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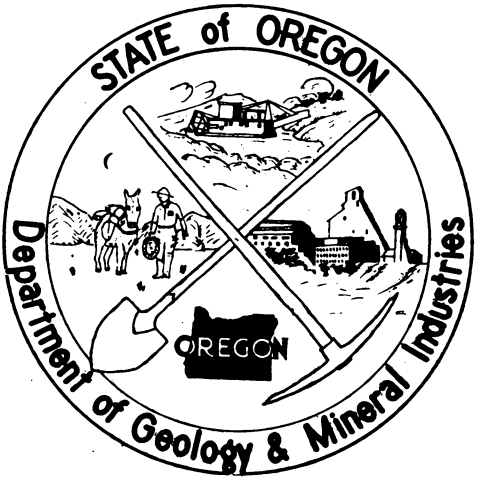

STATE DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES
Head Office: 702 Woodlark Bldg., Portland 5, Oregon

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NORTHWEST SOURCE OF ALUMINA VITAL

by

Mason L. Bingham
Vice-President, Columbia Metals Corporation

One of the basic problems to be solved if the Northwest is to retain a light metals industry is a competitive source of alumina. As most people know, plants for the production of aluminum metal in this country use, as a raw material, alumina (aluminum oxide) produced from high-grade bauxite by means of the Bayer process. The aluminum plants in the Northwest must, under present conditions, transport alumina across the country from these Bayer plants located in the east.

With the coming of the submarine war and the shortage of other transportation, attention was turned to the utmost utilization of domestic sources of bauxite. The result has been the virtual exhaustion of our domestic resources of bauxite suitable for treatment by the Bayer process. This has left us in the position of depending on overseas transport for bauxite. The alternative is to develop and apply processes to extract alumina from high silica bauxite or high alumina clays.

If the Northwest is to depend on bauxite, then of necessity a dependable source must be controlled. In this hemisphere, the principal known deposits are in Dutch and British Guiana. For a number of years, bauxite has been transported across the Carribean and treated in this country to produce alumina. Submarine sinkings brought home forcibly the extreme hazard of depending on foreign bauxite for production of aluminum in time of war.

Another question that arises is the economy of transporting bauxite to a Bayer plant located on tidewater in the Northwest. If high-grade bauxite is to be so transported, it would appear to be expedient to look for sources in the Pacific rather than to depend on those in the Carribean area. It was reported before the war that a substantial deposit(or deposits)of high-grade bauxite was known to occur in the Carolina Islands, and was operated by the Japanese. Inasmuch as Japan still controls a portion of these islands (August 1944), some time may elapse before this source of bauxite may be evaluated in relation to a Bayer plant located in the Northwest. Other possible sources are in the Dutch East Indies. Before the war, high-grade bauxite was mined at Bintan Island near Singapore and shipped to Japan.

It appears from the above that, if the aluminum reduction plants are to be operated economically in the Northwest and with national security in mind, other possible sources of supply are of first importance and should be investigated.

It is known that there are substantial deposits of aluminous clay in the states of Oregon, Washington, and Idaho. These have been explored and drilled to a limited extent by the U.S. Bureau of Mines and the three state mining departments. A substantial tonnage, estimated to be more than 100 million tons, is indicated. The average available alumina content is about 30 percent. However, the economics of the deposits and the metallurgical problems involved have not been fully explored. In furtherance of determining these factors, the Defense Plant Corporation is building a clay treatment plant at Salem, Oregon. The size of the plant is such as to preclude a commercial operation, but it is expected to show whether or not these clays can be treated economically. Allowing for the difference in available alumina as between clay and high-grade bauxite, it is estimated that a delivered price of clay at the plant of $3.50 to $4.50 per short ton would be competitive. In addition, there is the possibility of developing by-products that might increase the operating profit.

It is apparent that, if this process proves economic, the benefit to local areas would be much greater than if bauxite were mined abroad and merely treated at a Northwest tidewater plant. It is estimated that about 75¢ per ton of the cost of clay would go for direct labor in mining and transportation. An additional reason for the furtherance of clay developments is that of national defense. It is hardly likely that this country will ever again depend entirely on overseas shipment for supplies of such vital materials as aluminum and rubber if it can be avoided.

