probable origin. The results of the analysis of this sample have not yet been made known. When work was discontinued for the winter of 1927 the well had

reached a depth of 865 feet. The geologic conditions in the general vicinity of the well, so far as known, are not such as are usually associated elsewhere with commercial deposits of petroleum. The Peterson Oil Association, however, felt that the results it has so far accomplished were encouraging enough to warrant it in resuming drilling at this place as early in the spring of 1928 as practicable. So much effort and money have already been put into this work that the additional expense of continued drilling to obtain decisive proof whether or not oil is present is probably justified.

No further explorations by the Government of Naval Petroleum Reserve No. 4, in northern Alaska, were made during the year. A comprehensive report giving an account of the recent work that had been done by the Geological Survey in determining the major topographic and geologic features of the region, together with an analysis of the facts bearing on the presence of petroleum, was completed in 1927 and has been forwarded to the officials who are concerned with the problem and is also to be published by the Geological Survey.[13] No official announcement of the policy that will be followed by the Government with regard to this tract has been made. The general results of the exploration of this area by the Geological Survey have indicated that the Government is not warranted at this time in looking to this field as a potential source of oil for the Navy unless it is prepared to prospect the field adequately—a work that will entail considerable expense. The data already obtained indicate that such prospecting is likely to be worth while, but it is distinctly wildcatting and should not be regarded otherwise, either by the Government or by private companies if the reserve is thrown open to prospecting.

MISCELLANEOUS MINERAL PRODUCTS

The list of minerals of commercial value that have been found in Alaska is long. In addition to those described in the preceding sections of this report, the following have at one time or another been produced in sufficient quantity to arouse more than local interest, and some of them have been and still are the basis of profitable industries: Metallic minerals—antimony, arsenic, bismuth, chromium, iron, manganese, mercury, molybdenum, nickel, tungsten, zinc; nonmetallic minerals—asbestos, barite, clay, garnet, graphite, gypsum, jade, lime, marble, mica, stone, and sulphur. Unquestionably in 1927 small quantities of practically all these minerals were "produced" in the broadest sense of the word, but with the exception of stone, marble, and antimony, none of them were sold

[13] Smith, P. S., and Mertie, J. B., jr. Geography and Geology of Northwestern Alaska: U. S. Geol. Survey Bull. — (in preparation).

to an extent that justified their being considered to have contributed materially to the mineral output of the Territory.

Practically the entire output of Alaska marble comes from quarries owned and operated by the Vermont Marble Co. In the past the company's output of marble has come mainly from quarries at Tokeen, on Marble Island, off the northwest coast of Prince of Wales Island. Depletion of these deposits and demand for more of its product led the company to search the adjacent region for other deposits of the type desired. After a long hunt satisfactory masses of marble were found in the vicinity of Calder and El Capitan, and they will be developed as rapidly as conditions permit. At present all the marble shipped by the Vermont Marble Co. is rough stone that is dressed in the States for use in interior decoration. In the past several marble quarries were in operation in southeastern Alaska, and it seems strange that deposits so favorably situated with respect to ocean transportation have not been profitably developed. According to Burchard,[14] many different types of marble occur in these deposits, some even approaching statuary grade.

A new industry that is somewhat remotely related to the quarrying of marble was started during the year on Dall Island, in the extreme southwestern part of southeastern Alaska. This is the production of high-grade limerock required as one of the constituents of cement. This project is being carried on by the Pacific Coast Cement Co., whose principal plant is near Seattle. The company proposes to mine the limerock on Dall Island and transport it to Seattle in a fleet of its own ships and there grind the limestone and make the necessary mixture with other constitutents to produce cement. This plan was announced late in the year, though the search for a suitable limestone had been going on for some time, and active preparations were at once started for sending to Alaska the necessary personnel, equipment, and materials for the plant that the company will construct on Dall Island. The company expects to have the property in condition to begin shipping limestone early in the summer of 1928.

Antimony ore carrying approximately 35,000 pounds of the pure metal was produced as a by-product from concentrates of certain of the lode mines in the Fairbanks district. These concentrates were shipped to one of the smelters in the States for treatment. A considerable body of high-grade antimony ore was reported to have been discovered in the fall on claims on Cleveland Peninsula, in the Ketchikan district, southeastern Alaska. Rich antimony ore has been known in this same general region for several years. It is reported

[14] Burchard, E. F., Marble Resources of Southeastern Alaska: U. S. Geol. Survey Bull. 682, 118 pp., 1920.

that near the end of the season engineers made an examination of certain antimony prospects in the Kantishna district. This examination is said to have been made for English interests that would probably not be favorable to going into any development work there unless rather large tonnages were indicated.

The mill of the Alaska Juneau Gold Mining Co. is being equipped to recover the zinc that now goes to waste in the treatment of its ore. This project had not been under way long enough to affect the production of the mine for 1927, but its effect should be apparent in 1928.

Some prospecting and development work is said to have been continued on the nickel-bearing ores of the Chichagof district, but no ore is reported to have been produced for sale during the year.

No late information has been received regarding developments among the quicksilver deposits of the Kuskokwim. Probably prospecting has been in progress at some of the claims, but there is no record that any metallic mercury was produced or sold, and it seems extremely doubtful whether any was sold except for local use.

In the Kobuk district, northwestern Alaska, search for workable deposits of asbestos and jade is said to have been undertaken in the vicinity of Shungnak and Ambler River. That these minerals occur in that district has long been known, but the expense and difficulty of developing them in that remote region, even if they should be of higher quality than any samples so far seen, seems to shut out the possibility of their being mined at a profit or in appreciable quantities at present.

During the late summer samples of manganese-bearing rock that was said to occur in large quantities in the Broad Pass region, at the head of Nenana River, were brought in by a prospector. The real quality and quantity of this material can not be determined positively without more thorough examination in the field, but the character of the sample did not appear to indicate a body of manganese ore of commercial value. A prospector in the Noatak region sent a small piece of rock to the Geological Survey for identification. Although it contained some manganese, the tenor was so low and the region from which it came so remote that the deposit from which it was derived is regarded as probably having no commercial value.

In the course of the studies made by the companies that are undertaking the development of the paper-pulp industry in southeastern Alaska some consideration has been given to the possibility of obtaining the required sulphur from local sources. As a result some scouting has been done to look over the pyrites deposits that have been reported in various parts of the region, but no decision as to the out-

come of this search has been announced. No recent developments have been reported at any of the small sulphur deposits known to be associated with some of the volcanoes of the Aleutian Islands.

