

STATE OF OREGON
DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES
PORTLAND, OREGON

THE ORE.-BIN

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THE ATOMIC ENERGY ACT OF 1946
An Abstract

Public Law 585 passed by the 79th Congress and approved August 1, 1946, has to do with the development and control of atomic energy by a new Government agency. The Act is a most comprehensive one and is designed to cover all activities connected with production of fissionable materials and their application to production of atomic energy. The Commission, which is created by the Act, has absolute control, subject to Congress and the President, of all such activities. As time goes on, the work of the Commission will affect the well-being of every citizen. Probably the Commission will become one of the most powerful of Government agencies.

Those persons engaged in or interested in the mineral industry should be familiar with the provisions under Control of Materials, for under this heading is given the law relating to mineral deposits from which fissionable material may be produced.

The principal provisions of the Act are condensed in the following abstract.

Editor

Declaration of Policy

Purpose of the Act

The major programs are outlined as follows:

- (1) To assist and foster private research and development;
- (2) To control scientific and technical information and to plan for sharing on a reciprocal basis information concerning the practical industrial application of atomic energy as soon as safeguards against its use for destructive purposes can be devised;
- (3) To conduct Government research and development;
- (4) To set up a plan for Government control of production, ownership, and use of fissionable material;
- (5) To set up a program of administration.

Organization

Atomic Energy Commission

An atomic energy commission is set up; it is composed of five members including a Chairman all appointed by the President. The first members of the Commission are appointed for two years. At the expiration of the two years, appointments are made for five years, except that terms of office of the members first taking office after the expiration of two years from the date of enactment of this Act shall expire, as designated by the President at the time of appointment, one at the end of three years, one at the end of four years, one at the end of five years, one at the end of six years, and one at the end of seven years, after the date of enactment of this Act. The Chairman of the Commission is to receive a salary of \$17,500 a year, the other members of the Commission, \$15,000 a year. The principal office of the Commission is to be in the District of Columbia.

There is established within the Commission a General Manager appointed by the President at an annual salary of \$15,000 a year. The Commission may recommend to the President the appointment or removal of the General Manager.

Administrative divisions of research, production, engineering, and military application respectively are provided for. Each division is to be under the direction of a Director appointed by the Commission who is to receive a salary of \$14,000 a year. The Director of the division of military application must be a member of the armed forces. The Commission is allowed to delegate some of its powers, as the Commission shall determine, to each of the divisions except the division of research.

General Advisory Committee

Provision is made for a general advisory committee to be set up to advise the Commission on scientific and technical matters relating to materials, production, and research and development. This committee is to be composed of nine members to be appointed from civilian life by the President. Each member is to hold office for a term of six years after staggering the first appointments over two, four, and six years. The committee designates its own chairman and shall meet at least four times in every calendar year. Compensation to members of the committee is set at the rate of \$50 per day for each day spent in meetings or conferences plus all their necessary traveling or other expenses while engaged in the work of the committee.

Military Liaison Committee

There is set up a military liaison committee consisting of representatives from the War and Navy Departments who shall be appointed by the Secretaries of War and Navy in such number as the Secretaries may determine. The members of the committee serve without additional compensation. Close liaison between the Commission and military committee is mandatory under the Act in matters relating to military applications of fissionable material. Provision is made for making written recommendations by the committee to the Commission and if, in the opinion of the committee, the Commission fails to act on such matters as deemed needed by the committee, the latter may refer the action to the Secretaries of War and Navy. If either Secretary concurs, he may refer the matter to the President whose decision will be final.

An active or retired officer of the Army or Navy may be appointed as director of the division of military application at a salary of \$14,000 a year less the salary that he is drawing from the armed services at the time of appointment.

Research

Research Assistance

The Commission is directed to "exercise its powers in such manner as to insure the continued conduct of research and development activities" in various specified fields.

Such research is to be done by private or public institutions or persons, all under close supervision of the Commission. The separate fields listed are:

- "(1) nuclear processes;
- (2) the theory and production of atomic energy including processes, materials, and devices related to such production;
- (3) utilization of fissionable and radio-active materials for medical, biological, health, or military purposes;
- (4) utilization of fissionable and radio-active materials and processes entailed in the production of such materials for all other purposes including industrial uses; and
- (5) the protection of health during research and production activities."

Broad powers are given the Commission in the conduct of research, in financing, inspection, and the dissemination of information.

"The Commission is authorized and directed to conduct, through its own facilities, activities, and studies of the types specified . . . "

Production of Fissionable Material

Prohibition

The Commission is given control of all production of fissionable material, and it shall be unlawful for any person to own any facilities for the production of fissionable material except that authorized by the Commission.

Ownership and Operation of Production Facilities

The Act states that the Commission, as agent of and on behalf of the United States, shall be the exclusive owner of all facilities for the production of fissionable material other than those facilities useful in the conduct of research and development activities in those fields specified under "Research". Also exception is made of facilities which, in the opinion of the Commission, do not have a potential production rate adequate to enable the operator of such facilities to produce within a reasonable period of time a sufficient quantity of fissionable material to produce an atomic bomb or any other atomic weapon.

The Commission is authorized and directed to produce or provide for the production of fissionable material in its own facilities. The Commission may, if it is deemed necessary, make contracts with persons for production of fissionable material in facilities owned by the Commission. The Act states that the President shall determine at least once each year the quantities of fissionable material to be produced under this type of activity.

Fissionable material may be produced in the conduct of research and development activities in facilities not owned by the Commission but which the Commission would control as agent of and on behalf of the United States.

Irradiation of Materials

It is stated that the Commission and persons lawfully producing or utilizing fissionable material are authorized to expose materials of any kind to the radiation incident to the processes of producing or utilizing fissionable material in order to increase the supply of radio-active materials.

Manufacture of Production Facilities

No person may manufacture, produce, transfer, or acquire any facilities for the production of fissionable material unless authorized by the Commission. Licenses shall be issued under such regulations as the Commission sees fit to set up.

Control of Materials

Definition

As defined in the Act, "fissionable material" means plutonium, uranium enriched in the isotope 235, or any other material which the Commission determines to be capable of releasing substantial quantities of energy through nuclear chain reaction of the material. The term includes ores of uranium, thorium, or other fissionable materials only if they contain one or more of these materials in such concentration as the Commission may by regulation determine from time to time.

Government Ownership

All fissionable material under the jurisdiction of the United States now or hereafter produced shall be the property of the Commission by virtue of the Act. Just compensation shall be paid by the Commission to any person owning any interest in any fissionable material at the time of the enactment of this Act.

Prohibition

"It shall be unlawful for any person after sixty days from the effective date of this Act to (A) possess or transfer any fissionable material, except as authorized by the Commission, or (B) export from or import into the United States any fissionable material, or (C) directly or indirectly engage in the production of any fissionable material outside of the United States."

Distribution of Fissionable Material

The Commission is authorized to distribute fissionable material for the conduct of research, for use in medical therapy, or for any use licensed by the Commission. It is specified that in distribution of this material the quantity allowed an applicant will be insufficient for construction of a bomb or other military weapon.

The Commission is authorized to purchase or otherwise acquire any fissionable material or any interest therein, both inside and outside the United States, or any interest in facilities for the production of fissionable material or in real property on which such facilities are located, upon certification by the Commission that such action is necessary in the interest of the common defense and security. The Commission is further authorized to take, requisition, or condemn such facilities or real property and to make just compensation therefor.

Source Materials

Source material is defined as uranium, thorium, or any other material which is determined by the Commission, with the approval of the President, to be peculiarly essential to the production of fissionable materials.

License

A person must have a license from the Commission in order to transfer, receive, or export any source material. Procedures concerned with issuance and application of licenses shall be established by the Commission.

Acquisition

The Commission is authorized to acquire supplies of source materials in any way that it sees fit in the interest of defense and security, and may establish prices or just compensation.

Exploration

The Commission is authorized to conduct and enter into contracts for the conduct of exploratory operations, investigations, and inspections of deposits or supplies or source materials, making "just compensation" for any damage or injury occasioned thereby.

Public Lands

All uranium, thorium, and other "source materials", as determined by the Commission, contained in deposits in the public lands are reserved for use of the United States subject to valid claims existing on date of enactment of the Act (August 1, 1946). Exception is made that no one who had any part, directly or indirectly, in the development of the atomic bomb project, may benefit by any location, entry, or settlement upon the public domain if such location, etc., is made subsequent to date of enactment of this Act, if such benefit is derived because of confidential information of the existence of "source materials" acquired because of his part in the project.

The Secretary of the Interior shall cause to be inserted in every patent, conveyance, lease, permit, or other authorization hereafter granted to use the public lands or their mineral resources, a reservation to the United States of all "source materials" whether or not of commercial value. The reservation shall contain a statement of the right of the United States through its authorized agents to enter upon the land and prospect for, mine, and remove any of the reserved materials, "making just compensation for any damage, or injury occasioned thereby." The lands specified in this section may be used, and "any rights under any permit or authorization may be exercised, as if no reservation of such materials had been made under this subsection; except that, when such use results in the extraction of any such material from the land in quantities which may not be transferred or delivered without a license under this subsection, such material shall be the property of the Commission, and the Commission may require delivery of such material to it by any possessor thereof after such material has been separated as such from the ores in which it is contained." Provision is made for "fair and reasonable" payment by the Commission.

By-product Materials

These are defined as "any radio-active material (except fissionable material) yielded in or made radio-active by exposure to the radiation incident to the processes of producing or utilizing fissionable material."

"The Commission is authorized to distribute, with or without charge, by-product materials to applicants seeking such materials for research or development activity, medical therapy, industrial uses or such other useful applications as may be developed." Distribution of such materials shall be under such regulations as the Commission chooses to establish.

The Commission shall not distribute any fissionable material to any person for a use not under or within the jurisdiction of the United States nor to any foreign government.

Military Applications of Atomic Energy

The Commission is authorized to conduct experiments in the way of research and development work in the military application of atomic energy and to engage in production of atomic bombs or other military weapons utilizing fissionable materials except that such activities shall be carried on only to the extent that the express consent and direction of the President of the United States has been obtained at least once each year.

Utilization of Atomic EnergyLicense Required

The Commission is given the power to license any and all activities connected with utilization of fissionable material.

Report to Congress

The Commission shall report to the President whenever in its opinion any commission or other nonmilitary application of fissionable material has been sufficiently developed to be of practical value. The report shall be transmitted to Congress by the President with his recommendations.

Property of the Commission

All interests owned by the United States or any Government agency in all fissionable material, weapons, facilities, and property in connection with atomic energy research and development shall be transferred to the Commission.

Authority is given to the Commission to make payments in lieu of taxes to those States and localities in which the activities of the Commission are carried on and in which the Commission has acquired property previously subject to State and local taxation.

Control of Information

Policy

The Commission shall control the dissemination of information in connection with its work so as to assure the common defense and security.

It is stated "that until Congress declares, by joint resolution, that effective and enforceable international safeguards against the use of atomic energy for destructive purposes have been established, there shall be no exchange of information with other nations with respect to the use of atomic energy for industrial purposes;" and "that the dissemination of scientific and technical information relating to atomic energy should be permitted and encouraged so as to provide for free interchange of ideas and criticisms essential to scientific progress."

Restrictions

The term "restricted data" is defined as all data concerning the manufacture or utilization of atomic weapons, the production of fissionable material, or use of fissionable material in the production of power. Such data shall not be communicated, transmitted, or disclosed in any form to any individual or person.

Penalties for violating provisions of the act are provided. These penalties may consist of a heavy fine or imprisonment or both and could be, upon the recommendation of a jury, imprisonment for life or the death penalty in cases where the offense was committed with the attempt to injure the United States.

Patents and Inventions

Production and Military Utilization

"No patent shall hereafter be granted for any invention or discovery which is useful solely in the production of fissionable material or in the utilization of fissionable material or atomic energy for a military weapon. Any patent granted for any such invention or discovery is hereby revoked and just compensation shall be made therefor."

"Any person who has made or hereafter makes any invention or discovery useful in the production of fissionable material or atomic energy for a military weapon shall file with the Commission a report containing a complete description thereof unless such invention or discovery is described in an application for a patent filed in the Patent Office by such person within the time required for the filing of such report." The report concerning any such invention or discovery shall be filed on or before whichever of the following is the latest: (a) the sixtieth day after the date of enactment of this Act, (b) the sixtieth day after the completion of such invention or discovery, or (c) the sixtieth day after such person discovers or first has reason to believe that such invention or discovery is useful in such production or utilization.

Whenever any patent has been declared by the Commission to be effected with the public interest, the Commission is licensed to use the invention or discovery covered by such patent and any person to whom a license has been issued by the Commission may use the invention or discovery as authorized by his license. The owner of the patent shall be entitled to a reasonable royalty fee.

There are several provisions in the Act concerned with adjudication of patent controversies and compensation awards.

General Authority

The Commission is authorized to establish advisory boards to advise with and make recommendations to the Commission on legislation, policies, administration, research, and other matters and to hold hearings in which the Commission is authorized to administer oaths and to subpoena witnesses.

Joint Committee on Atomic Energy

A joint committee to be composed of nine members of the Senate, to be appointed by the President of the Senate, and nine members of the House of Representatives, to be appointed by the Speaker of the House of Representatives, is established by the Act. In each instance, not more than five members shall be members of the same political party. The joint committee shall make continuing studies of the activities of the Atomic Energy Commission and the Commission shall keep the joint committee fully informed concerning such activities. All legislation relating primarily to the Commission or to atomic energy shall be referred to the joint committee.

Reports

The Commission shall report to Congress in January and July of each year, and at any time it deems desirable, submit to the Congress such recommendations for additional legislation as the Commission deems necessary or desirable.

OREGON PERLITE REPORT

Perlite, a form of volcanic glass, is the subject of a geologic report just issued by the State Department of Geology and Mineral Industries. Perlite pops like popcorn when heated quickly to a high temperature in a furnace and the expanded product is very light in weight, making a superior insulating material.

There are several known large deposits of perlite in central and eastern Oregon. Those favorably situated in regard to transportation are the most attractive for commercial operation. Deposits now being developed by Dant & Russell, Inc., and which will soon be in production, are located near the railroad along the Deschutes River in southern Wasco County.

The report, GMI Short Paper No. 16, describes the geology of the deposits with particular attention to those on the Deschutes River, and includes maps, illustrations, and tables. Dr. John Eliot Allen, geologist, is the author. The report may be obtained at the office of the Department, 702 Woodlark Building, Portland, and at the field offices in Baker and Grants Pass. Price 15 cents postpaid.

GOVERNING BOARD CHANGE

Recently Mr. S. H. Williston resigned as a member of the Governing Board of the State Department of Geology and Mineral Industries because of the press of business which requires him to spend part of his time in the East.

On January 20, Governor Snell appointed Mr. H. E. Hendryx, Baker, advertising manager for the Baker Herald, as Mr. Williston's successor on the Board. The State Senate has confirmed the appointment of Mr. Hendryx.

HORSE HEAVEN MINES TAKEN OVER BY CORDERO

Horse Heaven Mines, Inc., has assigned all of its mining property in Jefferson County, Oregon, to Cordero Mining Company of Nevada. There will be no change in ownership or operating personnel since both companies have the same stockholders.

ROGUE RIVER MINING CLOSURE ORDER

According to the Coos County Reporter, Gold Beach, issue of January 10, the Rogue River Coordination Board at a meeting held in Grants Pass agreed to order the Rogue River closed to mining between April 15 and November 1 of this year. A similar order by the Board closed the river to mining between the same dates last year.

ANNUAL ASSESSMENT WORK

Public Law 47, approved May 3, 1943, provided for suspension of annual assessment work on mining claims held by location until 12 o'clock noon on the 1st day of July after the cessation of hostilities of World War II as determined by proclamation of the President or concurrent resolution of the Congress. The President has officially declared that hostilities ceased on December 31, 1946; therefore it will be necessary to do annual assessment work for the assessment year beginning at noon July 1, 1947, unless Congress takes further action to suspend such work.

In order to obtain the benefits of the Act for the current assessment year, it is required that a claimant must file in the office where his location notice is recorded a notice of his desire to hold his mining claim or claims on or before 12 o'clock noon of July 1, 1947.

SWITZERLAND REMOVED CONTROLS FROM GOLD

The Swiss, always a progressive people, have removed controls from gold. The lucky Switzer may now own all the coin he can afford, hoard all he wishes, and buy and sell as he pleases. Convertibility with paper is restored. Evidently the Swiss government does not question its citizens' faith in the country's paper money. From Pay Dirt, December 21, 1946, published by the Arizona Small Mine Operators Association.

CLEARING HOUSE

CH-90- FOR SALE: 8 gold (free milling) claims comprising Nicolai Group, Powers District, Coos County. For further information write Mrs. E. L. Coy, Powers, Oregon.

MINING NOTES

R. G. Amidon is superintendent of the Buffalo Mines in the Granite District, eastern Grant County.

* * * * *

The Williams Paint Company, Emeryville, California, has recently purchased and shipped 1,233 tons of limonite to be used as pigment. The ore was mined from the Ironcrest property, located about 8 miles west of Scappoose in Columbia County. The property is owned by the A. A. Muck interests.

* * * * *

W. E. Pantle Gold Dredging Company is dredging ground located about one mile east of Jacksonville, Jackson County. Equipment consists of a $1\frac{1}{2}$ -cubic yard Bucyrus-Erie dragline and a Judson-Pacific dry land washing plant mounted on caterpillar treads. Gold is recovered in Ainlay bowls. Overburden is stripped and overcast, and will be returned to the leveled-off tailings as a reociling operation.

* * * * *

Calhoun and Howell are operating a 3-yard dragline on the North Fork of the John Day River at a location about 8 miles up the river from Dale.

* * * * *

A new 3-yard Monighan dragline has recently been installed on Sucker Creek, Josephine County, by the B-H Company, Tom Gerety, President, Medford, Oregon.

CLEARING HOUSE

CH-91: Philip S. Hoyt, Inc., 1002 Mills Bldg., El Paso, Texas, wishes to obtain economic deposits of the following minerals and rocks:

- (1) siderite (iron carbonate)
- (2) chalk
- (3) sandstone (containing from 20 percent to 30 percent iron oxide; large tonnage and low cost production)
- (4) barite - witherite (mixture of barium sulphate and barium carbonate; large tonnage)
- (5) halloysite
- (6) pitchstone (perlite)
- (7) fluorspar - barite ore
- (8) pyrophyllite

HIGH METAL PRICES

Excepting silver and mercury, there has been an up-surge in most metal prices since OPA ceilings were removed. Demand continues strong. Recent market quotations are as follows: copper, $19\frac{1}{2}$ ¢ per pound, Connecticut Valley; lead, 13¢ per pound, New York, and 12.8¢ at St. Louis; zinc, 10.5¢ per pound, East St. Louis; antimony, 29.6¢ per pound, New York; tin, 70¢ per pound.

The price of silver used in trade and industry has been weak - falling below 80¢ per ounce. The price of silver paid to domestic producers is of course fixed by law at 90.5¢ per ounce. Mercury is quoted at from \$88 to \$92 a flask.

AGRICULTURAL LIMESTONE

Oregon farms, particularly those in Western Oregon, may receive substantially greater tonnages of agricultural limestone during 1947 than they did last year. The field service branch of the Production Marketing Administration, U.S. Department of Agriculture, has awarded contracts to 5 Northwest limestone producers which have indicated that they might deliver a possible maximum total of 271,000 tons during the year. The Portland office of Production Marketing Administration expects actual delivery to be considerably smaller than this figure, however. Last year approximately 35,000 tons of limestone were delivered to farmers enrolled under the Government program which was formerly handled by the Agricultural Adjustment Administration.

Principal sources of limestone contracted for are Silica Products Company, Bryant, Washington; Oregon Portland Cement Company, Oswego, Oregon; and Electro Lime & Chemical Company, Gazelle, California, with smaller tonnages from Limestone Products Inc., Dallas, Oregon, and Shell Rock Products, Chinook, Washington. Cost of the limestone (F.O.B. plants in bulk) ranges from \$2.97 to \$5.50. Freight and spreading charges vary considerably and add materially to the above figures.

TEXAS COMPANY OIL TEST PROGRESS

The Texas Company test well, Clark & Wilson No. 6-1, located near Mist, Columbia County, was 2875 feet deep on the evening of January 23. Mr. Rex Grivetti, geologist with the company, has reported that the excessively cold weather has slowed up progress considerably because of frequent freezing of the main water line.

SPANISH QUICKSILVER

According to U.S. Bureau of Mines Mineral Trade Notes, October 19, 1946, "Mercury output in Spain totaled 14,110 flasks during the first half of 1946, compared with 9,221 flasks in the same period of 1945. Exports during the first half of 1946 totaled 2,982 tons." (Nearly 80,000 flasks. Ed.)

PUBLICATIONS

GEOLOGIC MAP SERIES

	<u>Price postpaid</u>
1. Geologic map of the Wallowa Lake quadrangle, 1938: W.D. Smith & Others (also in Bull. 12)	\$ 0.45
2. Geologic map of the Medford quadrangle, 1939: F.G. Wells & Others	0.40
3. Geologic map and geology of the Round Mountain quadrangle, 1940: W.D. Wilkinson & Others	0.25
4. Geologic map of the Butte Falls quadrangle, 1941: W.D. Wilkinson & Others	0.45
5. Geologic map and geology of the Grants Pass quadrangle, 1940: F.G. Wells & Others	0.30
6. Preliminary geologic map of the Sumpter quadrangle, 1941: J.T. Pardee & Others	0.40
7. Geologic map of the Portland area, 1942: Ray C. Treasher	0.25
8. Geologic map of the Coos Bay quadrangle, 1944: Allen & Baldwin (sold with Bull. 27)	----
9. Geologic map of the St. Helens quadrangle, 1945: W.D. Wilkinson, W.D. Lowry, & E.M. Baldwin (sold with Bull. 31)	----

MISCELLANEOUS PUBLICATIONS

The Ore.-Bull: issued monthly by the staff as medium for news about the Department, mines, and minerals. Subscription price per year	0.25
Oregon mineral localities map (22 x 34 inches) 1946	0.10
Oregon quicksilver localities map (22 x 34 inches) 1946	0.25
Landforms of Oregon: a physiographic sketch, (17 x 22 inches) 1941	0.10

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BUILDING-BLOCK BOOM

by

Ralph S. Mason*

Concrete building blocks are enjoying an unprecedented boom as a result of the enormous demand for building materials of all kinds and the current shortage of lumber. In the Portland area there are half a dozen block plants which produce approximately 16,000 blocks a day - a large increase over prewar production. A survey made by the Department reveals that several manufacturers are producing blocks using pumice as an aggregate. These blocks weigh roughly 30 percent less than the regular sand-cement-gravel blocks, have superior heat insulation and sound absorbent properties, and can be used for partitions without the necessity of using so-called nailing blocks or furring strips since nails can be driven directly into the pumice blocks.

Popularity of the lightweight blocks is due to their greater ease of handling, reduced trucking charges from plant to construction site, and their inherent low thermal conductivity. The lightweight blocks are ideally suited for construction of homes, small commercial and industrial buildings, and for partitions in office buildings where acoustic problems are involved.

Pumice is the only lightweight aggregate being used locally at the present time. Shipments of this material are coming from Tumalo in Deschutes County where Walter A. Larsen is operating a quarry, and from just north of Chemult in Klamath County where Chrystallite Aggregates Company is shipping from a pit beside the Great Northern Railroad.

The Portland city building code requires a minimum of 1500 pounds crushing strength per square inch. All of the pumice blocks now being produced at plants visited will test more than this figure. Considerable interest was shown by the various operators in other types of lightweight aggregates such as volcanic cinders and haydite. (Haydite is a clay or shale expanded by rapid heating in a kiln.)

The biggest headache for all block plants is the shortage of cement. Every plant visited was running below full capacity for this reason. Some operators have brought in cement from as far away as Kansas City, with a freight charge larger than the original cost of the cement.

The area in which blocks produced in Portland can be marketed seems to vary with the individual producer. Some operators felt that they could compete anywhere within a radius of 100 miles; others thought 200 miles would not be too far. One manufacturer declared that he even could ship lightweight blocks to points in the Mississippi Valley where block costs have more than doubled since OPA regulations expired.

Concrete blocks are manufactured in much the same way by all block plants. The mix consists of either water, sand, cement and gravel for the standard block, or water, sand, cement and pumice for the lightweight blocks. Some manufacturers also add small amounts of chemicals to the mix to speed setting of the blocks and to facilitate stripping from

* Mining Engineer, State Department of Geology and Mineral Industries.

the molds after forming. The mix is fed into a machine which molds and compacts the material into any one of a number of standard shapes. The block is ejected, placed on racks, cured in a steam room for 12 hours and then allowed to yard cure for a week or ten days before shipment. Some block machines compact the block by means of a vibrating action, some use a tamping or pressing action, and some use a combination of these. Machines at two of the larger plants are completely automatic, and require only a man to prepare batches of mix, and an offbearer to remove the finished blocks and place them on racks. Smaller machines range from the semi-automatic models on down to those which are manually powered and operated.

Empire Building Material Company operates one of the largest block plants in Portland at 92nd and N.E. Halsey Street. This recently opened plant is modern in every respect and produces approximately 5000 blocks per eight-hour shift. At the present time only the regular sand, cement, gravel block is being produced, but plans for making lightweight blocks are being considered. Cement is purchased in bulk, while sand and gravel are obtained from local pits.

Smithwick Concrete Products Corporation, N.E. Lombard and Columbia Blvd., is producing between 4000 and 5000 blocks per day. Both regular concrete and pumice blocks are made. Consumption of pumice, which is obtained from Volcanic Materials Company near Bend in Deschutes County, is about two cars a day. Pit run pumice is currently being used which is composed of 3/8-inch lumps and finer sizes. Blocks are steam cured for 12 hours at a temperature of 200° F., after which they are allowed to yard cure for 10 days. Fork trucks are used to carry stacks of cured blocks around the plant. Steel forks fit into the core holes of blocks on the bottom row and no pallet is required. A full line of both types of blocks is manufactured.

The Perma-Insul Company, located on Suttle Road in North Portland, is currently producing about 2500 lightweight blocks per day from 65 yards per week of pumice shipped from a pit near Chemult operated by Chrystallite Aggregates Company. One of the novel features of the Perma-Insul plant is the block machine which is powered by both steam and electricity. A "shotgun" feed actuates a sliding hopper which fills the electrically vibrated mold. A steam piston applies pressure to the top of the mold and also serves to eject the blocks. Steam is also used in the curing room. A 45-h.p. coal-fired upright boiler serves the plant.

Builders Concrete Products Company, 110 N.E. Farragut Street, Portland, is producing both plain and colored concrete bricks. The bricks are cast on an automatic machine at the rate of 33 per minute, and have a recessed bottom face which forms a mortar lock. Approximately two million bricks have been produced since April 15, 1946, when the plant commenced operations. Current consumption of fine-sized aggregate runs about 30 yards per day. Plans for making brick with a lightweight aggregate such as pumice or haydite, are being considered. Oxide pigments are used to color the cement mix before molding; these pigments produce a solid coloring throughout the brick. Forty-five different shades are available for coloring the bricks which are to be used in home, fireplace, barbecue pits, and similar constructions. The plain bricks are in demand principally for cesspools at the present time. Concrete roof tiles in five different styles are to be produced in the near future. A novel process for applying special coatings to freshly cast bricks and to poured walls is in use at the plant. A portable compressed air "gun" equipped with a double hopper first applies a base coat to which the finish coat is added. A concrete pipe plant producing standard sizes of soil and sewer pipe is operated in conjunction with the brick plant.

The Gardner Concrete Block Company, 2700 N.E. 82nd Avenue, commenced operating in February 1946 and is currently turning out 1000 blocks a day with one vibrating machine. Aggregate is obtained from the adjacent Rose City Sand and Gravel Company pit.

A new approach to the construction of buildings with nonmetallics is being developed by the Loya Corporation, Portland. Operations so far have been along experimental lines.

Volcanic tuff from quarries near Baker is sawed accurately into various sized blocks having a dimension tolerance of 1/3000 of an inch. The blocks are cemented firmly together with a thin film of plastic which penetrates into the pores of the blocks. When laid up in a wall, the blocks form a flat, even surface on which paint, plaster, or wallpaper can be applied directly. Minor imperfections, such as chips, caused by handling can be filled with a fast-drying "spackle" composed of powdered tuff and the plastic bond. The tuff blocks possess the qualities of lightness, good thermal insulation, and sound absorption. They have a crushing strength in excess of 3000 pounds per square inch. Nails and screws can be driven and held in the blocks as if they were wood. In addition to the squared blocks, the tuff can be turned on a lathe and shaped easily. The material may also be crushed and used for terrazzo floors.

Heisen, Cole & Company, Inc., Park Building, Portland, are preparing to manufacture and lease a special block machine capable of producing keyed blocks. The machines are to be leased under a franchise to block manufacturers scattered throughout the Northwest. The block machine is designed for both regular and lightweight blocks.

Manford Pate is manufacturing an interlocking tile at a plant located at 82nd and N.E. Brazee Street. No lightweight aggregates are used since the blocks are composed of several small easily handled units.

In addition to the above block producers, several other firms are contemplating production of lightweight blocks when the current cement shortage eases and the cost of pumice decreases. One manufacturer is particularly interested in pumice fines for special concrete building accessories.

Tigard Concrete Products, Inc., Tigard, Oregon, is currently producing about 2500 regular concrete blocks per day, as well as road pipe, well curbing, and septic tanks. Some test work has been done with pumice as a lightweight aggregate, but only standard sand-cement-gravel blocks are being produced.

Umatilla Building Materials, Inc., Umatilla, is currently producing 4 thousand 4 x 8 x 12-inch sand-cement-gravel blocks a day. Some lightweight blocks using pumice from Burns have been produced experimentally, and the company is considering plans for manufacturing this type on a commercial scale. Concrete bricks are scheduled for early production at an estimated rate of 8000 units per day. Eight men are employed in the plant. Mr. J. M. Davies is president, and Mr. J. B. Redwine is plant superintendent.

The B and B Mortarless Block Company at Pendleton is producing interlocking building blocks which require no mortar when they are laid up in a wall. Pumice is obtained from the Volcanic Materials Company at Bend. The plant is owned and operated by Mildred and Stanley Bergeman. A full line of blocks is manufactured.

Lightweight building blocks, using pumice from the Volcanic Materials Company are being produced by the Pendleton Pumice Products Company. Mr. James L. Hinds is owner-operator of the plant which is manufacturing 4 x 8 x 16, 6 x 8 x 16, 8 x 8 x 16, and half-size blocks.

The current boom in concrete building blocks is not a local condition. In the city of Kassel, Germany, which was more than 90 percent destroyed by aerial bombardment during the war, hollow concrete blocks similar to the 3-core blocks produced here are being turned out on huge cumbersome machines. Aggregate, as might be suspected, is obtained from the finely pulverized brick and stone buildings - the rubble of the bombings.

Western Block Co., 101st Avenue and S.E. Foster, is erecting a block plant which will begin production of a full line of pumice building blocks and brick in about 2½ months. The plant is owned and operated by Messrs. C. A. and C. E. Felmley, and will produce 10,000 units per 8-hour day. Pumice will be obtained from Chrystallite Aggregates Company at Chemult.

