

ALASKA'S MINERAL SUPPLIES.

By ALFRED H. BROOKS.

INTRODUCTION.

The principal industrial uses of minerals that are now in special demand or that may be in special demand during the war are described in the other papers of this series, which also treat of the reserves of these minerals within the United States proper. It is the purpose of this article to describe the available mineral reserves of Alaska. The Territory is now producing copper, gold, and silver in large quantities and making a smaller output of antimony, tungsten, tin, lead, petroleum, coal, etc. The output of some of these minerals could be increased without great delay. There is a possibility also that platinum, chromite, molybdenite, and other undeveloped mineral deposits known in Alaska may be able to furnish a supply during the present emergency.

For the purpose of the present paper Alaska's mineral reserves may be roughly divided into three groups. One group includes those so inaccessible at the present time as not to form a part of the available supply. This group includes a considerable part of the mineral wealth of the Territory but needs no discussion here. A second group includes the mineral reserves which, though now inaccessible and undeveloped, could be made available by one or two years of preparatory work. This group includes much of the coal and oil and a part of the copper, gold, and other metalliferous deposits. In general, most of the mineral deposits that are far from tidewater fall in this category, though exception must be made of some tributary to the existing railroads. Undeveloped deposits, even though they are located close to the seaboard, also belong to this group in so far as they require extensive mine equipment before productive operations can be begun. The third group, constituting the most available but much the smallest part of Alaska's mineral wealth, includes developed deposits lying on or near established transportation routes. In this group fall not only the deposits on tidewater and railroads but also those in inland districts that are accessible for a part of the year by river transportation.

TRANSPORTATION.

As the availability of Alaska's mineral wealth depends on transportation, a brief consideration of this subject is necessary. The entire Pacific seaboard of the Territory, with the exception of the upper part of Cook Inlet, is accessible to shipping throughout the year. Mineral deposits that lie on the Pacific seaboard can be made available to transportation without great delay. These include the copper deposits of Ketchikan and Prince William Sound and the gold and silver deposits of Juneau and other coastal districts. However, none of Alaska's mineral wealth is available to industry unless shipping is provided and the paths of commerce are kept open.

The lower Copper River basin is accessible by a railroad which skirts the southern margin of the Kotsina-Chitina copper belt. Unfortunately this railroad has no branches and there are but few wagon roads tributary to it. Therefore the utilization of the copper deposits that do not lie close to the line is dependent on construction, some of which would require much time.

The Government railroad extending inland from Seward is at present in two unconnected sections. One leads from Seward to Turnagain Arm, and the other northward from Anchorage to the Matanuska coal field. The port of Anchorage is closed by ice for several months annually. The work of connecting these two sections is under way but can probably not be completed in much less than a year. Therefore the Anchorage section is now available for transportation only during a part of the year.

The conditions in the rest of Alaska are still less favorable to rapid development. Seward Peninsula is accessible to ocean boats from about June to October, and the inland mining districts depend for transportation on the navigation of Yukon and Kuskokwim rivers and their tributaries. These waterways are open to steamers from about June to October. The Fairbanks district is, however, also accessible by wagon roads leading from the Pacific seaboard at Valdez and from the Copper River Railroad at Chitina. In case of emergency some of its minerals could be sledged out during the period of closed navigation. In the winter of 1915-16 considerable tungsten ore (scheelite) was brought out by sleds.

The transportation conditions involve heavy freight charges, and therefore certain minerals—for example, antimony—can be produced and shipped out only during a period of great demand and attendant high prices. The high cost of transportation also makes for high operating cost, which is likewise a controlling factor in production. On the other hand, mining along the Pacific seaboard does not necessarily involve higher operating costs than in the States—in fact, the costs are less than in many mining districts of the Cordilleran region.

In 1916 mining operations in Alaska were much hampered by the lack of shipping. This was especially true of the copper-mining industry. Had there been ships to transport the ore and smelters and refiners to reduce it, the copper output from Ketchikan and Prince William Sound would have been very much larger than it was.

GOLD AND SILVER.