In many of the tables accompanying this report a group of so-called miscellaneous mineral products has been shown. This group includes not only the products mentioned in the foregoing paragraphs but also all the others that are produced in quantities so small that to list them separately would disclose the production of individual operators. Among the mineral commodities that are included in this miscellaneous group in the tables are stone, marble, petroleum, quicksilver, and platinum. A large part of the decrease in the reported production of these minerals in 1927 was due, as already noted, to the cessation of palladium lode mining.

Value of output of miscellaneous mineral products of Alaska, including platinum, petroleum, gypsum, marble, and other products, 1901–1927

Year	Value	Year	Value	Year	Value
1901	$500	1911	$141,739	1921	$235,438
1902	255	1912	165,342	1922	266,296
1903	389	1913	286,277	1923	229,486
1904	2,710	1914	199,767	1924	348,728
1905	710	1915	205,061	1925	454,207
1906	19,965	1916	326,737	1926	444,500
1907	54,512	1917	203,971	1927	162,000
1908	81,305	1918	171,452		
1909	86,027	1919	214,040		[a] 5,125,000
1910	96,408	1920	372,599		

[a] $112,000 of placer platinum metals mined prior to 1926 and $238,000 of antimony mined prior to 1927 is not distributed by years but carried in total.

ADMINISTRATIVE REPORT

By PHILIP S. SMITH

INTRODUCTION

In 1867 the people of the United States bought Alaska, and in so doing they assumed, as a necessary result of that ownership, an obligation to and an interest in the new possession. For many years after the purchase, however, this obligation was not keenly felt and there was little interest in Alaska except for its strangeness. After the discovery of bonanza deposits of gold within its borders the people in general began to look upon "Seward's Folly" as a real asset. With the recognition of this value came the demand for authoritative information regarding all phases of its character and resources, so that as owners the people might wisely plan for the development of their possession. This was not done through any sense of paternalism or condescension but was simply the action that any landlord, owner, or trustee would take in handling property in his charge. The Federal Government, as the agency through which the whole people expresses its will, was early among the organizations that keenly felt the need of accurate information regarding Alaska, if it as trustee was to see that its client's interests were properly administered.

Obviously, among the first things people wished to know about Alaska were its geography, the character, extent, and distribution of its natural features, and its mineral resources. This information was sought by many of the people in the dual capacity of landlords and prospective tenants. It was the sort of information that naturally fell within the field of activities of the Geological Survey, many of whose geologists had made notable contributions to knowledge of the mineral resources of the West when that region was frontier country. So for more than 30 years to the Geological Survey has been intrusted the task of supplying information regarding the mineral resources of the Territory and using its best efforts to aid the mining industry in developing those resources, the legislative bodies in dealing with problems relating to the best utilization of those resources, and the people in general in understanding Alaskan geogra-

phy and geology, which enters into every line of endeavor that pertains to the Territory. In fulfillment of its duties the Geological Survey has published hundreds of reports regarding all the known mineral-producing camps and much of the country adjacent to them, and hundreds of maps that show the geology and the topography of more than two-fifths of the entire Territory, answered thousands of inquiries of all sorts, and prepared annual statements of the production of the different mineral commodities from different parts of Alaska.

The task before the unit of the Geological Survey that is intrusted with the Alaskan work is therefore a major project whose entire accomplishment is still far in the future. Approach toward this end, however, is made by the continuous accumulation of facts through original surveys and investigations and the utilization of all results of work by others that bear on the general problem. The main task is therefore a continuing one, with no sharply marked breaks or interruptions that form natural regular intervals at which to report progress. However, it is obviously necessary that a periodical accounting of the Survey's stewardship of this trust should be given, and in accordance with general governmental practice, the fiscal year has long been used as the period to be covered by the annual report. The selection of any regular period leads to difficulties in properly describing any scientific or technical work, and the fiscal year is an especially inappropriate period to use in describing the Alaskan work of the Geological Survey. Even if the individual undertakings of a single year are considered to be specific projects, there is no uniformity in starting or completing them. The field projects begin whenever the conditions are suitable; some may be started in January and others in July, and the actual field work may close in July or in October, but there still will be a large amount of office work in preparing the reports and maps that is as much an integral part of the projects as the field work. Many times the preparation of the report and map may run over a year or more, so that it may or may not be considered two separate projects. Furthermore, the fiscal year for the Survey's Alaskan work is a most variable period, because most of the appropriations for this work are made immediately effective on the passage of the act through which the money is appropriated. Thus, the act may pass at any time from January to June, and the funds its authorizes may at once be allotted and expenditures commenced. It is therefore not at all uncommon for two projects to be carried on simultaneously and yet be paid for from two different appropriations for the same object. For instance, the appropriation for the Alaskan work in the 1928-29 act for the Interior Department became effective on March 7, 1928, and was available for expend-

iture at any time after that date until June 30, 1929. At the same time, the similar appropriation contained in the act for 1927-28 was available for expenditure until June 30, 1928. Therefore the determination to which of these appropriations a certain project should be charged was based more upon administrative convenience than upon difference in character or object of the work. To attempt to separate two jobs simply because they were paid for from different appropriations would fail to give a correct picture to one interested in the work rather than in the details of accounting procedure. For this reason in the following pages the projects have been described principally on the basis of what may be called field seasons, though not all of the time was spent in the field. Thus, the field season of 1927 began in the late winter or early spring of 1927 and continued, with related office work, into the spring of 1928, when the projects of the 1928 field season were started. Of course, some of the projects naturally fall better into other periods. For instance, the statistical studies of mineral production relate to the calendar year, though the most intensive part of the work falls in the early part of the year succeeding the year to which the statistics relate.

Although there is no direct relation of the field-season year to the fiscal year, the amount of money spent during any field season closely approximates the amount of money appropriated for the fiscal year. Thus, on the whole, expenditures for starting parties before July 1 in the field season of 1927, for example, which were paid from one appropriation, are about offset by the expenditures of the parties that start before July 1 of the next field season, which are paid from the next appropriation. In other words, the sum of the expenditures during a field season, though perhaps paid from two appropriations, is essentially identical with the total amount of the appropriation available for a single fiscal year, unless there is a very marked change in the amounts of money appropriated in the two years.

The funds used by the Geological Survey in its Alaska work are provided in two items in the general act making appropriations for the Interior Department. One of these is " for continuation of the investigation of the mineral resources of Alaska, * * *." In the act for 1926–27 the amount specified in this item was $50,000, in the act for 1927–28 it was $60,000, and in the act for 1928–29 it was $64,500. Each of these appropriations was available immediately on the passage of the act in which it was contained.