A list by counties of concrete block manufacturers in the State follows:

Building-Block Manufacturers in Oregon

Baker County

Bilt Rite Block Company
Baker

Baker-Union Concrete Products Co.
North Powder

Deschutes County

Grimes Pumice Block Company
Bend

Oregon Pumice Products Company
Bend

Deschutes Concrete Products Co.
Redmond

Douglas County

Chrystalite Tile Plant
Roseburg

Pre-Mix Concrete
Roseburg

Roseburg Concrete Products Co.
Roseburg

Jackson County

Acme Block Company
Medford

Builders Supply Company
Medford

Conco Block Company
Medford

Crater Pumice Company
Phoenix

Day, Orrin
Medford

Eagle Flue Company
Eagle Point

Hiatt & Korble
Central Point

Ideal Block Company
Medford

John Nosler
Ashland

K. C. Jones
Medford

Medford Concrete Construction Co.
Medford

Jackson County

(cont.)

Savage Creek Block & Concrete Co.
Rogue River

Triple A Block Company
Medford

Valley Block Company
Medford

Jefferson County

Pum-Brick Tile Company
Madras

Josephine County

Concrete Products
Grants Pass

V. R. Huffman
Grants Pass

Pumice Block Plant
Grants Pass

Klamath County

Boorman Pumice Products
Klamath Falls

Chrystolite Products Company
Klamath Falls

Hodges Bros.
Merrill

Insulite Pumice Brick & Tile Co.
Klamath Falls

Klamath Pumice Brick & Tile Co.
Klamath Falls

L. P. Montgomery
Klamath Falls

A. J. Tracy
Klamath Falls

Lake County

Concrete Products Company
Lakeview

Mr. A. B. Seymour
Lakeview

Lane County

Creswell Concrete Block Company
Creswell

Malheur County

Armco Drainage and Metal Products Company
Ontario and Nyssa

Eastern Oregon Pipe Company
Ontario

Nyssa Tile & Pipe Company
Nyssa

Marion County

Boock Building Block Company
Salem

Mortarless Block Company
Salem

Oregon Gravel Company
Salem

Pumilite Concrete Block Company
Salem

Salem Concrete Pipe and Products Company
Salem

12th Street Block Company
Salem

Multnomah County
(Portland)

Builders Concrete Products
110 N.E. Farragut Street

Empire Building Materials Company
92 Avenue & N.E. Halsey Street

Gardner Concrete Block Company
2700 N.E. 82 Avenue

Multnomah County (cont.)

Pate, Manford
82 Avenue & N.E. Brazee Street

Perma-Insul Company
North Suttle Road

Smithwick Concrete Products Company
Columbia Blvd. & N.E. Lombard St.

Western Block Company
101 Avenue & S.E. Foster Blvd.

Polk County

Reimer, Ben
Dallas

Umatilla County

B & B Mortarless Block Company
Pendleton

Pendleton Pumice Products Company
Pendleton

Umatilla Building Materials Company
Umatilla

Washington County

McCormack Concrete Pipe Company
Hillsboro

Tigard Concrete Products, Inc.
Tigard

OREGON SODIUM DEPOSITS DESCRIBED

Sodium salts of Lake County, Oregon, is the title of a report just issued by the State Department of Geology and Mineral Industries. Summer, Abert, and Alkali lake brines and playa deposits are described and analyses of samples are tabulated. Authors of the report are Dr. I. S. Allison, professor of geology at Oregon State College, and Mr. R. S. Mason, mining engineer with the State Department.

Sodium salts are primary raw materials in many industries, and the stepped-up industrial activity all over the country has increased the demand for these salts. Supplies are short at the present time.

The 12-page report, G.M.I. Short Paper No. 17, includes an index map, several tables, and two illustrated plates. It may be obtained at the Portland office of the Department at 702 Woodlark Building, and at the Department field offices at Baker and Grants Pass.

SOAP FROM PETROLEUM

(Reprinted from The Link, issue of January 1947,
published by the Carter Oil Co., Tulsa, Oklahoma)

A new development in soap - the first soap powder made entirely from petroleum without the use of either animal or vegetable fats - has been perfected and now is in the process of being marketed for both consumer and industrial users.

The finished compound consists of white, free-flowing particles similar to other soap powders, and is used in much the same way.

The new product, technically known as a synthetic detergent, is said to be superior to present cleaners for such household chores as washing dirty dishes, since it won't scum and it has a high sudsing quality, according to the chemical company, which handles the new product. ...

The new "soapless soap", described as an all-purpose cleanser, is said to be equally effective in laundering fine fabrics, dish washing, cleaning the family car and in cleaning industrial equipment, such as bottles and cans. It also is said to be useful as a basic ingredient in textile, tanning and dyeing industries and in the making of insecticides and herbicides.

Of especial interest to housewives, is the fact that the new detergent spells the doom of "bathtub ring." ...

Few persons except experts who developed them understand synthetic detergents, but whereas soap acts as a catalyst, most synthetic detergents are dissolvents.

Soap is a chemical compound made by combining fats with an alkali (potash or soda). Middle-aged persons who grew up on the farm or in small towns will recall the yellow home-made laundry soap which their mothers made by using waste fats and lye water. The lye water oftentimes was obtained by pouring rain water through a hopper of wood ashes numerous times. The result was a strong yellow soap which cleaned thoroughly, but lacked some of the more gentle qualities of our modern soaps.

While the chemical formula varies, generally speaking, synthetic detergents are composed of hydrocarbon chains derived in this case from petroleum, and modified by various chemical groups.

"Soapless soap" from petroleum performs equally well in any kind of water - hard, soft, hot or cold, and even in sea water. It produces more suds per amount used than does soap. A test performed with one brand of synthetic detergent showed that one teaspoon of the synthetic detergent was equal to 4 to 6 teaspoons of a well-known brand of soap. ...

From no production in 1928, the production of synthetic detergents leaped to 125,000,000 pounds during 1945. This still is little more than five percent of the 2,350,000,000 pounds of soap manufactured annually in the United States, where housewives place a premium on cleanliness.

TEXACO TEST

The Texas Company's Clark and Wilson No. 6-1 test well, located near Mist, Western Columbia County, Oregon, had reached a depth of 4700 feet on February 18. No information on the drilling results is available.

OREGON KING MINE TO RESUME

The Oregon King Mine, Jefferson County, a past producer of gold, silver, lead and copper, with principal values in silver, is to be reopened in the immediate future under the supervision of Carl V. Ohman, with William J. Murphy as mill superintendent and William J. Shannon as assayer.

NEW CHIEF METALLURGIST ALBANY LABORATORY

Stephen M. Shelton has been appointed Chief of the Metallurgical Division of the U.S. Bureau of Mines' laboratory at Albany, Oregon, to succeed Bruce A. Rogers who is taking a leave of absence. Mr. Shelton has already taken over the work at Albany.

CHROMITE

Most of the chromite produced in South Africa since the end of World War II has been exported to the United States as shown by the following statistics reprinted from U. S. Bureau of Mines Mineral Trade Notes, issue of December 20, 1946.

Union of South Africa: Production, local sales, and exports of chromite during 1944 and 1945 are given below in short tons:

	1944	1945	First quarter 1946
Production	98,006	109,229	41,663
Local sales	6,277	7,027	2,117
Exports:			
United States	22,584	184,447	36,522
Argentina	887	1,050	54
United Kingdom	32,318	5,650	2,320
Sweden	931	5,125	7,289
France	-----	-----	22
	56,720	196,272	46,207

The large increase in 1945 exports was due largely to the improvements in railroad and shipping facilities. Exports in 1945 exceeded the peak prewar production reached in 1938 of 194,626 tons averaging 44 percent Cr_2O_3 .

For industrial uses, the ore is classified as concentrates, friable ore, and hard lumpy ore. The Union Department of Mines gives the following typical analyses of the ores:

	Concentrates, percent	Friable ore, percent	Hard lumpy ore, percent
Cr_2O_3	53.33	47.05	43.38
FeO	19.24	23.8	25.62
SiO_2	1.04	3.16	1.70
Al_2O_3	14.70	16.18	18.65
MgO	12.18	9.58	10.66
CaO	nil	.91	.10

(Minerals Attaché William O. Vanderburg, Pretoria.)

PUMICE SHIPPED FROM TUMALO, DESCHUTES COUNTY

Walter A. Larsen is shipping pumice from a pit leased from the city of Tumalo, Deschutes County. Current production is approximately 15 cars per month, with shipments going to lightweight pumice building-block manufacturers located in Pendleton, Walla Walla, Portland, and other points. The deposit is reported to have an overburden of about two feet, with a 15-foot layer of pumice beneath. Rail shipments are made from Deschutes on the Great Northern Railroad. Larsen's operation is called the Volcanic Materials Company and is one of five similar operations now producing pumice in the Bend area. Equipment used at the plant includes a bulldozer, rolls, and screens.

INTERIOR DEPARTMENT CLINGS TO LEASING POLICY

Interior Secretary J. A. Krug, in the annual report of his Department, states, in part:

"The Department's conviction that metallic minerals on the public domain as well as oil, coal, and potash should be leased rather than be taken over in fee simple has for some years met the opposition of the mining industry. The mineral and land agencies of the Department believe that the public domain is public property and that the national mineral situation is serious enough to demand that some supervision be exercised over the timing of mineral production. They also believe that some royalty should be paid into the public treasury on wealth located on and produced from the public domain. The industry generally believes that the hazards of prospecting and costs of extraction are already sufficiently high, and that the addition of payments on production is one straw too many, and holds back development. Some plan that would allow a basic net income after all costs and taxes and would provide for graduated royalties thereafter, might make the leasing proposal for minerals more acceptable to those small operators who would settle for a reasonable income instead of a killing."

(From News Letter, Mining Association of Montana, February 1947)

CLEARING HOUSE

CH-92: FOR SALE OR LEASE 160 acres patented dredging ground on Pleasant Creek, Jackson County, Oregon, by Mrs. Sara C. Lowry, 502 East "A" Street, Grants Pass, Oregon.

PUBLICATIONS

<u>GEOLOGIC MAP SERIES</u>	<u>Price postpaid</u>
1. Geologic map of the Wallowa Lake quad., 1938:W.D.Smith & others (see Bull.12)	\$ 0.45
2. Geologic map of the Medford quad., 1939:F.G.Wells & others	0.40
3. Geologic map and geology of the Round Mountain quad., 1940: W.D.Wilkinson & others	0.25
4. Geologic map of the Butte Falls quad., 1941:W.D.Wilkinson & others	0.45
5. Geologic map and geology of the Grants Pass quad., 1940:F.G.Wells & others .	0.30
6. Preliminary geologic map of the Sumpter quad., 1941:J.T.Pardoe & others . .	0.40
7. Geologic map of the Portland area, 1942:Ray C. Treasher	0.25
8. Geologic map of the Coos Bay quad., 1944:J.E.Allen & E.M.Baldwin(sold with Bull.27)	----
9. Geologic map of the St. Helens quad., 1945:W.D.Wilkinson, W.D.Lowry, & E.M.Baldwin (sold with Bull. 31)	----
<u>MISCELLANEOUS PUBLICATIONS</u>	
THE ORE.-BIN: issued monthly by the staff as medium for news about the Department, mines, and minerals. Subscription price per year	0.25
Oregon mineral localities map (22 x 34 inches) 1946	0.10
Oregon quicksilver localities map (22 x 34 inches) 1946	0.25
Landforms of Oregon: a physiographic sketch, (17 x 22 inches) 1941	0.10
Index to topog, mapping in Oregon,1946; index to geol. mapping in Oregon,1946	Free

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March 1947

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NICKEL-BEARING LATERITE, RED FLAT,
CURRY COUNTY, OREGON

by

F. W. Libbey, W. D. Lowry, and R. S. Mason
State Department of Geology and Mineral Industries

Introduction

Peridotite and serpentine which occupy large areas in southwestern Oregon contain small amounts of nickel. Samples analyzed by the Department have ranged from trace to 0.25 percent nickel. Pecora and Hobbs (1942)¹ give analyses of peridotite (saxonite) and serpentine on Nickel Mountain, Douglas County, Oregon, which contain from 0.08 to 0.35 percent nickel.

A lateritic red soil, developed on peridotite areas, has been stripped by erosion in many places, but there are some areas which still have substantial thicknesses. Samples of this lateritic soil obtained by the Department in 1943 and 1944 indicated that in the process of weathering of the peridotite, there has been some concentration of nickel in the laterite. This is shown also by Pecora and Hobbs² in samples of the red soil on Nickel Mountain where a veneer of brick-red soil averages 2 or 3 feet thick and ranges in thickness from a few inches up to 9 feet. Samples of this soil contained from 0.61 percent to 1.10 percent nickel.

In the summer of 1946 the Department started a project planned to investigate the nickel content of lateritic soils on the peridotite areas of Oregon with especial attention to the possibility of secondary enrichment of nickel in the lower part of relatively thick sections of the laterite.

The first work was done in an area of Curry County known as Red Flat placers near the headwaters of Pistol River, because this locality was reported to have a section of laterite at least 32 feet thick at one place. This preliminary report is concerned mainly with the work done at Red Flat.

Four auger holes were drilled as shown on the accompanying map. Samples were taken for each foot of depth. The drilling showed that the laterite contains some hard, unweathered boulders of peridotite, and when one of these was encountered in a drill hole, no further drilling could be done with the equipment available. The deepest hole was 11 feet in depth. In addition to the drilling, a brief geological reconnaissance of the area was made.

The nickel content of the laterite appears to increase with depth, as shown by accompanying analyses, but far too little work was done to give conclusive results. Either heavier drilling equipment or, preferably, test pits or shafts will be necessary in order to sample the laterite down to the peridotite in place. All of the samples of laterite contained chromite.

¹ Pecora, William T., and Hobbs, S. Warren, Nickel deposits near Riddle, Douglas County, Oregon: U.S. Geol. Survey Bull. 931-I (1942).

² Idem.

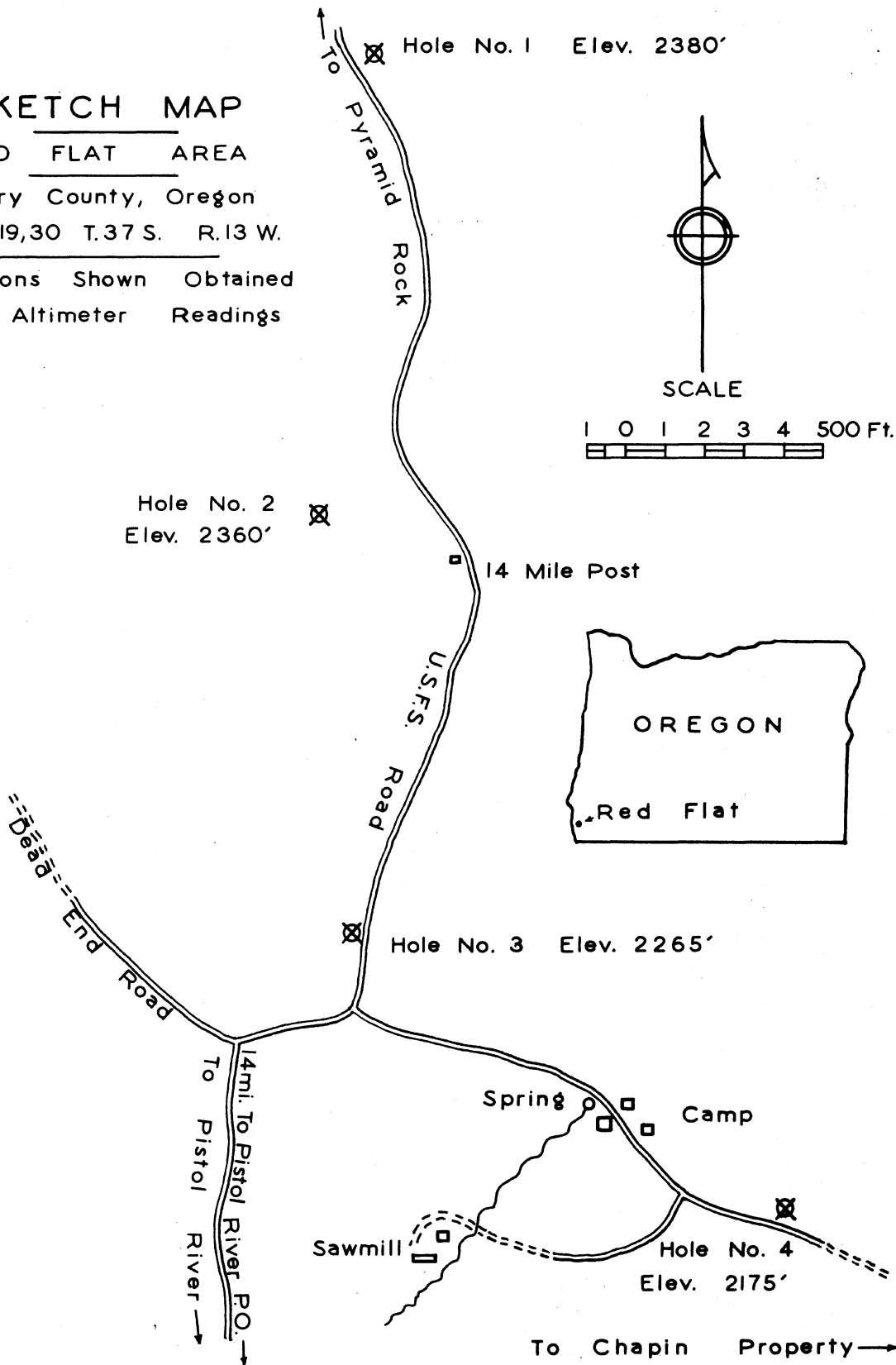
SKETCH MAP

RED FLAT AREA

Curry County, Oregon

Secs. 19,30 T.37 S. R.13 W.

Elevations Shown Obtained
From Altimeter Readings



A careful panning test of the laterite was made, using a composite of samples obtained in two drill holes, in order to get information on distribution of the mineral content which could be effected by gravity concentration. The test indicated that most of the nickel went into the tails along with a large part of the limonite. The magnetite and a large part of the chromite were concentrated in the heavy fraction.

Chemical and spectrographic analyses were made by L. L. Hoagland and Thomas Matthews, respectively, of the Department staff.

Mr. J. E. Morrison, mining engineer formerly with the Department, visited the Red Flat property in 1937 and sampled both the laterite and peridotite to check reported gold values. His samples returned 0.02 ounces per ton in the peridotite and a trace in the laterite. Mr. Randall Brown, geologist formerly with the Department, investigated reported mercury values at both Red Flat and the Chapin property, just east of Red Flat proper, in 1942. His samples returned traces of mercury. During the war period, engineers of both the U.S. Bureau of Mines and the War Production Board examined the Red Flat area. There has been no commercial production.

Location

Red Flat is about 8 miles southeast of Gold Beach, Oregon, as shown on the accompanying map. The area lies west of the North Fork of the Pistol River and is 14 miles by way of the Pistol River road from Pistol River post office on the Coast Highway (U.S. 101). The Pistol River road is graded and drained but was in only fair condition at the time of the investigation in late May and early June. Most of Red Flat is in secs. 19 and 30, T. 37S, R. 13 W., W.M., at an elevation ranging from about 2000 to 2500 feet.

Ownership

Nine association placer claims of 160 acres each, known as the Red Gold Association nos. 1 to 9, are held by Carl Smedberg and associates of Gold Beach, Oregon.

Topography and climate

Red Flat is not a large nearly flat area as might be assumed from the name. However, as compared to most of the surrounding area, which is rugged and steep, it is relatively flat and undissected with a relief of two or three hundred feet. Scattered trees cover part of the area but large patches covered only by ground shrubs are common. The climate of the area is characterized by a rainy winter and a comparatively dry summer. Red Flat is well below the summit ridges which are remnants of the Klamath peneplain at an elevation of about 3500 feet.

Development

A few shallow trenches and a shaft reported by Morrison³ to have been 32 feet deep, but now caved, comprise the bulk of the development work. A spring at the camp, when visited in June, had sufficient volume for all domestic needs and could probably supply a small mill also. Flycatcher Spring, about half a mile north of the camp junction, has a much smaller flow. The area is drained on the east by the North Fork of Pistol River, and on the west by the Big South Fork of Hunter Creek. Both stream channels lie several hundred feet below the level of the camp site.

Camp facilities include a cookhouse, bunkhouse, repair shed and other small buildings, some of which were under construction. A new sawmill and assay laboratory are located just below the camp buildings. The sawmill is used to provide lumber for construction of camp buildings. The timber is obtained from an adjacent stand of Port Orford cedar.

³ Morrison, J.E., Red Flat placers: Oregon Metal Mines Handbook, Coos, Curry, and Douglas Counties: State Dept. of Geology and Min. Industries Bull. 14-C, vol. I, p. 64, 1940.

Geology

As noted by Morrison, the deposit is of residual origin and was derived by the weathering in place of ultramafic rocks which underlie Red Flat and crop out on it in several places. These rocks, largely peridotite, intrude an older dark-colored greenstone (?) which occurs as isolated masses in some of the outcrops of peridotite. Greenstone (?) also crops out in a few places both just east and west of Red Flat proper. It carries quartz veinlets which are not present in the peridotite, suggesting that the greenstone (?) underwent one period of quartz mineralization that the peridotite did not.

The peridotite is one of the ultramafic intrusives which are common in southwestern Oregon and northern California. According to Wells⁴ these rocks intrude all formations older than the Cretaceous including the Galice and Dothan formations of Jurassic age. A sample of peridotite from one of the outcrops on Red Flat was made up largely of olivine and darker green derived serpentine. The olivine was largely free of inclusions but magnetite grains were common in the serpentine. The greenstone (?) in the Red Flat area may be similar in age to or possibly older than the Galice and Dothan formations. The report by Butler and Mitchell⁵ contains a geologic sketch map of Curry County which shows both the Dothan formation and the Colebrooke schist in contact with peridotite in the Red Flat area. According to Maxson⁶, acid intrusives of late Jurassic or early Cretaceous age intrude the ultramafic rocks elsewhere in the Klamath Mountains.

The Red Flat surface was probably formed by an erosional cycle subsequent to that which formed the Klamath peneplain.⁷ This is supported by Diller's statement that although residual deposits may have covered the Klamath peneplain, they have been largely removed. The Klamath peneplain, according to Diller, was developed while the Wimer beds were being laid down in the sea in the adjacent area southwest of the drainage of the Trinity River at the northern end of the Coast Range of California. As the Wimer beds, on the edge of the plateau at an elevation of about 2200 feet, 13 miles northeast of Crescent City, California, were then considered to be of Miocene age, Diller assigned the formation of the Klamath peneplain to that epoch. However, Diller pointed out that although the deposition of the Wimer beds occurred in late Tertiary time and probably in the late Miocene, further study might show that the Wimer beds and correlative formations are of Pliocene or even Pleistocene age and hence the age of the Klamath peneplain would be correspondingly reduced. Unfortunately no further attempt to date the Wimer fauna is known to have been made. Hence the development of the Red Flat surface, which apparently took place after the Klamath peneplanation, probably occurred during Pliocene time. Laterization of the Red Flat surface occurred during or subsequent to that epoch and prior to the elevation of the Red Flat surface to its present position. The uplift probably began late in the Pliocene or early Pleistocene and the ensuing erosion has removed part of the lateritic cover from Red Flat.

The laterite

The name Red Flat was undoubtedly suggested by the reddish color of the residual soil or laterite which covers much of the flat. Outcrops of country rock are fairly common. Color of the laterite ranges from yellow through yellowish brown and brown to deep reddish brown, and the texture is soft and earthy or mealy when dry. However, the moist laterite from the drill holes tended to be darker and mottled in places; some of the samples obtained

⁴ Wells, F.G., Preliminary geologic map of the Grants Pass quadrangle, Oregon: State Dept. of Geology and Min. Industries, 1940.

⁵ Butler, B.S., and Mitchell, G.J., Preliminary survey of the geology and mineral resources of Curry County, Oregon: Oregon Bur. Mines and Geology, Min. Resources of Oregon, vol. 2, no. 2, October 1916.

⁶ Maxson, J.H., Economic geology of Del Norte and Siskiyou Counties, northwesternmost California: California Jour. Mines and Geology, vol. 29, nos. 1 and 2, January and April 1933.

⁷ Diller, J.S., Topographic development of the Klamath Mountains, U.S. Geol. Survey Bull. 196, 1902.

were quite plastic. As shown in roadcuts and by auger drilling, unaltered or only partially altered ultramafic rock ranging in size from small pieces to boulders occur scattered through the laterite. As a result some of the laterite in the drill holes was quite gritty. The surface of the laterite as well as that of outcrop areas is in places covered by numerous hard round "shots" or concretions commonly 1/8 to 1/4 inch in diameter. The areal extent of the lateritic soil is limited by that of the flat itself but the maximum thickness is not known. None of the four drill holes went deeper than 11 feet. However, the laterite may actually be thicker in places for it is believed that the peridotite rocks encountered at the bottom of three of the holes were loose. A caved shaft a short distance north of the mining camp near the south end of Red Flat is reported to have penetrated somewhat more than 32 feet of lateritic material. Thus the thickness of the laterite ranges from nil where the country rock crops out to at least 32 feet in places.

The chemical composition of the laterite is shown by the following analyses. Sample P-5452 is a composite of the samples from hole 1, and sample P-5455 is a composite of samples from hole 4. Sample P-5455 contained numerous rock fragments which account for a much higher silica and a lower iron content.

	<u>P-5452</u> (composite of hole 1)	<u>P-5455</u> (composite of hole 4)
Fe	42.51 %	22.36 %
Al ₂ O ₃	10.76	16.80
SiO ₂	7.58	24.49
Cr ₂ O ₃	3.31	1.53
Ni	0.845	0.516
TiO ₂	0.75	1.16
Au	0.015 oz/ton	0.004 oz/ton
Pt group metals	nil	nil
(determined spectrographically)		

Analyses of the samples from the 4 auger holes are shown graphically on following pages. Most of the samples contained only a trace of gold or silver but two samples did contain 0.02 ounce gold and a third contained 0.20 ounce silver. Although mercury has been reported to occur in the laterite, none was present in any of the samples collected by the Department.

As shown by these analyses the nickel content ranges from 0.27 to 1.46 percent. Partial chemical analyses of successive pan concentrates, tailings, and slimes of a composite sample of material from holes 1 and 4 are given on the following page. They indicate that the nickel content of the lighter fractions is much greater than that of the concentrate.

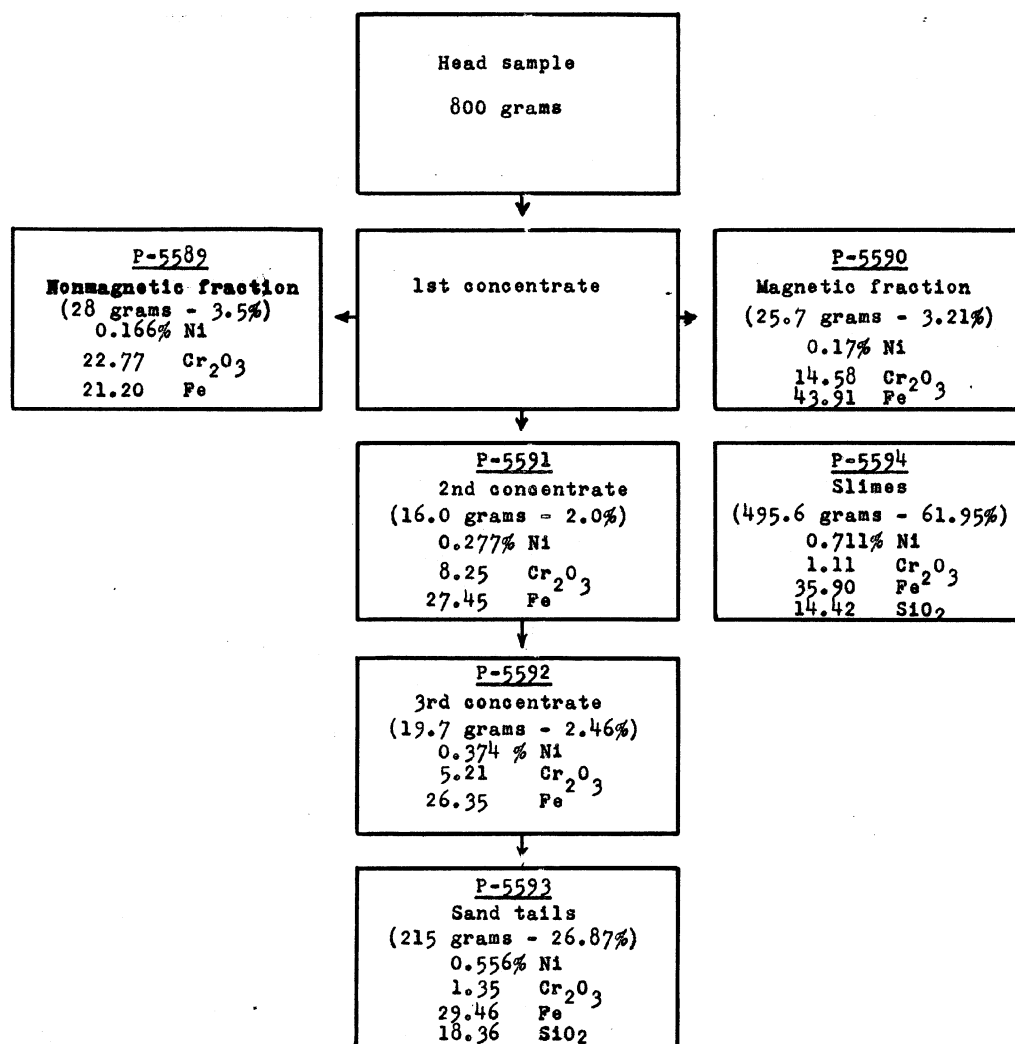
Petrographic examination of the laterite from hole no. 1 (sample P-4838) failed to reveal the nickel-bearing mineral or minerals. Most of the laterite is made up of limonite, largely goethite, and magnetite grains. The magnetite grains, which are residual from the weathering of the peridotite, contain a small amount of nickel. Chemical analysis shows that most of the nickel in sample P-4838 occurs in the slimes which are largely limonite. Other constituents of sample P-4838, which together contain only a small percentage of nickel, are serpentine (chrysotile), opal (including associated chalcedony), chromite, and a mica-like mineral. The last is fairly common and is similar in most properties to phlogopite but differs in that, unlike the micas, it has an optically positive interference figure.

Chemical analysis of a selected portion of the slimes (sample P-5594 of panning test) showed that it contained 0.74 percent nickel, 4.70 percent magnesia, 13.88 percent silica, and 65.88 percent R₂O₃ (mainly iron oxides). Petrographic examination of this selected slimes sample showed it to be predominantly limonite. No nickeliferous minerals were identified. A sample of soft limonite from Nickel Mountain near Riddle, Oregon, carefully collected by Pecora and Hobbs⁸ in 1942, was reported to contain 1.3 percent nickel.

⁸ op. cit.

Thus the analyses indicate that most of the nickel, as well as silica, is intimately associated with the limonite. Possibly the nickel is tied up molecularly with the limonite.

Results of Panning Tests, Red Flat Laterite
Composite of Drill Holes 1 and 4



Loss of slimes and sand during panning amounted to 10.48 percent.

The lateritic origin of the deposit is indicated by the presence of residual magnetite, chromite, and serpentine as well as by pieces of peridotite.

Derivation of the laterite from the peridotite is also shown by the following spectrographic analyses. Sample P-4848 is a specimen of peridotite exposed near hole 2, and sample P-4827 is laterite from hole 1. Also listed in the table is the spectrographic analysis of the concretions or "shots", sample P-4849, which occur on the surface near hole 2.

