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SALEM ALUMINA-FROM-CLAY PLANT SOLD TO HARVEY

Early in the World War II period, many bauxite boats transporting ore from Surinam to the United States were sunk by German submarines. Great concern was felt at that time over the adequacy of domestic supplies of bauxite to keep our defense plants operating, since in peacetime we had depended upon Surinam for a large proportion of our bauxite ore. It was decided in government circles that experiments should be started immediately to develop a process for recovering alumina from so-called high-alumina clays or other high-alumina silicates. The Defense Plant Corporation decided to try out three different processes. The first was a lime-sintering process in South Carolina. The principal raw materials were high-alumina clay and limestone and the sintered product was leached with sodium-carbonate solution to obtain aluminum hydroxide. The second process, started at Laramie, Wyoming, involved sintering anorthosite, a calcium-sodium-aluminum silicate, to produce sodium aluminate which could be leached and the leach solution treated to precipitate aluminum hydroxide. It was said that the sintered rock residue could be used in making portland cement. The third process using an acid ammonium-sulphate leaching solution was planned for development at the plant at Salem, Oregon. The Chemical Construction Company, New York, a subsidiary of the American Cyanamid Corporation, developed the process in their laboratories and built and started up the Salem plant with government funds to try out the process on Northwest clays.

The Salem plant hardly had a chance to work the "bugs" out of the equipment when the government decided to close down the experiments. The plants in North Carolina and Wyoming were also closed down. The submarine menace had been overcome and it was felt that the need for obtaining alumina from clays had abated. After the war ended, the Salem plant was leased to Columbia Metals Corporation for the production of ammonium-sulphate fertilizer, mainly for shipment to Japan under government contract. Later the Continental Chemical Company leased the plant from the government for making ammonium-sulphate fertilizer and also for experimenting with the production of battery-grade manganese oxide. The Continental Chemical Company was sold to Ray-O-Vac Company for the production of manganese oxide and this latter company operated the plant for several months before bids were asked by General Services Administration which had taken the plant over as surplus government property.

A new chapter in the varied history of the Salem plant was begun March 25, 1953, when it was announced that Harvey Machine Company of Torrance, California, was the successful bidder. The sale price was $325,000. Original government investment was in excess of $4,000,000 but depreciation, obsolescence, and cannibalizing of equipment reduced the value of the plant substantially. It was announced on April 11 that the United States Department of Justice had given its approval to the sale, and transfer only awaited release by the General Services Administration Seattle office. Harvey Machine Company stated that experiments begun at the plant during World War II on methods for production of alumina, aluminum oxide, from high-alumina clay would be continued.

Why is it desirable to develop a commercial process for production of aluminum oxide from clay? To explore this question, let us consider briefly the method of producing aluminum from its ores.

In the production of metallic aluminum, two steps are required. First, bauxite, at present the only commercial aluminum ore, is treated by a chemical process known as the Bayer process to obtain a pure aluminum oxide, or alumina as it is called. Theoretically bauxite contains only alumina and water. In nature, however, the bauxite contains impurities, mainly silica, iron oxide, and titania, and these must be eliminated before the pure Al_2O_3 may be used in an electric furnace to produce metallic aluminum. Although this electrolysis is expensive because of the cost of electric power, it is a standard procedure now and presents no technical difficulties. In the second step, the pure aluminum oxide obtained through the Bayer process is electrolized in cells called pots to obtain metallic aluminum. In the Northwest we have plants for producing only the metal. The plants for the first step - that is, making alumina - are all in the Midwest and South, and a large part of the bauxite used to produce the alumina is still brought in across the Caribbean.

Aluminum metal is the third most abundant element in the earth's crust, making up about 8 percent. The other two more abundant elements are oxygen (46.5 percent) and silicon (27.6 percent), which for convenience are considered to be combined as SiO_2, silica. The great mass of the earth's crust is aluminum silicate - that is, the combination of the three elements aluminum, silicon, and oxygen. If we consider aluminum silicate as a reserve from which we could obtain the metal aluminum, the supply would be inexhaustible even on the superficial thin skin of the earth.

Clays are essentially aluminum silicates which have resulted from weathering of the rock aluminum silicates. Some of these clays have weathered under conditions which have concentrated the alumina. These are called high-alumina clays. In Oregon, high-alumina clay localities are known and have been explored at Hobart Butte south of Cottage Grove and at Molalla south of Oregon City. In addition, many other deposits are known but have not been explored.