A large increase in Alaska's gold production under present conditions is hardly to be expected. The present high prices affect gold mining more adversely than any other industry, for they involve a relative decrease in the value of the product. The constantly increased cost of equipment, supplies, and labor maintained during the war make gold-mining ventures less attractive to capital than under ordinary conditions. The most promising field for an immediate increased production of gold is in the placer districts. Yet most of these lie far from the coast or in regions difficult of access. Moreover, the great reserves of auriferous gravels on which the future of the industry depends have a low gold tenor, and their profitable exploitation depends on the installation of machinery—a matter that involves much time and capital. Hence, even public-spirited operators who might be willing, for the sake of increasing the gold output, to operate at the lesser profit which war-time conditions involve could hardly bring an enterprise to a productive basis in less than two years. It is not intended by this statement to imply that the production of placer gold will fall off while the present economic conditions prevail, but only to point out that a greatly increased output can hardly be expected. There are, however, a number of large placer-mining plants that have been under construction for a year or more, and some of them may yield gold this year to help swell the total. Moreover, in many Alaska districts there are rich deposits that are being mined by simple methods and will continue, as in the past, to be the source of a large part of Alaska's placer-gold output. In 1916 the value of the placer gold produced in Alaska was \$11,140,000; in 1915, \$10,480,000. It is not possible to forecast what the output of 1917 will be, but there is no reason to believe that it will materially decline.

The conditions described above as affecting gold-placer mining are still more potent in gold-lode mining. The mining of siliceous auriferous ores had been on the increase for a number of years until 1916. The value of the gold output from this source was \$5,912,736 in 1916 and \$6,069,023 in 1915. Of the total output in 1916 over \$4,500,000 came from the large low-grade mines of the Juneau district. These great enterprises, which depend for their economic success on the handling of a large tonnage at a small margin of profit, will be more directly affected by the present adverse economic conditions than the smaller mines working on ores of high value. The recent

serious accident to the great Treadwell group of mines, details of which are lacking at this writing, may reduce the gold output of the Juneau district. It is probable that there will be an increased gold output from the small mines of the Willow Creek and Prince William Sound districts, but this will for the present not be sufficient to offset the decrease in the Juneau output. Therefore the present outlook indicates that the production of lode gold in Alaska will be less in 1917 than it was in 1916.

Alaska's silver output, which in 1916 amounted to 1,379,261 ounces, valued at \$907,554, has practically all been won incidentally to the mining of gold and copper. Though the Territory contains some argentiferous galena deposits, referred to below, these are almost undeveloped. Of the silver produced in 1916 over 1,200,000 ounces came from the copper lodes. With the expected increase of copper mining during 1917 the output of silver will also increase.

COPPER.

The increase in the output of copper due to high prices for that metal is the most striking feature of Alaska's recent mining history. In 1914 the copper output from Alaska mines was 21,450,000 pounds; in 1915, 86,500,000 pounds; and in 1916, 119,600,000 pounds. In 1916 eighteen copper mines were operated in Alaska, but much the larger part of the output came from three large mines—two in the Copper River region and one on Prince William Sound. It is unfortunate that the maintenance of a large copper output from the Territory is so greatly dependent on the continued operation of two large and very rich mines in a single district, for if, by any accident to mining or to transportation, operations and shipments from this district should be interrupted, there would be a tremendous curtailment of the annual copper yield. The maintenance of Alaska's copper output is of importance under present conditions, and every encouragement should be given to the development of other deposits, especially those of the Pacific seaboard. A large number of mines, especially on tidewater, would give far greater assurance of a steady production of copper than the present conditions. The small copper producers of Prince William Sound and the Ketchikan district met with most discouraging conditions in 1917. In spite of the high price of copper they were unable to obtain either sufficient transportation for their ore or any assurance that the smelters would handle it if it could be shipped.