The other item is an allotment made from the appropriation " for the enforcement of the provisions of the acts of October 20, 1914, October 2, 1917, February 25, 1920, and March 4, 1921, and other acts relating to the mining and recovery of minerals on Indian and public

lands and naval petroleum reserves, * * *." Appropriations carried under this item are available only during the specified fiscal year. In the fiscal year 1926–27 an allotment of $19,500 was made for the kind of work in Alaska that is described by the language of the act, and for the fiscal year 1927–28 the allotment was reduced to $14,500. The two types of work indicated by the different phraseology of the appropriation items will be described separately in the following pages and for convenience will be referred to briefly, as the work on mineral resources and the leasing work.

WORK ON MINERAL RESOURCES

PRINCIPAL RESULTS OF THE YEAR

The principal products of the Alaska work of the Geological Survey are the reports and maps that are based on original surveys or investigations. During the year eight Alaska reports have been issued by the Geological Survey, as follows:

Mineral industry of Alaska in 1925, by F. H. Moffit (Bulletin 792–A).
Administrative report, 1925–26, by F. H. Moffit (Bulletin 792–A).
Geology of the Knik-Matanuska district, by K. K. Landes (Bulletin 792–B).
The Toklat-Tonzona region, by S. R. Capps (Bulletin 792–C).
Geologic investigations in northern Alaska (1925), by Philip S. Smith (Bulletin 792–C).
Mineral resources of Alaska, 1925, by F. H. Moffit and others (Bulletin 792).
Mineral industry of Alaska in 1926, by Philip S. Smith (Bulletin 797–A).
Administrative report 1926–27, by Phililp S. Smith (Bulletin 797–A).

Fifteen reports have been completed by their authors and approved for editing or printing, as follows:

The Upper Cretaceous floras of Alaska, by Arthur Hollick, with a description of the Upper Cretaceous plant-bearing beds, by G. C. Martin.
The Skwentna region, by S. R. Capps (Bulletin 797–B).
The Sheenjek River district, by J. B. Martie, jr. (Bulletin 797–C).
Surveys in northwestern Alaska in 1926, by Philip S. Smith (Bulletin 797–D).
Aerial photographic surveys in southeastern Alaska, by R. H. Sargent and F. H. Moffit (Bulletin 797–E).
The Aniakchak district, by R. S. Knappen (Bulletin 797–F).
Geology and mineral deposits of southeastern Alaska, by A. F. Buddington and Theodore Chapin (Bulletin 800).
Geology of Hyder and vicinity, with a reconnaissance of Chickamin River, southeastern Alaska, by A. F. Buddington (Bulletin 807).
Geology and mineral resources of northwestern Alaska, by Philip S. Smith and J. B. Mertie, jr.
Mineral industry of Alaska in 1927, by Philip S. Smith (Bulletin 810–A).
Administrative report, 1927–28, by Philip S. Smith (Bulletin 810–A).
Notes on the upper Nizina River, by F. H. Moffit.
The Mount Spurr region, by S. R. Capps.
The Chandalar-Sheenjek district, by J. B. Mertie, jr.
Geology of the Eagle-Circle district, by J. B. Mertie, jr.

The reports listed below have been in course of preparation by their authors as time permitted but have not yet approached near enough to completion to warrant any definite statement as to when they are likely to be printed and available:

The Tertiary floras of Alaska, by Arthur Hollick.

The igneous geology of Alaska, by J. B. Mertie, jr.

The Alaska Railroad route, by S. R. Capps.

The geology and mineral resources of the Chitina quadrangle, by F. H. Moffit.

Geology of the Fairbanks-Rampart region, by J. B. Mertie, jr.

Geographic dictionary of Alaska, 3d edition, by James McCormick.

Several other manuscripts are in course of preparation by their authors, but so little progress has yet been made in getting them in shape for publication that they are not listed above.

Practically every one of the foregoing reports is accompanied by maps, the base of which has been made principally from surveys conducted by the topographers of the Alaskan branch. Among these maps the following were completed during the year by members of the branch under the general direction of R. H. Sargent or were issued by the Geological Survey either in a preliminary photolithographic edition or in complete form:

Topographic map of northwestern Alaska, a map compiled from all available sources but mainly from surveys by the Geological Survey and including many new topographic data, derived principally from recent plane-table surveys by Gerald FitzGerald; scale, 1:500,000. Not to be issued separately from the report on northwestern Alaska by Smith and Mertie now in preparation.

Topographic map of Aniakchak district, by R. H. Sargent; scale, 1:250,000. Issued as a free preliminary photolithographic edition and to be included in the report on the Aniakchak district, by R. S. Knappen, in Bulletin 797.

Topographic map of East Fork of Chandalar-Sheenjek region, by Gerald FitzGerald and J. O. Kilmartin; surveyed on scale of 1:250,000 but compiled on scale of 1:500,000. Not to be issued separately from report on Chandalar-Sheenjek region by J. B. Mertie, jr.

Drainage map of part of the Hyder-Ketchikan region, southeastern Alaska, compiled mainly from aerial photographs made by the Navy Department, at the request of the Geological Survey. Compilation made under direction of R. H. Sargent; scale, 1:250,000. Not to be issued separately from the report on aerial photographic surveys in southeastern Alaska by Sargent and Moffit in Bulletin 797.

Preliminary topographic map of part of the Mount Spurr region, Alaska, by R. H. Sargent; scale, 1:250,000. To be issued as part of the report on the Mount Spurr region by S. R. Capps. This map will probably later be combined with the results of other surveys and issued separately as a compiled map in a free photolithographic edition.

In addition to these more detailed maps the base map of Alaska on a scale of 1:5,000,000 was revised and brought up to date, and an edition was issued in 1927 for sale. This same map was also published during the year as an index map to show the progress of topo-

graphic mapping in the Territory, containing on the back a list of selected publications of the Geological Survey that describe the mineral deposits of Alaska and the features of its major geographic divisions.

Besides the official reports, several articles were prepared by the scientific and technical members or former members of the Alaskan branch for publication in outside journals, and a number of public lectures were given regarding the general work of the branch or some of its special features. Most of these were prepared unofficially but represent excellent by-products of the regular work and serve to reach special audiences not readily reached by the regular form of official publication. Among the articles of this sort may be mentioned the following:

Some post-Tertiary changes in Alaska of possible climatic significance, by Philip S. Smith, published in National Research Council Bull. 61, pp. 35–39, 1927.