The critical characteristic of aluminum silicates, including clays, as far as treatment to obtain alumina is concerned, is the inherent quality of alumina in its persistent affinity for silica. Because of this strong attraction, it is difficult to separate alumina from silica and this presents the big problem in treatment of clays. Chemical processes to accomplish the separation are well known and have been carried out on a laboratory scale in many places. Germany produced alumina from clays commercially during World War II because of lack of bauxite. The whole question is a matter of competitive costs of producing alumina from aluminum silicates and from bauxite.

The Salem alumina-from-clay plant is favorably situated to carry on pilot plant work in the production of alumina from clays. East of Salem over a wide area extending to and beyond Mehama are several known and probably large but unexplored deposits of high-alumina clays. Both south of Salem in the Salem Hills and north in the Eola Hills there are lateritic clays which contain high alumina, high iron, and relatively lower silica than other high-alumina clays. The lateritic deposits have the added advantage of containing a certain small percentage of gibbsite cobbles. These cobbles consist of high-grade bauxite and contain usually less than 5 percent silica. Because of the availability of these lateritic clays and because of their low silica-to-alumina ratio, it would appear that they could be an important raw material if an economic process could be developed. Their high iron content would preclude their use in an acid process such as that originally planned for the plant by the Chemical Construction Company.

Typical analyses of Department samples from the lateritic clay in the Salem Hills show the following range:

	Percent
Alumina	35 - 42
Iron	13 - 23
Silica	13 - 20

At one bulldozer cut on the Veall place south of Salem, two channel samples covering 9 feet of depth below 3 feet of soil averaged 40.6 percent Al_2O_3, 17.6 percent Fe, and

18.6 percent SiO_2. From another cut on the same property a channel sample representing a section 9 feet thick below 2½ feet of soil averaged 35.5 percent Al_2O_3, 21.3 percent Fe, and 15.4 percent SiO_2. An undetermined thickness of the clay lies below the cuts.

Some progress is being made in direct reduction of an aluminum-silicon alloy from clay, and it has been announced that a pilot plant for testing work on production of this alloy will be built this year at Springfield, Oregon. An electric furnace process developed by the Bureau of Mines laboratory at Albany, Oregon, will be tried out. The fact that two companies experienced in metallurgical work, the Apex Smelting Company and the American Smelting & Refining Company, have combined to carry on the research is evidence of the apparent feasibility of the process and also that a good job of testing will be done.

It should be pointed out that production of an aluminum-silicon alloy directly from clay is considerably different from production of the same alloy synthetically from pure materials, as is the present practice. In direct reduction from clay, control of the composition of the alloy must in large part be in selecting as pure a clay as can be obtained because some of the impurities in the clay are reduced along with the aluminum and silicon. Where the alloy is made by combining pure aluminum and pure silicon there are no impurities in the alloy and complete control of its composition may be had. Of course for some applications, aluminum-silicon castings with some impurities may be acceptable, but in castings used in equipment that may be subject to critical strain it seems likely that nothing will replace the synthetic alloy.

Experiments which may lead to the production of aluminum oxide or alloys from high-alumina clays should be made in peacetime, not under the pressure of wartime necessity. If pilot plant experiments can be made by private industry rather than by the government, so much the better. There is no doubt that production of alumina from bauxite is cheaper than from clays under normal conditions and using known processes. However, American metallurgists and chemical engineers are especially resourceful and, given the chance, they may come up with a workable process which in time could be competitive with alumina produced from bauxite. Aluminum companies are using lower and lower grade bauxite in the modified Bayer process and a step to utilize clays instead of low-grade bauxite would not be too much to expect.

Certainly a shortage of domestic bauxite may be expected in a war emergency and it would be farsighted to be prepared with a workable process for treatment of clays when the need arises.

F.W.L.

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NEW OIL AND GAS CONSERVATION LAW

Senate Bill No. 433, a new oil and gas conservation law, was passed by the Forty-seventh Legislature and signed by the governor April 16, 1953. The new law repeals Chapter 365, Oregon Laws 1949, and becomes operative July 21, 1953.

Senate Bill No. 433 sets up machinery under the administration of the State Department of Geology and Mineral Industries to prevent waste in the drilling of oil tests and in production of petroleum when and if it is discovered. The Governing Board of the Department is given the authority to require that anyone proposing to drill a well for oil and gas must notify the director of the Department upon a form prescribed by the director and pay a fee of $25 for each such well.