The two large mines in the Chitina belt are probably now being worked to the limit of their capacity. The full development of the only other productive mine in this district is hampered by lack of transportation; up to the present time its shipments have been made only in the winter. There are in this general region other properties

which, if connected with the Copper River Railroad by aerial trams and spurs, would ship ore. Most of these have not yet been developed sufficiently to reveal any very large tonnage of ore. Any census of Alaska copper reserves that might be made available during the next two years, however, must take these into account. The best hope of an immediate increase of the copper output is in the development of the lodes along the Pacific seaboard. In 1916 there were nine productive copper mines in the Ketchikan district and six on Prince William Sound. In these two districts there are at least a dozen other copper properties which have been sufficiently developed to justify the hope that they could be brought to a productive basis within the present year. These properties, together with the fifteen that made an output in 1916, if developed to their full capacity, would probably increase their output of 1916 by 10,000,000 to 12,000,000 pounds in 1917. Such an increase can be brought about only, first, if copper remains at a high price, and, second, if shipping for transporting the ore and smelters for reducing it are available.

To sum up the copper-mining situation, there is good reason to believe that if the high price is maintained the Alaska copper output in 1917 will be larger than that in 1916. The best hope for an immediate and considerable increase is by providing better shipping and smelting facilities for the mines of the Pacific seaboard. Should the war make larger demands for Alaska copper, it is probable that within two years a still greater increase in the copper output could be brought about by providing means of transportation from such deposits of the Kotsina-Chitina district as are now unproductive.

TIN.

Placer tin has been mined in the York district of Seward Peninsula since 1902. The total tin output of Alaska up to the end of 1916 was 767 tons of metallic tin. This total includes a small output of lode tin from the York district and also some placer tin from the Hot Springs district, in the Tanana Valley. In the Hot Springs district the tin has been won incidentally to the placer mining of gold, and the first shipment of stream tin from this district was made in 1911. Alaska produced 139 tons of metallic tin in 1916 and 102 tons in 1915. The present urgent demand and consequent high price of tin will undoubtedly lead to a greater output in 1917. Most of the tin now produced in the York district is the product of two dredges. There are a number of tin-bearing placers in this field, but even at present prices they can probably not be profitably exploited except by the use of dredges. As it would take a year to install a dredge, there is no hope of making a notable increase this year in the production of placer tin from the York district. There are a number of tin lode prospects in the York district, from two of which some production

has been made. In 1917 a mill was installed at one of these mines, and its output should help to swell the tin production during 1917.

The York tin mines are worked only during the summer, and the shipping season is limited from about June to October. The uncertainty of the present means of ocean transportation for this field is shown by the fact that a large percentage of the tin produced there in 1916 failed to reach the market and can not now reach it until midsummer of 1917.

Stream tin is rather widely distributed in the Hot Springs district, but as yet few of the placer miners make any effort to save it. If they could be induced to save and ship their stream tin it might materially increase the total output from the Territory. Placer mining in the Hot Springs district can be carried on for about three months in summer. Transportation is afforded by river, and the open season of navigation is from June to October.

It is probably safe to state that the Alaska tin production of 1916 could be doubled in 1917—that is, it could be brought up to nearly 300 tons of metallic tin. In view of the great need of tin in the United States it is hoped that the Alaska miners will make every effort to increase their output.

TUNGSTEN.

Though scheelite has long been known to occur in the placers of the Fairbanks, Iditarod, and Nome districts, it has only recently been found in lodes. In 1915 a scheelite-bearing lode was opened near Fairbanks, and some shipments of ore were made by parcel post brought to the coast by the winter mail. Other scheelite-bearing deposits were developed in Fairbanks and also in the Nome district during 1916. Meanwhile some of the operators of dredges in the Nome and Iditarod districts began to save scheelite from the concentrates.

Wolframite and scheelite occur in some of the tin ores of the York district, Seward Peninsula, but these deposits have been only slightly developed. Wolframite has also been found in association with some of the gold placers of the Yukon-Tanana region. In 1916 a little wolframite won from the placers was shipped from the Birch Creek district.

In all, about 47 tons of tungsten-bearing mineral concentrates, chiefly scheelite, carrying from 60 to 65 per cent of WO_3 , were shipped from Alaska in 1916, about 30 tons of which came from Seward Peninsula. All of this output came from districts that are open to transportation during only a part of the year. The scheelite lode deposits that have been opened could probably double their production in 1917 if high prices are maintained and if there is assurance of a market for the product. To the lode production could be added the

scheelite obtained from placer mining, notably from dredging, if operators will save the concentrates. It is probable, therefore, that the summer mining operations of 1917 could be counted on for 130 tons of scheelite concentrates.