With the concentration of the aircraft industry on the Pacific Coast, an uninterrupted supply of raw material is vital. Prudence would therefore urge that a domestic source of alumina be developed, and the aluminous clays of the Northwest seem to be one likely source of raw material.

A third source of alumina is a deposit of bauxitic iron ore that occurs in northern Washington County, Oregon. The favorable area is included in approximately four townships. There has been some preliminary drilling done on these deposits by the Oregon Department of Geology and Mineral Industries, and results are described in a preliminary report recently published. In only one locality, where most of the drilling has been done so far, a deposit in excess of 2 million long tons of ore is indicated. A typical sample shows approximately 25 percent iron, 33 percent alumina, 10 percent silica, 3.5 percent titania, and 0.15 percent phosphorus.

The Oregon Department's report states that the deposits so far examined indicate that surface mining methods would be applicable, and that such operations would have a stripping ratio generally of not more than 2:1. The overburden is silt and could be easily handled. The ore itself is generally friable, and mining and crushing to the size required for smelting could be done cheaply. Apparently much of the ore so far explored would require no blasting. The average thickness of the ore, which is in flat-lying blanket deposits, is about 11 or 12 feet. The alumina content appears to be fairly constant for each deposit. However, in one area incompletely explored so far, the alumina appears to be considerably better than average and analyses indicate a grade of about 45 percent, with about 18 percent iron and 7 percent silica.

The Pedersen process has been used in Norway to treat material similar to Washington County ore. The U.S. Bureau of Mines has done considerable research work on treatment of siliceous and ferruginous bauxites using adaptations of the Pedersen process. The smelting operation is preferably carried out in an electric furnace, and power consumption is reported to be approximately 3600 kw-hr. per ton of iron produced. One very favorable factor in connection with commercial possibilities of the Washington County ores is the availability of low cost Bonneville power.

The economic possibilities of this ore arise from the fact that it can be treated to produce high-grade pig iron as a primary product, with a by-product of calcium aluminate slag. There is a steady demand for high-grade pig iron in the states of Oregon and Washington. The prewar price of pig iron, f.o.b. San Francisco, was $23 per short ton.

If a price of $20 per short ton f.o.b. Portland could be realized, it is estimated that alumina could be produced from the slag at a profit, and at a price less than $35 per ton f.o.b. Portland, Oregon. It is believed that this alumina would be competitive, both as to price and grade, with that produced from bauxite. There is a further possibility of producing a quick setting cement from the slag. Further drilling in this area is being done by the Oregon Department. A minimum of 10 to 15 million long tons should be assured before an economic operation could be planned.

In the development of all or any of the above-mentioned sources of raw material, careful studies should be made of the economic basis of the metallurgical problems involved. In this connection, it is pointed out that the U.S. Bureau of Mines is about to open an electrometallurgical laboratory at Albany, Oregon. Also the State of Washington has done extensive research on light metals at Pullman. Both these laboratories should be used to their fullest extent in determining which source of alumina would be most economic.

The Pacific Northwest Light Metals Committee, representing Idaho, Oregon, and Washington, was organized to promote the light metals industry in the Pacific Northwest. As it seems essential to a strong industry to have a Northwest source of alumina, the committee could well undertake the following activities:

(1) Determine the source and availability of bauxite deposits and economic location of a Bayer process plant on tidewaters.

(2) Obtain the assistance of the mining departments of the three northwest states and the U.S. Bureau of Mines in determining the most economic deposit of high alumina clay containing at least 30 million tons.

(3) Apply the same investigation to the bauxitic iron ore in Oregon with particular determination as to the market for pig iron in the Northwest.

(4) Enlist the cooperation of the U.S. Bureau of Mines through the delegations in Congress for laboratory testing and research on the raw materials problem.

(5) Coordinate the work of the state mining departments in location of workable deposits of raw materials.

It is believed that, if the committee and other interested agencies and groups operate along the lines indicated, a definite basis for economic production of alumina in the Northwest could be established.

Once a source of cheap raw material is assured there is little doubt, with the cheap power available, that Northwest reduction plants would be able to produce pig aluminum at a price competitive with any other plant in the United States.