The Alaskan branch of the Geological Survey, by Philip S. Smith, published in Mining Congress Jour., vol. 14, pp. 165–166, 1928.

Aerial surveys in southeastern Alaska, by R. H. Sargent, published in The Military Engineer, vol. 20, pp. 189–195, 1928.

Types of mineralization of southeastern Alaska, by A. F. Buddington, published in Econ. Geology, vol. 22, pp. 158–179, 1927.

Mineral deposits of the Hyder district, by W. B. Jewell, published in Econ. Geology, vol. 22, pp. 494–517, 1927.

The Mount Spurr region, Alaska, by S. R. Capps, delivered at meeting of Geological Society of America, Cleveland, December, 1927.

PROJECTS IN PROGRESS DURING SEASON OF 1927

Many of the results that the Geological Survey has achieved in Alaska may be expressed in terms of area covered. The following tabular statement indicates the areas covered by the surveys of different types. It should be noted that the areas are stated by field seasons and that no report is made for the field season of 1928, because that work is still in progress and the parties are all out in the field beyond reach of communication, so that the extent of the work can not be predicted. The absence of this information is relatively immaterial for all practical purposes, because for the field season of 1927 all of the area surveyed during that season is counted, even though part of the work was done during the fiscal year which ended on June 30, 1927. Therefore the areas surveyed in the fiscal year 1926-27 on projects that fall within the 1927 field season may be considered to offset the areas surveyed in the fiscal year 1927-28 that fall within the field season of 1928 but have been disregarded in the tabulation.

Areas surveyed by Geological Survey in Alaska, 1898–1927, in square miles

Field season	Geologic surveys			Topographic surveys		
	Exploratory (scale 1:500,000, 1:625,000, or 1:1,000,000)	Reconnaissance (scale 1:250,000)	Detailed (scale 1:62,500 or larger)	Exploratory (scale 1:500,000, 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)
1898–1926	75,150	163,255	4,277	55,630	197,400	4,066
1927		6,350			7,465	
Correction [a]	75,150	169,605	4,277	55,630	204,865	4,066
		300			300	
	75,150	169,305	4,277	55,630	204,565	4,066
Percentage surveyed of total area of Alaska	42.4			45.1		

[a] See text for explanation.

In the table given above only the net areas surveyed are listed in the appropriate columns and there is no duplication of area within the three columns relating to geologic surveys nor in the three columns relating to topographic surveys, though of course most of the areas that have been surveyed geologically have also been surveyed topographically. In other words, none of the area that is reported in the column of reconnaissance geologic surveys, for example, is also reported in the columns for geologic exploratory or detailed surveys. It is by no means unusual that in the course of later surveys it becomes desirable to revise the mapping or to resurvey on a large scale an area that had already been surveyed on a smaller scale. To avoid duplication in the statement of areas thus surveyed, it is necessary to deduct the proper amount from the area previously reported. This deduction for 1927 is shown in the line labeled "Correction" in the foregoing table. An area of 300 square miles previously covered by reconnaissance topographic and geologic surveying was resurveyed in 1927 with greater precision in the course of the regular work.

The necessity for resurveying in more detail some areas that were once mapped on a smaller scale is not due to faulty execution of the earlier surveys or to poor judgment in determining the scale first used. For many areas in Alaska exploratory mapping is all that may be warranted at first. As development of the areas progresses more specific information may be required and a more detailed survey made, and in an intensely developed mining camp only a most detailed map would furnish the desired information. To spend money on making detailed surveys everywhere would be a waste of time and funds far more reprehensible than the resurvey of different tracts here and there as changed conditions call for better maps.

Even in those areas where it is anticipated that more detailed maps may be required it has usually seemed best to make rapid and relatively inexpensive exploratory surveys so as to supply the most urgent demands for immediate information and then follow with the necessarily slower and costlier detailed surveys. This was practically the course adopted when the first stampede to Nome was in progress, for within two or three months of the return of the Federal geologist from this camp an exploratory map of the environs of Nome was published by the Geological Survey. This was succeeded the next year by reconnaissance field surveys of much of the region within 100 miles of Nome, and only a few years later detailed mapping was undertaken of the tracts adjacent to the richest mining camps.

At present the scale most generally adopted for Alaskan work is 1:250,000, or about 4 miles on the ground represented by an inch on the map, with a contour interval of 200 feet. That scale is adequate for general purposes, and by its use surveys can be performed expeditiously and very cheaply. It is obvious, however, that this scale is entirely inadequate for furnishing the more specific data required in many problems. Therefore, though the area that has been surveyed geologically is about 42 per cent of the Territory, only about 30 per cent has been surveyed on a standard that can be regarded as of reconnaissance grade. Unquestionably a greater number of detailed surveys should be made, but when it is realized that at the rate at which the work is now being done it will still be about 50 years before all the parts of the Territory that appear to show promise of containing deposits of minerals that may be of commercial value are surveyed even on a reconnaissance scale, it is evident that detailed surveys are practically out of the question unless more funds are made available.

The regions in which the surveys were made in 1927 as tabulated above were the Nizina district, of the Copper River region; the Sheenjek-East Fork of Chandalar district, in the northeastern part of the Yukon Basin in Alaska; and the vicinity of Mount Spurr, in the Alaska Range of southwestern Alaska. The work in the Copper River region was in charge of F. H. Moffit, who, with a small camp equipment and one camp hand, was engaged in general reconnaissance geologic studies directed toward obtaining additional data on the occurrence of the copper deposits of that region. In the course of the work much new geologic information was collected, and several areas that had been given but passing attention during the earlier surveys were more critically examined. Incidentally to the regular work of this party, the mining camps in the Nizina and Chitina Valleys were visited, and late information regarding recent developments of the mineral resources of the whole district was collected.