The new law requires drilling, casing, and plugging of wells to be done in such a manner as to prevent the escape of oil or gas from one stratum to another and to prevent the intrusion of water into oil or gas strata. Casing must be set so as to prevent the pollution of fresh water supplies by oil, gas, or salt water, and all wells are to be plugged and marked in accordance with specifications established by the Board. A reasonable bond will be required to insure good practice in casing each well and plugging each dry or abandoned well. Records of each well, including all logs, drill cuttings, or cores, if cores are taken, must be filed in the office of the director of the Department within 20 days from the date of completion or abandonment of any well and shall be maintained free from public inspection by the Department for a period of two years from the date of filing. Various other requirements are specified in case petroleum is discovered.

As soon as practicable a bulletin covering all requirements set up in Senate Bill No. 433 will be issued by the Department.

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MORE ABOUT BAKER CITY COINS

The April Ore.-Bin had an article on the 2-ounce gold coins or slugs issued in Baker City, Oregon, during the depression of 1907. John Arthur, well-known mining man and old-time resident of Baker, comments on the incident in a letter as follows:

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"I noted in The Ore.-Bin, vol. 15, no. 4, of April 1953, page 27, an article 'Baker City Coins,' made in Baker in 1907---It seems strange that no one knew who made them, as scores of people here knew who made the coins, or slugs. Of course, many have passed away and others have forgotten which would be natural after gold was outlawed in this United States.

"The only party who ever made these gold coins in Baker was John Arthur who made quite a number of them. This was during the depression when Hetty Greene, the richest woman in the United States as well as others, could only get a few hundred dollars a week to live on from the banks. We were trying to relieve Hetty's and other's money troubles, as only gold could do. The coins or round discs weighed two ounces, and actually had $40.00 worth of gold in each coin.

"As we took the Mellis 40-ton car of specimens to the San Francisco fair about that time for exhibit, we took quite a number of these Baker coins which were eagerly grabbed up. Thomas Edison, the electrical wizard, was much interested and secured one or two.

"John Arthur was a partner in the Oregon-Idaho Investment Company at Baker, who for twenty years operated a sampling works having a capacity of 75 tons per day; also an assay office. Ores were sampled and purchased for the Tacoma and Salt Lake smelters. As there were many placers and quartz mines operating we bought gold in quite large quantities; also sampled 90% of the chrome shipped out of Baker and Grant counties during World War I.

"The fine gold collection now in the Baker First National Bank was in our office for twenty years, and Fred Mellis purchased what interest the other partners had. Some of that gold was got later by the bank. . . ."

/s/ John Arthur

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FERRONICKEL TESTS

The U.S. Bureau of Mines reports that "use" tests of ferronickel have been made by the Electric Steel Foundry, Portland, Oregon, in 45 heats in electric arc and induction furnaces for the production of heat and corrosion resisting steels. The company reports that these tests show that ferronickel can be used readily in production of these steels, and that they are of normal quality as judged by chemical analysis and strength tests. The report also states that use of ferronickel involved no changes in the foundry's normal steel-making practices. Ferronickel is the product that will be produced by the Hanna Company from Nickel Mountain ore at a plant to be erected near Riddle, Douglas County, Oregon.

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NEW DEPARTMENT PUBLICATIONS

Two new bulletins, "Geology of the Albany Quadrangle, Oregon," and "Bibliography of the Geology and Mineral Resources of Oregon," have just been published by the Department.

"Geology of the Albany Quadrangle, Oregon," designated as Bulletin 37, is by Dr. Ira S. Allison, Chairman of the Department of Geology at Oregon State College. The Albany 15-minute quadrangle is in the center of the Willamette Valley and occupies the northwest corner of Linn County and the northeast corner of Benton County. The Willamette River meanders through the quadrangle and the geological features along it are typical of the Willamette Valley. The 18-page bulletin describes the historical, structural, and economic geology of the area and includes a bibliography and a geologic map. Bulletin 37 is priced at 75 cents.

"Bibliography of the Geology and Mineral Resources of Oregon," designated as Bulletin 44, is by Margaret Steere, librarian and geologist with the Department. Bulletin 44 is the second supplement of the original bibliography issued by the State Planning Board in 1936. The first supplement, covering the succeeding 9 years through the year 1945, was issued by the Department in 1946. Bulletin 44 covers the five-year period from January 1, 1946, through December 31, 1950. It consists of 61 pages and is made up of both an author and subject index. Included in the source material are unpublished theses and governmental reports available for public inspection. The Bibliography is priced at $1.00.

Both bulletins may be obtained postpaid at the prices indicated from the Department's Portland office in the State Office Building, or at the field offices in Baker and Grants Pass.