Table 1

<u>Percentage</u>	<u>P-4848</u> (peridotite exposed near hole 2)	<u>P-4827</u> (laterite from hole 1. 0' to 1'2")	<u>P-4849</u> (concretions from surface)
More than 10%	iron silicon magnesium	iron	iron aluminum (Chem., 19.92% Al_2O_3)
1 - 10%	----	silicon aluminum	silicon (Chem., 9.38% SiO_2)
0.1-1%	aluminum calcium	magnesium chromium cadmium nickel (Chem., 0.33%)	magnesium chromium cadmium sodium nickel (Chem., 0.178%)
0.01 - 0.1%	chromium nickel (Chem., trace) cadmium vanadium manganese sodium	calcium vanadium manganese sodium titanium boron tin	calcium vanadium manganese titanium
0.001 - 0.01%	titanium boron tin copper cobalt zirconium strontium potassium	copper cobalt zirconium strontium potassium	boron copper cobalt zirconium strontium potassium tin molybdenum
Less than 0.001%	barium silver molybdenum	barium silver molybdenum	barium

All of the elements shown to be present in the laterite occur in the peridotite. The spectrographic analyses show that of the major constituents of the peridotite the laterization removed much of the magnesium and part of the silicon, and concentrated the iron. The weathering process also concentrated the nickel and aluminum. Chemical analyses show that the peridotite near hole 2 contains a trace of nickel whereas a composite sample of the laterite from hole 2 contains 0.796 percent nickel. A sample of the greenstone, P-4860, from an outcrop northeast of hole 1 did not contain any nickel.

As previously noted, the weathering which produced the laterite probably occurred during the Pliocene before the area was elevated to its present position. Erosion has already removed part of the laterite as indicated by the presence on outcrop areas as well as on the surface of the laterite of hard round "shots" or concretions which were uncommon in the samples from the auger holes. The spectrographic analysis of a sample, P-4849, of the "shots" from the surface near hole 2, given in table 1, shows a further reduction in the magnesium content and a further increase in the aluminum content. Chemical analysis of this sample shows that the "shots" contain 19.92 percent Al_2O_3 (and 9.38 percent SiO_2) or nearly twice as much alumina as in the laterite from hole 1. The nickel content of this sample was 0.178 percent and that of the "shots" from 30 feet west of the road and 0.19 mile south of hole 1 was 0.341 percent.

From the amount of sampling done, there appears to be a tendency for the nickel content to increase with depth. If the concretions represent a former higher horizon, their lower nickel content follows the apparent trend. The apparently greater nickel content of the lower part of the lateritic section may be the result of greater leaching of the nickeliferous material in the upper part of the section or it may be due to an enrichment from above. Possibly both processes are responsible. However, if the nickeliferous minerals are formed near the bottom of the lateritic section from the olivine in the peridotite at the same time as the limonite, as seems reasonable, the lower nickel content of the upper part of the laterite may be largely the result of leaching. Possibly prospecting at depth will show appreciable enrichment.

The Red Flat deposit is similar in several respects to the brick-red laterite soil at Nickel Mountain⁹ which ranges in thickness from a thin veneer to 9 feet. Three composite samples of the Nickel Mountain laterite were reported to contain 0.95, 1.02, and 1.10 percent nickel, respectively. Pecora and Hobbs stated that the mineral in the soil containing the nickel is not known.

The Department plans to make further studies of Oregon nickel-bearing laterite.

A graphic representation of drill-hole sampling results follows:

Hole No. 1					
Sample number	Depth feet		Assay		
			Au oz.	Ag oz.	Ni %
	0				
P-4827	1		nil	tr	0.33
P-4828	2		0.02	tr	0.362
P-4829	3		---	---	0.29
P-4830	4		nil	tr	0.59
P-4831	5		tr	tr	0.695
P-4833	6		tr	tr	0.959
P-4834	7		nil	nil	1.09
P-4835	8		0.02	tr	1.25
P-4837	9		tr	nil	1.34
P-4838	10		nil	nil	1.46
P-4839	11	Bottom	---	---	1.18

⁹ Pecora, W. T., and Hobbs, S. W., op. cit.

Hole No. 2

<u>Sample number</u>	<u>Depth feet</u>	<u>Assay</u>			
		<u>Au</u> oz.	<u>Ag</u> oz.	<u>Ni</u> %	<u>Hg</u> %
	0				
P-4841	1	nil	nil	0.46	---
P-4842	2	---	---	1.38	---
P-4843	3	nil	nil	0.65	nil
P-4844	4	tr	tr	0.62	---
P-4845	5	---	---	0.62	---
P-4846	6	nil	tr	1.007	nil
P-4847	7	nil	tr	1.29	---

Hole No. 3

<u>Sample number</u>	<u>Depth feet</u>	<u>Assay</u>			
		<u>Au</u> oz.	<u>Ag</u> oz.	<u>Ni</u> %	<u>Hg</u> %
	0				
P-4851	1	nil	0.20	1.17	---
P-4852	2	nil	tr	0.934	nil
P-4853	3	nil	tr	0.857	nil
P-4854	4	---	---	1.02	---
P-4855	5	nil	tr	1.14	---
P-4856	6	nil	tr	1.129	nil
P-4857	7	nil	tr	1.25	---

Hole No. 4

<u>Sample number</u>	<u>Depth feet</u>	<u>Assay</u>			
		<u>Au</u> oz.	<u>Ag</u> oz.	<u>Ni</u> %	<u>Hg</u> %
	0				
P-4861	1	nil	nil	0.357	nil
P-4862	2	nil	nil	0.585	nil
P-4863	3	---	---	0.406	---
P-4864	4	---	---	0.27	---
P-4865	5	nil	nil	0.516	nil
P-4866	6	---	---	0.605	---
P-4867	7	---	---	0.69	---
P-4868	8	---	---	0.772	---

OREGON CHROME REOPENED

Mr. W. S. Robertson has resumed work at the Oregon Chrome mine on the Illinois River, Josephine County, which had been closed down for nearly a year. Six men are employed - 3 shifts, 2 men to the shift-driving a 500-foot drainage and access tunnel.

TEXACO OIL TEST

On March 19 Texaco's test well, Clark and Wilson No. 6-1, was drilling ahead at 6500 feet.

BILL SUSPENDS COPPER IMPORT TAX

HR 2404 which suspends the copper import tax until March 31, 1949, passed the House of Representatives March 12, 1947. The bill is now under consideration by the Senate Finance Committee.

METAL MARKET PRICES

Copper has advanced to 21½¢ a pound, Connecticut Valley; lead to 15¢ a pound, New York. Zinc remains steady at 10½¢, East St. Louis. Foreign silver advanced early in the month from 75-3/4¢ to 86-1/4¢ on orders for export to India. However, the Reserve Bank of India issued an order prohibiting imports of silver, and the price receded to 77¢. Price of silver mined in the United States is fixed by law at 90½¢ an ounce. The quicksilver market has strengthened somewhat with quotations from \$87 to \$90 a flask, but trading has been moderate because of the usual uncertainties.

According to the Engineering and Mining Journal, New York, the advance in the price of copper and lead is caused by the heavy demands both here and abroad. Domestic prices were advanced to make them equivalent to foreign prices. The St. Joseph Lead Company issued a statement to the effect that the company raised its price reluctantly and felt that it is a mistake to make the price for the larger tonnages of lead consumed in this country the same as for the relatively small tonnages of foreign lead.

CLEARING HOUSE

CH-93: WANTED - deposits of white potash feldspar. Philip S. Hoyt, 1002 Mills Bldg., El Paso, Texas.

HENDRYX REAPPOINTED

Governor Earl Snell has reappointed Mr. H. E. Hendryx, Baker, as a member of the Governing Board of the State Department of Geology and Mineral Industries. Mr. Hendryx was named for a four-year term beginning March 19, 1947, and ending March 16, 1951. The appointment was confirmed by the State Senate March 18.

MISCELLANEOUS PUBLICATIONS

Price postpaid

THE ORE.-BIN: issued by the staff as medium for news about the Department, mines, and minerals. Subscription price per year	\$ 0.25
Oregon mineral localities map (22 x 34 inches) 1946	0.10
Oregon quicksilver localities map (22 x 34 inches) 1946	0.25
Landforms of Oregon: a physiographic sketch, (17 x 22 inches) 1941	0.10
Index to topographic mapping in Oregon, 1946	Free
Index to geologic mapping in Oregon, 1946	Free

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THE LIGHTWEIGHT AGGREGATE, PUMICE

by
N. S. Wagner¹

Interest in Oregon pumice occurrences is nothing new. For years people have toyed with the idea of developing it for aggregate purposes, but past production never amounted to much - was very limited and sporadic.

The California Stucco Products Company was perhaps the first company to attempt to develop the field in anything resembling a large scale. This company opened a pit near Chemult, Oregon. The history of this operation began and ended in 1929. Many obstacles existed, not the least of which were transportation difficulties and consumer indifference.

Today the picture has changed. Both the prevalent building boom and the building materials shortage have contributed to the public demand. What is more important, during the nearly 20 years that have elapsed since the California Stucco Products Company endeavored to operate, the public has become "insulation" conscious. Thus, the consumer is as interested in insulative value as he is in lightness of weight, and since pumice possesses both of these properties, it is being actively produced as an aggregate today.

This current activity in connection with pumice mining in Oregon is the chief subject of this talk. To begin with, however, it might be well to tell you something about the rock itself - and the nature of its occurrence.

Origin

As is generally known, pumice is a volcanic rock. As such, pumice belongs to the variety of rocks that originates from a molten magma which has been erupted to the surface of the earth.

By no means does all such magma make pumice, nor does it even make a lightweight rock. In fact, most magmas are extruded as lavas which cool to form rocks that are dense and stony or glassy in texture and have corresponding specific gravities. Yet as a rock, pumice has such a highly developed cellular structure that it will float on water.

What then are the circumstances under which pumice acquires this cellular structure? As the reasons back of the formation of this cellular structure are tied in with the composition of pumice and also with the very nature of its occurrence, I am going to outline the mechanics of the origin in some detail.

In the first place, volcanic eruptions occur in two distinct ways. Sometimes molten magma will just well up and be discharged from the vent as a lava which will flow over the surrounding country and eventually solidify. Sometimes the molten magma within a volcano will be erupted so explosively that solidified fragments will be hurled high into the air.

¹Field Geologist, State Department of Geology and Mineral Industries, Baker, Oregon.
From a talk given before the Associated Concrete Products Manufacturers, March 7, 1947,
at Portland, Oregon.

Under such circumstances, the fragments will rain down to blanket the surrounding country with an unconsolidated assortment of volcanic materials. Explosive eruptions may assume such proportions that the finer ashes are blown to the level of the upper air currents which may carry them thousands of miles before they fall. Naturally enough, the larger and heavier pieces of ejecta fall near the vent, or directly upon the volcano itself. As a volcanic product, pumice is explosively ejected in fragmentary form, and falls both near the volcano or far away depending on the size of fragments.

New geologic events and processes, no matter what sort of events or processes, or no matter how obscured and complicated they may seem to be before they are understood, are, in the last analysis, governed by the common ordinary variety of physical and chemical laws. Thus, it isn't just happenstance that there are two types of volcanic eruptions, and that pumice deposits are associated with the explosive type.

The picture is this: Molten magma isn't just melted rock. Molten magma is melted rock more or less highly charged with gasses. It differs from lava in much the same manner that soda water differs from ordinary water.

In the deep magma reservoirs within the earth, pressure is so tremendous that these gasses remain dissolved and dissociated within the magma. So long as the magma remains static, all is well. But when the magma is forced to the surface of the earth, this pressure is reduced and the gasses are liberated. It is the manner in which these gasses are liberated that is important. Whether they escape passively or violently has a profound bearing on the nature of the surface manifestations of volcanic activity. If the gasses can escape freely, then the surface manifestations of volcanic activity are characterized by lava flows. When gas escape is impeded conditions favor the explosive fragmental type of eruption.

It goes without saying that many factors may impede gas escape, but in this connection the composition of the melt itself remains as perhaps one of the most important. Melts of both basic and siliceous composition will make lava flows - but each in its own characteristic way, and because of its own individual characteristics. Melts of basic composition are notably fluid and because of their lower melting point they remain fluid longer than those of siliceous makeup. These factors combine to permit a relatively free and regulated liberation of gas. Because of relatively low melting points, basic melts will flow long distances over even gently sloping surfaces. Volcanic cones built of basic lavas may attain great heights, but they are typified by gently sloping flanks (2-8°), and by bases whose diameter may be many times greater than their height. The very eruptions of such volcanoes are as distinctive as is their shape - the eruptions consisting of great billowing clouds of smoke and relatively passive outpourings of molten rock.

Melts of siliceous composition, on the other hand, tend to be viscous and they solidify quickly. Thus they don't flow readily and, because they cool quickly, they commonly congeal on steep slopes after flowing only a short distance. Thus volcanic cones built of siliceous lavas are characterized by steep sides and bases which are of small areal extent in proportion to their height. This viscosity and tendency to solidify quickly impedes the liberation of contained gas with the result that eruptions associated with lavas of siliceous composition are punctuated by explosive bursts. In addition to the general outpourings of molten lavas, cappings of congealed lavas are also shattered and hurled into the air.

Pumice originates from the more siliceous lavas. To make a long story short, the formation of pumice represents one phase in the eruption of siliceous lavas, a phase in which the relief of gas pressure is so excessively rapid as to transform the lava into a froth, and in which eruption is accomplished in so explosive a manner that this froth is broken into fragments which are shot high into the air as already mentioned.

So much for the origin of pumice. The overall account of volcanic activity as just presented has been reduced to the barest essentials. The types of volcanic activity and volcanoes described represent the extremes in type, and they are here described as more or

less ideal examples. One of the things which befuddle geologist in making field interpretations of geologic processes; whether the process be the mechanics of volcanism, or the mechanics of ore formation, or any other aspect of geologic happening, is that these processes rarely ever carry through to completion in a simple, uninterrupted manner in nature. Thus, actually, most volcanoes in the world today represent composites of the two types mentioned. The very character of a magma often changes during the life cycle of a given volcano or, perhaps, the magmas involved were fundamentally of an intermediate composition from the outset - neither truly siliceous nor truly basic.

Oregon deposits

In Oregon we have extensive pumice deposits. It was Mt. Mazama (which is the name given to the formerly active volcano situated where Crater Lake now is) and several lesser volcanoes in the general region, which erupted these deposits. For the most part, these volcanoes erupted basic lavas in a characteristically passive manner. It was only during the later part of the volcanism that lavas became more acid and eruptions became increasingly explosive in nature. Nevertheless, the pumice deposits cover an area embracing some 3500 square miles according to Moore² who studied them extensively in 1930. This area lies east of Crater Lake between Bend and Klamath Falls and embraces the southern portion of Deschutes County, the northern part of Klamath County, and the northwest corner of Lake County.

Several different overlapping pumice falls are recognized. An attempt to describe them individually would entail needless confusion. For our purposes here, it will be sufficient to say that the volume of frothy pumiceous and scoriaceous glass erupted from Mt. Mazama alone has been calculated by Williams³ at 7.5 cubic miles.

By way of contrast, the figures on the smallest deposit described by Moore - that of the Newberry Crater - reads like this, "If the area covered by the pumice sheet is reckoned at 150 square miles, and the average thickness is taken as 2 feet, a total of 300,000,000 cubic yards is obtained."

Taking the "Younger Pumice of Crater Lake," as it is known, this fall forms a single sheet which covers about 3000 square miles. This fall has an average thickness of 6 feet near the center of the deposit and tapers to a foot at the margins. Moore's estimate, based on an average thickness of 3 feet, amounts to 45,000,000,000 cubic yards.

The significant thing with us here now is that, assuming pumice should prove to have lasting value as an aggregate, or as a resource, there is an almost unlimited quantity of it to be had. Of course, as a low unit value product, only such pumice as is advantageously situated with respect to transportation can ever be regarded as minable. But in this respect the Southern Pacific and the Great Northern Railways, as well as several first class highways, cut through some of the best of the deposits.

In presenting the figures on the dimensions of the deposits you will recall that the thicknesses were given as averaging 2 and 3 feet. These figures may be misleading and may serve to give the wrong impression. When the pumice fell it filled valleys and canyons, and it has also been drifted by wind. Thus locally thicknesses of 30 and 40 feet are not uncommon and many greater ones have been measured.

When pumice falls like this, it also segregates. Big pieces fall close to the vents, and the smaller ones proportionately farther away. To try to give screen analyses would be as confusing as trying to discuss the volume in detail. Places showing great variations in fragment size can be found if one wanted to search for extremes. But for mining purposes in connection with aggregate production, miles and miles of pumice exist in which the fragment sizes range from an inch or so down to sands.

²Moore, B.N., Nonmetallic mineral resources of eastern Oregon: U.S. Geol. Survey Bull. 875. 1937.

³Williams, Howel, The geology of Crater Lake National Park, Oregon: Carnegie Inst. Washington Pub. 540, 1942.

Composition

That pumice is siliceous in composition has already been pointed out. However, a complete chemical breakdown might be of especial interest. Silica, alumina, and soda in the order mentioned are the three most abundant constituents. In a typical pumice the silica amounts to about 69 percent; the alumina averages about 15 percent; and the sodium oxide about 5 percent. Potash, lime, and water are the next three most abundant constituents, running just a little over 2 percent each. Iron oxides are fairly constant at 2.75 percent. Titanium, manganese, magnesium, and phosphorus occur in amounts of less than 1 percent. All of the foregoing substances are combined as a glass.

Mining operations

Six Oregon pumice producers commenced operations in 1945. While three of them were in limited production early in the year, two did not get started until July, and the sixth not until the end of the year.

The production figures for 1946 sound insignificant in terms of the figures mentioned above or, for that matter, in terms of the production figures you are accustomed to dealing with. Just the same they are impressive. The 1946 production of pumice aggregate totaled 26,614 cubic yards with a value of \$43,649.00 at the plant.

The impressive part about pumice production to me is not what it was last year, but what it is going to be this year. Last year operators were just getting themselves established. The indications are that 1947 production will be appreciably greater. For instance, in discussing this subject with me, one of the two largest producers in the Bend region tallied his shipment records for the first 15 days of February just past. His production for that month amounted to half of his entire last year's production.

The mining and processing of pumice, as it is now carried on, is the essence of simplicity. Around Bend, where 5 of the 6 producers are set up, mining is accomplished by dozers and scrapers. At one of the largest pits the only item of mining equipment is a lull loader which digs and loads the pumice out directly. The small amount of overburden that is handled is removed by dozer on a contract basis. In this particular instance the operator is also marketing volcanic cinders, and his processing plant is situated on a railway siding located halfway between the two deposits. One other producer who mines aggregate for use in his own block plant, and not for retail, trucks pit-run material to his plant where it is processed. All other producers have screening and sizing plants at their pits and mine by dozing the pumice to elevator traps.

The largest single operation is at Chemult, and here a dozer and carryall has been used in the past, but a slackline with a 450-foot sweep has just been set up and will be used in the future. Incidentally, a 15-car siding has just been installed there.

Processing plants consist of shaker screens and rolls. Present practice consists of crushing and screening to one quarter- or three eighths-inch mesh, or whatever the customer wants. No further sizing is done, but some producers mix small amounts of pumice sand with their products if they judge the natural amount of fines to be insufficient. After this processing, the pumice is ready for delivery. Shipments are made both by motor truck and rail. In the Bend area trucking distances to the rail sidings vary from $1\frac{1}{2}$ to 8 miles, with two of the biggest producers having 5- and 8-mile hauls. Truck distribution using semi-trailers has reportedly reached to such points as Vancouver, Washington, and Redding, California.

Only recently have rail rates been published but, since they have been established, rail deliveries have been made to points as far away as Bellingham, Washington, and King City, California. A considerable amount of the production is delivered by rail to San Francisco and Portland. The largest producer estimates that 30 percent of his deliveries are by truck and 70 percent by rail.

Prices for pumice aggregate range from \$1.25 to \$1.85 per cubic yard loaded f.o.b. railroad cars or trucks.

The weight of pumice varies from pit to pit, but usually runs about 1100 pounds per cubic yard, pit run. What the weight of truly dry pumice is, I do not know. No shipper dries it although one operator is planning to do so. However, neither shipping in open cars during the winter nor mining during the stormy season has imposed any special difficulties so far. One operator whose shipments normally weigh out around 1050 pounds per cubic yard, found that the weight only jumped to about 1250 pounds during the winter.

Problems

One problem of serious nature is beginning to take shape. The aggregate as processed today tends to segregate during shipment. Also, when it is unloaded and stockpiled at the consumers' plants, there is a marked tendency for the fines to concentrate in the center of the piles, leaving the coarser sizes on the sides. Thus consumers who are operating small block plants, and who feed their mixer by shoveling off the stockpiles, find themselves making blocks of varying density from day to day depending on what portion of the stockpile they are drawing from.

I have heard many complaints about this from consumers. The solution, of course, is simple - and is one that perhaps should be practiced in the interest of putting out the best possible concrete products that can be made with pumice. That is, the making of clean, sized aggregate of both coarse and fine mesh.

One block manufacturer in eastern Oregon does size his aggregate, and he produces pumice for his own use. Of 12 block plants in eastern Oregon, which I have visited within the last 8 weeks, this is the only plant using a fixed charge of sized aggregate. The practice there is to size the pumice into minus 3/16-inch mesh, and into a plus 3/16-inch, minus 3/8-inch mesh, using them in a 60 to 40 ratio.

Otherwise, all that the other consumers have done about the situation to date is to complain and occasionally to switch producers in the hope of obtaining more satisfactory aggregate. One plant operator, however, has expressed his intentions of installing sizing equipment of his own if the producers themselves do not.

Other problems with respect to the use of pumice aggregate exist, but these are in the province of the consumer rather than the producer.

From my visits to block producers, I gather that on account of its high porosity, pumice does not cure the same as does common sand.

At least practices differ widely, and each block-plant operator has his own ideas on the subject. The problem would certainly seem to be one worth study to determine what the best practices might be.

Some question also exists concerning the best type of block machine for use with pumice, because of the capacity of pumice to float. This question was brought to light in an interesting way. One pumice operator has an overburden of a pink-colored assortment of ash and glass fragments. At one time one of his consumers who visited his pit decided that he would like to have a certain amount of this overburden ground fine and mixed with his aggregate. In its natural state the ash is very light in weight, but upon being ground quite fine, the producer reported that it became conspicuously heavy, its structure evidently being destroyed. It so happens that the consumer in question had used a vibrating-type block machine. His experience reportedly was that this special fraction tended to sink to the bottom of his blocks as was revealed by a dense, off-color streak.

If segregation does occur to this extent, it is worth knowing because, at present, many block manufacturers practice adding a fraction of common sand to their mix in the belief that it enhances their product. Since sand does not possess any conspicuous off-color, the question remains as to how much it tends to segregate with vibration. This might be another problem well worth at least a little investigation to determine how real it is, and what the best means for handling pumice mixes might be.

Conclusion

Such is the picture of the activity in connection with the production of pumice aggregate today. We have extensive deposits in Oregon, and several operators have taken advantage of the prevailing building boom and materials scarcity to try to develop the field. Experience indicates that it can be processed and shipped long distances at reasonably low cost. What the picture will be a few years from now - that is, whether or not a continuing demand for pumice aggregate will exist, will depend to a large measure on how successfully the pumice is used today.

2,4-D

Not an isotope, not the number of a government order; it is the abbreviated name for 2,4-dichlorophenoxyacetic acid (you do not question the need of an abbreviation). And why is 2,4-D important? This is explained in the lead article of the February issue of The Scientific Monthly, the official publication of the American Association for the Advancement of Science. The article is entitled "2,4-D, a Potent Growth Regulator of Plants," and was written by Dr. H. B. Tukey of Michigan State College. Dr. Tukey states that 2,4-D has the earmarks of being to the plant world what the insecticide DDT has been to the insect world, and some of his further interesting comments are given in the following abstract:

In popular usage "2,4-D" has been used to mean any preparation that contains 2,4-dichlorophenoxyacetic acid or any of its salts, esters, amides or related compounds.

2,4-D is prepared by the chlorination of phenol (carbolic acid). The phenol compound is neutralized with sodium carbonate to form a sodium salt of 2,4-dichlorophenol which is then combined with chloroacetic acid to give 2,4-dichlorophenoxyacetic acid. The process is cheap and lends itself to large commercial operations.

Physical properties add to the usefulness of this material. In refined form it is a white powder having no offensive odor or corrosive action on skin or container. It appears to be nontoxic to animals in the concentrations commonly used.

The acid itself is difficultly soluble in water. It is dissolved first in alcohol, then in water or some solvent such as polyethylene glycols. Sodium and ammonium salts are water-soluble and are generally equally as effective as the acid.

As a herbicide 2,4-D is used in a water-spray diluted to about 1 part per thousand. It may be applied in aerosol form just as DDT is used in aerosol bombs. For heavy concentrations in pastes and salves, lanolin may be used with other solvents in concentrations up to 1:100 or 1:200.

Many investigators have participated in studies of growth regulators, which are defined by Dr. Tukey as a group of chemicals which do not enter into the composition of the plant as do fertilizers but which used in minute amounts cause changes or effects in growth.

In the 1920's investigators established the fact that hormones entered into plant growth just as in animals. These plant hormones were isolated and a large amount of research was conducted on their growth-regulating properties. One of the growth regulators tested was known as 2,4-dichlorophenoxyacetic acid and entered into a patent assigned to E. I. DuPont de Nemours Company. At first the acid as applied showed powerful regulating activities but often so powerful that it was injurious. At this time it was discovered that growth regulators had practical uses such as rooting of cuttings and the prevention of pre-harvest drop of apples. From this followed work by investigators in the University of Chicago demonstrating the herbicidal properties of the chemical. In 1944 the Chemical Warfare Service became concerned and secret investigations were conducted at Camp Detrick, which included work in the U. S. Department of Agriculture and Ohio State University.

In the same year the paper by Hammer and Tukey was published which described successful field tests using the 2,4-D as a herbicide on bindweed.

During this time the American Chemical Paint Company conducted field trials independently and patented the material as a herbicide. This company as well as other companies went into production of the chemical in a large way and the price dropped from \$125 a pound to \$3.00. Inside of two years the value of production amounted to millions of dollars. Results of field work in 1945 and 1946, both in this country and in Europe, indicated successful use of 2,4-D as a herbicide. The reports showed that favorable results were obtained in inhibiting the growth of bindweed and sow thistle. The pollen of flowers shriveled, leading to the application of 2,4-D to destroy ragweed pollen in an attempt to reduce hay fever. Plants such as lamb's-quarters and pigweed were killed. The material has selectivity and it has been found that it would kill dandelion and narrow-leaf plantain without injuring the grass. With the exception of Bermuda grass, it was found that grasses and cereals were unaffected by concentrations that were toxic to broad-leaved plants as applied to grains. Wild radish, mustard, and the like were killed without injuring oats and wheat. A favorable result was obtained by dusting rice fields from an airplane.

It was found that 2,4-D was successful when applied to woody plants the same as to herbaceous plants and was most successful in periods of active plant growth, in sunlight, and at high temperatures. There were many examples of success in treating various trees and eliminating suckers.

By proper treatment weed seed may be destroyed in the soil. It is stated that amounts applied to the soil have ranged from 3 to 5 to 10 pounds per acre. Results appear to be better on sandy soils than on muck soils. Many details of treatment to eliminate weed seed are yet to be worked out.

2,4-D appears at present to be the most potent of the growth regulators. Much work is required to determine the many details of the usefulness of these materials.

Quoting from the Number 55 issue of Ceneco News Chats, the house organ of the Central Scientific Company, Chicago,

"A solution of 2,4-D containing as little as 1 - 1/3 ounces of the chemical in 10 gallons of water (1/10 of 1 percent by weight) when used as a spray is deadly to many species of broad-leaved plants. Some species on which it has been effective are:

Dandelion	Daisy	Three-seeded mercury
Narrow-leaf plantain	Heal-all	Burdock
Lawn pennywort	Chickweed	Wild mustard
Japanese honeysuckle	Winter cress	Frenchweed
False strawberry	Pokeweed	Wild lettuce
Annual morning-glory	Curled dock	Annual sow thistle
Broad-leaf plantain	Ragweed	Pigweed
	Poison ivy	

"The same is true of many other woody plants and of perennial farm weeds, including bindweed, Canada thistle, white top, Russian knapweed, leafy spurge, Klamath weed, perennial sow thistle, Texas blue weed, gaura, and others. Many experiments are in progress on various weeds and the results have been promising.

"2,4-D has not been found effective on crabgrass, quackgrass, Johnson grass, nutgrass, or other weedy grasses and sedges. It does affect bent grass and anyone with a bent grass lawn should be cautious about this new treatment. A favorable feature of the 2,4-D spray is that it does not hurt Kentucky bluegrass, annual bluegrass, redtop, fescue, and buffalo grass. It will kill or seriously retard the growth of White Dutch clover."

PERLITE MINE IN COMMERCIAL PRODUCTION

Dant and Russell, Inc., perlite division, is now processing perlite mined from the Lady Frances mine on the Deschutes River, southern Wasco County, Oregon. The material is crushed and sized at the mine and then shipped to the furnace plant at St. Helens on the Columbia River, north of Portland. Two commercial products are being marketed - a superior plaster sand which weighs about 12 pounds per cubic foot, and an accoustical plaster made up essentially of perlite plus a binder. Both products possess many advantages in building construction, and will come to be recognized as representing a forward step in building technique.

NEW CHIEF, CALIFORNIA DIVISION OF MINES

Dr. Olaf P. Jenkins, Chief Geologist of the California Division of Mines since 1929, has been appointed Chief, Division of Mines, succeeding W. W. Bradley who for many years was State Mineralogist and has now retired.

PUBLIC LAND POLICY OF NORTHWEST MINING ASSOCIATION 52nd Annual Meeting - 1946

We disapprove of public land policies by which Federal administrative agencies have used arbitrary and dictatorial methods to acquire more and more land to the detriment of state and county tax rolls. In some instances such methods have been employed to withdraw lands from application of the U.S. mining laws as was done in setting up a program of sustained yield of timber on 2½ million acres of the old Oregon and California Railroad revested lands in western Oregon.

We therefore urge the following:

1. That Congress continue its review of Western land policies, particularly withdrawal policies.
2. That no land withdrawals be made without public hearings in the states affected.
3. That the Mineral Leasing Act of February 25, 1920, be not extended to include other minerals.
4. That there should be no basic change in our mining laws which provide for discovery, location, and patent.
5. That lands acquired by the Federal government and not needed for clearly defined governmental purposes be disposed of, and that the lands retained be administered with respect to their mineral content under the public land laws applicable to both metalliferous and nonmetalliferous minerals.
6. That full support be given to Oregon's Senator Gordon in his efforts to return lands designated as O. and C. Railroad revested lands to their rightful status as potential producers of mineral wealth.

WASHINGTON FUEL REPORT ISSUED

A comprehensive report entitled "Washington Fuel Requirements and Supplies" has just been issued by the State of Washington, Dept. of Conservation and Development. This report is the result of a study by the Battelle Memorial Institute. A limited number of copies are available at the Dept. of Conservation and Development, Olympia, Washington., at a price of \$10.00. In Oregon, the report is on open file at the following places: Oreg. Dept. of Geology & Mineral Industries, Portland Chamber of Commerce, Bonneville Power Admin. offices, and the U.S. Bureau of Mines, Albany.