ANTIMONY.

Stibnite, as has long been known, is very widely distributed in Alaska, but it is only the stimulation of war prices and demand of the last two years that has caused any of this ore to be mined. In 1915 the output of stibnite ore was 833 tons; in 1916 it was 1,458 tons. Most of this ore came from the Fairbanks district, where half a dozen mines have been developed on a small scale. Some ore has also been shipped from two mines in the Nome district. Transportation from both these districts is limited to the open season.

The most accessible of Alaska's antimony lodes is one located in the Ketchikan district, where a little development work has been done. Some stibnite-bearing lodes are known on Prince William Sound, on Kenai Peninsula, and in the Nizina district, but so far as has been ascertained none of these have been sufficiently developed to determine whether the ore occurs in commercial quantities. If the demand for antimony ore continues, these deposits are worthy of careful prospecting, for they are accessible to transportation throughout the year.

In an emergency demand for antimony and with the attendant high prices the stibnite mines of Fairbanks and Nome should be able to increase their annual output at once to, say, 4,000 tons. This ore, however, could be shipped only during the summer. The output might be very greatly increased if some of the stibnite deposits on or near the Pacific seaboard were found to be large enough for profitable exploitation.

LEAD.

The total lead output of Alaska mines is 2,080 tons, of which 820 tons was produced in 1916, 437 tons in 1915, and 28 tons in 1914. Most of the lead has been recovered from gold ores. The large increase in output in the last two years is due to the development of the large lode mines of the Juneau mainland belt, which carry considerable galena. Some lead was also recovered from galena ores shipped from several localities in Alaska. Galena-bearing lodes occur in the Ketchikan and Wrangell districts of southeastern Alaska, and these afford a possible field for comparatively rapid development. A test shipment of galena was made in 1916 from the Fairbanks district. The ore also occurs in the Fish River basin of Seward Peninsula and has been reported in the Broad Pass region, in the Mentasta Pass region, in the Koyukuk district, and at numerous other localities. Few if any of these occurrences are near enough to

transportation to justify the hope that they could be made to contribute to the lead supply, even if the ore bodies are large enough to justify development. Galena ores rich in silver would, of course, bear heavy transportation charges. At best, however, they would not be expected to contribute enough lead to increase Alaska's total output materially. Therefore the continuation or increase of Alaska's present lead output is dependent on the operations of the low-grade auriferous lode mines of the Juneau district. It is not unlikely that similar deposits may be discovered in other parts of southeastern Alaska, but it will require many years of development work to bring them to a productive basis.

PLATINUM.

Small quantities of platinum have been found in a number of placer districts in Alaska, and traces of this metal occur in the copper ore of the Goodro mine, in the Ketchikan district. In 1916 the Alaska placer miners began to pay attention to the finding of platinum, and as a result about 10 or 12 ounces was recovered, chiefly from the placers of the newly developed Koyuk district, in the southeastern part of Seward Peninsula, also from Bear Creek, in the Fairhaven district of Seward Peninsula, and from Slate Creek, in the Chistochina district of the upper Copper River basin. It is not known that there are in any of these districts placers which could be profitably worked for their platinum content alone. The present high price of the metal will stimulate the prospectors to give special heed to the platinum concentrates, and undoubtedly there will be a larger production in 1917 than there was in 1916.

Platinum has also been found on Boob Creek, in the Tolstoi region of the Innoko district. Prof. Herschel C. Parker reports considerable platinum in the gravels of Kahiltna River. His information is based on drilling of gold placer ground with a view to installing dredges. Small quantities of platinum are also reported in the beach placers of Lituya Bay and of Red River, Kodiak Island. Less definite information has been received of the presence of platinum in some of the creeks of Kenai Peninsula.

Those of the deposits above reported that occur in shallow placers, perhaps all except the one on Kahiltna River, can be developed rapidly by use of the ordinary manual methods of mining. The Kahiltna River deposit will require the installation of a dredge, which Prof. Parker reports he is proposing to put in but which can not be ready for operation until the summer of 1918.