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OREGON MINERAL PRODUCTION

The U.S. Bureau of Mines reports that Oregon mineral production in 1943 was valued at $12,310,000, and that Oregon was second among the states in mercury and diatomite production and third in antimony ore and chromite. Other metallic minerals produced were gold, copper, manganese, and silver.

Value of metallic mineral production was $1,346,000; nonmetallics including sand and gravel, cement, and stone were valued at $10,964,000.

Oregon's total mineral production since 1911 has exceeded $200,000,000 in value.

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QUICKSILVER PRODUCTION

The U.S. Bureau of Mines monthly mercury report for August 1944 released October 5, 1944, gives the following information:

A further decline of 200 flasks in production of mercury in August was accompanied by a sharp rise of 900 flasks in consumption and as a consequence, consumption exceeded domestic production by 1,400 flasks. Of the total output of 2,500 flasks, 7 mines contributed 87 percent. Of these mines, the Abbott, New Idria, New Almaden, Mt. Jackson, and Reed are in California; the Cordero is in Nevada; and the Bonanza in Oregon. The consumption excess affected producers' stocks chiefly and they dropped from over 4,000 to less than 2,300 flasks during the month.

Salient statistics on mercury in the United States in 1939-43 and in January-August 1944, in flasks of 76 pounds each

Period	Production	Consumption	Stocks at end of period: Consumers and dealers 1/	Stocks at end of period: Producers 2/	Price per flask at New York
	Average Monthly				
1939 . . .	1,553	3/ 1,742	12,600	376	$ 103.94
1940 . . .	3,148	2,233	14,100	607	176.87
1941 . . .	3,743	3,733	12,400	439	185.02
1942 . . .	4,237	4,142	10,700	1,377	196.35
1943 . . .	4/ 4,327	4,542	13,200	3,457	195.21
	Monthly				
1944:					
January	4,400	3,400	11,300	5,459	151.60
February	3,800	3,700	9,400	5,450	130.00
March	3,800	3,600	9,900	5,011	130.00
April	3,700	3,200	9,700	5,604	128.20
May	3,400	3,100	8,900	6,171	115.54
June	3,000	3,400	9,000	5,757	101.69
July	2,700	3,000	9,300	5/ 4,025	100.56
August	2,500	3,900	9,100	2,252	104.04

1/ Largely excludes redistilled metal. 2/ Held by reporting companies. 3/ Apparent consumption. 4/ Based on final figures. 5/ Revised.

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MINERALS NEEDED

The Foote Mineral Co., Philadelphia, large dealer in minerals, is interested in purchasing the following on a commercial scale:

Dumortierite	Spessartite	Rhodochrosite
Andalusite	Beryl	Wollastonite
Topaz	Brucite	Rutile
Tourmaline	Staurolite	Zircon
Gadolinite	Titanite	Lepidolite
Columbo-Tantalite	Perovskite	Amblygonite
Schorlomite	Rhodonite	Spodumene

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THE PIONEERS

(As related by G. F. McDougall)

When the West was young, two chums started towards the setting sun together. Though not related, both had the same surname and given name; but one being slightly larger than the other was known as "Big John" and his partner as "Little John."

Big and Little John finally reached an attractive spot on the Missouri, now the site of an important city, and recognizing its potentialities filed on the vacant land, afterwards accumulating more land until they had a sizeable piece. Since it was on one of the main trails, they soon established a trading post, and a small town arose almost as by rubbing Aladdin's lamp. The partners had land, cattle, and a large safe filled with gold. One partner was mayor and the other school director, a recently created office demanded by the growth of the settlement.

Sending to St. Louis, they were greatly pleased one day when the steamer discharged the new school-teacher, a very attractive young lady, who was immediately installed in the school that had been built, and in suitable lodgings. Frequent after-school journeys to the combined postoffice and store for mail, and to confer with the school director brought her into frequent contact with the two Johns, who promptly fell in love with her. The girl showed no preference, but quite evidently she couldn't marry both so there the matter stood, with the former complete trust and comradeship between Big and Little John worsening every day until finally a bitter quarrel resulted.