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OREGON'S 1946 NONMETALLICS PRODUCTION

Nonmetallic mineral production in Oregon in 1946 was valued at \$11,700,000, according to a canvass just completed by the State Department of Geology and Mineral Industries. This compares with a total of \$8,718,000 in 1945 as reported by the U.S. Bureau of Mines. It is known that the totals for both years are low because many logging companies quarried rock for roads and kept no record of the amount produced.

Sand, gravel, and crushed rock combined in one classification are valued at \$6,479,000. This classification is followed in order of value by portland cement, clay products, uncrushed road metal, coal, diatomite, limestone other than for portland cement, pumice, dimensional stone, quartz, and silica sand.

Sand and gravel pits, rock quarries and limestone quarries were very active throughout the year. The demand for construction materials was seemingly insatiable. Production of lightweight aggregate, mainly pumice, increased greatly. There were 325 sand and gravel pits and rock quarries, employing about 800 men, not including those operated by the State Highway Department. However, many of the individual quarries were not operated continuously.

The value of both portland cement and clay products represents an all-time high record for the state. Clay products in 1946 were made up essentially of building brick and tile. Nearly 29 million brick and 3 million tile were produced.

The table on the following page gives statistics of production. Certain industries are grouped under "miscellaneous" to avoid revealing the production of individual producers.

Oregon's Nonmetallies Mineral Production

1946

Classification	Number of operations	Number of men	Cubic yards and tons	Value \$	Remarks
Sand and gravel	215	578	3,370,771 yds.	3,224,851	
Crushed rock	90	174	2,225,696 yds.	3,253,701	
Clay products	23	172	83,617 tons	914,645	Does not include potteries.
Uncrushed road metal (shale, granite, cinders, loam)	20	27	292,318 yds.	153,832	
Coal	3	34	18,352 tons	87,172	Largest producer was Coast Fuel Corp., Coos Bay.
Limestone (other than for cement)	9	90	48,653 tons	53,439	Includes small output of shells. Includes men employed at all limestone quarries but not cement plants.
Pumice	12	13	31,329 yds.	47,905	Practically all for lightweight aggregate.
Cut stone, granite, basalt.	3	6	2,177 yds.	16,635	Includes flagstone.
Miscellaneous: portland cement, diatomite, quartz, silica sand.	7	326	---	3,946,761	Value estimated in part.
Totals	382	1,420	---	11,698,941	Nearly \$10,000/man.

ASSESSMENT WORK

An owner of an unpatented mining claim should file before July 1, 1947, in the office where his location notice is recorded, a statement of his desire to hold his mining claim.

Unless Congress takes further action to suspend annual assessment work, it will be necessary to do such work for the assessment year beginning July 1, 1947, and ending July 1, 1948.

DEPARTMENT SPECTROGRAPH

by

T. C. Matthews*

The laboratories of the State Department of Geology and Mineral Industries are equipped to do complex spectrographic analyses in addition to chemical and petrographic analyses of rocks and minerals. The spectrograph is used independently or in conjunction with the other methods for more thorough and complete analysis of all contained elements. It is able quickly to determine the approximate quantities of the various elements present in a given substance, irrespective of the mode of combination.

The spectrograph has a great variety of applications in many fields of science and engineering. Some of these applications are as follows:

1. The detection of totally unsuspected elements present in a substance.
2. The detection at one operation of all the metallic elements and many of the nonmetallic elements present in the sample, with a semiquantitative estimate of each. This operation is carried out in a small fraction of the time required for chemical analyses.
3. The analysis of substances difficult to analyze chemically, such as refractories, enamels, glass, and slags.
4. The detection of impurities in metals and alloys, because the most effective range of the spectrograph is from 1 percent down to .001 percent and below.
5. The solution of cases in criminology or sabotage where it is necessary to identify substances or to detect the nature of minute quantities in order to determine their origin.
6. The analysis of road and construction materials by highway departments to detect undesirable elements or to determine the cause of flaws.
7. The rapid determination by agricultural and soils agencies of the metallic and nonmetallic elements contained in various soils.
8. The analysis of water to detect small amounts of various salts.
9. The detection of trace elements in rocks for purposes of correlation of types and determination of origin.

Certain types of analysis may be carried out more accurately by other than spectrographic means. Among these are the following:

1. Exact quantitative analysis of any substance, especially for elements making up more than 10 percent, is more accurate and sometimes faster by chemical means.
2. Assay of an ore for silver, gold, and platinum can be performed much more accurately by fire analysis, except that small amounts of platinum metals may be determined most accurately by a combination of fire assaying and spectrographic analysis.
3. Certain elements, such as hydrogen, fluorine, chlorine, bromine, iodine, oxygen, sulphur, phosphorus, and mercury, do not give satisfactory spectrum lines and must be analyzed by other methods.

To analyze a substance spectrographically it is crushed and ground in a mortar or ball mill to a fine powder. A pure metal or alloy is first dissolved in acid and then dried to a sulphate or other salt in order to change it to a powdered state. The sample should be thoroughly mixed and then quartered in accordance with ^{standard} practice, because the sample finally tested is quite small.

*Spectroscopist, State Department of Geology and Mineral Industries.

All standard plates at the laboratory of the Department are made up on the basis of a 50-milligram sample, and this is the size ordinarily used. However, tests can be run on a sample as small as 5 or even 2 milligrams, but the accuracy of the analysis is decreased accordingly.

After the powdered sample is weighed out, it is mixed with graphite to promote even burning and then pressed into a tiny briquette. The briquette is placed in a drilled-out carbon electrode and burned in a direct current carbon arc. The 50-milligram sample is completely volatilized in the arc and its spectrum is photographed on a sensitized plate. When the plate is developed, the spectral lines characteristic of the sample may be compared with corresponding lines on standard plates made by burning 50-milligram samples of known chemical standards. To be sure that the lines may be compared with accuracy, an intricate procedure is closely followed using the Baird spectrograph, a Gaertner micro-densitometer, and a projection comparator.

Since each element has its own characteristic lines, and since the density and thickness of these lines depend on the percent of that element in the sample, it is possible by comparison to determine which elements are contained in the sample and their approximate percentages. In a qualitative analysis the elements present are usually reported, in percentages, within the power of ten; that is more than 10, 10 to 1, 1 to .1, .1 to .01, and so forth. For more exact analysis a quantitative procedure must be used. In this case sample and standard are photographed together on the same plate and comparable quantities read directly with the micro-densitometer.

Some types of analysis in which the Baird spectrograph at the State Department of Geology and Mineral Industries has proved valuable are the following:

1. Determination quickly whether or not an ore is worth further analysis for any element, or is waste rock.
2. Detection of rare minerals such as uranium and thorium.
3. Comparison of a number of kinds of wire in a criminology case to determine whether all samples were the same.
4. Analysis of a number of samples of aluminum alloy to determine whether all come up to specifications.
5. The determination of impurities in a filler for paper.
6. Analysis of various types of welding rod to find correct type for a special purpose.
7. Scientific research on problems of composition of cement, impurities in mercury, composition of a molybdenum ore, and determination of alkalis in feldspar.

The facilities of the spectrographic laboratory are available to all citizens of Oregon and others desiring such services. Samples of any type substance may be sent in for analysis or identification. The law which established the laboratory states that a charge must be made for work done according to a price schedule set up by the Governing Board of the Department. A discount is allowed to all citizens of the State for the analysis of samples of ore or mineral originating in the State of Oregon. A schedule of prices will be sent upon request to the Department.

RESUMPTION OF WORK - BAKER COUNTY MINE

According to the Record-Courier, Baker, Oregon, May 1, 1947, work has been resumed at the McGee mine on East Eagle Creek, Baker County, by Chadwell and Sons after the winter shut-down. Repair work on the access tunnel has been completed. The ore carries both gold and copper.

FROM NEWS LETTER, MINING ASSOCIATION OF MONTANA
Issues of April and May 1947

Gold and Silver

The Wall Street Journal carried the following news item from Amsterdam:

"The Netherlands Bank is calling in gold coins, gold and gold alloys, and foreign currency and silver.

"The calling in affects not only gold and currency offered to the bank under previous foreign exchange decrees, but also to those so far not offered. The gold and currencies must be sold to the bank before May 1, 1947.

"The calling in includes gold and currency deposited abroad."

* * * * *

Public Lands

Congressman Barrett, of Wyoming, has introduced into Congress Bill H.R. 3022 "to promote the mining of coal, phosphate, sodium, potassium, oil, oil shale, gas, and sulphur on lands acquired by the United States." It is believed that this bill is really a substitute for H.R. 1684, previously introduced by Congressman Barrett. The provisions of H.R. 3022 provide for the extension of the mineral leasing laws to lands "acquired" or to be acquired under the provisions of the Act of March 11, 1911, which are not now subject to mineral leasing laws.

METAL MARKETS

The domestic copper market has been very unsettled since the excise tax was suspended by Congressional action, according to the Engineering and Mining Journal, Metal and Mineral Markets, New York. During the second week of the month there were two prices for domestic copper. Some producers are selling the metal at 21½¢ Connecticut Valley while others are selling at 24¢ which represents the foreign price. The demand is so great that many buyers are willing to pay the higher price. It is thought that these prices will be equalized shortly and that there will be one selling price in this country. In the meantime the market is in a confused state. The high price for copper is apparently stimulating production. Domestic output for March was 74,340 tons compared with 68,327 tons in February and 70,415 tons in January, according to the U.S. Bureau of Mines. Production in the principal copper-producing states was up from 9 to 11 percent.

Market price for lead continues at 15¢ per pound, New York, and 14.8¢, St. Louis. There has been a sustained demand. The market price for zinc is unchanged at 10½¢ East St. Louis. Business is reported as spotty, that is, some producers report a good volume of business but others state that buying has slackened off.

It is reported that consumption of quicksilver has increased somewhat. The quoted price remains at \$85-\$87, New York. Western producers predict that domestic production cannot be maintained at the present price.

CARBORUNDUM

Carborundum is the trade name for all the abrasives manufactured by the Carborundum Company which uses flint, emery, garnet, silicon carbide, aluminum oxide, and diamonds in its various products.

LIGHTWEIGHT AGGREGATES FOR CONCRETE*

Professor Raymond E. Davis of the College of Civil Engineering at the University of California recently discussed the characteristics of various lightweight aggregates for concrete before a joint meeting of the National Sand and Gravel Association and the National Ready-Mixed Concrete Association.

Pumice is the only natural lightweight aggregate that has real possibilities at the present time, Davis declared, adding that all aggregates of igneous origin have high absorption and possess limited strength. The ideal concrete lightweight aggregate should have smooth surfaces to seal out absorption. In Florida pulverized fuller's earth is being nodulized with water and treated in rotary kilns in an attempt to produce an "ideal" aggregate which would require no final crushing. Pre-sized, oil-impregnated diatomaceous shale is being nodulized in California in kilns after dusting with material having a higher fusion point to prevent sticking. Another California product called Rocklite is being manufactured at Ventura from shale. The aggregate has low absorption, smooth surfaces, and although weighing about 110 pounds per cubic foot, has a compressive strength in excess of 6000 pounds per square inch.

Professor Davis stated that some 30 different interests are actively developing perlite aggregates which weigh less than 10 pounds per cubic foot. Although obsidian resembles perlite in composition, it makes an aggregate weighing about twice as much when expanded by heating.

* Abstract of an article appearing in Rock Products, April 1947.

THE "CHICO-PAN"

A new prospecting tool has been developed by Mr. A. O. Bartell of the Bartell Engineering Company, Box 6125, Portland, Oregon. The "Chico-Pan", as it is called, resembles a grocer's scoop combining in miniature the shape of a gold pan and a trowel. Specifications of the pan are: length 8 inches, width $4\frac{1}{2}$ inches, depth $1\frac{1}{2}$ inches; weight 6 ounces. The pan fits easily into the hip pocket for carrying. The "Chico-Pan" is formed from 20-gauge hardened stainless steel containing 18 percent chromium and 8 percent nickel. The pan is designed for use as a scoop for filling sample sacks; as a trowel to clean out "pockets", and as a gold pan.

PLACER GOLD AMALGAMATION

In testing some placer ground in southwestern Oregon it was found that some of the metallics recovered from the gravel would not amalgamate. It was evident that at least a part of these metallics was platinum but Mt. Hollis Dole, field geologist for the Department who witnessed the clean-up, determined to find out if there were other metals present besides platinum. He sent a sample of the metallics to the Portland laboratory where it was determined that they were made up of 38 percent gold, 50 percent platinum, and 12 percent silver, plus other platinum metals such as palladium, iridium, osmium, rhodium, and ruthenium. Under the microscope some of the metallic particles had the color of platinum, whereas others were dark brown with a yellowish cast. These latter particles were separated out and both parts analyzed spectrographically. The platinum scales contained iron, iridium, and rhodium in the 10 - 1 percent range; copper, gold, osmium, ruthenium, and palladium in the 1.0 - 0.10 percent range; and magnesium, germanium, and nickel in the 0.01 - 0.001 percent range. The yellowish metallics were nearly all gold with iron in the 1.0 - 0.1 percent range, and lead and copper in the 0.01 - 0.001 percent range. The failure to amalgamate was undoubtedly due to the iron oxide coating on the outside of the metallic particles.

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SOME GEOLOGICAL ASPECTS
of the
GRANTS PASS QUADRANGLE
by
Erle C. Annes*

In selecting the subject for this paper, it was not my purpose to enter into an exhaustive dissertation on the geology of the region under consideration. This has been covered generally and in greater or lesser detail by the various members of the U.S. Geological Survey and later amplified by the State Department of Geology and Mineral Industries. My purpose is, rather, to call attention to certain salient aspects which develop and become of interest and more or less self-evident to the economic geologist and engineer who has occasion to do detailed work within the district.

The features to which I intend to refer are of primary interest to the gold miner and to the gold mining industry. This section of southern Oregon, from the time of its first settlement, has been and is essentially a gold-producing locality. I am inclined to think it will continue to be so long after our learned exponents of fiat money are but unpleasant memories.

Now, by the foregoing, I do not mean to imply that gold is the only economic mineral (and I use the word "economic" advisedly) which is peculiar to the Grants Pass area. The contributions of chrome to the war effort are well known, and these deposits are far from being exhausted. There are copper deposits which have produced in the past and will probably do so again. The possibilities of the production of mercury are not to be overlooked if we again reach that stage of rationalism in our international affairs when we cease to sacrifice our own industries to starry-eyed idealism. In the nonmetallies field, the lime and silica deposits, together with their various processing plants, are of increasing importance, and the potential value of the various types of clays are not to be overlooked. At the present time, the lime and silica industries represent the most important mining operations in the district. The predominant economic mineralization of the region, however, is gold, and I am convinced that, as a mining district, the region will either stand or fall by its production of that metal.

Now, of course, when we speak of the economic production of gold, we must do so relative to the conditions of the past or to what we hope they may be in the future. As for the present, perhaps the least said, the better. Certainly, if we adhere to F. A. Rickard's time-honored definition of an ore, as applied to gold ores, that is, "A metal-bearing rock which can be exploited at a profit," the term must be entirely relative. We must return to the economic conditions of the past, or there must be an increase in the price of gold together with an open market, or we must confine ourselves to the exploitation of deposits sufficiently high in grade as to comply with the definition of the term. Since the latter

* Annes Engineering Company, Grants Pass, Oregon. Talk given at meeting of Oregon Section, American Institute of Mining and Metallurgical Engineers, May 24, 1947.

type of deposit is becoming as scarce as the proverbial "hen's teeth", revival of the gold mining industry must depend upon one or the other of the first two postulates. Let us hope that day is not too far distant.

For the benefit of those who are not familiar with the general geology of this part of Oregon, a brief resumé will probably not be out of place.

A study of the region was carried on intermittently by Diller and Kay of the U. S. Geological Survey from 1908 to 1924; their work is covered in U. S. Geol. Survey Bulletins 380 and 546 and by the Geological Atlas of the Riddle Folio, No. 218, published in 1924. In 1913, Dr. A. N. Winchell, working under the auspices of the Oregon Bureau of Mines and Geology, made a study of the petrology and mineral resources of Jackson and Josephine Counties. This report was published in 1914. In 1939, a preliminary geological map of the Medford quadrangle by Francis B. Wells of the U. S. Geological Survey was published by the Oregon Department of Geology and Mineral Industries, and this was followed in 1940 by a similar map of the Grants Pass quadrangle by the same geologist as a cooperative project between the Federal Geological Survey and the Oregon Department. These two maps, together with Diller's map of the Riddle quadrangle, are being used to illustrate the present paper, for the reason that both the Medford and Riddle quadrangles are closely related, both economically and geologically, to the Grants Pass quadrangle.

The oldest rocks of the region are a series of schists which occupy an area of about 30 square miles in the extreme southeastern corner of the Grants Pass quadrangle and the southwestern corner of the Medford sheet. These rocks have been placed in the Paleozoic age or older and are believed to have been derived from both volcanic and sedimentary rocks.

Next in age is a thick series of Paleozoic or Mesozoic rocks, consisting of altered volcanics interbedded with argillites, cherts, quartzites, and limestones. This formation underlies about half of the Grants Pass and Riddle quadrangles and a small portion of the Medford quadrangle. The series has been classified by Wells as meta-volcanics and meta-sedimentaries, but Diller referred to the meta-volcanics as greenstone, a term which, as applied to this formation, is one which covers a multitude of sins.

Economically, the meta-sedimentaries of this formation are particularly important for their limestones, especially as related to the cement industry, paper manufacture, agricultural lime, etc. As a source of commercial silica, they are also of considerable importance.

The meta-sedimentaries, including the limestone, in the Grants Pass quadrangle have been grouped by Diller into four northeasterly trending belts as follows: The first, farthest northwest, includes several masses extending south of Cheney Creek to about 10 miles southwest of Grants Pass. The second, which contains the most limestone, nearly follows the northeasterly trending diagonal of the quadrangle. It includes the ledges west of Gold Hill, passes near the Oregon Bonanza mine, and contains the Oregon Caves. The third includes several ledges on Kane Creek, four miles southeast of Gold Hill, and others on the southwest slopes of Wellington Butte and Steamboat and Whisky peaks. The fourth appears on Little Applegate River, and on the upper Applegate River at Seattle Bar. Diller tentatively dated the first two belts as Devonian and the third and fourth as Carboniferous. It remains to be seen whether this classification will stand in the light of new evidence now available but not yet fully studied.

A formation which extends along the northern half of the western boundary of the Grants Pass quadrangle and thence northeasterly across the Riddle quadrangle, where it is known as the Galice formation, has been placed in the Jurassic by both Wells and Diller. Wells, however, observes both sedimentary and volcanic rocks within the formation in the Grants Pass quadrangle, whereas Diller classifies it almost entirely as sedimentary within the Riddle quadrangle. Economically this formation has so far proved to be unimportant.

Diller has also mapped several areas of later sedimentary and meta-sedimentary rocks within the Riddle quadrangle. The May Creek formation he places provisionally in the Devonian; the Galice and Dothan formations in the Jurassic; the Knoxville, Horsetown, and Chico formations in the Cretaceous, and the Umpqua formation in the Tertiary. Most of the formations show unconformable relations. Correlation of these formations with those of the Grants Pass quadrangle are not clear, and as they are of little more than academic importance as related to this paper, no further detail will be attempted.

In the Medford quadrangle northeast of the Southern Pacific Railroad, a belt of Eocene sediments of the Umpqua formation, several miles in width, extends northwesterly across the area. Northeasterly from this belt, the remainder of the quadrangle is covered by 3000 to 5000 feet of volcanic flows and breccias known as the volcanics of the Western Cascades.

The rock formations of greatest interest economically, in that they probably represent the source of the major metallic mineralization of the district, are the late Jurassic to early Cretaceous intrusives. The earliest of these are the serpentines derived from peridotites and pyroxenites of probable late Jurassic age. These intrusives are widely exposed in all three quadrangles, as well as to the westward, and range from less than an acre to many square miles in extent. They not only represent the source and locale of the chromite deposits, but also, in all probability, are source rocks of platinum which is to be found in various placer deposits of the region.

Next in point of time and of major importance economically was the intrusion and consolidation of what is termed by Winshell "the great Siskiyou tonalite batholith" which, in turn, was followed by minor intrusions of dacite and auganite or augite-andesite and by the various gabbroid, aplitic, porphyritic, and pegmatitic dikes.

Within the area of the three quadrangles which we are considering, the granitoid intrusion is exposed in three main localities and in numerous other smaller patches or tracts between. The largest of these occupies the south central portion of the Medford quadrangle forming a part of the main Siskiyou Range. Another occurs in the southwestern portion of the Grants Pass quadrangle and forms the mass of Grayback Mountain, over 7000 feet in elevation; a third covers a considerable area to the south, west, and north of Grants Pass, whereas the fourth exposure extends from near the town of Rogue River northeasterly, the full length of the Riddle quadrangle. Wells has suggested the Grayback stock and the Merlin stock as appropriate names for the second two mentioned and admits the probability that all the areas, large and small, represent one great batholith underlying much of the southeastern part of the quadrangle at a rather shallow depth. This is probably true, but I think the observation may be extended to include also considerable areas within the Medford and Riddle areas. Wells also observes a wide variation in the rock types of the intrusives both in the Medford and Grants Pass quadrangles but states that quartz diorite is probably the prevalent variety and that granodiorite is common.

I am inclined to like the term tonalite as used by Winshell and as applied not only to the prevalent rock type of the batholith but also to a direct association, if not origin, of the gold mineralization of the district which includes the three quadrangle maps which we have before us. Winshell uses the term tonalite in accordance with the following definition: "Tonalite is a plutonic rock consisting essentially of sodic plagioclase feldspar, quartz and more or less hornblende or biotite or both." While I am quite aware that generalizations are often dangerous, it has been my observation that many of the more productive gold deposits of the district are associated either directly or indirectly with the soda-lime plagioclase feldspar rocks. I am inclined to believe that this association will be more definitely established as development at depth takes place within the district.

The gold-bearing lodes of the district have prevalent strikes of from N. 60° W. to N. 30° E. and dips ranging from 40° to vertical. They usually contain several lenses of quartz a few hundred feet long and averaging 3 to 4 feet in width. Longer and wider ore

shoots have been noted in several mines which have attained depth. The vein fillings are mineralized quartz and crushed rock; the walls are well-defined and their composition apparently has little or no influence on the character of mineralization. From 60 to 90 percent of the gold is free milling and the balance accompanied by or associated with sulphides. Of these, pyrite and pyrrhotite are the most common with minor percentages of galena and sphalerite. Rarely does oxidation extend below 100 feet.

As this region is the original habitat of the pocket hunter or at least where the technique reached its highest degree of efficiency, any paper of this nature would be incomplete without mention of the so-called "pocket occurrences" which are peculiar to the district. The term is used to describe high-grade segregations of free gold which occur in a restricted space. Though both supergene and hypogene processes were undoubtedly influential in their formation, it is probable that the largest ones, such as the Gold Hill and Steamboat pockets, were largely epigenetic in origin.

Winchell draws the inference that the mineralization of the district, including not only the gold ores but those of mercury and antimony as well, is directly attributable to the tonalite and its magmatic solutions. Later and more detailed observations lend considerable support to this inference and tend to warrant the conclusion that such is the fact.

The general pattern of the lode gold deposits, both mines and prospects, has a distinct areal relationship to the batholithic intrusions. Very few of them are within the actual boundaries of the exposed stocks. Of the few mines which do lie within these boundaries, however, at least two, the Ashland mine in the south, which has attained a depth of over 900 feet, and the Granite Hill mine toward the north, which attained a depth of over 400 feet, consist of true fissure veins in the tonalite as much as 12 or 14 feet in width on the lower levels and carrying values in gold sufficient for profitable mining even under present restrictive economic conditions.

Two type examples of this nature should be sufficient to enable one to refute any statements which may have been made or impressions which may have been gained to the effect that lack of depth, continuity, or value characterize the occurrence of the gold quartz veins within the underlying intrusives of the district.

In the Riddle quadrangle, the most noted producer has been the Greenback mine which is credited with a production of about $3\frac{1}{2}$ million dollars. The vein, as explored to date, occurs in greenstone and has an average width of about 3 feet. Operations have attained a depth of 1000 feet along the dip, which is about 60 degrees. It is probable that the underlying dioritic or tonalitic intrusive is at no great distance.

Another type of gold mineralization which is of considerable interest and probable importance is to be found in the serpentine gold ores of King Mountain and vicinity within the Riddle quadrangle. The source and mechanics of this mineralization are still somewhat obscure but evidence to date seems to indicate that it also is directly associated with the Jurassic intrusives. The ores, which are among the most spectacular of the district, are to be found over a considerable area. While as yet they have not been commercially developed, they offer one of the most interesting possibilities of the district.

Placer mining in southwestern Oregon has followed the history of practically every gold placer field of the continent. The original discoverers devoted their efforts to the rich and highly concentrated deposits and when these were exhausted, drifted on to other fields. These men were followed, probably to a lesser degree in this district than in many others, by the Chinese, who, by their more economical methods of working and living, were able to work at substantial profits many of the lower grade gravels left untouched by the original stampeder. The third stage to be reached was that of the exploitation of the larger areas of still lower grade gravels, first by hydraulic mining methods and secondly by the various types of gold dredging. Placer mining development in southwestern Oregon is now in the last stage, or may I say hopes to be again, when economic conditions permit.

Areas suitable to large dredges of the bucket-line type are probably limited in extent, but there is considerable ground available and adaptable to shovel, dragline, and bulldozer operation, provided of course, that the industry is not further handicapped by restrictive legislation.

It has been estimated that a section of rock from 1000 to 3000 feet thick has been removed by erosion in the area under discussion, and the resultant concentration of the gold into the creek and river gravels has given rise to the rich placer fields which have in the past made southwestern Oregon famous as a gold-producing section. The placer gravels, in all cases, reflect the locale of the lode deposits and, in my opinion, are indicative of large untouched low-grade lode deposits rather than comparative exhaustion of the small high-grade occurrences as has been intimated in some of the technical literature published on this section of Oregon.

The reputation of southwestern Oregon as a gold-mining district has been adversely affected by a number of contributing factors. Impressions have been formed in mining circles to the effect that the lode deposits do not extend to appreciable depths and that, within the depths which they do attain, both veins and enclosing formations are so badly broken up that successful mining is impractical, if not impossible. This impression still exists in many quarters in spite of the records of the Ashland mine to the south, the Greenback to the north, and the Benton mine to the west of the Grants Pass quadrangle. This impression may probably be attributed directly to a statement made by G. F. Kay referring to the Grants Pass quadrangle in U. S. Geol. Survey Bulletin 380, Contributions to Economic Geology, 1908, which I quote verbatim from his conclusions: "Of the many veins and veinlets on which work has been done, few have developed into profitable mines, and the outlook for profitable gold-quartz mining in the region is not encouraging." By both inference and reference, this same statement has been made applicable to the Medford quadrangle to the east and the Riddle quadrangle to the north. J. S. Diller's subsequent reports served to modify this statement somewhat but not to a great extent. In any event, the impression went abroad to this effect and the mining industry in this area must still cope with it.

Now, Diller and Kay did some very excellent pioneer work in southwestern Oregon, and it is not my intention to attempt to belittle either their work or that of the U. S. Geological Survey. I do, however, with all respect to these workers, wish to take issue with the above statement and with others of a similar nature. I do not believe that sufficient criteria exist even today to justify such a generalization. On the contrary, I think that there is considerable evidence to support exactly the opposite conclusion and that future development will prove this to be the case.

Another factor which has adversely affected the reputation of the district has been that of wild reports of high values which have been given wide publicity and which have usually been based on some new and mysterious method of assaying or revolutionary metallurgical process, one or both of which purported to show phenomenal gold values where little or no value was indicated by standard procedure. It has seemed that whenever an individual or a group has something of this kind to try out, they come to Grants Pass and the surrounding area to commercialize the experiments. Since at least 99 percent plus of these abortive attempts are due to fail before they start, the effect on an area which has been selected as a proving, or shall I say disproving, ground is not too salutary.

Still a third factor has been the propensity of unskilled operators and owners (and this is not confined to southwestern Oregon alone) to place the cart before the horse or to design and build the mill before the ore body is developed. In many cases, where ore was developed, the flow sheet which was adopted was designed to recover only those free gold values which respond to straight amalgamation or cyanidation. In many of these instances, grinding to minus 30 mesh was considered fine. As the difference between profit and loss of many of these operations was contained in the values which might have been liberated and recovered by finer grinding and improved metallurgy, and as this latter procedure was not adopted, eventual failure of such operations was inevitable.

The aforementioned factors, while only a few of those referred to, are sufficient to indicate my point. I have a great deal of faith in the future of southwestern Oregon as a gold-producing district when economic conditions so readjust themselves so that profitable gold mining may be carried on to any extent in this country. What is needed for the industry, both now and in the past, are mining companies and individuals with sufficient capital and vision to carry exploration and development to depth, and in doing this to utilize to the fullest extent a combination of modern geophysical equipment, the core drill and improved metallurgical, geological, and managerial practice, carried out under the guidance of highly trained and efficient engineering personnel. When this point is reached, I believe that southwestern Oregon will again resume its place among the leading gold-producing districts of the country.

Portland, Oregon
May 29, 1947

Editor
The Ore.-Bin
Portland, Oregon

Dear Sir:

I was interested in the last paragraph of the current issue of the "Ore.-Bin" concerning the metallic concentrates at a placer mine in southwestern Oregon. When I first visited Bonanza Creek in the Klondike, in the fall of 1897, I found that every claim above "ten below" discovery to the "forks" had several whiskey barrels filled nearly full of black sand shot through and through with small particles of yellow gold, the heavier gold having been recovered. The miners, practically all of whom had learned all they knew of placer mining right there, had tried every expedient to save that gold. It, too, refused to amalgamate. Some thought that their quicksilver had grease on it, and redistilled, but this did not help the amalgamation. I bought two especially good looking casks of the sand for \$100.00 and tried diligently to pan my money out with no practical result. The next spring I built a small pipe boiler (I think the first one of the thousands eventually used there for "thawing machines") took a steam pipe over, put six cans of concentrated lye into each cask and gave it a thorough cooking. That did the trick, the gold was cleaned and amalgamated instantly on contact. The lye was put in with the sand and water cold and the whole well heated. After it was hot, I could make enough steam to give the sand and water a rolling boil. Then I borrowed a small duplex air compressor from a neighbor who had no steam and got a further agitation. My cleanup weighed out a little more than \$3,200 (at \$16.00 an ounce) and I got nearly twice that for the steam boiler after I found out that everyone on the creek knew how, and that barrels of black sand were no longer to be had at bargain prices. Those two were all that I ever got.

In that case, too, I decided that the trouble was iron oxide as the "coarse gold" in the district was similarly coated so distinctly, in fact, that, with a jeweler's loup, one could see that the gold had a coat of reddish-brown substance that could be cleaned off with yellow soap, water, and a toothbrush.

The use of six cans of lye per barrel was not the result of any computation but merely an equal division of the available supply at the time.

Yours very truly,

/s/ G. F. McDougall

MINES BUREAU SUPERVISOR DIES AT DENVER

George Ensor Woodard, 35, supervising engineer of the Metal Economics Division's Denver office, Economics and Statistics Branch, Bureau of Mines, who died in Denver on April 28 following an operation, had returned temporarily from Japan where he was serving as a scientific consultant on loan to the staff of Gen. Douglas MacArthur. He had been directing the compilation of data on Japanese mineral production and reserves for the occupation forces and the reparations mission, and had just begun the reorganization of statistical practices in the Japanese Bureau of Mines.