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CHROMITE IN FEBRUARY 1953

The U.S. Bureau of Mines reported in No. 37 Chromite Report that shipments of domestic chromite to the government purchase depot at Grants Pass in February totaled 1,232 short tons compared to 815 short tons in January. The report also states that according to the Bureau of Census imports of metallurgical grade chromite during February increased 55 percent compared to January and were the highest for any month for at least 5 years. Refractory imports dropped 12 percent and chemical grade imports increased 17 percent. During February total imports of all grades amounted to 204,202 short tons of which metallurgical grade comprised 110,448 long tons, refractory 61,341 long tons, and chemical grade 10,413 long tons, making a total of 182,202 long tons which is equivalent to the previous figure of 204,202 short tons. (Short tons of 2,000 pounds are used in one part and long tons of 2,240 pounds are used in another part of the report.)

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OFFICIALS NAMED FOR NICKEL PLANT

According to the Grants Pass Courier, April 27, 1953, the general manager of the Riddle, Oregon, nickel operation for the M. A. Hanna Mining and Smelting Company will be Earl S. Mollard, who has been in charge of the Hanna Company operations in Minnesota since 1948. Plant manager will be E. Emmons Coleman. Mr. Coleman previously was general manager of Bradley Mining Company's furnace plant at Stibnite, Idaho.

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GYPSUM ACTIVITY

It was reported that the Northwest Gypsum Company, which has been developing a gypsum deposit on the bank of the Snake River in Washington County, Idaho, has completed installation of a cable tramway across the river to loading bunkers situated on the Oregon side. The company's main office is 201 Main Street, Colfax, Washington. There are plans for a field office at Weiser, Idaho. Gypsum will be produced for the agricultural market.

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THE STOCK PILE IN NEW DRESS

Vol. 1, no. 6 of The Stock Pile, the periodical published by the Chrome Committee of the Oregon Mining Association, has been issued in a new attractive form and contains numerous photographs of chrome mines and mountain scenery where chrome mining is carried on. These photographs illustrate graphically some of the natural difficulties which the chrome miner has to overcome, particularly in building access roads. Some are aerial photographs and show that much of the high country in northern California and southwestern Oregon still has a heavy snow pack. The editor of The Stock Pile is Fay Bristol, Box 505, Rogue River, Oregon. The Publishing Committee of the Oregon Mining Association is composed of Walt Freeman, William S. Robertson, and Dewey Van Curler. Subscription rate is $3.00 yearly.

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NEWS FROM THE STOCK PILE

Elmo and Franklin King and Roy Hanson, partners in Chrome King mines No. 1 and No. 2, are building a new road off the McCaleb road which crosses the Illinois River near the mouth of Rancherie Creek. Their low-water bridge near the mouth of Dailey Creek was washed out.

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Ernest Foster's mill, located near milepost 13 on the Illinois River road, Josephine County, is now ready to operate. Ore from the Pearsoll mine, about 8 miles distant, has been stockpiled at the mill. The mill has one and one-half tons per hour capacity with nearly 10 tons per hour crushing capacity.

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Rice Brothers mill near Takilma in Josephine County has recently been sold to Eggers and Tyoer.

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Word has been received from Senator Guy Cordon that access road money to improve the Illinois River road, the Wimer road, and the Youngs Valley road has been approved and will soon be available to the Forest Service so that work can be started.

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NEW CHROME AT BIG BEAR MINE

As reported in the April Ore.-Bin, Fred Langley and Claude Dean, Grants Pass, Oregon, are running a crosscut at the Big Bear mine on Slate Creek, Josephine County, designed to intersect downward extension of a chromite pod found in an adit 75 feet higher in elevation than the present workings. In the lower crosscut small pods of chromite have been encountered about 300 feet from the portal and 6 tons of shipping ore have been taken out. Raising will be done on this ore toward the old adit.

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NEW RIVER BASIN COMMISSION

The Upper Columbia River Basin Commission was established by the 1951 Legislature according to Chapter 522, Oregon Laws 1951. Senate Bill 136 of the 1953 Legislature, authored by Senators Rex Ellis, Hounsell, Smith, and Steen, and Representatives Goad, Steiwer, and Tom, creates new provisions and amends the original law. A bill (Senate Bill 139), by Senator Ellis and Representative Goad, provides an appropriation of $40,000 for the expenses of the Commission. Both bills were passed by the Legislature. This Commission will promote studies of development of the Upper Columbia River basin system and will assist any interstate agency established for such development. The Commission has the power to hold hearings and to recommend projects which have promise of promoting the best interests of the Upper Columbia River Basin area. The State Engineer is named Engineer for the Commission, and the Director of the State Department of Geology and Mineral Industries is Geologist.

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