The work in the Sheenjek-East Fork of Chandalar region was a combined geologic and topographic reconnaissance survey in charge of J. B. Mertie, jr., geologist, with Gerald FitzGerald, topographer, and two camp assistants. In order to utilize most effectively the short open season the topographer left Washington in February and went by ordinary means of transportation to Fairbanks, where a dog team was purchased and a camp assistant hired. This advance party then traveled by dog team to Circle and thence to Fort Yukon where necessary supplies and equipment needed for the rest of the season were bought. From Fort Yukon this party early in April struck across country for Christian River and Arctic Village, on the East Fork of Chandalar River, having hired natives to help freight in some of the supplies. Surveys were started, and while sledding on the snow was still possible caches of supplies were distributed at selected points so that they would be available during the summer. With the break-up of the ice on the rivers, so that travel by regular lines of transportation could be resumed, the geologist went to Fort Yukon, where with a small load of supplies in a canoe, he and one camp hand started up Chandalar River. Travel upstream was extremely slow because of the high water in the river and speed of the current, but eventually junction with the advance party was made and the work carried on by the combined unit. During the subsequent work the men traveled entirely on foot, and the only means of transporting their supplies was on their own backs or on those of their dogs. With the approach of cold weather the party descended East Fork of Chandalar River in skin boats until they reached the point where the geologist's canoe had been left in the course of the upstream journey in the spring, and then the return journey to Fort Yukon was resumed and carried on as rapidly as stops necessary to make the desired surveys permitted. This work resulted in approximately 3,700 square miles of geologic reconnaissance mapping and 4,900 square miles of topographic reconnaisance mapping of hitherto unmapped country and, in addition, the resurvey, both topographic and geologic, of 300 square miles of country that had been mapped with less precision in an earlier year. A fuller account of this work and its results is given in another section of this volume.

The field project in the vicinity of Mount Spurr was conducted by a combined geologic and topographic party in charge of S. R. Capps, geologist, with R. H. Sargent, topographer, and four camp assistants. These surveys were essentially a continuation of those made to the north of Mount Spurr in 1926. Through the courtesy of the Alaska Railroad the party, with all its equipment, was landed at Trading Bay, on the west side of Cook Inlet, about the middle of June and thence proceeded westward, mapping the country

as it advanced. The coastal part of the region is exceedingly difficult to traverse because of the swampy lowlands, the large streams, and the tangle of trees and brush. In the mountainous part of the region the slopes are steep, the large streams are unfordable and flow with great velocity, and glaciers protruding from the valleys block the natural routes, so that passage is prohibited or made only after laborious effort. For instance, to build a trail passable for horses across one of the moraine-covered glaciers required the work of all members of the party for a time equivalent to the labor of one man for 20 days. Many interesting geologic and geographic facts were brought to light by the surveys of this party, besides the reconnaissance topographic mapping of 2,265 square miles of hitherto unmapped country and the reconnaissance geologic survey of 2,000 square miles. Among these items may be mentioned the discovery of a large river, numerous lakes, glaciers, mountains, and an active volcano. Unfortunately, the observations made by this party do not indicate that the region offers much promise of containing mineral deposits that are of present economic value. These facts, together with many more details concerning this region, are given in a separate chapter of this volume.

The only other field work in progress was a general reconnaissance of several of the placer-mining camps in Seward Peninsula and of a few of the camps along the western stretches of the Yukon and in the vicinity of the Alaska Railroad. This work, which was done by Philip S. Smith, does not lend itself to expression in terms of area and was undertaken mainly to provide information regarding recent mining developments and to permit the laying out of plans for future work, so as best to fit the needs of the industry. No separate report will be issued describing the results of that work, but many of the facts learned in the course of it have been incorporated in the chapter on the mineral industry of Alaska in 1927, which forms a part of this volume.

One other piece of field work which was done by the Geological Survey in Alaska, though not under the jurisdiction of the Alaskan branch or at its expense, comprised volcanologic studies conducted in the Aleutian Islands, Alaska Peninsula, and Kodiak Island by T. A. Jaggar, jr. This work was an outgrowth of studies that have been carried on for many years in the Hawaiian Islands and consisted in a general reconnaisance of the western part of the Territory and the installation of instruments that will record various seismologic data.

One of the most important pieces of work that was started in the winter of 1926–27 and will be continued for several years is the compilation and working up into maps of the aerial pictures taken

by the Navy Department, at the request of the Geological Survey, of a large part of southeastern Alaska. This work has been largely under the technical direction of R. H. Sargent, with the cooperation of F. H. Moffit in special phases of the work. As the preparation of the photographs for cartographic use and their assembly into large-scale drawings is a type of work which the topographic branch of the Geological Survey is especially well prepared to do, arrangements were made for this part of the work to be done by that branch, and Messrs. J. H. Wheat, E. A. Shuster, Eric Haquinius, and R. K. Lynt were largely responsible for the excellent results achieved. These assembly sheets were then adjusted by members of the Alaskan branch to correct their scale and position and compiled to form a drainage map of a tract of about 2,000 square miles that includes all of Revillagigedo Island and some of the near-by islands. This map is included in the report on that work, which forms another chapter in this volume. No relief is represented on this map, and it was expected that the next step in converting this drainage base into a complete topographic map would be field surveys. While the compilation work was in progress a specially devised machine known as an aerocartograph, for determining relief directly from photographic plates by means of stereoscopic principles, was made available to the Geological Survey for experimental use. It at once became evident that, if the machine could do the work successfully, it might be a better means of performing the next step of the work than ordinary field methods. Experiments were therefore begun, in cooperation with the topographic branch, to test the quality and cost of this method. The results are not yet available for analysis, but so far as the tests have gone they appear to justify belief that the results may compare favorably with these obtained by other methods. The topography of southeastern Alaska furnishes a very severe test of the applicability of the method, for the relief in that region is so strong that distortion of scale by aerial photographs is especially great. It offers many advantages over ground methods, however, because of the difficulty of traversing the high ridges, precipitous ledges, and almost impenetrable forest and brush clad slopes.

Another of the major projects of the Alaskan branch is the annual compilation of statistics of the production of all the mineral commodities from the Territory. The production is reported on the basis of the calendar year, but the work of canvassing the producers and assembling data goes on uninterruptedly; for example, the work relating to the production of minerals in 1927 started on January 1, 1927, and was not finally completed until June, 1928, and during part of that period it was carried on coincidentally with the canvass that

covers the production in 1928. The results of this annual survey of the mineral industry of Alaska are published as a separate section in this volume.

In addition to the office work that is an essential part of completing the current field projects, there are a number of former field projects on which the office work had not been completed during the season in which the field work was done. This work includes the critical reading of proof of reports that are being printed, the preparation of manuscript for copy, and even laboratory examination of some of the material collected. Considerable work of this sort was accomplished during the season, and as a result four reports that had been begun in earlier seasons were completed and are now in various stages of editing or publication. Those reports are as follows:

Geology and mineral resources of northwestern Alaska, by Philip S. Smith and J. B. Mertie, jr.

The Chandalar-Sheenjek district, by J. B. Mertie, jr. In Bulletin 810.

Geology of the Eagle-Circle district, Alaska, by J. B. Mertie, jr.