Dr. R. R. Sayers, Director of the Bureau of Mines, has designated Samuel A. Gustafson as acting supervising engineer at Denver. With the Bureau since 1940, Gustafson also is a graduate of the Colorado School of Mines. He served as Captain of Engineers during World War II and, prior to entering Federal service, worked for several mining companies and the State of Colorado as engineer, surveyor, foreman, and accountant.

NEW CHIEF TOPOGRAPHIC ENGINEER

Mr. T. P. Pendleton has retired as Chief Topographic Engineer of the U. S. Geological Survey following a prolonged illness. He was largely responsible for adaptation and development of the "multiplex" method of topographic mapping and is an outstanding authority on photogrammetry, surveying, and mapping.

Mr. Gerald Fitzgerald who succeeds Mr. Pendleton was born in Burns, Oregon, and has long been connected with the Geological Survey on surveying and mapping assignments. In World War II he was commanding officer of Aeronautical Chart Service. He returned to the Survey from the army in 1945.

ONLY FEW DAYS LEFT

In order to hold their claims under the wartime exemption act, owners of unpatented mining claims should file a notice of their desire to hold their claims prior to July 1, 1947. Filing should be made in the office of the County Recorder of the county in which the claims are located.

O.S.C. FIELD CAMP

The summer field camp of the Department of Geology, Oregon State College, has been established at the Mascall Ranch west of Dayville in the John Day Valley. Dr. W. D. Wilkinson is in charge. He has 19 students who will study the geology of the Dayville quadrangle. Two of the students are doing graduate work leading to degree of Master of Science.

OREGON GEOLOGY MAPPED

Dr. Thomas P. Thayer, geologist with the U. S. Geological Survey, is continuing geologic mapping in the John Day, Mt. Vernon, and Aldrich Mountain quadrangles. He was recently joined by Mr. Allan B. Griggs of the Survey who will assist in the mapping work for the balance of the field season.

NEWS OF SOUTHERN OREGON DREDGES

Stearns and Owens have moved their dragline operation from Poormans Creek to the Applegate River near the town of Applegate. This is a resumption of an operation started before the war. Part of the dredged ground will be rescoiled. A 2½-yard dragline will be used.

The W. E. Pantle Gold Dredging Company which has been working ground near Jacksonville has suspended operations because of lack of water supply. This company is testing ground at the town of Rogue River. If the testing work is sufficiently encouraging, leveling and rescoiling will be practiced after dredging.

ALUMINUM

The following quotation is from Mineral Resources of the United States for the year 1887, and shows strikingly the progress in production, uses, and cost of metallic aluminum during the past 60 years (price of ingot aluminum now 15 cents per pound).

"No progress in the methods of extracting aluminum appears to have been made in this country since the last report. The Castner process of manufacturing sodium cheapens the production of that metal to such an extent that by its employment in the process of extracting aluminum it is said that the latter metal can be produced for less than \$5 per pound. A company has been formed in England to use this process, but no advantage appears to have been taken of it in this country. The patents for extracting aluminum issued within the past year, cover processes which have not yet been put into successful operation. Notices of new processes for the same purpose, and of new enterprises, supported by companies with large capital, have appeared from time to time in the newspapers, but the returns received from dealers and workers in aluminum do not show that there is any real production of the metal in the United States.

"The price of metallic aluminum during the past year varied from 90 cents to \$1.25 per troy ounce, according to the dealers and workers, and was quoted as low as \$11 per avoirdupois pound in the trade journals. In considerable quantities it was sold for less than \$10 per pound. Its applications were confined, as before, to small articles, such as dental plates, parts of surgical, electrical, optical, and surveying instruments, beams of fine assay balances, apothecaries' weights, tobacco boxes, spoons, etc., it was used in the form of foil, and leaf for lettering, and for various other articles where lightness and strength are desired. Its use seems to be extending in this direction, but its price and limited production prevent its application on a large scale."

COPPER IMPORT TAX SUSPENDED
(Public Law 42 - 80th Congress)
AN ACT

To suspend certain import taxes on copper.

BE IT ENACTED BY THE SENATE AND HOUSE OF REPRESENTATIVES OF THE UNITED STATES OF AMERICA IN CONGRESS ASSEMBLED, That the import tax imposed under section 3425 of the Internal Revenue Code shall not apply with respect to articles (other than copper sulphate) entered for consumption or withdrawn from warehouse for consumption during the period beginning with the day following the date of the enactment of this Act and ending with the close of March 31, 1949.

Approved April 29, 1947.

CLEARING HOUSE NO. 94

CH-94: W. D. Bowser, P.O. Box 162, Grants Pass, Oregon, wishes to buy two tanks having a capacity of 500 barrels each, and two tanks having a capacity of 250 barrels each, suitable for use in cyanidation. Second-hand tanks would be satisfactory.

The ORE.-BIN
State of Oregon
DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES
702 Woodlark Bldg., Portland 5, Oregon
POSTMASTER: Return Postage Guaranteed

Sec. 562, P. L. & R.



STATE OF OREGON
DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES
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GEM MINING
A NEW OREGON INDUSTRY

by
H. C. Dake*

Introduction

For more than 50 years Oregon has been a producer of high-grade gem quality agate, but it is only during the past decade that production has reached a notable amount. Prior to World War I, more than 90 percent of agates and similar semi-precious gems sold in America were produced in Germany from rough, imported material. During World War I, this enormous industry was temporarily lost to Germany, but recovery of the world market was rapidly made after the close of hostilities. During this time the agate cutting industry in Oregon expanded widely, but for various reasons the local cutters could not compete and did not have the production facilities to hold the market.

Beginning in 1933, with the organization of the Oregon Agate and Mineral Society of Portland, considerable publicity has been given to the gem minerals of Oregon and the possibilities of developing a new industry in the State. Functioning regularly and continuously since 1933, this organization has been instrumental in building a new Oregon industry. Prior to 1933 little attention was given to the gem deposits of Oregon, but with wide local publicity, hundreds of people became interested in collecting and cutting gems as a hobby; but a substantial number of people, also, went into the business commercially.

By 1937 the value of the gems mined and finished in Oregon amounted to approximately \$250,000 annually. This included both rough materials produced in the State and shipped to various cutting centers, and stones finished by local cutters.

Industry expands

At the outbreak of the war in Europe, in 1939, imports of finished gems were cut off. This created a wide demand for finished gems produced by domestic lapidaries. It is a notable fact that in times of wide prosperity the demand for all types of gems, including both precious and semi-precious stones, increases markedly. Oregon was already geared for production, with dozens of commercial shops and hundreds of home cutters scattered throughout the state ready to meet this demand from the jewelry manufacturing industry. To date there is practically no importation of semi-precious gems from Germany or other European cutting centers; hence the domestic cutters continue to supply the demand. It is unlikely that the Germans can ever recover their former world-wide market. It is reported that they have no stocks of rough materials to process.

Million dollar industry

It is estimated that, at the present time, the annual production of rough and cut gems in Oregon amounts to approximately one million dollars. One large commercial cutting establishment alone produces more than \$100,000 a year in finished stones and finished gem

*Publisher, The Mineralogist, Portland, Oregon.

specimens which are shipped to markets throughout the United States and Canada. Probably there are now over 50 commercial cutting shops in Oregon and over 500 home gem cutters mainly engaged in the work as a hobby.

Thunder eggs

In addition to the agates mined in Oregon other gem materials enter into the picture. Some 15 years ago peculiar, spherical masses of silicified rhyolite were discovered in central Oregon at a number of localities. These spherical masses are often filled with colorful, high-grade, gem quality agate, and are in wide demand for use as a gem cutting material and as polished specimens. The rough masses are generally sectioned in the middle with a diamond saw, and the exposed surfaces polished. These specimens are popularly known as "thunder eggs" from an old Indian legend which gives an account of their genesis.

During the past 15 years thunder eggs have been collected in central and eastern Oregon by the tens of thousands. The early collectors merely gathered them up by the truck load from the surface where they had been exposed through weathering. Most of the best deposits are located in Wasco and Jefferson counties, but in recent years deposits have also been discovered and mined in Harney, Crook, and Deschutes counties.

In size the thunder eggs range from quite small up to several feet in diameter, but the average and most popular sizes are about 5 to 6 inches in diameter. The finished polished half brings anywhere from \$1.00 to upwards of \$20.00 each, all depending on quality of the individual specimen. They have found their way into practically every museum and private collection in the United States. Notable quantities have also been utilized for gem cutting.

In places, after the surface deposits of thunder eggs were depleted, hand mining was employed to win the material covered by surface debris. Recently more extensive mining operations have been carried on in central and eastern Oregon.

The rhyolite rocks

Practically all the quartz gem deposits of Oregon are directly associated with the high silica rhyolite rocks - rarely if ever are they found associated with the dark-colored basaltic rocks. This fact is well known to gem hunters. Invariably thunder eggs are found associated with or near veins or seams of rhyolitic perlite (a variety of obsidian), and often the eggs are found embedded within perlite. Only a very small portion of the rhyolite rock areas in Oregon have been explored. In recent years a number of discoveries of thunder eggs have been made in the rhyolite rocks some 22 miles east of Burns in Harney County. This locality produces exceptionally large and colorful specimens.

On the Friday Ranch in central Oregon a considerable amount of mining has been done, and this famous locality has produced no less than \$150,000 in quartz gems during the past 15 years - more than the property recently brought in a sale.

During the past 10 years the Friday Ranch has attracted thousands of gem miners from nearly every part of the country. Luck appears to have played an important part in the winning of quartz gems at this locality, but it has been no uncommon occurrence for a party of energetic diggers to expose a rich pocket in a few days and leave with \$1,000 or more of high-grade gem material.

Plume agate

In addition to the thunder eggs mined on the Friday Ranch property, the locality is also noted for its high-grade plume or flower agate. This material is probably equal in quality to the best gem agate found anywhere in the world. The agate occurs in veins or seams from a few inches to several feet below the surface, and tends to segregate into pockets. High-grade plume agate in the rough brings as high as \$50.00 a pound, and individual stones (finished) bring \$5.00 or more each.

A considerable area was originally dug by hand labor, but this has proved wasteful as many areas were missed or covered with debris. In recent years the greater part of the production has been won by sinking shafts and drifting, and by using bulldozers which are most useful where the gem deposits are reasonably near the surface.

Antelope Valley

The gem deposits of Antelope were known for at least 50 years before the discovery of gems elsewhere in central Oregon. This region has produced great quantities of quartz and gem minerals, and continues to produce them, but underground mining methods are now indicated. Antelope has been notable for its production of high-grade iris agate, jasp-agate, and enormous quartz crystal-lined geodes. Geodes from Antelope have found their way into numerous large museums and private collections of the country.

Crook County

Crook County and the high desert regions east of Bend in Deschutes County have been productive of gem materials. Most of the material so far gathered in this great area has been on the surface. One of the most valuable single masses of agate ever found in Oregon was recently mined in Crook County near Post. This mass of gem agate weighed 186 pounds and was sold to a Portland gem cutting firm for \$1,000, or more than \$5.00 per pound in the rough. This pocket was discovered as an outcrop and in addition to the single large mass, produced numerous smaller masses; to date a total of more than \$8,000 has been mined from the pocket. The discovery was made by a Bend, Oregon, gem prospector.

Harney and Malheur counties

Harney and Malheur counties cover some 20,000 square miles, with an average population of less than one person per square mile, with most of them concentrated in a few small cities. A large part of these counties is covered with rhyolite rocks, and it is expected that important discoveries will be made in this little known region.

Beach deposits

The Oregon beach gem deposits have been known for many years and have served as an important tourist attraction. There are dozens of large and small gem cutting establishments along the Oregon coast that cater largely to the wants of tourists. While the beach deposits have yielded some superb gem materials, the production has not been nearly as great as from the central and eastern parts of the state. At times some exceedingly valuable single agates have been found in the beach gem-bearing gravels. Several years ago, near Yachats, a number of small but valuable agates were found. The largest was a nearly spherical mass some 5 inches in diameter and, when cut into polished sections, sold for more than \$300. The beach deposits also yield valuable specimens of rare silicified corals, fossil worm-bored woods, water-filled (enhydros) agates, jaspers, and carnelians. All of these items find a ready market among tourists and collectors.

High prices

Owing to the wide demand for all types of semi-precious gems, prices have risen correspondingly. Where some years ago it was not especially profitable to prospect for or mine gems in Oregon, it is now attracting many persons and forming the principal occupation of many of them. Rough gem materials of all types, if of good quality, find a ready market locally or at other gem cutting centers, at record prices.

Along with the development of the gem cutting industry in Oregon, a minor industry of lapidary machinery manufacturing has also developed locally. The gems of the state are so widely known and distributed that the accompanying publicity has served to make Oregon a center of supply for much of the country for lapidary machinery and supplies of various kinds. A number of manufacturing firms in Oregon distribute their products throughout the world.

Other gems

While the quartz family comprises the greater part of the gem production of the state, there are a number of other gems produced. The peculiar variety of garnet, known as grossularite, has often been termed Oregon jade. This gem material closely resembles jade in hardness, specific gravity, and is even found in practically all the colors of jade, including green, mutton fat yellow, brown, white, pink, and black. The layman finds difficulty in distinguishing this material from true jade.

The pleasing pink rhodonite found on Evans and Cave creeks in southwestern Oregon, finds minor use as a gem material. This material could doubtless be utilized more widely, but little attention has been devoted to the deposits or rhodonite possibilities in the gem markets.

Great deposits of green serpentine rock occur at several regions in Oregon, notably in southwestern Oregon and on the John Day River near Canyon City. While this material finds little value as a gem stone, it does have possibilities as a material for the manufacture of ornaments like book ends, paper weights, ash trays, and various other desk ornaments.

The obsidian rock of central Oregon has been widely used as a gem material, especially the iridescent variety. Ordinarily obsidian is opaque and worthless as a gem material, but the gem variety found at Glass Buttes, some 50 miles east of Bend, has been sold widely throughout the country. This material has not been exploited to any great extent.

A considerable amount of agatized and opalized (petrified) wood has been produced in Oregon. Little of this material is used for gem cutting, but it is widely sold as specimen material, especially in the form of intact tree and limb sections. The region east of Bend is noted for its agate tree casts which were formed where the original wood was engulfed by lava and destroyed, but leaving a cast within the lava, the cavity of which was subsequently filled with agate.

NEW UNIT TRIPLES CEMENT OUTPUT*

Oregon Portland Cement Company, through its president, F. E. McCaslin, this week announced completion of its new cement manufacturing unit at its plant at Oswego, Oregon. Ground was broken about eleven months ago, and the construction of this new unit involved the superimposing of an entirely new cement plant upon the former facilities. The plant has cost about \$1½ million.

The former plant produced about 1,150 barrels of finished Portland cement per day, while combined capacity of the new unit is in excess of 3 thousand barrels per day.

The new construction has included the following items of machinery and equipment:

- A new rotary kiln
- A Cottrell electric precipitator
- A new Hammermill crusher
- An additional new raw grinding mill
- Two new slurry basins, 36 feet in diameter by 30 feet in height
- An additional new finish grinding mill

The increases materially add to the company payroll, and make the plant one of the most modern cement manufacturing units in the country, McCaslin stated.

The entire construction program has been under the supervision of David H. Leche, vice-president and general superintendent of the Oregon Portland Cement Company.

*From Commerce published by Portland Chamber of Commerce.

CONTROLLED GASIFICATION OF UNDERGROUND COAL

A valuable and interesting article on gasification of coal in place appears in the Quarterly Report of the Interstate Oil Compact Commission, April 1947, State Capitol Building, Oklahoma City, Oklahoma. The article is entitled, "An Experiment in the Underground Gasification of Coal at the Gorgas Mine of Alabama Power Company" by Milton H. Fies, Consulting Engineer and Manager Coal Operations, Alabama Power Company, Birmingham, Alabama. Following is a brief abstract:

The experiment was planned by the Alabama Power Company in September of last year and the company secured the aid of the Federal Bureau of Mines in carrying out the project. The company furnished the site together with supplies and labor necessary for the construction and maintenance of the project, and the Bureau provided technical assistance together with labor, equipment, and laboratory staff.

At the outset a study of the history of previous experiments, largely by the Russians, was undertaken. Also a review was made of the data acquired by members of the staff of the Bureau of Mines who had visited Europe, but not Russia, immediately after V-E day. The data available was not detailed enough to permit planning any definite procedure. Sir William Siemens had suggested the underground gasification of coal as early as 1868. Russian literature dates from 1934 but is indefinite in its descriptions.

The first step in conversion of natural gas to gasoline by the Fischer-Tropsch process is to change methane (CH_4) to carbon monoxide and hydrogen. Underground gasification can yield carbon monoxide and hydrogen, if coal is burned under control with admission of air or steam, and if proper engineering control is exercised.

It is estimated that liquids and gaseous fuels make up only 1.2 percent of the mineral-fuel reserves of the United States and coal and lignite account for 98.8 percent of the total. Therefore the domestic reserves of coal and lignite must form the backbone of our future fuel needs. If these solid fuels can be converted economically into gaseous fuels without removing the coal from the ground, a gigantic contribution to humanity would be made.

The author mentions the application that could be made of this method of obtaining gas to the gas turbine. This machine is being rapidly developed. A high temperature gas drawn from the mine would make very low cost power if used in the gas turbine located at the mine mouth. It is stated that the largest gas turbine unit now in operation is rated at 10,000 kilowatts. The largest on order is for 27,000 kilowatts. There is talk of closed-cycle units as large as 100,000 kilowatts.

The actual combustion of such mine gas under boilers as a source of energy was one of the underlying reasons for trying out the experiment.

The experiment demonstrated that combustion was maintained, and that, varying the direction of the air, some control could be exercised over the position of the flame. It is stated that although much was learned regarding the roof conditions resulting from burning coal, such conditions may not be predicted in advance of other experimental work. Under the conditions of this one experiment, the heat content of the gas during the air blast operations was held to a range of 50 to 100 B.t.u. However, gas having a heating value of 150 B.t.u. was produced and the gas analysis corresponded to that which would be produced at 1250° F. at equilibrium conditions with a limited supply of only 200 cubic feet per minute of oxygen and 291 B.t.u. (calculated air free) when steam only was used.

It is emphasized that results obtained may be interpreted only in the light of the conditions of this particular experiment. A vast amount of experimental work is required before commercial projects for underground gasification of coal may be undertaken.

The experiment was studied by two representatives of the British Government who stated that experiments in underground gasification would be undertaken in England. Information which the Bureau of Mines has from Belgium is that work there is proceeding on a large scale both in new and old mines. The supposition is that in Russia a great expansion of subterranean gasification is planned or is under way.

A paper describing the Alabama experiment is being prepared for a joint meeting of the Coal Division of the American Institute of Mining and Metallurgical Engineers and the Fuels Division of the American Society of Mechanical Engineers to be held in Cincinnati in October.

HISTORY OF ASSESSMENT LEGISLATION IS GIVEN*

* * *

The requirements for annual labor on mining claims have varied greatly in recent years. Because of this a brief review of the several acts of Congress on the subject might be of interest to prospectors and miners, and assist them in determining what lands are open for location.

The legislation which expires July 1, 1947, as a result of President Truman's proclamation of January 1, 1947, is the act which was passed by Congress in May of 1943. This measure suspended all assessment work for the war period and to July 1 following cessation of hostilities as determined by presidential proclamation or concurrent legislation of the Congress. However, the requirement was made that claim owners must file with the county recorder of the county in which the claims are situated a notice of intention to hold their claims without performance of the \$100 annual labor requirement on each claim.

A year previously, in May of 1942, Congress had suspended assessment requirements for a period of two years - from July 1, 1941, to July 1, 1943. That act also required the filing of notices of intention to hold, and limited the number of claims to which the exemption applied. In other words, exemption could be taken by an individual on only six lode claims, and by an association, corporation, or partnership on 12 lode claims. No limitation was placed on the number of placer claims as all assessment work was suspended on placers.

In addition to the above wartime measures, special legislation was passed which waived assessment work requirements for members of the armed forces, as well as on all claims located in defense areas, bombing ranges, etc.

Assessment work was required for the three fiscal years ending July 1, 1939, 1940, and 1941, following moratoriums which had been granted during the depression years.

The first of these was the act of Congress which suspended the assessment work on all claims for the assessment year ended July 1, 1932. For the next three years the exemption applied only to claim owners who were exempt from the payment of a federal income tax. It also was subject to the filing and recording of a notice of intention to hold the claims without assessment work.

For the fiscal year 1934-35, a further limitation was placed on the assessment moratorium in that the suspension applied to only six lode claims or 120 acres of placer ground held by an individual, or 12 lode claims or 240 acres of placer ground held by a partnership, association, or corporation. The same provisions regarding non-payment of a federal income tax and the necessity for filing and recording notices of intention to hold were included. These same limitations were included in the acts of Congress which suspended the annual labor requirements for the fiscal years 1935-1936, 1936-1937, 1937-1938.

Thus, during the last 16 years, some type of moratorium has been in effect except for the three fiscal years starting July 1, 1938, and ending July 1, 1941. A blanket moratorium was in effect for one year - 1931-1932; only those who were exempt from the payment of a federal income tax were relieved of the annual expenditure requirements (subject to filing of notices of intention to hold) for the fiscal years 1932-1933, and 1933-1934; starting with the fiscal year 1934-35, the exemption was limited to six lode claims or 120 acres of placer ground held by an individual, or 12 lode claims or 240 acres of placer ground held by a partnership, association, or corporation; and for 1941-42 and 1942-43, assessment work

*From Pay Dirt for June 20, 1947, published by Arizona Small Mine Operators Association.

was suspended on all placer claims and on six lode claims for an individual or 12 lode claims for a partnership, association, or corporation, but owners were required to file their notices of intention to hold.

During the war years 1943-1947, the limitations as to number of claims and payment of federal income taxes were waived, and it was only required that notices of intention to hold be filed with the county recorder of the county in which the claims are situated.

MERCURY AND CHROMITE

Although there appears to be a general apathy to mineral industry problems in this country, Oregon should be vitally interested in anything affecting the supplies and markets of these two essential mineral raw materials. During the last war when foreign supplies of both were cut off, representatives of Governmental agencies in large numbers spread out over western states in order to urge and promote the production of the vitally needed mercury and chromite. Producers and potential producers, laboring under the many handicaps of wartime labor and material shortages, did a magnificent job in providing these needed minerals. After the war emergency passed and domestic supplies were not urgently needed, the efforts of the producers were conveniently forgotten in Washington. Very soon domestic users turned to foreign sources with both passive and active support of Governmental officials, and imports became the mainstay of domestic consumption. Figures on chromite and mercury brought into this country, just released by the U.S. Bureau of Mines, show strikingly the peacetime handicaps of producers or would-be producers of mercury and chromite in this country.

In 1946 domestic production of primary mercury was 25,348 flasks. General imports totaled 23,062 flasks. Consumption was 31,200 flasks. Principal foreign sources were Italy, Mexico, and Spain although, in the first quarter of 1947, over 3000 flasks were imported from Japan.

As far as chromite is concerned, 1946 domestic production amounted to 3,920 tons as compared to imports of 754,308 tons. In the first quarter of 1947 there was no domestic production. Imports for this quarter amounted to 188,247 tons.

In another war emergency, there would be the same crying need for mercury and chromite, but there would not be time to open domestic mines and put them into condition to produce. If our mines are to save us again, they must be kept in a healthy condition; that condition can be realized only if they are allowed to operate profitably.

NOTICE OF HEARING

The Legislative Mining Interim Committee, as set up by Senate Joint Resolution No. 18 to study surface mining operations in relation to agricultural land, will hold public hearings in eastern Oregon as follows: at John Day, September 8; at Sumpter, September 9; and at Baker, September 10.

Members of the Interim Committee are Senators Austin Dunn, Paul Patterson, and Rex Ellis, Chairman, and Representatives John Dickson, E. W. Kimberling, and Marie Wilcox.

A hearing was held at Grants Pass by the committee on May 24.

SMELTER NEEDS SILICEOUS ORES

The Tacoma Smelter needs to increase its supply of siliceous ores. Anyone who can ship quartz or other highly siliceous ore containing low gold or copper values may receive a favorable smelting contract. Correspondence should be addressed to D. A. Summerville, Tacoma Smelter, Tacoma, Washington.

GOLD

During the past two or three weeks considerable publicity has been given in press reports concerning the so-called "free market" for "gold in its natural state."

It is difficult, however, to understand how a higher price than that paid by the U.S. Mint may be obtained by gold producers in this country. Possibly there is a very limited open market in which people with foreign connections would purchase gold here and ship it abroad to persons who would sell in open or "black" markets. Such shipments would have to be sub rosa, as a license is required from the Treasury in order to ship gold out of the country. In this regard the Treasury has licensed and presumably will continue to license domestic smelters to ship gold abroad equivalent in amount to that received in the form of concentrates from Canadian producers and for the account of these producers. Such gold may be sold in foreign open markets at a price in excess of the \$35 an ounce paid by the U.S. Mint.

The Engineering and Mining Journal "Metal and Mineral Markets," July 17, 1947, states that "free market" gold values have varied considerably, but little gold above \$43 an ounce has changed hands in dollar transactions. As reported in the Portland Oregonian of July 19, the Associated Press stated that gold sold abroad above the official U.S. price of \$35 an ounce, and that the U.S. Treasury and Federal Reserve Board had appealed to individuals and businesses to assist in stopping active speculative markets abroad in gold. The report also stated that Secretary of the Treasury Snyder had said that officials had not discussed the offer made by the American Smelting and Refining Company to buy Canadian gold concentrates, refine them here, and export the gold content at a price above \$35 an ounce.

As reported by the News Letter of the Mining Association of Montana for July 1947, the Wall Street Journal, Toronto bureau, published the following item on June 17:

"The open market for gold is substantially above \$35 an ounce. Directors of McIntyre Porcupine Mines Ltd. believe the open market price indicates a trend that cannot long be ignored, Balmer Neilly, president, told stockholders at the annual meeting.

" 'Today's official price of gold represents the judgment of a few men, while the higher prices prevailing abroad mirror the price that men are willing to pay,' he said.

"J. P. Bickell, chairman of the board, discussed the storing of the company's gold production. ... Mr. Bickell disclosed that the company replaced its short-term low yield bonds by gold in storage to the extent of \$5,887,000. He also revealed that the return to parity of the Canadian dollar meant a reduction in excess of \$1 million in the value of American securities held by the company."

CLEARING HOUSE

CH-95: For sale - Huckleberry Mine (gold) located on Ash Creek 5 miles south of Riddle, Douglas County, Oregon, in sec. 7, T. 31 S., R. 5 W. Access to the mine is by means of a road and trail, 3 miles and 2 miles long respectively. The property comprises 7 patented lode claims. Record of production is approximately \$6,500. The property is owned by E. B. Hart, Riddle, and Frank Fahy, Bandon. Anyone interested should contact Mr. Hart.

CH-96: For sale - Roberts Mine located two miles southwest of Greenhorn, Grant County, Oregon, in sec. 21, T. 10 S., R. 35 E. The property is 20 miles from Sumpter. There are four unpatented claims containing 600 feet of tunnels partly caved. The production record shows that over \$10,000 in gold has been produced. Very high-grade values have been found. Assay records show samples assaying from \$25 to \$80 at the old price of gold. Anyone interested should see or write Mr. Frank Roberts, Yamhill, Oregon.

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DEPARTMENT LOSES GEOLOGISTS

Three geologists occupying key positions in the Department have resigned to accept better jobs. Their leaving brings home a condition in the country which was confidently predicted in educational and scientific circles, but was given little attention by those in authority during the war.

Young scientists were grabbed by the draft and in many instances put into service bearing little relation to their training and possible future use to the country. As a consequence, they lost three or four years of training work in their professions, causing a present shortage of those qualified to carry on scientific investigations and research. This shortage is accentuated by the large increase in enrollment at institutions of higher learning and the increased need for teachers, especially those qualified to teach science and engineering. The shortage, of course, has resulted in bidding (in which the Federal Government has participated) for qualified men, which leaves relatively small agencies like the Department, whose salary ranges are pretty well fixed by law, out in the cold. Such small departments are not able to fill vacancies immediately by promotion, and must suffer a setback in work on projects which are interrupted by resignations.

Dr. Wallace D. Lowry left the Department on August 1st to take a position in California as geologist with the Texas Company.

Dr. Ewart M. Baldwin has accepted the position of Assistant Professor of Geology, University of Oregon, at Eugene. He is leaving the Department early in September.

Dr. John Eliot Allen, department geologist for ten years, is leaving in September to become Associate Professor of Geology at Pennsylvania State College.

Editor

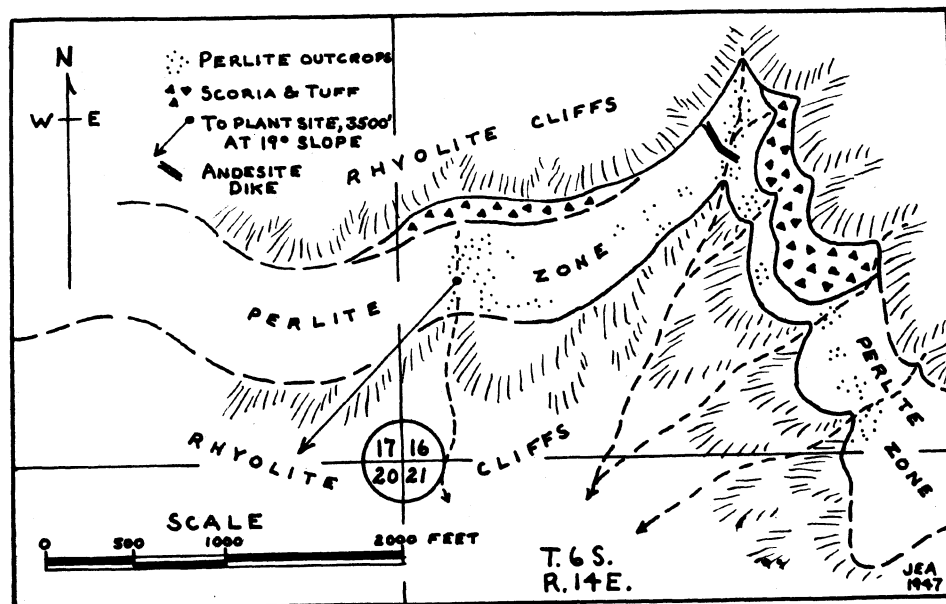
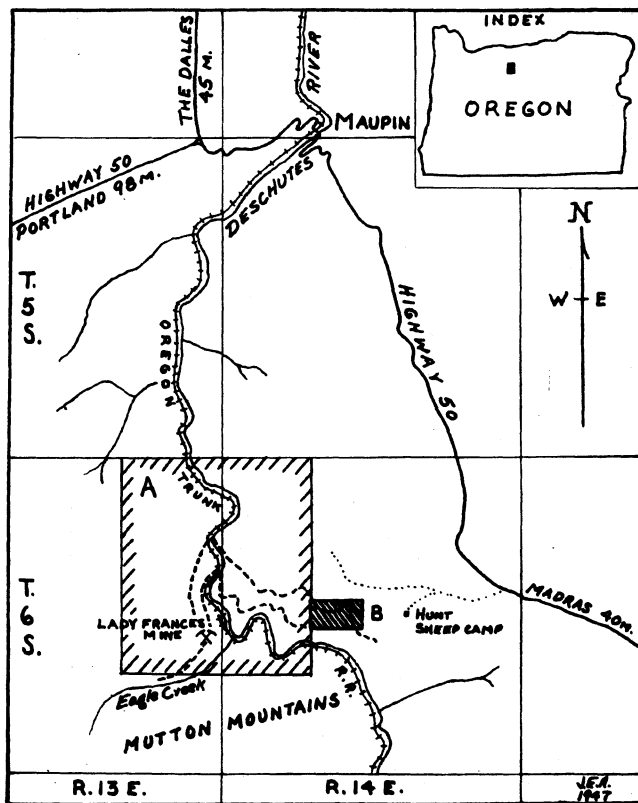


Fig. 2 Sketch geology of Oxford-Hunt perlite deposit.