The outlook for some platinum production from Alaska during the next two years is hopeful, though as yet there is not a single mine in the Territory that has produced more than a few ounces. More definite information about the occurrences mentioned will be available in the fall of 1917, after certain field investigations are completed.

CHROMITE.

It has long been known that some chromite deposits occur on the southwest end of Kenai Peninsula. Two localities of this mineral are known, one near Port Chatham and the other about 7 miles inland from Seldovia. It is not known whether these deposits are of commercial size, but they are to be examined this summer. Their association with ultrabasic rocks suggests that they might also carry platinum. Some small veins carrying chromite have been found in the Tolovana district of the Yukon-Tanana region. The above meager facts indicate that there is no certainty that Alaska deposits could be depended upon for chromite in the immediate future.

NICKEL AND COBALT.

A copper lode recently discovered near Pinta Cove, on the west side of Chichagof Island, in the Sitka district of southeastern Alaska, is reported to carry nickel and a little cobalt. A specimen of ore which carries considerable nickel has been received from George R. Goshaw, who reports that it was taken from a lode not far from Spirit Mountain, in the lower basin of Copper River, but the exact locality has not been learned. Some years ago a copper-bearing lode which was reported to carry nickel was found near Canyon Creek, in this same general region. This locality is about 12 miles from Spirit Mountain and may be the one from which the specimen sent by Mr. Goshaw was obtained. Little is known about the geology of these localities where nickel has been reported or the extent of the deposits. They are to be investigated this summer. Both are accessible throughout the year, one being on tidewater and the other probably not over 10 miles from the railroad.

QUICKSILVER.

Quicksilver-bearing lodes occur in the lower Kuskokwim region and in the adjacent parts of the Yukon basin. The most accessible of these deposits and the only ones that have been prospected are on or close to Kuskokwim River. The best known of these prospects is the Parks property, on the west bank of the Kuskokwim about 330 miles from its mouth. Here some cinnabar ore has been retorted, and the quicksilver thus produced was sold to the placer miners of Seward Peninsula. There has been some prospecting of other quicksilver deposits in this general region, but so far as known no properties have been sufficiently developed to give assurance of a definite output. The deposits could be made productive with little equipment, but there is no information on which to base an estimate of their possible quicksilver yield.

The lower Kuskokwim Valley is readily accessible during the summer. Small ocean vessels can ascend the Kuskokwim as far as Bethel, and river steamers fully 500 miles farther.

MOLYBDENITE AND BISMUTH.

Molybdenite-bearing lodes are reported to have been found near Skagway and on Lemesurier Island, in southeastern Alaska; on Canyon Creek, a tributary to the upper Chitina River, which flows into Copper River; and in the Willow Creek district. It is not known whether any of these lodes are large enough to permit commercial development. The molybdenite deposits of southeastern Alaska and of the Willow Creek district are readily accessible throughout the year. No molybdenite has been produced in Alaska.

A small bismuth-bearing vein has been found on Charley Creek, in the Nome district, but is undeveloped. Bismuth has been found in gold prospects at two localities in the Tanana Valley—on Eva Creek, a tributary to Totatlanika Creek, and on Melba Creek, in the Fairbanks district—but nothing is known of the extent of these deposits. There has been no production of bismuth in Alaska.

IRON.

Iron ores are rather widely distributed in Alaska. Magnetite occurs in association with some of the copper deposits of the Ketchikan and Iliamna districts and also in a deposit near Haines, in southeastern Alaska. In the Lake Clark district there is a vein of specular hematite carrying some copper. Considerable bodies of iron ore have been found in the Nome district. Most of these deposits are undeveloped. If there were a demand for iron on the Pacific coast, some of the iron ores could be made available in a comparatively short time.

COAL.

By G. C. MARTIN.

The coal of Alaska, which occurs in many parts of the Territory and which includes many grades ranging from lignite to anthracite, should be grouped in a consideration of possible development into the fields that are or can be made immediately accessible and the fields that are remote or inaccessible. A further grouping should be made on the basis of the adaptability of the coal for special uses.