Geology of Hyder and vicinity, with a reconnaissance of Chickamin River, southeastern Alaska, by A. F. Buddington.

Geology and mineral deposits of southeastern Alaska, by A. F. Buddington and Theodore Chapin.

Some progress was also made during the year on the preparation of the reports listed on page 69 as still in the author's hands. Of these, the most active work was done on the "Igneous geology of Alaska," by J. B. Mertie, jr., and the "Geographic dictionary of Alaska," by James McCormick.

In all the office work on the technical reports the members of the Alaskan branch have received considerable assistance and advice from their associates in other branches of the Geological Survey. T. W. Stanton, G. H. Girty, J. B. Reeside, jr., Edwin Kirk, David White, and E. W. Berry, paleontologists, examined and reported on fossils collected in the course of the surveys. C. S. Ross made several tests of certain clay minerals, and the chemists of the geologic branch assisted in identifying and testing certain rocks and minerals from Alaska. The map editors of the topographic branch were also helpful in critically scrutinizing the maps that were in course of preparation to see that they conformed so far as practicable to the best Geological Survey standards.

PROJECTS FOR THE SEASON OF 1928

The projects for the field season of 1928 had been under way only a short time at the end of the fiscal year 1927-28, and as all the parties are out of touch with ordinary means of communication it is not practicable at this time to make any detailed statement of the work

actually accomplished or to give much more than an outline of the principal objects of the different projects. Six field projects were under way before the end of the fiscal year 1927-28 and will continue through the open season. These are as follows: Reconnaissance topographic mapping in the Ketchikan district, southeastern Alaska; detailed topographic mapping on Admiralty Island, southeastern Alaska; geologic reconnaissance mapping in the Nizina district of the Copper River region; geologic reconnaissance mapping in the upper Tanana and Yukon regions west of the international boundary; combined geologic and topographic reconnaissance mapping in the Alaska Range region of southwestern Alaska; and a general inspectional trip to check up recent mining activities in the Territory and to visit some of the field parties.

The reconnaissance topographic mapping in the Ketchikan district, which is in charge of R. H. Sargent, was planned primarily to furnish an adequate topographic map of this important district. This is part of the area of which the drainage map compiled from aerial photographs, noted on page 75, has already been prepared. In addition, therefore, to furnishing a useful map, this survey should supply many valuable tests by which to compare the accuracy and the relative cost of the base made by phototopographic methods and a map made by ordinary ground methods. Very probably the tests will show that certain combinations of the two methods may be desirable. At any rate, all the data obtained will be extremely valuable in determining the best method of conducting the work and will give information that must be available before further compilation of the thousands of photographs already in hand can be undertaken with assurance as to the results.

The other topographic work in southeastern Alaska is being performed by a Geological Survey topographer, R. K. Lynt, who is attached to a timber-cruising party of the Forest Service. The cost of this work is being borne entirely by the Forest Service through transfer of funds to the Geological Survey, and it is therefore not included in the table of expenditures given on page 80. The work is regarded by the Forest Service as an indispensable part of its activities in developing the paper-pulp industry in southeastern Alaska. Obviously adequate topographic maps are among the first things needed in laying out plans for the efficient and economical utilization of the natural resources of the region. The work will be done on a scale of 1:62,500, which will give a much more detailed map than most of the Geological Survey's maps of Alaska, except those of areas in the immediate neighborhood of the richest mining camps. The area covered will therefore probably be small.

The work that is being undertaken in the Copper River region has been so planned as to form a continuation of the work that has been in progress there during the last three seasons by amplifying the observations of earlier geologists and reviewing their conclusions from the vantage ground of the added experience and information which have accumulated in the score of years that have elapsed since the earlier work was done. This work is to be done by a party consisting only of F. H. Moffit and one camp assistant. These more thorough studies seem to be essential to working out the true geologic history of the region, and until that history is better understood no satisfactory conclusions can be drawn regarding the origin of the great copper deposits of the region or their probable extension into the regions where they are not yet known. In addition to these more strictly geologic duties Mr. Moffit will collect general information regarding all the mining activities in the Copper River region and will visit such operating mines as time and other conditions permit.

The reconnaissance geologic and topographic survey in the Alaska Range region west of Mount Spurr is perhaps the most difficult project that is being undertaken in the summer of 1928. This work is in charge of S. R. Capps, geologist, with Gerald FitzGerald, topographer, and four camp assistants. The plans of the party contemplate the hire of commercial airplanes to transport perhaps half a season's supply of food and equipment and the geologist, topographer, and one assistant to a lake discovered by the party during its work in the season of 1927, where work that joins with those earlier surveys will be started. In the meantime a pack train of 13 horses and 3 camp assistants, with supplies for half the season, will go overland to this lake by way of the trail made in 1927. When the two sections of the party have united, the work will be pushed westward as rapidly as possible, and the mountains will be crossed at a pass discovered and described by R. H. Merrill, one of the aviators whose headquarters are at Anchorage, who has made many flights across the range. The party will then carry their surveys into the valleys of the streams on the west side of the range that are tributary to Kuskokwim River. If other passes across the range are discovered in the course of this work, the party in the fall may cross back to the east side of the mountains by one of them; or, if not, it will return by way of its outgoing route and be picked up about the middle of September at Trading Bay by a boat sent out through the courtesy of the Alaska Railroad. The geographic results of this expedition should be of great interest, as the surveys will traverse many hundred miles of hitherto unexplored country that has long remained a blank area on maps.

North of Tanana River adjacent to the international boundary and extending westward for more than a hundred miles is a triangu-

lar tract of country that lies south of the Fortymile placer district. A reconnaissance topographic map of this tract was made a number of years ago, but the geology was not mapped. In this tract a geologic party in charge of J. B. Mertie, jr., and two camp assistants, with a small pack train, was to make geologic surveys during the season of 1928. A serious injury to one of the members of the party necessitated return to Eagle in order to send the man to the hospital. As the party was too short-handed to tackle the job without additional assistance and as in that remote region it might be impossible to obtain a packer without too much delay, the original plans were suspended and alternative plans suggested. At the time that this report is submitted selection between these various plans had not been made, but whatever the choice, it will involve carrying on some geologic work in the general tract between Yukon and Tanana Rivers. As is true with respect to most of Alaska, there is no trouble in finding problems that are worth while undertaking; the trouble lies in selecting the one which can best be done under existing conditions.