Fig. 1 Location of perlite deposits north of the Mutton Mountains, Oregon

Perlite zones ----

A Area mapped in Short Paper No. 16.
B Area mapped in this report.

ANOTHER PERLITE DEPOSIT IN OREGON

by

John Eliot Allen*

Introduction:

The expanding use of perlite for plaster and concrete aggregate, wallboard, and other insulating, acoustical, and building materials has stimulated search for other perlite deposits in the West. This glassy volcanic rock, which, when heated to 1700° F. "pops" like popcorn to produce a white, frothy, lightweight aggregate, is already being mined at one place on the Deschutes River in Wasco County. This deposit has been described recently in Short Paper No. 16 of the Department (Allen, 1946).

Location and ownership:

Another deposit, owned by Joseph M. Axford and Clarence N. Hunt, lies about 2 miles farther east. The perlite zone extends through the SW $\frac{1}{4}$ of section 16 into the SE $\frac{1}{4}$ of section 17, T. 6 S., R. 14 E., in southern Wasco County, about 9 miles airline south of Maupin on the north side of the Deschutes River at an elevation varying from 2300 to 2450 feet (see fig. 1).

History:

Perlite in central Oregon was first definitely identified in 1919 when Axford sent samples from this deposit to the Oregon Bureau of Mines. When Dant and Russell, Inc., became interested in perlite early in 1945, and was told of the Wasco County deposits by the Department of Geology and Mineral Industries, Axford took the engineers for Dant and Russell over the ground and they located the deposit 3 miles due west of the Axford-Hunt deposit, which is now being developed as the Lady Frances mine.

Topography:

The perlite zone lies from 1300 to 1450 feet above and north of the Deschutes River, which at this point is flowing west. The deposits are less than 3500 feet airline from the river, so steep are the cliffs below. Both above and below the zone the hillside is steeply cliffed, but it would not be too difficult to build a road in from the north, a distance of about 1 mile.

Geology:

The general geology of the district has been treated by Wilkinson (1932) and the perlite deposits immediately adjacent to the west (see fig. 1 for location) have been discussed by Allen (1946). The perlite zone on this property has not been connected with the zones to the west, but it is believed to represent the upper perlite of the Frieda area. It overlies banded, lithophysal rhyolite at least 300 feet thick and is overlain for a distance of more than 1000 feet by 10 to 100 feet of andesitic scoria, thin flows and ash, overlain in turn by massive rhyolite at least 500 feet thick. The entire series appears to dip gently to the north (from 4 to 5 degrees) although the dips in the red scoria are steeper in places, probably representing initial dips in a cinder cone.

The perlite zone varies in thickness from 40 to 180 feet, the thickest section visible appearing at the west edge of section 16 (fig. 2). The lower 10 to 40 feet of the perlite section is made up of a dark gray crumbly perlite (Sample No. 4) containing occasional marekanite (black glass) cores and is in places penetrated by chalcedonic crusts and seams. This is overlain by a 5- to 10-foot bed of dark-colored brown to gray dense massive pumiceous rock (Sample No. 1). Above this bed, which is particularly prominent at the west edge of section 16, lies 120 to 140 feet of pale gray perlite breccia, containing angular

* Geologist, Oregon Department of Geology and Mineral Industries.

fragments of granular perlite from a few inches to several feet in diameter, in a matrix of finer grained perlite material. The upper 10 to 30 feet consists of a fine-grained sandy perlite (Sample No. 5) having almost the appearance of a pumicite.

Relationships are actually not as simple as the above, which is generalized. The gray crumbly perlite is found in zones of variable size within the breccia and throughout the section.

Samples from the perlite zone were crushed, screened to -14 and +20 mesh, and expanded in an electric furnace at 1850° F. to give the following results:

Sample No.		Approx. Expansion	Pounds per cu. ft. (calc.)
5	Fine sandy perlite	x3	20.4
4	Gray crumbly perlite	x $5\frac{1}{2}$	15.6
2	Light-colored massive pumiceous rock	x $3\frac{1}{2}$	18.5
1	Dense brown to gray massive pumiceous rock	x3	17.2

Results of these preliminary tests indicate that the best material (Sample No. 4) is commercial in grade, and that the other samples, with proper expansion technique (not obtainable with laboratory equipment available), may also be of economic value. Tonnage estimates cannot be made on this material on the basis of prospecting work now done. Further trenching, sampling, and tests must be made before it can be told how large an amount of expandable material is present, but it may be large.

Economics:

The value of perlite, as with other nonmetallic products, depends in large part upon the ease of access and transportation facilities. This property is located about 14 miles by road from the railroad at Maupin, but it is only 3500 or 4000 feet from the railroad across the river in the gorge below. If the deposit should prove to be of sufficient grade and size, an aerial tramway to the mill and railroad-siding site across the river might solve the transportation problem.

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PHILIPPINE GOLD AND THE BLACK MARKET

Press reports emanating from Hong Kong early in August stated that a large quantity (approximately 13 tons) of gold was to be flown from Manila to Macao, the Portuguese colony at the mouth of the Canton River. According to the reports, Philippine officials were alerted to prevent shipment as such export of gold has been banned by the Philippine government. It is stated that Macao is the center of a large gold black market and that Chinese in the colony pay premium prices for the metal - at the time of the report about \$51 an ounce.

SUSTAINED YIELD OF TIMBER ON O&C REVESTED LANDS

by
E. K. Peterson*

The topic of your discussion today concerns one of our basic, but nonrenewable, natural resources - minerals. We shouldn't forget for a moment that the natural resources with which this country was endowed were almost completely responsible for victory in the recent war and for this country's dominant economic position in the world today.

It is true that the United States also has superior scientific brains and unexcelled organization and efficiency in our manufacturing of consumer goods; but how many of you think that the present high standard of living which we enjoy could have been reached if we had no gold in this country, or if we had to import most of our iron ore, or coal, or oil, or food supplies, or timber?

The O&C and Coos Bay Wagon Road lands in western Oregon, comprising approximately 2½ million acres, have two predominant natural resources: One being scattered and as yet largely undeveloped deposits of minerals such as gold, chrome, iron, copper, manganese, limestone, and silica; and the other, a renewable resource, the forests - representing approximately 30 percent of the remaining merchantable timber in western Oregon.

I think all of you know the importance of timber in a state which is the largest lumber producing state in the Union and in which lumbering and associated industries comprise more than 50 percent of the total payroll. Mr. Bristol has asked me to discuss with you briefly today the sustained yield management of the timber on these lands, because the forests often occur on the same ground or in the same vicinity as paying deposits of minerals. All of us are, or should be, striving for the wisest development of both resources and it is felt that their development will be more harmonious if the mining interests fully understand the importance, methods, and long-term objectives of the timber interests, and vice versa.

In order to enable all of you to understand better the present situation concerning timber management on the O&C lands, I shall attempt to give you a brief glimpse into their very interesting legislative history.

Congress created the O&C lands from the public domain in 1866 for the purpose of subsidizing the construction of a railroad from the Columbia River to the California line. The Oregon & California Railroad Company was granted title to all lands in alternate odd sections for a distance of 20 miles (later, 30 miles) on both sides of the right-of-way. Title was not granted to lands classified as mineral. In the 1880's the Oregon & California Railroad went into bankruptcy and was taken over by the Southern Pacific Company.

In 1916, by a Supreme Court decision, such of these lands that had not already been sold were taken away from the Southern Pacific Company because of violations of the original grant, and were returned to the United States with the provision that they be administered by the Secretary of the Interior. The land, except power sites, then became subject to the general mining laws of the United States, with the exception that holders of mining claims could use the timber therefrom in the development of their claims only until the United States decided to sell it. Also, the government reserved title to the timber on all timberlands patented as mining claims.

The Act further provided that the timber from the O&C lands should be sold as fast as a reasonable market would permit. This condition continued until Congress passed, and the President signed on August 28, 1937, an act requiring that the timber on the O&C lands be managed on a sustained yield basis. The Secretary of the Interior was directed to divide the O&C lands into sustained yield units and to determine the rate of timber growth in each

*District Forester, O&C Lands Administration. Talk presented at meeting of Oregon Mining Association, Grants Pass, May 24, 1947.

unit, and then to limit the timber sales in any given period to that figure. To carry out the Act of 1937, the O&C Administration was created, with W. H. Horning as Chief Forester in Portland, and district headquarters at Salem, Eugene, Roseburg, Coos Bay, and Medford.

The Act of 1937 specifically repealed any laws of Congress in conflict with its stated major objective - the sustained yield management of its timber resources. In 1941, Mr. Oscar Chapman, Assistant Secretary of the Interior, ruled that the general mining laws of the United States were in conflict and therefore did not apply to the O&C lands after August 1937.

Meanwhile, the O&C lands have been divided into over 100 sustained yield units, and timber sales in each of these units have been limited to the amount that will grow each year. For western Oregon this figure is now approximately 600 million. Furthermore, the purchasers of the timber are required to cut it in the manner best designed to save all existing young trees and to get another crop of seedlings started by natural seeding as rapidly as possible.

In most cases, our loggers cutting O&C timber are anxious to do, and are doing, a good job. This policy has already resulted in a fairly uniform distribution of the lumber industry throughout western Oregon, in contrast to the previous over-development of the industry in northern Oregon and the under-development in southern Oregon. However, the sustained yield management of the private timberlands intermingled with the O&C lands is still not a reality. In most areas at the present time, including Josephine, Jackson, and Douglas Counties, cutting on private lands far exceeds the annual growth.

To encourage an improvement in the methods of cutting timber on private lands and to make possible their management on a sustained yield basis, the O&C Administration is willing to enter into cooperative sustained yield agreements with owners of private timberland for periods of 100 years or more. In order to qualify, a possible co-operator would agree to commit a substantial acreage of forest-producing land as his contribution, keeping it all on the tax rolls, and agree to cut the timber in a manner best designed to get another crop of trees established as soon as possible, and to limit the cutting of timber on his own lands to the number of board feet they will grow each year. The O&C Administration, in return, would agree to sell to the co-operator all of their timber in the proposed area without competitive bidding, but at a fair appraisal.

The cooperative sustained yield approach to our forest problems has been adopted by the West Coast Lumberman's Association, the Pacific Northwest Loggers Association, the Western Pine Association, and the Willamette Valley Lumbermen's Association, and it is heartily endorsed and actively promoted by the entire Oregon Congressional delegation, especially by Senator Gordon.

It is expected that within the next 5 years 60 percent of the forest area where O&C lands occur will be included in cooperative sustained yield agreements. The remaining 40 percent probably will be available for competitive bidding in the present form for a long time.

In December 1945 the O&C Administration held at Eugene, Oregon, a public hearing for the purpose of hearing evidence, pro and con, on the proposal that cooperative agreements be authorized for western Lane County, called the Siuslaw Master Unit. A year later the Siuslaw Master Unit was declared by the Secretary of the Interior, Krug, and the O&C Administration as preparing cooperative agreements with various operators in western Lane County. I believe one with the Hult Lumber Company near Triangle Lake will be the first one adopted. Similar hearings for Josephine, Jackson, and Douglas Counties are tentatively scheduled to be held at Roseburg during July.

We believe that if the principle of cooperative agreements is approved for these areas that cooperative agreements will soon follow and the lumber industry will then become stabilized; will be able to install and operate at a profit various types of wood remanufacturing plants, wood chemical plants, and pressed wood factories of various types; and will be in the business of growing trees in addition to harvesting and manufacturing them.

OAC LANDS LEGISLATION

S. 579 and H.R. 2354, in effect to restore application of the Federal mining laws to OAC and Coos Bay Wagon Road grant lands, were introduced in the Senate and House of the last Congress by Senator Gordon and Congressman Ellsworth respectively. In reply to an inquiry by the Department concerning the fate of these bills, Senator Gordon wired that they were not acted upon during the last session but that he hoped to get his bill passed early after the second session convenes in January 1948.

BENTONITE COMPONENT OF NEW PLASTIC

According to Science News Letter, May 24, 1947, a new use for bentonite has been developed by the Mellon Institute in Pittsburgh. The process takes advantage of the very fine grain size of the silicate particles in bentonite. A chemical reaction is induced between the silicate particles and resin-forming organic polymers so that a copolymer of the organic resin and the mineral is formed. The advantages of the new plastic substance are that the material, when molded, absorbs only a little moisture, has great resistance to chemical attack, and also can withstand elevated temperatures.

TO PRODUCE BURNED LIME

A new corporation called the Horsehead Lime Corporation with headquarters at 319 Leverette Building, Medford, Oregon, has taken over the Washington Brick and Lime property at Williams, Josephine County, Oregon. This company is actively engaged at the present time in installing new equipment and reconditioning the old plant. They expect to be in operation as soon as this work has been accomplished.

The company is composed of Mr. Walter Leverette, Medford, President; W. E. Coleman, Portland, Vice-president; Vincent Vaughn, Medford, Secretary-Treasurer; and W. H. Holloway, Medford, Manager. Mr. Wolf G. Bauer, Chemical Engineer of Seattle, is the Consulting Engineer.

SOUTHERN OREGON MINING BULLETIN

The Benton mine, largest prewar gold producer in southern Oregon, is among the twenty-four mining properties in the Mt. Reuben mining district, Josephine County, which are listed and described in Bulletin 34, just issued by the State Department of Geology and Mineral Industries. This district, the scene of much gold mining activity early in the present century, is in the northwestern part of the county and extends from the Rogue River north to Mt. Reuben near the Douglas County line. Mining activity subsided and there was little in the way of development or production for many years until the price of gold was raised in the early 1930's. From then until the war stopped gold production in 1942, the Benton mine situated near the center of the Mt. Reuben district was one of the most important gold producers in the State.

Bulletin No. 34 is entitled "Mines and Prospects of the Mount Reuben Mining District, Josephine County, Oregon." It describes the geology and ore deposits of the area and contains several illustrations and maps. The author is E. A. Youngberg, formerly field engineer for the Department at Grants Pass. The bulletin may be obtained from the Portland office of the Department at 702 Woodlark Building or from the field offices situated in Baker and Grants Pass. Price is 50 cents postpaid.

DEPARTMENT PERSONNEL CHANGES

Mr. Hollis M. Dole, Field Geologist stationed at Grants Pass, has been transferred to the Portland office. Mr. Harold Wolfe has succeeded Mr. Dole at the Grants Pass office. Both Mr. Dole and Mr. Wolfe are graduates in geology of Oregon State College and both are ex-service men. Mr. Dole served with the Navy in the combat zone of the South Pacific. Mr. Wolfe was with combat troops in Italy.

RESOLUTIONS

The Mining Association of Montana at its recent convention in Butte, August 3-4, adopted a set of strong resolutions, a few of which are given below:

Bureaucracy

It is written in the pages of all history that the downfall of government "by the people and for the people" began with the birth of bureaucracy, centralizing the power in the hands of a few.

During the past two decades especially, the federal government has increasingly been usurping the functions and sovereignty of the states of this union, contrary to the spirit of the Declaration of Independence, the Constitution, and the Bill of Rights, and foreign to the minds of the great patriots who planned this form of government.

We urge a revival of state and local interests and that our elected representatives immediately begin unraveling this totalitarian skein to the end that government start in the states, rather than in Washington, D.C.; that we work from the bottom up, rather than the top down.

As an illustration of this encroachment: The taxpayers of Montana in 1933 contributed 23.9 percent of their tax money to the federal government, 20 percent to the state government, and 56.1 percent to county and city government. In 1946 the federal government, as a result of the war, took 79.2 percent of the tax money of the people of Montana, leaving only 9.8 percent to the state government and 11 percent for county and city governments. With the war now over "it's time for a change."

Taxation

Government spending means government taxation, from which no one escapes. An old maxim states: "Let George do it." In the past few decades the tendency has been to let the government do it; the people little realizing that they are the government and that whatever the government spends, the citizens themselves must pay directly or indirectly. The present income tax alone at this time is from 20 to 90 percent of the yearly income. Taxes inevitably are added to the cost of production, thereby placing the burden on the consumer, be he large or small. This condition cannot continue; like the vampire, it devours the substance of the people and will destroy the incentive to individual effort. We favor immediate drastic reduction in public expenditures, to the end that taxes may be lowered, thus giving a larger "take home" pay check to the workers and enabling industry to accumulate funds for expansion of business and creation of more jobs.

Public land policy

We condemn the policy of the federal government to nationalize and withdraw from entry large acreages of public lands that rightfully belong to all citizens for location and settlement. That policy takes from the homesteader an inalienable right that long has been recognized; and deprives the prospector and mine operator of the incentive to develop the latent resources, by placing upon them restrictions and royalty burdens of no benefit to the community or the state and depriving the state of taxable property.

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STATE OF OREGON
DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES
PORTLAND, OREGON

THE ORE.-BIN

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SODIUM CHLORIDE BRINE OCCURRENCE NEAR VALE, OREGON

By
Norman S. Wagner¹

Introduction:

Sodium chloride brine with a concentration of 56,000 parts per million was reported² to have been obtained from a well situated in sec. 8, T. 18 S., R. 45 E., which is near Vale, Malheur County. An investigation made by this department during the Fall of 1946 disclosed no known brine well in this location. Numerous reports, however, were heard about early-day attempts to commercialize a sodium chloride brine occurrence near Alkali Springs. Subsequent investigation, an account of which follows, led to the confirmation of these reports.

Location:

Alkali Springs is situated in sec. 8, T. 17 S., R. 45 E. This is the same range and section as given in the above reported location, but in the adjoining township. It would thus appear that this is the same occurrence as referred to in the U.S. Geological Survey report³ and that the township location given in the report is in error. Access to the springs is by 6.5 miles of road which turns off to the north of U.S. Highway 28 at a point 6.4 miles northwest of Vale. A small portion of the side road is lightly graveled but the bulk of it is an unimproved, dry-weather, stockmen's access road.

History:⁴

The circumstances surrounding the original discovery of the brine are not known, but the discovery was presumably made by some homesteader or rancher who was attempting to develop water. The attempted commercialization of the brine is more fully known. This was done by a Mr. Johnson of Vale during the early 1920's. Johnson's work consisted of the drilling (auger) of numerous but shallow holes, and also the sinking of a few pits. A 50 ft. x 50 ft. concrete evaporating tank was constructed adjacent to one of these pits for solar evaporation. It is also reported that attempts to effect evaporation were made, utilizing metal tanks and sagebrush fuel. Although the experimental production made by this work did serve to focus local attention upon the occurrence, no further development of the occurrence ever materialized.

Area:

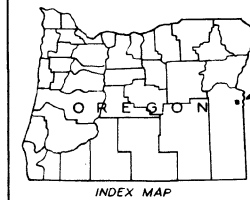
Alkali Springs is a group of springs controlled by the U.S. Grazing Service. They occur in a relatively flat valley which lies to the west, and southwest of a pronounced range of hills. Elevation of the springs is about 2500 feet. Drainage by an unnamed and usually dry creek is to Willow Creek to the south.

¹Field Geologist, State Department of Geology and Mineral Industries, Baker, Oregon.

²U.S. Geol. Survey News Release, 1931.

³U.S.G.S., op. cit.

⁴Informants include: Messrs. V.E. Johnson, Civil Engineer; Irwin Troxell, County Judge, Malheur County; Homer King and O.E. Clark, ranchers.



APPROXIMATE LOCATION SECTION 5
SECTION 8

ALKALI SPRINGS

NO. 7
13'0"
17'0"
34,600

NO. 8
11'3"
15'3"
20,150

NO. 9
8'9"
13'4"
36,200

NO. 6
10'0"
14'0"
26,000

NO. 1
11'8"
3'0"
44,000
45,900

NO. 2
14'0"
17'4"
51,500

NO. 3
14'0"
17'0"
46,000

NO. 4
14'0"
17'6"
47,800

NO. 5
DRY
18'3"

Old concrete evaporating tank

APPROXIMATE LOCATION, CENTER LINE



VALE SALT PROJECT

T17S. R45E. S8 - MALHEUR COUNTY

CONDUCTED BY
R. S. MASON & N. S. WAGNER

STATE DEPARTMENT OF GEOLOGY
AND MINERAL INDUSTRIES - OREGON

JUNE 1947

SCALE
0 500 Feet

First figure — Depth to water table.
Second figure — Total depth of hole.
Third figure — NaCl content of brine
in parts per million.

✕ Drill hole □ Old shaft

The precise location of the Johnson wells is not known except that there are two pits found close to the remains of the concrete evaporating tank. This tank is adjacent to the access road about 2000 feet to the southwest of the springs, and in the west half of the section (8). This half section is owned by Otto Broweleit, Route 3, Kearney, Nebraska.

As the above mentioned pits are themselves just sluffed-in "relics," and as no other means of sampling existed, the department drilled⁵ several holes to confirm the occurrence. The area covered by this drilling is set forth on the map accompanying this report. The first hole was drilled within a few feet of the concrete tank on the presumption that this tank was located on one of Johnson's most promising test hole sites. Likewise the second departmental hole was located to the east of the first hole on the strength of the other Johnson shaft situated nearby. For want of additional knowledge concerning the extent of the brine area, the remaining departmental holes were located arbitrarily on a grid pattern. Grid intervals used approximated 500 and 1000 feet but these distances were "adjusted" with respect to favorable topographic and drilling conditions.

Procedures followed in the field:

Drilling was done by hand auger supplemented in the case of the deeper no. 1 hole by a tripod (Mason, 1944). Three-inch augers were used for the most part although, on occasion, difficult drilling made the use of a 2-inch auger expedient. The nature of the strata encountered frequently necessitated a "preconditioning" of the ground before the conventional auger would function efficiently. This was accomplished by the use of a chopping bit or by a coal auger. Drilling was supervised by Ralph S. Mason, department engineer.

A total of nine holes was sunk for an aggregate depth of 148 feet 4 inches. Excepting for one dry hole which was abandoned because of excessively difficult drilling conditions, water was encountered at depths ranging between 8 feet 9 inches and 14 feet.

The first hole was sunk to a depth of 31 feet. This gave a penetration of 19 feet 4 inches below the horizon at which water was first encountered. Sinking the hole to this depth was done to determine if there was significant increase in flow or salinity at depth. A slight increase in flow was noted as was to be expected, but no positive or significant increase in salinity was observed in this distance. Since appreciably deeper drilling was indicated for a test of these factors, and since the objective of this project was merely to confirm the reported existence of the sodium chloride brines here at this time, it was thought best to sink as many holes as possible within the time available in order to give some idea of the extent of the area underlain by brine. Therefore subsequent holes were sunk only a sufficient distance below the water horizon to permit sampling.

Large samples were taken and allowed to settle before bottling. The clear solution was siphoned off. Samples of cuttings were saved from only a few of the holes as the material encountered in all holes proved to be similar.

The sodium chloride content of the brine for each hole appears on the map. A more complete tabulation of the analyses showing associated compounds, etc., is set forth in the accompanying table.

Geology:

The northeastern portion of Malheur County is occupied largely by lacustrine and fluvial sediments of the Payette formation. These sediments have been classified (Lindgren, 1898) as being of fresh water origin. The composition of the formation varies widely and includes the extensive diatomite deposits in the Harper and other Harney County areas to the west. The elastic portion of the formation is composed chiefly of clays, sands, and conglomerates. In the Harper and other more western areas where the formation has been mapped, Moore (1937) describes the elastics as being primarily water reworked materials of volcanic origin such as tuffs, ashes, etc. In the Vale to Payette (Idaho) area, Washburne (1910) points out that while the coarser water-rounded pebbles appear

⁵Permission for drilling granted by Mr. Broweleit.

TABULATION BY COMPOUNDS - VALE BRINE SAMPLES
(All results given in parts per million)

Hole no.	Water-bearing section sampled	Total solids	Sulphate compounds			Chloride compounds			
			CaSO ₄	MgSO ₄	Na ₂ SO ₄	CaCl ₂	MgCl ₂	KCl	NaCl
1	11'8" to 14'0"	55,300	5,110	1,540	1,160			205	44,600
1	11'8" to 19'0"	57,100	4,750	1,440	2,475			565	45,900
1	11'8" to 27'4"	55,100	4,900	1,480	1,950			325	44,000
1	11'8" to 31'0"	55,500	5,510	1,530	1,380			420	44,500
1	Average of above fractional samples	55,750	5,067	1,497	1,741			379	44,750
2	14'0" to 17'4"	70,100	3,525			5,900	2,990	290	51,500
3	14'0" to 17'0"	65,600	2,960			7,390	3,150	520	46,000
4	14'0" to 17'6"	65,600	5,500			3,990	2,870	290	47,800
6	10'0" to 14'0"	43,000	2,340	770	11,400			140	26,000
7	13'0" to 17'0"	44,200	4,850	1,860			580	210	34,600
8	11'3" to 15'3"	25,800	1,940	590	1,470			160	20,150
9	8'9" to 13'4"	49,400	690	600	8,880			250	36,200
Alkali Springs		1,200	22	20	120			14	910

No bromine or iodine was found in the samples.

abundant on the surface, deep well logs show the formation to be composed predominantly of clays. Buwalda (1921) expresses the opinion that these beds are not true lakebeds but, instead, largely river flood-plain and waste-slope deposits laid down only in part in lakes; while strata of Pliocene (and possibly Pleistocene) age have been recognized and included in the Payette, the bulk of the formation is generally regarded as being of Miocene age.

Basalt and vitrophyre flows of a younger or Pliocene and possibly Pleistocene age, according to Moore (1937) and Washburne (1910), constitute the next most abundant formation to be seen in the area.

So thoroughly do the Payette sediments blanket the area in general, that little is known concerning the identity of the underlying formations over a wide area. In his report, Washburne goes into this aspect of the geology to a considerable extent. Established formations of pre-Miocene age include Cretaceous granitics exposed 20 miles east of Payette; other igneous rocks and Paleozoic-Triassic metamorphics (schists, limestones, and slates) in the Burnt River and Mormon Basin areas 20 to 25 miles or so to the north and northwest of Vale; and rhyolitic and other igneous rocks in the Owyhee Range, 23 miles south of Nyssa. The foregoing is only a rough and incomplete summary of Washburne's observations, but it is sufficient to give the picture - especially so since no geologic mapping having a direct bearing on the subject has been published covering this portion of Oregon since Washburne's report.

Insufficient data exist at this time on which to base conclusive statements concerning the origin of the salt brine found. Accordingly, only a discussion of such observations and data as seem pertinent to the subject will be given here.

Saline waters are not uncommon. They range in age from present day saline lakes to brines associated with formations of almost all geologic ages. Various theories concerning origin have been advanced, especially in the case of the older brines. Some of these saline waters are regarded as connate, or original sea water trapped in sedimentary formations of marine origin. Others clearly originate from the solution of salt deposits contained in sedimentary formations. Still other saline waters associated with igneous and volcanic rocks are believed to originate from volcanic sources.

Saline beds of the type normally associated with the evaporation of saline lakes have not been described as being integral to the Payette sedimentaries, nor is a connate origin compatible with the fresh water classification of the formation.

Washburne mentions reported finds of rock salt (small fragments from unspecified depths) in two different oil well tests, and even states that one dome near Vale "bears some resemblance to those in other oil fields that have cores of salt, dolomite, or basalt." This brings up the possibility that the underlying formations may contain rock salt deposits. None of the underlying formations is known to contain such deposits although the Triassic sedimentaries could possibly be regarded as a potential host formation.

One horizon of this formation is known as the "Gypsum formation" (Livingstone, 1925) because of contained gypsum deposits.

This horizon is characterized by red and green shales and conglomerates. If the contained gypsum of this formation is of sedimentary origin, it would not be unwarranted to suspect that the formation might also contain beds of salt as the two minerals are commonly found together. It is the writer's belief, however, that the gypsum is of secondary origin, the result of the reaction of sulphur-bearing waters on contained limestone lenses. In the old gypsum mine near Huntington, Oregon (Wagner, 1946), the gypsum is closely associated with an area of sulphide mineralization and faults. The gypsum gives way progressively to limestone with distance from the faults whereas nearby limestone lenses in the formation show no alteration. Whether this origin for this deposit is an exception would necessitate study of the formation at large and of the other known gypsum occurrences in the formation in Idaho. Of interest is the fact that the writer has traced this "Gypsum

formation" in Oregon to a point on Durbin Creek about 18 miles to the north or north-northwest of the Vale salt brine area under discussion. At this point the "Gypsum formation" is exposed as a "window" of only a few acres in area in a region occupied predominantly by lake beds and basalts. The occurrence of this formation here shows its trend to be towards the salt area in general. Whether or not it continues its trend in this direction, and whether or not it does contain rock salt beds in that area is something that cannot be answered with the data at hand. Whether or not the brine originates from the solution of salt beds thus remains problematical.

A volcanic origin for the brine is also a possibility, as an association of saline waters of various types with volcanic rocks and volcanic activity has been noted the world over. Such waters are believed to have been contributed from primary volcanic sources in some instances while, in others, their mineral content has undoubtedly been derived in a secondary manner by widespread leaching or dissolving of soluble salts from such volcanic materials as contain them. Very likely the mineral content of saline waters found in volcanic areas includes components derived from both primary and secondary sources.

In considering the origin of the brines under discussion here, it must be noted that thermal waters are common in the Vale area. Washburne makes special comment on the wide variations prevailing in both physical and chemical properties of some of the waters to be encountered there. Likewise, it must be noted that volcanic rocks of both acid and basic types, and ranging from early Tertiary to Recent in age, are widespread in southeastern Oregon. Further, a study of nitrate occurrences in this part of the State has shown that other salts, such as sulphates and chlorides of magnesium, potassium, sodium, and calcium, are not uncommon. Although neither the nitrates nor the other salts occur in commercial amounts, their study has led to several observations which may prove pertinent to any consideration of the origin of the Vale brines.

The salts have been established as accumulations resulting from the evaporation of underground waters where such are exposed to the surface climatic conditions because of erosion or structural agency. They are to be found only in selected places where they are protected from being re-dissolved by rainfall or other surface waters. Furthermore, Williams (1918) reports that they are associated almost exclusively with rhyolitic rocks.

Although several of the "nitrate" occurrences are many miles distant from the Vale brine area, some of them are situated near Vale. Their origin is of significance as, from a geologic standpoint, the Vale brine area is an integral part of the same geologic province as a whole. No direct evidence is at hand to prove that the Vale brines represent concentrations of salts derived either directly or indirectly from volcanic sources, but the weight of available evidence strongly suggests such an origin for these brines.

Discussion of drill hole data:

While the drilling done has confirmed the reported occurrence of sodium chloride brine here, neither the nature nor scope of this drilling permits an economic evaluation of the occurrence. Such conclusions as can be made follow.

An examination of the tabulation (opposite page 71) shows that two types of brines were encountered. Both contain NaCl as the chief constituent. The significant difference is that in one brine the associated compounds are predominantly sulphates as compared to the other in which the associated compounds are predominantly chlorides. This will be more clearly seen if only the average of the fractional samples for hole no. 1 be considered in comparison with the brines from the other holes. Predominancy, as estimated by the writer, consisted of comparing the sum of the parts per million of sulphate compounds with the sum of the chloride figures with only the associated compounds (not NaCl) being considered. Whichever was greater was considered as predominant.