The coal fields that are now or can soon be made accessible include those of the Pacific seaboard and the Nenana field, which will be accessible both to the coast and to the placer camps of the Tanana Valley when the Government railroad is completed. The other coal fields of the interior and northern part of Alaska can be developed in the near future only for minor local use. The accessible coal fields of the Pacific seaboard include the Matanuska field, with high-grade steam and coking coal and low-grade bituminous coal, which is now

accessible by the Matanuska branch of the Government railroad; the Bering River field, with high-grade steam, smithing, and possibly coking coal, as well as anthracite (mostly crushed), which can be made accessible by the completion of a short railroad, now under construction;¹ the Cook Inlet field, with lignite, which is situated on tidewater and is therefore now accessible; and several small fields in southwestern Alaska, with coal of various grades ranging from lignite to bituminous, possibly including some coking coal, some of which are on tidewater and now accessible and the rest of which could be made accessible by the construction of short railroads. Of these coast fields only Matanuska and Bering River contain large amounts of coal of the quality for which there is likely to be an immediate demand. The Nenana field, in the interior, although containing coal of lower grade (lignite), will probably soon be developed on a small scale because of urgent local demand.

The possible immediate markets for Alaska coal are indicated below:

Eastern Matanuska (Chickaloon) field:

Coke for Alaska smelters.

Coke for Puget Sound (if relative costs permit competition).

Bunker coal (Alaska steamers).

Navy coal (if relative costs permit competition with coal from Bering River and Chesapeake Bay).

Smithing coal (local and export).

Western Matanuska (Moose and Eska Creek) field:

Locomotive fuel ² (Chickaloon to Seward).

Local power (Willow Creek mines).

Domestic fuel in Anchorage, Seward, Valdez (?), and Cordova (?).

Locomotive fuel on Copper River Railroad (if Bering River branch is not built).

Nenana field:

Locomotive fuel (Matanuska Junction ³ to Fairbanks).

Power and thawing (mines in Tanana Valley).

Domestic fuel (Tanana Valley).

River-boat fuel.

Bering River field:

Locomotive fuel (Controller Bay Railroad).

Locomotive fuel on Copper River Railroad (if Bering River branch is built).

Coke for Alaska smelters (if competition with Matanuska coke permits).

Bunker coal (Alaska steamers).

Navy coal (if competition with coal from Chesapeake Bay permits).

Smithing coal (local and export).

Domestic fuel in Cordova and Valdez (if Bering River branch is built).

¹ The railroad that is now under construction from Controller Bay will, according to present information, reach only the patented coal claim in the eastern part of the Bering River field and will not furnish access to the high-grade steam and coking (?) coal in the central and western parts of the field. There would be no difficulty, however, in extending the railroad into those areas.

² The lower-grade coal from the western part of the field should be used for locomotive and power-plant fuel because the high-grade (Chickaloon) coal is too valuable for this purpose.

³ Nenana coal should be used on the greater part of the railroad (rather than the better and nearer Matanuska coal) because the heavy freight traffic will be northbound, leaving southbound empties available for hauling coal.

None of the uses indicated above calls for a large quantity of coal, and there will probably be no physical difficulty in developing the mines, within a few months after the time when transportation is available, to a sufficient extent to supply the present demands. In fact, it is probable that the most serious difficulty will be that of finding a sufficient market to justify the opening of the mines on a scale large enough to permit the coal being mined and shipped at a profit.

It is public policy rather than any reasonable hope of even moderate private profit that calls for the development of the Alaska coal fields on a large scale. The reasons for the present urgent need of developing the coal fields are as follows:

1. To provide fuel for the Alaska railways.
2. To furnish the Alaska railways with the freight without which they can not be operated save at a loss.
3. To furnish cheap fuel for the Alaska mines and towns in order that the production of other necessities may be encouraged.
4. To furnish bunker coal for Alaska steamers, so that they may not be compelled to use cargo space in carrying fuel for the return voyage (on the assumption that other demands for California oil will be so great that the Alaska steamers can advantageously use local coal rather than California oil).
5. To provide coke for local smelters so that cargo space may be saved by shipping metal rather than ore and that the development of new metalliferous mines may be encouraged.
6. To provide a quickly accessible reserve of high-grade fuel for the Navy or for other urgent need.