The only field work of a general character that is to be conducted by a member of the staff with headquarters in Washington during the season of 1928 is the customary broad survey of recent developments in the mining industry as a whole, with special visits to some of the more active mining camps or those that have not recently been visited by members of the Geological Survey. In the course of this work it is proposed to visit such of the Geological Survey parties and local offices as can be reached without too much delay, so as to be in close personal touch with the problems of each. This work will be done by the chief Alaskan geologist, who left Washington the last of June.

On July 1, 1925, certain of the work related to mining on the national domain that was formerly performed by the Bureau of Mines was transferred to the Geological Survey, and that part which related to Alaska was assigned jointly to the conservation and Alaskan branches. This arrangement worked satisfactorily until changes in the wording of the appropriation act for the work of the conservation branch made it desirable that work transferred from the Bureau of Mines relating to mineral leasing in Alaska should be differentiated from all work of a general investigative character in that Territory, by being paid for from separate appropriations. Therefore, in the appropriation act for 1928–29 the amount allotted for the strictly leasing work is still retained but the item for the other work, amounting to $4,500, has been added to the item for the investigation of the mineral resources of Alaska. Therefore, henceforth some of the work done

by the local offices of the Geological Survey in Alaska will be comparable with and included with work now done under this general authorization. Inasmuch, however, as the fitting of this work into the general scheme must be worked out gradually and as the general work performed by the Alaskan office of the Geological Survey is more fully discussed in a later section of this report, further discussion here or prediction as to the details of its work in relation to future investigations of mineral resources may be omitted. The administration of both the leasing and the mineral resources work conducted through the Alaskan office will continue to be in local charge of B. D. Stewart, and every effort will be made to give better and greater service to the mining industry through the change in fiscal responsibility.

EXPENDITURES

The funds available for the regular work by the Geological Survey on Alaskan mineral resources during part of the fiscal year 1927–28 were appropriated in the Interior Department appropriation acts for both the years 1927-28 and 1928-29. For the season of 1927 there was also available, until June 30, 1927, any unexpended balances from the appropriation for 1926–27. The amount appropriated in the act for 1926-27 was $50,000; in the act for 1927-28, $60,000; and in the act for 1928–29, $64,500. From the foregoing statements it is evident that for a large part of the time two appropriations were running concurrently. All the expenditures from these different appropriations have been properly accounted for, but the mere bookkeeping statement, as has already been pointed out, does not give any clear picture of the real conduct of the work. In spite of this difficulty of presenting a simple statement of the expenditures, the following generalized analysis of the actual expenditures from the appropriation for 1927–28, distributed among a number of major heads, may be of service:

Expenditures from funds appropriated for investigation of mineral resources in Alaska for the fiscal year 1927–28

Projects for season of 1927	$16,180
Projects for season of 1928	7,560
Administrative salaries from July 1, 1927, to June 30, 1928	3,250
All other professional and scientific salaries, July 1, 1927, to June 30, 1928	24,933
All other clerical and drafting salaries	5,888
Office maintenance and expenses	1,511
Bureau of the Budget reserve	678
	60,000

In the first two items in the foregoing table no charges are included for salaries of any of the permanent employees of the branch, as these are all carried in the three following items. Proper proportional charges for these services, as well as for the expenditures listed as office maintenance and expenses, might well have been included in these first two items, for practically every expenditure of the branch relates directly or indirectly to these projects. Thus the scientific and professional force is maintained solely to carry out these projects; the clerical and drafting force is maintained solely to help in preparing the reports and maps and in attending to the innumerable details connected with the business of properly conducting the projects; and all the office supplies and equipment purchased are really incidental to the task of carrying through the projects.

The expenditures for the projects of 1927, amounting to $16,180, included $6,323 for geologic and general investigations and $9,857 for topographic work, including the compilation of maps from aerial photographs. These figures are based on the assumption that in combined geologic and topographic parties the expense is divided equally between the two types of work. A similar analysis of the allotments for the season of 1928 from the funds for the fiscal year 1927–28, amounting to $7,560, shows $4,360 allotted to geologic surveys and $3,200 to topographic surveys.

The following tables prepared on a seasonal basis will make the true relation of the work to sources of funds more apparent:

Approximate cost and distribution of work by geographic divisions for the season 1927

Region or work	Appropriation for 1926–27		Appropriation for 1927–28		Total
	Expenses	Salaries	Expenses	Salaries	
Southeastern Alaska			$6,190	[a] $3,332	$9,522
Copper River	$575	$575	1,790	2,300	5,240
Alaska Range	1,800	1,445	4,782	6,633	14,660
Yukon	4,250	2,510	2,551	4,140	13,451
General	190		867	1,350	2,407
Mineral resources				[b] 2,133	2,133
Office work on former projects				4,043	4,043
	6,815	4,530	16,180	23,931	51,456

[a] Includes $1,000 of drafting salaries.
[b] Includes $1,683 for clerical salaries.

Approximate cost and distribution of work by geographic divisions for the season 1928

Region or work	Appropriation for 1927-28		Appropriation for 1928-29		Total
	Expenses	Salaries	Expenses	[a] Salaries	
Southeastern Alaska [b]	$1,900	$765	$4,700	$3,067	$10,432
Copper River	360	765	2,440	3,067	6,932
Alaska Range	2,600	1,445	5,800	6,230	16,075
Yukon-Tanana region	2,400	700	2,600	2,450	8,150
General			1,500	1,900	3,400
Mineral resources				[c] 1,750	1,750
Alaska district office					[d] 4,500
Office work on former projects				3,218	3,218
	7,560	3,675	17,040	21,682	54,457

[a] Exclusive of changes in rates of pay that will be made through operation of the Welch bill.
[b] Exclusive of $2,150 transfer from Forest Service for special work ($750, 1927-28; $1,400, 1928-29).
[c] Includes $1,300 for clerical services.
[d] Not separately apportioned for expenses and salaries but larger part for salaries and excluded except in last column.

The item of $3,250 for administrative salaries, shown in the table on page 80, includes only those salaries that are directly related to the administration of the work of the branch as a whole and does not include administration such as each party chief is called on to perform with regard to the unit under his charge. The amount expended for administration is exceedingly low, because much of the time of the principal administrative officer is spent on specific technical and related projects, which therefore bear their proportional share of the charge for salary. Although this practice undoubtedly makes the cost of administration low, it is not regarded as good, because it leads to the loss of real directive handling of many matters. With the present personnel of the Alaskan branch, made up as it is of men long familiar with the work and well qualified to solve many of the problems as they arise, the loss is not so apparent, but it is believed to be no less real.