A distinct segregation or zoning of these sulphate and chloride brines is apparent when they are entered on the map. The sulphate bearing brines occupy the northwest portion of the map, or in holes numbered 1, 6, 7, 8, 9, and also includes Alkali Springs.

The brines in which chlorides predominate originated from holes 2, 3, and 4. A marked decrease in NaCl content is to be noted as existing with the sulphate brines. The brine from hole no. 1 is the only exception.

The value of saline brines depends not only on a high concentration of a marketable compound, but also upon the nature of associated brines and the ability to effect a separation within commercial cost limits. Since a variation in brine types to be had here is indicated, it is possible that a more extensive exploration program might disclose not only areas of higher grade NaCl brine, but also areas in which some of the present associated compounds may occur in significantly greater amounts.

From the foregoing it is apparent that any exploration program would have to be extensive, not alone for the purpose of proving a large area to be underlain by brine, but also for the purpose of determining the type and grade of brine.

Flow encountered in the holes sunk was negligible from a commercial standpoint. Drilling at depth will be necessary to reveal the amount of flow that may be had.

Conclusions:

The brines recovered from the holes drilled confirm the reported occurrence of such brine in the area, and this confirmation was the objective of the drilling project described. The geologic nature of the brine occurrence from the standpoint of origin is uncertain but probably represents concentrations of soluble salts derived from volcanic agencies, although a possibility exists that the brine could be derived from the solution of saline deposits contained in Triassic sedimentary rocks buried beneath the Payette formation. Additional drilling, so conducted as to increase present knowledge concerning the area underlain by brines, the nature and grade of the brines, and the quantity available, will have to be done before any consideration of commercial value for the occurrence is warranted.

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INTERIM COMMITTEE HEARINGS ON DREDGING

The legislative Interim Committee, set up to study the effects of dredging on agricultural land in the state, held meetings in John Day, Sumpter, and Baker on September 8, 9, and 10 respectively. The committee is composed of Senators Ellis (Chairman), Dunn, and Patterson and Representatives Dickson, Kimberling, and Wilcox.

In John Day the testimony was nearly all by farmers who were opposed to dredging in agricultural land unless it be resoiled. Testimony was presented to the committee purporting to show the amount of farm land dredged in Grant County, the evils of tearing up land, and the lack of anything to compensate for the loss of such land. Questions were asked by members of the committee in regard to land destroyed by improper farming methods, by over grazing, and concerning the proportions of unproductive to productive land said to have been destroyed by dredging. The committee also brought up for discussion the possibility of regulating dredging by "zoning" as has been attempted in some counties in California.

In Sumpter the committee members inspected the operations of the Sumpter Valley Dredging Co.

On the 10th the committee held a hearing at the Baker Hotel in Baker attended by both farming and mining interests. Members of the grange testified concerning the amount of farm land destroyed in the Sumpter Valley and the value of such land for raising hay. As in John Day the statements by farmers were against dredging of farm land unless it could be resoiled. Mr. Clayton Jones of the Sumpter Valley Dredging Co. and Mr. Robert Porter of Porter & Co. made statements as to the value of dredging to the community and as to the impracticability of resoiling on most types of dredgable ground. Members of the committee attempted to obtain a figure representative of the cost of resoiling after dredging but witnesses testified that so many variables entered into the cost that a single figure would mean little and a range of costs would mean less. Witnesses stated that each project would have to be judged by itself.

OREGON MUSEUM FOUNDATION LECTURES

Co-sponsored by the Oregon Museum Foundation, Inc., and the Oregon Audubon Society, a series of illustrated lectures called Audubon Screen Tours will be given in Portland during the coming fall and winter season. "Fun with Birds," the first of these lectures, will be on Friday, October 3, 1947, at 8:00 p.m. at the Benson High School auditorium. The speaker, Mrs. Laurel Reynolds, is an expert in nature photography and an authority on bird life.

The Audubon Screen Tours lectures are part of an intensified campaign by the Museum Foundation to enlist support in its campaign for construction of a suitable museum building where exhibits of great educational value, including minerals, rocks, fossils, and many other natural wonders will be housed. Admittance to the lectures will be a membership card in the Museum Foundation.

STAFF SCIENTIST ON TRAINING DUTY

Mr. Thomas C. Matthews, spectroscopist for the Department, has gone to the Naval Ordnance Test Station at Inyokern, California, for a tour of training duty in connection with guided missiles. Mr. Matthews, a lieutenant in the Naval Reserve, was engaged in this type of work while in the Navy during the war.

MINERAL MARKETS

As of the middle of September the market prices for metals show very little change except in price of quicksilver which had declined about \$2.00 per flask. The weakness in the domestic quicksilver market was, as could be expected, the result of offerings of metal from foreign sources. The condition of the copper market is complicated by inability of foreign countries to obtain dollar exchange. There is a large unsatisfied demand for copper but there is also the inability to pay in dollars for the metal. The domestic price remains at 21½ cents. Demand for lead continues strong and the price has remained at 15 cents at New York. The zinc market has been quiet, with the price remaining at 10½ cents, East St. Louis. The price of platinum has dropped \$2.00 an ounce to \$64.00 for wholesale lots and \$67.00 for sales to consumers. Silver has been somewhat stronger at 70½ cents an ounce. This price, of course, does not apply to silver mined in the United States. Following is a list of market prices of selected metals as given by Engineering and Mining Journal Metal and Mineral Markets, September 18:

Aluminum	ingot 15 cents and pig 14 cents per pound.
Antimony	boxed, New York, 35.9 cents; bulk, Laredo, 33 cents
Bismuth	in ton lots \$2.00 per pound.
Cadmium	wholesale quantities, \$1.75 per pound.
Iridium	\$85.00 to \$90.00 per troy ounce.
Magnesium	20½ cents per pound in car lots.
Nickel	35 cents per pound.
Osmium	\$100 per ounce.
Palladium	\$24 per ounce.
Tin	80 cents per pound.

Prices for metallic ores are quoted as follows:

Antimony ore	50 to 55 percent, \$4.30 to \$4.40 per unit of antimony contained.
Beryllium ore . . .	\$14 to \$16 per unit of BeO in 10 to 12 percent ore.
Chrome ore	per long dry ton, 48 percent Cr ₂ O ₃ , 3:1 chrome-iron ratio, \$39.00 f.o.b. nearest shipping point.

CONTINUED SHIPMENTS FROM BUFFALO MINE

A carload of gold-silver concentrates was shipped from Baker on September 2 by the Buffalo Mine, located near Granite, Eastern Grant County, according to the Record-Courier, Baker. The mine owned by Kissock and Ramsey, and managed by R. G. Amidon, has been making shipments each month during the summer.

PUBLIC LANDS

Following are extracts from a report by Senator Guy Cordon of Oregon on hearings conducted by a subcommittee of the Senate Public Lands Committee on the subject of Federal fiscal responsibility to local governments because of ownership of Federal properties within the boundaries of such local governments.

* * * * *

The testimony established beyond doubt the dire need for immediate legislation to relieve local governments from an excessive and inequitable tax burden.

Many facts established at this hearing should be brought to the attention of the Members of the Congress.

It was found that the total land area of the continental United States is 1,900,000,000 acres and of this acreage, in 1943, in excess of 455,000,000 acres were owned by the Federal Government, this being in excess of 24 percent of the total land area of the United States.

This property owned by the Federal Government is not subject to taxation by the taxing agencies of local government except in rare instances where a special Federal statute makes some provision for a payment to local government by the agency administering the federally owned property.

* * * * *

Your committee finds that there is a different policy from that which was originally intended and under which different policy all of the States of the United States are losing taxable lands by reason of unprecedented acquisitions by the various boards, bureaus, and departments of the Federal Government. Testimony established the fact that within the past 10 years the Federal Government had acquired from the tax rolls of the Nation in excess of 16,000,000 acres of lands. This inordinate and unnatural growth at the expense of the normal tax base of local government has been the cause of undue hardship.

Withdrawals and purchases are being made by the various departments of the Federal Government in certain areas without first taking into consideration previous withdrawals and purchases in those areas by other departments, to the end that some counties have been made to supply large tracts for as many as six different activities. The burden of Federal ownership is not being spread in an equitable manner.

* * * * *

Your committee finds the Federal Government has abandoned any theory which holds that the public domain lands of the United States were to be held in trust to be utilized for the growth of the several States of the United States.

The total area of unappropriated and unreserved lands owned by the United States as of June 30, 1944, totaled 168,236,447 acres. Until 1934 many of these public lands were available for homestead. In that year the President withdrew from settlement, sales, or entry and reserved for classification the unreserved and unappropriated public lands in the following 12 Western States: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, and Wyoming.

NEW DREDGE

The El Rio Dredging Company of Los Angeles, with Frederick Reed, consulting engineer, in charge, is setting up on the South Fork of the Illinois River in the Takilma area, Josephine County, about 40 miles southwest of Grants Pass. The company is also operating in the Sutter Creek and Ione areas of California. Besides Mr. Reed, Fred C. Stillwell and Walter G. Bergeren are owners of the company.

CLEARING HOUSE

CH-97: For sale: Lode gold property known as Lone Wolf group consisting of 4 unpatented mining claims located 3 miles northwest of Marial in northeastern Curry County, two 50-foot tunnels, two shafts, and several open cuts. For information write Hill H. Smith, Box 145, Gold Beach, Oregon.

CH-98: For sale: Assembled in kit form, gold testing outfit for use in field. Furnished with instructions at price of \$5.00 by Walter J. Robertson, 627 W. Lillian Avenue, Stockton, California.

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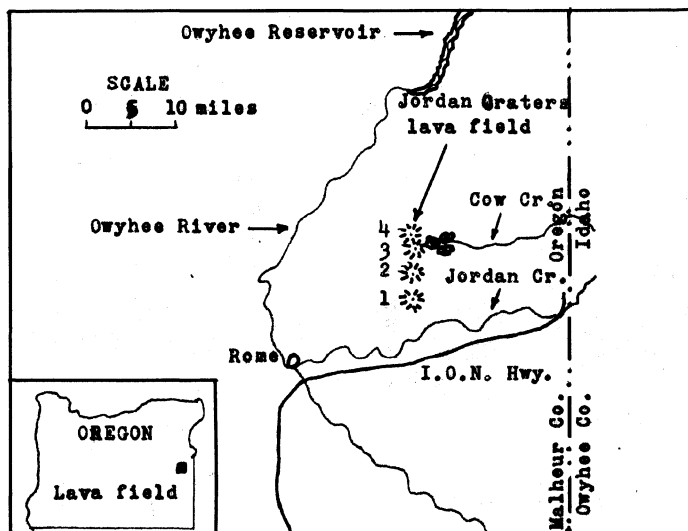
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COW LAKES LAVA FIELD

Introduction

The Cow Lakes lava field, formed from Crater No. 4 of the Jordan Craters as designated by Russell*, consists of basaltic lava apparently of quite recent age. An examination of a portion of this area was made by F. W. Libbey and N. S. Wagner of the Department staff on September 14, 1947. A description of the field follows.



Index map showing location of Jordan Craters lava field.

Location

The lava of this field covers an area in the vicinity of and mainly west of Cow Lakes which are in T. 28 S., R. 44 E., Malheur County, Oregon. Although only a small portion of the area was examined, the extent of the field is of such proportions that it very likely is to be found extending in to at least part of adjacent townships. Access is by a dirt road which turns off the I.O.N. Highway near Sheaville and follows westerly down Cow Creek. The lava is seen from a distance of several miles and resembles a huge shadow because of the contrast between the black lava and the light colored rhyolitic rocks of the older surface.

* Russell, Israel C., Geology of Southwestern Idaho and Southeastern Oregon, U.S. Geol. Survey Bull. 217, 1903.



Surface of lava field taken
from near margin.



View from surface of flow showing
crater in distance.



Collapse holes are common in this lava.
This one is about 30' deep.



Portion of crater shown
in above picture.

Geology

A variety of flow structures are exhibited in the lava. The sides of the part of the field visited stand conspicuously higher than the soil surface of the draw down which it flowed. Sparse vegetation is to be seen on the edges of the flow surface where a small amount of dust and sand has been blown into depressions of the lava from the old surface. The volcano which poured out the main flow is located near the northwest edge of the field and abuts against a rhyolite hill. A crater about 500 feet in greatest diameter was formed, in part, by collapse. Eruption consisted of a relatively quiet flow as but a scant amount of explosive ejecta is to be seen in the area. The lava is of the pahoehoe type, that is, it has a relatively smooth, ropy surface. The texture is generally vesicular with a glassy surface and partly crystalline interior.

Extracts from a much more comprehensive description of Crater No. 4 and the lava field are reproduced from Russell** below:

Jordan Craters

"In the east-central part of Malheur County, Oregon, and from 18 to 20 miles west of the Idaho-Oregon boundary, there are four recently extinct volcanoes, which are here termed, collectively, the Jordan Craters. They are situated to the north of Jordan Creek and to the west of its tributary known as Cow Creek. The four craters referred to are nearly on a line bearing a little west of north and are approximately 3 to 5 miles apart, although the distance of the one at the north from its next neighbor is somewhat greater than the spaces between the others in the series. While but four recent craters are here referred to, there are certain rounded hills to the west of the south end of the series which are probably of volcanic origin, and perhaps represent ancient craters, but these have not yet been examined.

* * * * *

"While craters Nos. 1, 2, and 3 are instructive on account of the many square miles of lava poured out from them and the various stages reached in its change to smooth pasture land, the chief interest of the general locality centers about Crater No. 4, at the north end, the youngest of the series.

"Crater No. 4 - This very modern crater, unlike its companions, came into existence on a somewhat steep-sloping hillside, which was trenched by erosion channels previous to the volcanic outburst, and the great flood of extruded lava flowed away in one principal direction. * * *

"Crater No. 4, as it exists today, is in part a cinder and lapilli cone, and in part a lava cone, and extending over an area of about 50 square miles on its southeastern side is a black lava field entirely bare of vegetation. * * *

"Throughout about one-half of the periphery of the cinder and lapilli cone forming Crater No. 4, the older rocks, consisting mainly of Tertiary rhyolite, are without a covering other than a thin layer of soil, to within a distance of 800 or 1000 feet of its base. * * * On the hillside, where the crater is situated, and extending in an essentially straight line from it, both to the north and south, there is a faint escarpment averaging perhaps 15 feet in height, and facing east. This escarpment has the general appearance of a fault scarp, but is by no means certainly of that nature. The only unquestionable evidence of a break in the rocks on which the crater stands is furnished by a row of about 12 dribble cones, situated in a line extending west from the principal center of eruption and up the slope of the hill at right angles to the faint escarpment referred to above. * * *

* * * * *

** Russell, I.C., op. cit.

"The lava from Crater No. 4 of the Jordan series, as already stated, flows southeastward over a previously stream-eroded surface. The lava, just after leaving the crater from which it came, formed a stream 545 yards wide, and increasing rapidly in width reached a distance of about 8 to 10 miles. The entire flow is by estimate between 50 and 60 square miles in area. The average depth may perhaps be taken as approximately 100 feet. These statements, it must be remembered, are rough estimates as no surveys have been made, and no maps of the region are available. The lava as it advanced was guided in a conspicuous way by the pre-existing topography, and in several instances progressed short distances up lateral valleys tributary to the main depression down which it flowed. * * * Near the eastern limit reached by the lava it ascended the small canyon of Cow Creek for about 1 mile, and on cooling formed a dam, which now retains the largest and most northern of the Cow Creek lakes, as has been described on a previous page. About its southeastern margin there are several other lakes.

"This great lava stream or lava sheet came from a small crater, termed above Crater No. 4, the bottom of which is approximately 300 feet across. Seemingly the actual conduit must be of still smaller diameter. This effusion of highly liquid lava, with only mild explosions at the beginning of the discharge, is a typical illustration of the manner in which many extensive lava sheets of Idaho, Oregon, and Washington were poured out. * * * "

SHORTAGE OF SCIENTISTS¹

In reference to the shortage of technical personnel resulting from the war, Vannevar Bush estimated in his report to the President in 1946 that the deficit of those who would have received a bachelor's degree in science or technology had reached 150,000 and that by 1955 there would be a loss of 17,000 who would otherwise have been given advanced degrees. Karl T. Compton² has pointed out that a survey recently conducted among 125 companies throughout the United States by a committee of the American Society of Engineering Education has shown that the future annual demand for engineering graduates will be more than twice as great as before the war. The number graduating from engineering schools has declined to a low in 1946 of less than 7,000 compared to the normal complement early in the war of almost 15,000. These developments point to the immediate need for increasing the number of engineers and scientists in training at the fastest possible rate.

J. R. Killian, Jr.,³ considers that our national future is more than ever dependent upon the discovery and application of new scientific knowledge. The field of atomic research promises to give us an entirely new technologic structure of its own, yet the United States faces a serious shortage of scientists. At the present time we do not have the scientists needed to take full advantage of our multiplying opportunities in this world of an accelerating technologic change. He remarks that the shortage is not unexpected, inasmuch as we were the only country in the war, either enemy or ally, to stop nearly all scientific and engineering education during the conflict.

* * * * *

Coming now to the subject of the training of geologists, it is interesting to learn that the National Roster of Scientific and Specialized Personnel reported at the close of 1945 that 6,113 geologists were among the 396,865 scientific and professional men who were registered with the roster. Compared with mining, metallurgical, petroleum, civil, mechanical, chemical, and electrical engineers, the extent of the education of the geologists was reported to be substantially greater, 24 percent of those registered having master of science degrees and 17 percent having doctor of philosophy degrees.

¹From "Advances in petroleum geology and allied subjects," in Quarterly of the Colorado School of Mines, vol. 42, no. 3, July 1947.

²Compton, K.T., "A challenge and an opportunity," in Educational Focus, vol. 17, no. 3, 1946.

³Killian, J.R., Jr., "Tomorrow's scientists," in The Lamp, vol. 28, no. 4, August 1946.

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THE MINES OF LAURIUM*

by

E. De Golyer **

Laurium is an ancient silver-lead mining district lying near the promontory of Sunium in southernmost Attica. It centers about twenty-five miles south of Athens. The minerals of the district may have been discovered and worked by the Phoenicians as early as 1000 to 700 B.C. but the mines did not become important until about the middle of the sixth century B.C. It was the silver of Laurium which enabled Athens to win and for a long time to maintain her supremacy in the ancient Greek world.

There are more than 2000 pits which represent ancient workings in the district. Some reached depths of almost four hundred feet but none of them extended below sea level. Ore bodies occur chiefly in Cretaceous limestones along their contacts with schists. There are at least two beds of schist and consequently, several contact zones. Shallower zones are relatively unimportant, the deeper ones supporting the richer ore bodies. The ore is a silver-bearing galena or sulphide of lead with which are associated the sulphides of zinc and of iron. The silver content is estimated to have been from 40 to 120 and rarely less than 60 ounces per ton of ore. From the dumps of the old workings it is estimated that silver to the value of some \$800,000,000 was produced during the three centuries of prosperity of this district.

The first Athenian coins may have been struck as early as the time of Solon but we know for certain that in 561 B.C., the four drachma pieces bearing the head of Athena on one side and the Attic owl on the other were struck by Peisistratus, the first of the tyrants, whose archonship had begun a few years earlier. These "Laurian owls," as they were called, became the trade dollars - the standard currency - of the Aegean world.

Most histories of Greece have been written by classical scholars and in the days before economic determinism had emerged as a distinct school of historical thought. One searches the older histories for an adequate consideration of the fundamental importance of the Laurian Mines, therefore, without too much success. From scattered statements, however, it seems certain that it would be difficult to overestimate such importance. Specifically, all of the histories cite the building of the fleet which enabled the Greeks to defeat the Persians at Salamis on September 23, 480 B.C. and thus turn the tide of human history. A deeper and rich ore body had been found at Laurian in 483-2 B.C. and the Athenian treasury had grown rich from its share in the product of this discovery. It was at the urging of Themistocles that the citizenry agreed to forego their customary sharing of this windfall and to devote it to the building of ships. It may have been this happy circumstance that prompted Aeschylus, a few years later, to apothosize Laurium as "a fountain running silver, a treasure of the land."

The yield of silver from the Laurian mines, according to Xenophon, sufficed for several centuries to make the Laurian income an important part of the revenue of Greece. The prosperous condition of Athens in the sixth century B.C. was in large part the consequence, according to Herodotus and Aristotle, of new discoveries at Laurium.

* Commencement address, Trinity College, Hartford, Connecticut. Courtesy of Edward L. Troxell, Connecticut State Geologist and Professor of Geology, Trinity College.

**Petroleum geologist.

The importance of the silver of Laurium transcended that of being an easy source of revenue for the city state of Athens. Attica was notably a poor land agriculturally. She exported wine and oil but imported wheat and her unfavorable trade balance was paid with this silver. Her sound coinage, moreover, gave her a dominant position in commerce which she could not otherwise have achieved. "There was never any secret about it," wrote Henry Adams in a letter from Athens to his brother Brooks, "her Laurium silver mine made her and its exhaustion unmade her. All Greek and Phoenician economical development after B.C. 1000 is the history of mining and coinage, as fascinating as a fairy-story. It has the advantage also of being fairly established and undisputed. All subsequent history merely illustrated it."

Just how important was this eight hundred million dollars' worth of silver which came from the mines of Laurium? If one mistrusts the amazing array of adjectives which may be marshalled in its support and sticks to numbers, as engineers are prone to do, the results are not less astounding. The purchasing power of the silver in that day - and coinage was its real value - was much greater than in modern times. An able engineer and scholar writing in the times of the late President Coolidge considered that it was forty times as great in ancient times as for the time in which he wrote. Scholars are always a little behind in their accounting but I have not the temerity to attempt to bring this estimate closer to our time. The purchasing power of the Laurian silver in modern terms then would be thirty-two billion dollars. This was distributed over several centuries but in the hands of a people who did not number more than a quarter million souls. Proportionate wealth for a country as large as our own would run into sums of astronomic magnitude. Even when one considers that the street revenue to the state was probably about five percent, proportionately the sum is still exceedingly great.

I have selected this particular example of the economic, political, and social consequences which followed upon the exhaustion of an important mineral resource because it is so simple and so direct; not, as you may suspect, because I could refer to Aeschylus, Aristotle, Thucydides, Herodotus, etc., and thus impress upon you that the classics are a common heritage, even to Texas. That the example which came to hand was Greece is doubly pleasing. The citizens of Greece Macaulay considered to have been "the most remarkable people who have yet existed" and he credits them also with having been "the beginners of nearly everything . . . of which the modern world makes its boast." The achievements in culture and civilization of this people are great beyond question. I was happy also that the civilization under consideration was one which had gone farthest in things of the spirit and yet, one which rested upon very material foundations.

Nor does the example of Athens stand alone, even in the Greek world. The silver of Pangaea served as sinews of war to Philip of Macedon and to his son, Alexander, in their world conquest and played quite as effective a part as the silver of Laurium in decisive historic events.

Our country is richly endowed with mineral resources - more abundantly so perhaps than any other nation - and upon them we have builded the material civilization with which we face the world. But we are voracious consumers; normally the United States uses half of the world's output of industrial minerals. And so it comes about, as we periodically take stock of our diminishing resources, dividing the most recent estimate of proved reserve by current rate of consumption for each particular mineral, that we are alarmed at the low ratios thus secured. Three to five years for lead, zinc, mercury, tungsten and even less for bauxite - the aluminum ore. Ten years for copper, fifteen or so for petroleum, and say twenty for iron. It is only the coal ratio that is reassuring, running as it does to hundreds if not thousands of years.

We view these ratios too seriously. In the first place they are only for proved reserve. For many years to come, our undiscovered reserve is likely to be greater than our proved reserve. This is particularly true for the metals. Our metal miners as prospectors are still in the highly primitive desert-rat-finds-outcroppinglege stage and are just beginning to make the scientifically and technically competent large-scale effort to find additional ore bodies which are needed.

Nor can any national mineral reserve be mined to the very end at the undiminished current rate of operations. The assumption that we will do so is the most widespread and common misuse made of our reserves - consumption ratio. If the petroleum ration, to take an example, is thirteen years, we mentally wring our hands over the absolute lack of petroleum products to appear January first of the fourteenth year. Supply diminishes gradually and over a long period. When acute shortages appear they are usually the result of abnormalities in consumption or in transportation. Actually, in the hypothetical case of oil, the thirteen years is being extended and most likely will continue to be extended in substantial degree by the discovery of additional reserves and whether or not there will be a shortage depends upon the rate at which additional reserves are discovered, the rate of imports from other countries and upon the changing rate of consumption. If discoveries should be altogether inadequate or if consumption should increase abnormally, shortage would begin to show long before the end of thirteen years - perhaps as early as three to four years but petroleum would continue to be produced in appreciable quantities fifty, sixty, seventy years from now - perhaps indefinitely into the future. Meanwhile substitutes are developed or come into use and increasing cost weeds out less important and unnecessary uses.

Is the rapid rate at which we are exhausting our mineral reserves as they are measured today cause for alarm? I think not. It is cause for concern, for constant study and review of mineral resources on a worldwide basis, for continued intelligent prospecting both at home and abroad, for scientific and technologic research on utilization as well as production. We should import minerals with the possible exception of coal to the point where further importation would harm our own extractive industries - our first line of defense in time of emergency.

We are fortunate in the tremendous reserves of coal with which the nation is endowed. Coal is power and most of the metals will always be available to us - at a high price perhaps - but available in emergency at a cost in power.

DEALINGS IN GOLD FURTHER RESTRICTED

According to the Engineering and Mining Journal, Metal and Mineral Markets issue of October 30, 1947, the Treasury has set up regulations further to restrict export of gold. The regulations go into effect on November 24, 1947. After November 24th gold may not be exported in bar form by private concerns. Licenses to export will be issued only for export of semi-processed gold such as sheets, powder, wire, and dentures. Exception is made where gold will be processed and returned to this country. One of the new Treasury regulations is that gold brought into this country for refining from gold-bearing materials may not be exported for sale by the refineries. Incorporated subsidiaries or branches of United States corporations that mine gold outside of the United States are allowed to ship gold to this country for refining. On the return of the gold to the shipper he may sell it on any terms allowed by the country where the shipper resides. The International Monetary Fund requested the action taken by the Treasury.

Restrictions in London are along the same lines as the United States. The statement is made that the demand for gold for export in semi-manufactured form is large but the authorities have reduced the amount for which export licenses are granted. Gold may not be handled in London for the account of non-residents at a higher price than the official Bank of England (172s, 3d). At the request of the American Government authorities have ruled that gold shipped to London for refining by non-residents may be returned only to the country from which it was shipped.

The article states that under the present circumstances an active gold business is being carried on by the Far East and Middle East on one hand and South America on the other.

GAS AND OIL PROSPECTING IN OREGON*

By

F. W. Libbey

Introduction

For more than fifty years tests have been drilled in Oregon seeking petroleum. A great many of these tests were by groups with no technical supervision and wholly lacking in proper geological investigation or control. Some oil promotions were out and out frauds, but the great majority were honest in their plans although woefully ignorant of geological and engineering essentials. It goes without saying that most of the tests were under-financed.

Some methane has been found both in eastern and western Oregon but only in small quantities. Some oil was reportedly discovered in early-day tests but these reports have not been verified by the writer.

Reports on oil and gas

Until recent years studies of oil and gas possibilities in Oregon by public agencies were of a reconnaissance nature only. Chester W. Washburne made reconnaissance studies in both eastern and northwestern Oregon in the early part of the present century. His work resulted in two U.S. Geological Survey bulletins - No. 431-A, with chapters on Gas and Oil Prospects near Vale, Oregon, and Payette, Idaho, and Gas Prospects in Harney Valley, Oregon, (1911); and No. 590 entitled "Reconnaissance of the Geology and Oil Prospects of Northwestern Oregon" (1914). Harrison and Eaton, consulting petroleum geologists, were employed by the Oregon Bureau of Mines and Geology to make a study of western Oregon and a bulletin entitled "Investigation of Oil and Gas Possibilities of Western Oregon" was published in 1920. This report had no geologic map and was mainly a statement of opinion. John P. Buwalda made a reconnaissance study of oil and gas possibilities in eastern Oregon in 1921 under a co-operative arrangement between the U.S. Geological Survey and the Oregon Bureau of Mines and Geology, and a bulletin was published, more for the nontechnical reader than for the geologist. It does, however, contain a large amount of useful information condensed in a small size. In 1945 the Oil and Gas Division of the U.S. Geological Survey, in co-operation with the Oregon Department of Geology and Mineral Industries, published a map entitled "Geology of Northwestern Oregon West of Willamette River and North of Latitude 45° 15'." This map was aimed at oil and gas possibilities and gives several stratigraphic sections. In 1945 the Oregon Department of Geology and Mineral Industries published a preliminary geologic map of the St. Helens quadrangle - a 15-minute quadrangle in an area in northwestern Oregon under study by several large oil companies - followed by a bulletin in 1946 entitled "Geology of the St. Helens Quadrangle, Oregon."

Investigations

In 1943 and 1944 the Texas Company engaged in a rather extensive preliminary investigation in northwestern Oregon and southwestern Washington. Geology was mapped, subsurface structure was studied by means of shallow drilling, and, somewhat later, geophysical studies were made. Work by the Texas Company stimulated other companies to send geologists into Oregon to find out if they had been overlooking something. Geologists of Richfield, Amerada, Phillips, Shell, Standard of California, Union, General Petroleum, Carter Oil Company, and representatives of some of the smaller midcontinent operators did geological work, mainly in northwestern Oregon and western Washington.

In 1943 the Phillips Petroleum Corporation drilled a test 6441 feet deep in the middle of the Coos Bay coal field at a place where gas had reportedly been encountered in a shallow hole previously drilled. This test started in and passed through the coal-bearing Eocene series and entered volcanics at a depth of 2300 feet. It passed through a thick section of volcanics with some shale interbeds and was in volcanics at the bottom.

*From Journal of Association of American State Geologists, October 15, 1947.

The Texas Company drilled three tests from 1945 to 1947, all in the northwestern part of the State. The first, Benson Clatskanie No. 1, was located about 50 miles airline northwest of Portland in Columbia County. It reached a depth of 5924 feet after penetrating Eocene formations including basalts, basaltic breccia, and sediments. The second was called Cooper Mountain No. 1 and was located about 12 miles west of Portland in Washington County. It reached a depth of 9263 feet and penetrated much the same section as the first test except that it started higher in the section and probably bottomed at a lower horizon. No gas or oil was reported in either of these tests. The third hole was called Clark and Wilson No. 6-1 and was drilled in Columbia County about 35 miles airline northwest of Portland. Total depth was 8500 feet and the hole was abandoned June 30, 1947. Cores were predominantly sedimentary with minor amounts of basaltic rocks. The section appears to include both upper and middle Eocene. Formation tests were made and one interval was reported to have had a little gas but not enough to be of value.

The Richfield Oil Company drilled a test in the hills on the west edge of Portland city limits in 1946. It reached a depth of 7885 feet after penetrating first basalt and then Oligocene sediments and finally over 5000 feet mainly of volcanics. No encouraging evidence of oil or gas was uncovered.

Conclusion

In 1946 most of the geologists of the major oil companies who had been in Oregon moved over into Washington where there was and is considerable prospecting activity. The Texas Company Clark and Wilson No. 6-1 was the last test drilled and since then there has been no prospecting activity in Oregon by a major oil company. Geologists are studying possibilities and following closely the drilling activities in western Washington, with very little oil work of any kind being done in Oregon. However, should any favorable developments occur in Washington, undoubtedly further prospecting would be done in Oregon.