One said to the other, "It's Virginia that is at the bottom of this and I'll tell you what I'll do; we'll play a ten-point game of euchre. The loser can load a lead horse with whatever he chooses, take $2,000 in gold and his rifle and blankets on a saddle horse, ride out of town and never come back." The other agreed; referees were appointed; others volunteered, and the game started. It was played with great caution, and chance decreed that finally one player had eight points and the other had nine. On playing the next hand, the one that had eight points euchered the one that had nine, and won the game. So Big John took the $2,000 in gold and stuffed his money belt. He loaded his pack animal, and, with his rifle across the saddle, left without looking back on what he was leaving behind.

He traveled many days and maybe a thousand miles and then he saw a site that he liked, pitched camp, built a cabin, and started over. Fortune smiled as before, for his site was a good one, and today is another important city. As the years rolled by he again became wealthy but remained a bachelor. The great trail ran by the new town, and one autumn he saw a covered wagon with two yoke of bullocks slowly drawing it down the long hill toward the town. A prairie schooner then being a thing of the past, Big John strolled down to the road to await its arrival. As it drew near there loomed into view a wide slatternly looking woman on the front seat, with a background of children who filled the remaining space under the large bow with dirty faces. A man was walking on the far side of the lead bullocks. Finally the cavalcade stopped and the walking man came around in front. It was Little John, again face to face with the partner of his youth, Big John. Big John was first to speak.

"Well, Little John, what in the world are you doing away out in this country?"

Said Little John, "I heered of your prosperity and I jest thought I would mosey out here and find out what other man you had stacked a deck of cards on."

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GEOLOGIC REPORT ON HIGH-ALUMINA CLAY DEPOSIT NEAR MOLALLA, OREGON

A large deposit of high-alumina clay occurs approximately three miles southeast of Molalla, Oregon, about thirty miles south of Portland and about thirty miles north of Salem, where a Government plant is now being constructed to test the extraction of alumina from clay. This clay deposit was investigated by the State Department of Geology and Mineral Industries in 1937. Between July 1942 and May 1943, the deposit was investigated jointly by the U.S. Geological Survey and the U.S. Bureau of Mines. In this latter project, 77 holes having a total footage of nearly 8000 feet were drilled and over 30,000,000 dry tons of measured ore containing 25.7 percent of available alumina and 7.7 percent of available iron were indicated.

A preliminary geological report on the area has been prepared by Dr. Robert L. Nichols, field geologist in the High-Alumina Clay Division of the U.S. Geological Survey, and this report together with maps may be examined at the office of the State Department of Geology and Mineral Industries at 702 Woodlark Building, Portland.

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OREGON ANTIMONY

Oregon deposits of antimony, a metal in great wartime demand for shrapnel, bearings, and storage batteries, are described in a short report just issued by the State Department of Geology and Mineral Industries. The title is "Antimony in Oregon" and the report was prepared by Norman S. Wagner, field geologist of the Department stationed at Baker. The report describes antimony mines and prospects in the State and also treats briefly of economics and properties of this important war metal.

Prior to the entrance of this country into the war, the United States had depended largely on imports for certain metals to supply our industries. Antimony was one of these metals and had been imported mainly from China where there are large deposits of stibnite, the sulphide of antimony. Because of shipping difficulties, the supply from China was cut off and it was necessary to increase domestic production as much as possible. This increase was attained and United States production, aided by imports from Mexico and South America, was soon able to meet all essential demands.

This report, G.M.I. Short Paper No. 13, is one of a series which the Department has made in the study of Oregon's war mineral deposits. It is available at either the Portland office or the field offices at Baker and Grants Pass.

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DEPARTMENT NOTES

Elton Youngberg, formerly general superintendent of the Benton mine in Josephine County at the time of its closing down in 1942 because of war conditions, and more recently mineral specialist with the U.S. Tariff Commission, has succeeded Dr. W.A.G. Bennett as field engineer for the Department at Grants Pass. Dr. Bennett resigned in order to undertake work for the Washington State Division of Mines at Olympia.

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John Eliot Allen, Department geologist, has been given a leave of absence to do graduate work at the University of California.

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Mr. R. E. Stewart has joined the staff of the Department as paleontologist. Mr. Stewart, formerly geologist and engineer with the Chanslor Canfield Midway Oil Co., has for several years specialized in micropaleontology.

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