The item of expenditures for clerical and drafting salaries covers part of the salary of the chief clerk, Miss L. M. Graves, and all of the salaries of a junior clerk and a draftsman. Part of the pay of the chief clerk is included in the item for administration, as during much of the field season she is in charge of the office. Three-quarters of the time of the junior clerk is devoted to the computation of the statistics of the production of minerals and work related thereto. During the year several clerks have handled this work; the present incumbent is Miss L. H. Stone. The drafting work of the branch is done by J. B. Torbert. The clerical personnel is entirely too small to handle the large volume of work expeditiously and thoroughly, but it has been cut down to the lowest limits so as to provide funds for the important field projects. The cut was first made to meet what was believed to be temporary curtailment of appropriations for the

branch as a whole, but as subsequently there has not been a return to the former rate of appropriation, it is probably not wise to hold this clerical force much longer at its present small size.

Only about 2½ per cent of the entire appropriation for Alaskan work was spent for items that are included in the table as office maintenance and expenses. This item does not cover purchases of supplies and equipment for the specific field projects, as those expenses are included in the allotments for the individual projects. It does, however, include the general repair of all instruments or the purchase of such instruments and material to be used in the field as are not directly assigned to an individual project. The repair and purchase of instruments and related supplies was the largest item of expense included under office maintenance and expenses and for the fiscal year 1927–28 amounted to slightly more than $590. The next largest item is for photographic and related work in developing and printing the many photographs taken in the field and making the necessary copies of field sheets and other cartographic data used in compiling the maps prepared in the branch for publication. Other items that are included under this head are telegrams; general office supplies, principally stationery used in the field; technical books; services rendered by other units of the Geological Survey, such as making thin sections of rocks and minerals needed in microscopic examinations and editorial inspection of maps and other cartographic data submitted for publication; and such other expenses as do not relate solely to a specific project.

LEASING WORK

As already noted, the leasing work in Alaska in 1927–28 was conducted from an allotment of $14,500 made from a separate item in the appropriation for the Geological Survey. In order that the policies and practices that have been developed for handling the much larger volume of similar work in the States should be maintained so far as they are applicable or should be appropriately modified to meet Alaskan conditions, and in order to utilize the existing agency that is charged with the administration of other Alaskan affairs for the Geological Survey, the general conduct of the leasing work in Alaska is shared between the conservation branch and the Alaskan branch. For the conduct of the field work local offices are maintained at Juneau and Anchorage, Alaska, in charge of B. D. Stewart, supervising mining engineer, with a staff of two other engineers, J. J. Corey and J. G. Shepard, together with the necessary clerical assistance.

The Territorial government of Alaska cooperates in certain of the work conducted under this allotment to the extent of furnishing

office facilities and clerical services at Juneau and supplying funds for such travel expenses as are performed in the interests of the Territory. This arrangement appears to be especially fortunate, for it eliminates much duplication that would be necessary if the Federal and Territorial Governments each maintained separate organizations to conduct the work desired by them, much of which is identical in character.

The primary purpose of these local offices in Alaska is to supervise the operations under the coal and oil leases issued by the Government. Nearly all the coal mining and much of the oil drilling in Alaska is done on public lands, held temporarily by private individuals or companies under leases or permits. The interest of the Government in these lands requires that the developments shall be supervised so as to insure that proper methods of extracting the minerals are employed, to prevent undue waste, and that the lives, health, and welfare of those employed in the work are properly safeguarded. The coal-mining developments are carefully supervised, and wherever possible assistance is given to the operators by outlining and putting into effect economical and safe development and mining programs. Special attention is given to the installation and maintenance of safe and efficient hoisting and tramming equipment; to mine ventilation; to the reduction of fire, explosion, and blasting hazards; and to the providing of adequate pillars in advance of all mining operations. During the current year there was one fatality in connection with coal mining—the second to occur during a period of six years. There was one accident which resulted in permanent, partial disability and four serious and four slight accidents that together caused the injured employees a total loss of time of 147 days. This record is exceedingly good, as on the average 95 men were employed throughout the year in coal mining and approximately 32,000 man-shifts were worked.

The care and maintenance of the coal properties and equipment that the Government owns at Eska, Chickaloon, Sutton, and Coal Creek devolves upon the members of this unit. All these properties are now idle, but the Eska mine and camp are kept in condition for immediate reopening in case an emergency should arise that might jeopardize the coal supply for the Alaska Railroad.

During the season of 1927 it was also practicable for the engineers attached to the Alaska local offices to conduct general investigations and be of assistance to miners in many of the districts of southeastern Alaska and in the country adjacent to the Alaska Railroad. Special mention may be made of the work of this kind done at Taku River, Windham Bay, Chichagof Island, Hyder, and Chickamin River, in southeastern Alaska, and at Willow Creek, in the vicinity of the Alaska Railroad.

Their familiarity with mining matters throughout many parts of the Territory and their availability for consultation enabled Mr. Stewart and his staff to give much valuable information and advice to many of the Federal and Territorial agencies in Alaska, including the Alaska Railroad, the Forest Service, the governor, and members of the Territorial legislature, and also to many individual operators and prospectors. The Alaska offices also act as local distributing offices for publications of the Geological Survey and assist in furnishing the main office at Washington with information on many phases of the mineral industry.

During 1927–28 the following was the approximate distribution of funds expended by this office:

Administrative salaries	$3,200
Other technical salaries	8,000
Clerical salaries	1,500
Field and office expenses	1,800
	14,500

Much of the time of the administrative officer in Alaska is given to field work and other duties not regarded as strictly administrative in character, so that only a proportional part of his salary is charged as a direct administrative expense and the rest is included in the item "Other technical salaries."

As has been indicated above, some of the activities of the members of the Alaskan branch who have been paid from appropriations for the leasing work can not strictly be considered as closely related to that work. To remove any possible difficulties that might arise from this condition, it was decided to carry the two different kinds of work in separate appropriations. In the appropriation act for 1928–29 $4,500 was added to the appropriation for the investigation of mineral resources of Alaska, to cover work of this type, and the appropriation for leasing work was reduced by a similar amount. Henceforth, therefore, the two kinds of work will be accounted for separately, and for the fiscal year 1928-29 the amount allotted to the strictly leasing work will be $10,000. No decided change is contemplated in the future handling of either phase of the work. The result of the separation of funds should be not only to get on a strictly accurate basis but also to give greater flexibility in the use of the funds appropriated for the general investigative work and place more definitely the responsibility for planning the use of those funds, so that they may be used to best advantage by removing duplication and causing closer coordination between all the units that have a share in fostering the mineral industry of the Territory.