In conclusion, although there are no difficulties (given transportation and a market) that will prevent the quick development of the few small mines that can supply the demands that can be foreseen at present, the opening of the coal fields on a large scale is quite a different problem. The development of a large coal mine requires considerable time, even under favorable circumstances. In Alaska it is not merely a simple matter of expanding the workings to a point where there is room for enough miners to produce the required tonnage. This must be done, but first there must be a slow process of prospecting, drilling, and experimental mining in order to determine where the coal for a large mine is to be found and what the method of working the mine is to be. These problems have not yet been solved in the Alaska coal fields, and consequently there is no assurance that a large tonnage of high-grade coal could be quickly obtained for the Navy or for other emergency use. This condition, in the writer's opinion, requires not only that the small mines which can supply the present demand should be opened at once, but that every possible encouragement should be given for the development of the Alaska coal industry.

PETROLEUM.

Petroleum has been found in four districts along the Pacific seaboard. These are the Yakataga field, which is comparatively inaccessible on account of the lack of a harbor; the Katalla field, which is the only one that is producing oil and which can be made tributary to Controller Bay without great expense for construction and without great loss of time or can be reached by an easily constructed 60-mile branch from the Copper River Railroad; the Iniskin Bay field, on Cook Inlet; and the Cold Bay field, on the Alaska Peninsula. The last two are tributary to harbors that are free of ice throughout the year.

Drilling has not been sufficient in the partly developed field at Katalla to determine the presence of any considerable pools. The rather wide distribution of seepages and the results of the drilling of some 25 holes indicate that oil might be obtained in this field in a much larger quantity than that now yielded by the five or six wells that are being pumped. The petroleum from this field, like that from other Alaska fields, is a high-grade refining oil with a paraffin base. As oil of this grade is now in great demand for the manufacture of gasoline, and as the supply under war conditions may not meet the needs, every encouragement should be given to those who are willing to spend the money necessary for the drilling. Unless a large pool is struck early in the operations, which is not believed probable, it will take at least a year to drill a sufficient number of holes to assure any considerable production. This statement is based on the records of the existing wells. The producing wells are shallow and the oil has to be pumped. To meet the present emergency it will probably be best to drill a large number of shallow wells rather than to attempt to test the ultimate possibilities of the field by sinking deep holes. The above statement of conditions and possibilities in the Katalla field probably holds, in general, for the Iniskin and Cold Bay fields. In these fields, however, there has been very little drilling and no production. The geologic structure of these fields, so far as known, is simpler than that of the Katalla field, and it is therefore easier to direct operators to the most probable locations of possible pools.

The Alaska oil lands were withdrawn from entry in 1910. A small area of oil land has been patented in the Katalla field, and other claims are still pending. If the Alaska oil fields are to be regarded as a possible source for refining oil during the present emergency, immediate action should be taken by which operators can obtain freehold or leasehold titles to sufficient areas to justify the large expenditures necessary for drilling.

MISCELLANEOUS MINERALS.

There is one gypsum mine on the east side of Chichagof Island, in southeastern Alaska, but no information is at hand as to the size of this deposit, and no other gypsum has been found in the territory.

Graphite deposits of commercial quality and extent occur on the north side of the Kigluaik Mountains, in Seward Peninsula. Two of these deposits have been opened and have yielded some graphite, though none has been shipped. Graphite from these deposits can be shipped only during the open season.

Two barite deposits are known in Alaska, one in the Wrangell district and one in the Ketchikan district. Both are on tidewater, accessible throughout the year, and are capable of rapid development. Some small shipments have been made from one of these deposits.

Sulphur is known to occur on Makushin Volcano, Unalaska Island, at the east end of the Aleutian chain. This deposit has been but little prospected, and its extent is unknown. Makushin Volcano is about 5,700 feet high, and its summit lies about 6 miles from Makushin Bay, the nearest harbor. Unalaska Island is unforested, and all timber for use in construction would have to be brought from a distance. This sulphur, even if it proves to be present in commercial quantities, could not be made available without much preparation for mining. Sulphur deposits are also reported on other volcanoes of the Aleutian chain, notably on Akutan Island. The above facts indicate that Alaska sulphur could not be made available for any immediate demand.