SOURCES OF ENERGY USED IN UNITED STATES, 1945^{1/}*

<u>Sources of energy</u>	<u>Energy</u> ^{2/}	<u>Percent</u>	<u>Quantity</u>	<u>Value</u>
Bituminous coal and lignite (short tons)	15,091	46.6	576,000,000	\$1,777,336,000
Anthracite (short tons)	1,485	4.6	54,933,909	323,944,435
Petroleum (42-gal. bbls.)	10,712	33.2	1,711,103,000	2,093,300,000
Natural gas (M cu. ft.)	3,662	11.3	3,875,172,000	821,099,000
Water power (fuel equivalent) ^{3/}	1,399	4.3	---	---
Totals	32,349	100.0		\$5,015,779,435

1/ Figures from U.S. Bur. Mines Minerals Yearbook.

2/ Expressed in trillions of B.t.u.

3/ Computed at 1.3 lbs. of coal per Kw-hr.

*Adapted from Mining and Metallurgy, September 1947.

NEW GEOLOGY BIBLIOGRAPHY

Over a thousand references to publications on Oregon's geology and mineral resources are listed in a bibliography just issued by the State Department of Geology and Mineral Industries. Both an author index and a subject index are included to facilitate the work of the researcher. This volume is a supplement to the bibliography issued in 1935 by the State Planning Board, and brings the listing of Oregon's geological references up to the year 1946. The chief compiler was John Eliot Allen. The bibliography is issued as Bulletin No. 33 and may be obtained at the Department's office at 702 Woodlark Building, Portland, or the field offices at Baker and Grants Pass. Price postpaid \$1.00.

NEWS OF SOUTHERN OREGON PLACERS

L. O. Krewson is working the Hole-in-the-Ground placer with one giant.. Location is just off Wolf Creek east of the town of Wolf Creek.

* * * * *

W. C. Schleigh has started up the Old Jason placer on Coyote Creek, Josephine County, using one giant.

* * * * *

M. H. Davis has resumed work at the Blue Channel placer on Coyote Creek, using one giant. Normally this is the largest hydraulic operation in the Coyote Creek-Wolf Creek area, but because of the high cost of labor only one giant will be used this season.

* * * * *

Harold McIntosh has been working the McIntosh placer at Robinson Gulch on Coyote Creek with two giants in a limited way as water was available.

* * * * *

O. N. Snavely has resumed work at the Federal Placer on the Little Applegate near Buncom, Jackson County. There are three giants on the property; one is used for cutting, one for sluicing, and the third for stacking.

NORTHWEST ALUMINUM AND MAGNESIUM

The West Coast section of the Iron Age, San Francisco, released the following on November 18, 1947, from Seattle:

SEATTLE --- You are reminded of the hectic days of the War Manpower Commission and the ubiquitous labor expeditor as you scan the four-column display advertisements of Boeing Aircraft Company in the local newspapers which are headed, "1000 Men Wanted" and go on to tell about the opportunities in the aircraft field.

Boeing already has approximately 16,000 men and women on its local payroll and is hoping to get another 1000 before the end of the year to produce the 133 B-50's (Army bombers); 56 Stratocruisers; and 10 Stratofreighters for the Army; for which contracts have been announced. It is known that these contracts do not constitute the entire backlog of the company but details on other aircraft have not been officially released.

Boeing is definitely big business in this area. Seattle boasts of 212,000 persons engaged in manufacturing out of its total population of approximately 570,000. Eight percent of these are already employed at Boeing making it by far the largest single employer in the Pacific Northwest.

This high rate of production is more than interesting to Aluminum Company of America, Reynolds Metals Company, and The Permanente Metals Corporation as the present contracts will utilize approximately 1,160 tons of extrusions and 2,500 tons of sheets.

* * * * *

Morley & Associates which has for some time been in the picture as a bidder for the magnesium plant near Mead, Washington, is continuing its development of magnesium shipping reel for steel cable and electrical conduits to replace the conventional wood reels.

James C. Morley, president, reports that one five-foot diameter reel has had the equivalent of two years of service and has made a very creditable showing. Present plans call for the production of 36 additional reels which will be put into service by cooperating cable manufacturers to determine their ability to withstand wear and tear.

The reels are so designed as to permit their being taken apart and shipped back to the cable manufacturers in nested form with considerable savings in freight, according to Mr. Morley. He points out that with standard wood reels only about 14 can be placed in a freight car and that with the collapsible reel at least 100 can be shipped in one car.

The five-foot diameter reel now out on test weighs 220 lb as compared to 650 lb for a wood reel and 380 lb for a steel reel of the same size. Mr. Morley states that magnesium is the ideal material for this purpose and that it is far superior to aluminum. If the reels were made of this material they would have to be cast in such a manner as to approximate the weight of a steel reel; would have lower shock resistance; and that the price would ultimately be higher than that for magnesium reels. He said that his organization contemplates producing these reels at a cost of about 50¢ per lb.

There are approximately 84 manufacturers of wire rope and electrical conduit in the country who utilize this type of shipping reel and Mr. Morley states that 32 of these represent approximately 80 pct of all the business. Because of the wear and tear on shipping reels these companies have an inventory loss of approximately \$32 million per year. It is his contention that with the longer-lived magnesium reel this loss will be greatly reduced and even eliminated if his plan for a rental or lease pool is developed.

Extensive market studies have been made by Mr. Morley and his associates during the past two years and he has secured the support of cable manufacturers, objectively inclined state development men, and financiers. A local foundry is to be established here this month for production of the additional 36 test reels which will utilize unique improvements in permanent mold casting of magnesium according to Mr. Morley. He claims that his organization will be in a position to produce such castings of industrial grade for about 60¢ per lb. Work is now in progress on these molds and if everything proceeds according to plan the magnesium castings will be the world's largest produced in permanent molds according to Mr. Morley.

Morley & Associates had bid on the magnesium plant near Mead offered for sale by WAA under Section 19 but when announced as successful bidders failed to consummate the deal. The explanation for this reneging as given by Mr. Morley was that it was still necessary to prove beyond all doubt to potential financial backers that the magnesium reel was practical and economically advantageous.

Mr. Morley, who has had experience in magnesium production and sales with The Permanente Metals Corporation, states that he is convinced that this metal can be produced at Mead for approximately 18¢ per lb at 100 pct operation and for approximately 20¢ per lb at 50 pct operation. He is aware of the fact that Dow Chemical Company is producing magnesium at a cost of about 11¢ per lb. When the Mead plant closed it was producing magnesium at 19.40¢ per lb.

OREGON GOLD, SILVER, COPPER, LEAD, AND ZINC

According to the preprint from U.S. Bureau of Mines Minerals Yearbook for 1946, production of gold in Oregon in 1946 was four times the 1945 output, owing largely to dredging operations, but the total recovered was only 16 percent of the all-time record set in 1940. Silver production was down to 66 percent of the 1945 output, and copper and lead production remained extremely low. No zinc production was reported.

The total value of the gold, silver, copper, and lead (in terms of recovered metals) produced in Oregon was \$624,231 in 1946 compared with \$164,456 in 1945 and \$4,148,271 in the peak year 1940. It was divided among the metals as follows: Gold, 98.7 percent; silver, 0.9 percent; copper and lead combined, 0.4 percent. Baker County continued to be the leading metal producer and contributed 55 percent of the State total value; Grant County yielded 34 percent, Jackson, Josephine, and Lane Counties each 3 percent, and the other seven producing counties 2 percent.

The major portion of the increased value of production came from placer gold operations, largely worked by connected-bucket dredges. There was an increasing number of dragline dredges in operation in 1946 - the first year that any have been in operation since 1942, when gold mines were closed as the result of War Production Board Limitation Order L-208. Both placer and lode mines continued to face increasing costs and the problem of obtaining labor and supplies. Because of these factors and because of the smelter strike during the first half of 1946, the relatively minor contribution to output made by lode mines did not appear until late in the year.

Placer mines contributed 94 percent and lode mines 6 percent of the gold produced in Oregon in 1946. In 1945 the ratio was placer mines 89 percent and lode mines 11 percent.

* * * * *

Production of gold in Oregon in 1946 increased 294 percent compared with 1945, 94 percent coming from placer mines. Of the total placer gold, connected-bucket dredges recovered 84 percent, dragline dredges 12 percent, hydraulicking 2 percent, and combined small-scale hand methods, drift mines, suction dredging, and nonfloating washing plants (with mechanical excavators) 2 percent. All the lode gold was derived from dry and siliceous ores. Although 60 properties produced in 1946 (19 in 1945), the greatest proportion of the gold came from relatively few mines; the following 5 properties, listed in order of output, supplied 83 percent of the State total: Sumpter Valley Dredging Co., Western Gold Dredging Co., Porter & Co., and Sunshine Mining Co. (Burnt River Division) - all connected-bucket dredges - and Associated Dredging Co. (dragline dredge).

NEW DEPARTMENT GEOLOGIST

Miss Margaret Steers has joined the staff of the Department and is at present organizing and cataloging the Department museum specimens. Miss Steere majored in geology at the University of Michigan and received both bachelor's and master's degrees.

P. H. W. L. A. R. D. M. S.

PORTLAND ENGINEER AT MINERAL CONFERENCE

Richard J. Anderson, Managing Engineer of the Raw Materials Survey, Portland, Oregon, presented a paper on "Recent Developments in Mineral Raw Materials in the Pacific Northwest" before the Nonmetallic Minerals Conference, Pacific Chemical Exposition, held in San Francisco on October 23.

PUBLICATIONS

	Price postpaid
GEOLOGIC MAPS	
1. Geologic map of the Wallowa Lake quad, 1938:W.D.Smith & Others (also in Bull.12)	\$ 0.45
2. Geologic map of the Medford quad, 1939:F.G.Wells & Others	0.40
3. Geologic map and geology of the Round Mountain quad., 1940: W.D.Wilkinson & Others	0.25
4. Geologic map of the Butte Falls quad., 1941:W.D.Wilkinson & Others	0.45
5. Geologic map and geology of the Grants Pass quad., 1940:F.G.Wells & Others	0.30
6. Preliminary geologic map of the Sumpter quad., 1941:J.T.Pardee & Others	0.40
7. Geologic map of the Portland area, 1942:Ray C. Treasher	0.25
8. Geologic map of the Coos Bay quad., 1944:J.E.Allen & E.M.Baldwin (sold with Bull. 27)	----
9. Geologic map of the St. Helens quad., 1945: W.D.Wilkinson, W.D.Lowry, & E.M.Baldwin (sold with Bull. 31)	----

MISCELLANEOUS PUBLICATIONS

THE ORE.-BIN: issued monthly by the staff as medium for news about the Department, mines, and minerals. Subscription price per year	0.25
Oregon mineral localities map (22 x 34 inches) 1946	0.10
Oregon quicksilver localities map (22 x 34 inches) 1946	0.25
Landforms of Oregon: a physiographic sketch, (17 x 22 inches) 1941	0.10
Index to topographic mapping in Oregon, 1946	Free
Index to geologic mapping in Oregon, 1946	Free

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A RECONNAISSANCE BETWEEN THE ALMEDA AND SILVER PEAK MINES
OF SOUTHWESTERN OREGON

By

H. M. Dole* and E. M. Baldwin*

In the latter part of July a reconnaissance traverse was made from the Almeda Mine on the Rogue River in northwestern Josephine County to the Silver Peak Mine, a few miles south of Riddle, in southern Douglas County. The area which this reconnaissance concerns is roughly 6 miles in width by 20 miles in length. It is a belt of greenstones bordered by Galice slates and volcanics on the east, and Dothan sediments on the west. Within the greenstones are masses of serpentine, rhyolite, and small diorite and related intrusives.

This reconnaissance was undertaken to find out how readily the mineralized zone of these two mines could be traced in the area between and, because of the similarity of mineralization at each mine, to see if the zones could be connected. Also, it was hoped that further information could be gained on the mineral deposits of the area and to ascertain if barite in commercial quantities were indicated.

Mining and prospecting have been carried on in this region for many years. One of the first geologic studies was published by J. S. Diller (1914). Later studies by P. S. Shenon (1933) and by W. R. Lowell (1942) have given additional details on the ore deposits. W. E. Caldwell and D. Sumner (1946) studied the copper content of the Silver Peak mine waters. A study of the Mt. Reuben area has been completed by E. A. Youngberg (1947). These should be consulted as a background for a better understanding of this region.

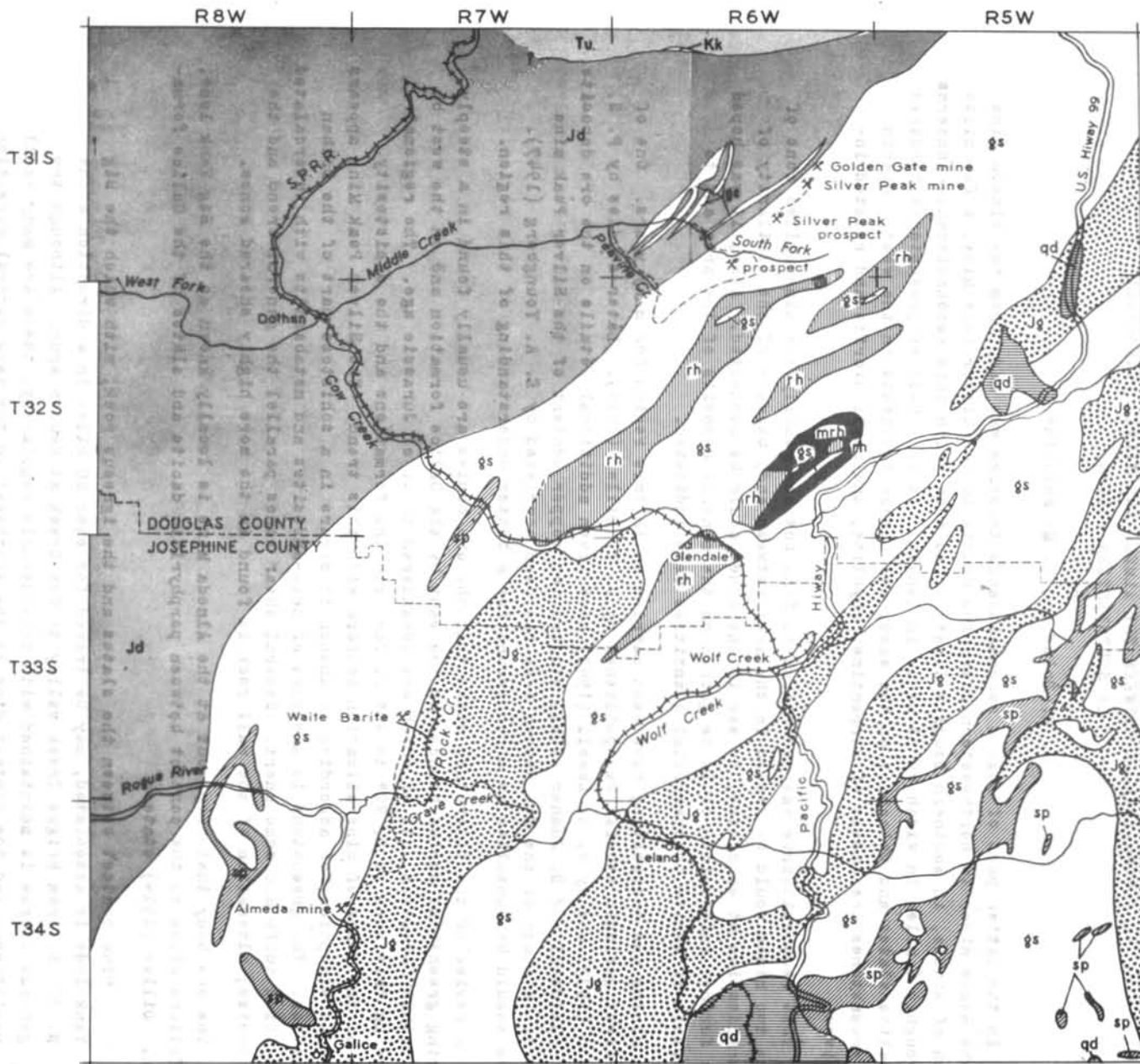
A review of the literature shows that the ore bodies are usually found in a steeply dipping greenstone series bounded on the east by the Galice formation and on the west by the Dothan formation, all of which are considered to be of Jurassic age. The regional trend in this area is N. 20° to 40° E. for both the formations and the schistosity. Most of the zones of mineralization conform with this trend. The Silver Peak Mine appears to be an exception for according to Shenon it occurs in a schistose part of the Dothan formation. The greenstone is a series of meta-andesites and metabasalts with intercalated silicified tuffs and some chert. Several shear zones parallel the general trend and the ore bodies; alteration of the wall rock is found in the more highly sheared zones.

The ore body that crops out at the Almeda Mine is locally known as the Big Yank lode. It follows close to the contact between porphyritic dacite and slates of the Galice formation. Diller (1914) states:

"The contact between the slates and the igneous rock, with which the Big Yank lode is associated, may be traced for over 20 miles in a direction about N. 30° E. from Briggs Creek valley to Cow Creek at Reuben spur. Although the general course is maintained with considerable regularity, there are many small variations, and the contact dips to the southeast in the same general direction as the slates. The plane of contact is generally a fault plane and is for the most part followed by the lode. The contact is apparently most irregular and the quartz porphyry¹ most out by shearing planes in the vicinity of the ore bodies."

¹Called "porphyritic dacite" by Shenon (1933).

*Geologists, State Department of Geology and Mineral Industries.



Geology of the area in the vicinity of the Almeda and Silver Peak Mines.

Taken from U.S.G.S. Riddle Folio and Bulletin No. 546 by J.S. Diller.

SEDIMENTARY ROCKS

Tu

Umpqua fm.

Kk

Knoxville fm.

Jd

Dothan fm.

Jg

Galice fm.

Eocene

Cretaceous

Jurassic

IGNEOUS ROCKS

qd

Quartz diorite and related rocks

sp

Serpentine

gs

Greenstone, gabbro and related rocks

rh mch

Rhyolite and metarhyolite

Late Jurassic or early Cretaceous

Chiefly late Jurassic



Most of the ore bodies south of the Alameda toward Briggs Creek do seem to follow the Galice-greenstone contact as pointed out by Diller. However, there is little evidence of mineralization along the contact farther north. At the Waite barite prospect on Rock Creek, the mineralized zone is at least 1000 feet west of the contact, and at Silver Peak, mineralization according to Shenon (1933) is within an altered part of the Dothan formation.

The ore occurs in shear zones. Such zones are common and the location of the ore bodies may therefore depend more on the location of the contributing intrusives rather than the location of the zones. For instance, the California tunnel (Wheeler tunnel) on Reuben Creek encountered numerous shear zones in its 7364 feet (Youngberg, 1947), few of which were mineralized.

Quartz diorite crops out at the Benton mine a few miles to the west of the projected trend of the Big Yank lode; porphyritic dacite was encountered in the Alameda mine. Other intrusives occur to the east and although none is known in the region between the Alameda and Silver Peak mines it is probable that they occur at depth.

Alameda Mine

Mineralization at the Alameda mine has been discussed in some detail by Shenon (1933). He reported two types of ore, the "siliceous gold-silver ore" and "copper ore with barite." Shenon (1933:30) described the latter ore as follows:

"The ore from the higher-grade shoots is composed principally of barite, quartz, and sulphides. The barite was introduced into the intensely silicified porphyritic dacite before the sulphides, and locally it has almost completely replaced the quartz. The sulphides, in turn, have replaced the barite as well as the quartz. Some specimens clearly show veinlets of sulphides cutting coarse-grained barite. The sulphides include pyrite, chalcopryrite, galena, sphalerite, chalcocite, and covellite."

Lowell (1942:574) seems to differ as to the age of the barite. He stated:

"In the Alameda and Silver Peak ore, barite replaces quartz and fills fractures in pyrite, chalcopryrite, and tetrahedrite.... Barite was deposited late in the mineralizing stage and was followed by sericite which is developed as shreds in fractures in barite."

Lenses of pink and gray massive barite, in several instances 4 to 8 feet in width, were found on the surface of the Big Yank lode up the hill behind the Alameda mine. Some barite was interspersed in the silicified rock from which the sulphides had been leached. The lode was traced to a point between 600 and 700 feet above the river at which point it was lost, presumably cut off by a low angle/^{reverse} fault similar to or the same as the fault noted by Hotz and Bell (unpublished map, U.S. Geological Survey) a short distance to the northwest. The massive lenses of barite appear to be podlike and might pinch out rapidly, nevertheless, a large tonnage is indicated. A sample assayed 37.36 percent BaSO₄.

Alameda Mine-Grave Creek Valley

No mineralization was noted along the ridge between the Alameda mine and Grave Creek.

The contact of the greenstone and Galice formation showed little sign of mineralization along Grave Creek, although it is not well exposed. It is possible, however, that further prospecting would show some signs of mineralization in this intermediate area.

Waite prospect

A prospect, under lease to E. R. Waite, Grants Pass, is located in the NW $\frac{1}{4}$ sec. 29, T. 33S., R. 7 W., along the west side of Rock Creek valley and about 2 $\frac{1}{2}$ miles by trail from a point where the Grave Creek road crosses Rock Creek. There is a preliminary report on this property in the files of the State Department of Geology and Mineral Industries.

Several short prospect tunnels and open cuts reveal a mineralized zone which contains barite, one lens being more than 4 feet in width. The deposit, like others in the greenstone, strikes N. 40° E. It lies at least 1000 feet west of the Galice-greenstone contact. One sample of barite contained .05 oz. gold, 2.80 ozs. silver and 91.34 percent BaSO₄. A sample (P-6194) from the lower tunnel by the trail contained .01 oz. gold, .10 percent copper, trace of lead, 2.05 percent zinc. A sample from a prospect pit a few hundred feet up the hill (P-6195) contained .10 oz. gold, 5.33 ozs. silver, 1.30 percent lead, .40 percent copper, .55 percent zinc, and 52.27 percent barium. More work is needed at this prospect to determine the amount of ore.

Cow Creek valley near Reuben Station and Koler

The greenstone-Galice contact in the vicinity of Cow Creek is irregular. The belt of greenstone broadens to the north. Although exposures were poor along both sides of the creek, the lack of established claims near the contact at Reuben Station points to a probable lack of mineralization in that region. A short distance to the north along the west side of Panther Butte and Grayback Mountain, a zone of mineralization has been found that if projected would reach a point a mile or so west of Reuben Station.

South Fork of Middle Creek to Grayback Mountain

A mineralized zone trends northeastward across the South Fork of Middle Creek valley from Panther Butte to and beyond Silver Peak. This belt of claims is near the west boundary of the greenstone mass and appears to follow a persistent shear zone. It does not form prominent outcrops and is difficult to find except for iron staining. A prospect tunnel driven by Al Glick and C. L. Cox along a quartz stringer is situated above the creek near the mineralized zone. The tunnel, about 75 feet long, trends S. 70° E. although it turns a little more to the south near the end of the drift. This quartz stringer is bearing across the greenstone belt and not following the shear zones; it may be along a cross fracture formed during the stage of deformation that caused shearing. Further inspection of this region and an examination of the other claims in this zone are needed.

Silver Peak

The mines in the vicinity of Silver Peak are described by Shenon (1933). Two of these, belonging to the Silver Peak Copper Company and the Umpqua Consolidated Mining Company, lie south of Silver Peak. The Golden Gate mine lies about half a mile north. The district is reached by a forest road that leaves the county road near Russell Creek. According to Shenon (1933:18):

"The ore minerals occur as massive tabular bodies and disseminated in highly foliated schist. The two principal workings expose a zone of mineralized schist more than 100 feet wide. Across most of this zone sulphide minerals are rather sparsely distributed, but in at least two places bodies of nearly solid sulphide ore occur. * * * Normally the massive ore grades into schist with disseminated sulphides, but in some places, especially where the massive ore pinches, one or both walls are slickensided fault surfaces commonly lined with several inches of gouge.

"The massive sulphide ore is distinctly banded, probably in part because the ore minerals have replaced schistose rocks and in part because the minerals were introduced along parallel fractures in the rock. The sulphides include pyrite, sphalerite, chalcopyrite, bornite, galena, tennantite, chalcocite, and covellite named in their relative order of their abundance. The last four mentioned occur in relatively small amounts....The gangue minerals are principally quartz, barite, and sericite."

The order of mineralization as given by Lowell (1942:589) shows pyrite followed by quartz, then fracturing, sphalerite, more fracturing followed by tetrahedrite, tennantite, chalcopyrite, bornite and galena, more fracturing with barite and sericite the last of the hypogene minerals.

Considerable barite is present as lenses in the ore bodies uncovered in the mines. Some of this has disseminated sulphides which might be a hindrance for some uses of barite.

Several prospects are located in this mineralized belt to the southwest. A tunnel on the Silver Peak property, located at the head of a small tributary of the South Fork of Middle Creek, trends N. 40° E. and parallels the schistosity. Considerable exploration has been done as is shown by the size of the dump.

Although most of the ore bodies are in the greenstone, those at Silver Peak, according to Shenon (1933:16), are in the schistose part of the Dothan formation. He describes the schist as follows:

"Near the Silver Peak mines the Dothan formation is composed principally of dark-gray to almost black thin-bedded schist and highly altered fine-grained argillite. Many of the Dothan rocks are so completely altered that it is difficult to differentiate them in the field from the altered greenstones. Near the ore bodies the schist is bleached to light gray or almost white, and, because of the abundance of sericite, has a talcose appearance. In addition, the ore-bearing schist commonly contains considerable quartz, barite, and disseminated sulphides."

Conclusions

Mineralized zones have been with few exceptions found within the greenstone mass. Diller indicated that the position of the Big Yank lode between Briggs Creek and the Alameda mine closely paralleled the contact between the Galice formation and the greenstone; thus it is relatively easy to locate. However, it is difficult to prove that the ore bodies farther north are a direct continuation of this lode. Instead, they appear to be independent shear zones located in an echelon arrangement and situated progressively westward in the greenstone mass when traced northward to Silver Peak where they are in the Dothan formation. This generalization needs further checking. As was shown in the California (Wheeler) tunnel, several shear zones exist, few of which were mineralized. Thus it may be the location of the intrusive at depth, rather than the shear zone that determines the location and extent of mineralization.

With the exception of the Big Yank lode above the Alameda mine, the outcrops of the mineralized zones are not particularly prominent. Mineralized zones farther north were difficult to locate and had little on the surface to indicate their presence. In such rugged terrain, considerable time will be needed in which to locate claims and prospects as well as other existing mineralized zones.

At present, the Alameda and Silver Peak mines appear to have the largest and perhaps the most accessible deposits of barite. The barite appears to be but one phase of regional mineralization. The barite deposits might well be studied in conjunction with a study of the ore bodies. More work is needed, particularly in the area just south of the Alameda mine, between Grayback Mountain and Silver Peak, and perhaps for a few miles north of Silver Peak. All existing claims in this area should be visited.

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CANADA SEEKS WAY OUT OF EXCHANGE TROUBLES

The Canadian Government has announced that Parliament will consider legislation which will in effect allow a \$7.00 an ounce increase in the price of newly mined gold produced from Canadian mines in excess of that produced in the year ending last June 30. The program would be for a period of three years and is designed to strengthen Canada's dollar exchange which has been showing a progressively weakening tendency. Officials of the U.S. Treasury and of the International Monetary Fund have been thrown into a dither over the Canadian announcement. It is reported that a formal protest has been made by the United States, and that it has been effective in stopping this Canadian subsidy plan.

The United States Treasury has made much over the inflationary effect of the large and increasing stock of gold held in this country. Without commenting on the relatively small increase in the flow of gold which would be caused by the Canadian bonus, it would appear that the United States officials are obstinately and unrealistically clinging to an untenable policy. With all currencies tied to the dollar we are attempting by the indirect means of the International Monetary Fund to regulate value of these currencies. It may prove to be an impossible task like opposing the law of supply and demand. In addition the subject is so tied up with international politics that nobody understands the probable consequences of devaluation of currencies.

The Engineering and Mining Journal has recently stated editorially that the French Government will reduce the official value of its currency in dollars, and the report is that other European countries will follow suit. The Italian lira has recently been devaluated. In the editorial the Journal expresses the belief that devaluation is a formal acknowledgment of the free-market price of gold, and that a higher price of gold is inevitable in due course.

ALCOA WEST COAST FABRICATION PLANT

A fabrication plant which will specialize in making aluminum rod, wire, and electrical transmission cable will be built by Alcoa on the west coast probably at Vancouver, Washington, according to an announcement in the press on November 28. Construction will depend on assurances of availability of adequate power. This new plant will be an important step in company plans for integrating the Northwest aluminum industry. A further important step will be the production of alumina from Oregon ore. It is suggested that the company will do well to consider the desirability of putting the bauxite plant on the Oregon side of the river. Otherwise an undue proportion of the company's production facilities will be placed in Washington, giving that state all the cream, with Oregon receiving a very thin skim milk. Sharing of plant facilities with Oregon would make for much better public relations, and it is not clear why the Washington side of the river has any especial advantage over the Oregon side for a bauxite plant; in fact, from a security standpoint, there are certain disadvantages in grouping too many important production facilities at the Vancouver site.

CURRY COUNTY HAS NEW MINERAL SOCIETY

The Curry County Mineral Society has been organized at Gold Beach. Frank Schiska was elected president and Mrs. A. J. Russell, secretary-treasurer. Several field trips have been planned. According to the Curry County Reporter of November 27, membership is open to anyone interested in rocks, gems, mineral collecting, mining, or the lapidary art.

OREGON CHROMITE ORES CONCENTRATED BY U.S. BUREAU OF MINES

"Beneficiation of Chromite Ores from Western United States" is the title of the U.S. Bureau of Mines Report of Investigations 4079, June 1947. Deposits in California, Oregon, Washington, Idaho, and Montana were explored by the Bureau of Mines during the war and concentration tests were made on low-grade ores. Ores from three deposits near John Day, Oregon, namely the Chambers, Dry Camp, and Iron King, which contain 90 percent of the chromite in the area were beneficiated by tabling. Concentrates were produced as follows: Chambers, Cr_2O_3 , 33.8 percent with chrome-iron ratio of 1.69:1 and recovery of 74.1 percent; Iron King, Cr_2O_3 , 37.6 percent with chrome-iron ratio of 1.50:1 and recovery of 68 percent; Dry Camp, Cr_2O_3 , 48 percent with chrome-iron ratio of 2.58:1 and recovery of 82.4 percent. Concentration of ore from the Briggs Creek deposit, Josephine County, produced a 52.3 percent Cr_2O_3 concentrate having a 2.03:1 chrome-iron ratio with a 79.7 percent recovery.

SHEEP MOUNTAIN MANGANESE CONCENTRATION TESTS

The U.S. Bureau of Mines has released results of concentration tests performed on a sample of manganese ore from the Sheep Mountain property located about 8 miles west of Durkee, Baker County, Oregon. The information is published in Report of Investigations 4149, November 1947. Test work was done at the Bureau's Salt Lake City station on a 290-pound sample submitted by the State Department of Geology and Mineral Industries. The crude oxide ore contained 23 percent manganese with intimately associated silica as the principal gangue. Beneficiation tests included both gravity and flotation methods. Best results, obtained by jigging and tabling, produced a concentrate assaying 42.1 percent manganese with a 69.9 percent recovery.

MINE TO BE REOPENED

It has been reported that Mr. Robert Cannell of Semi, California, has recently purchased the Copper Queen Mine, two miles west of Leland, Josephine County, Oregon. Present plans are to mine by open pit method.

The Copper Queen was originally located in 1916 and has been worked sporadically since, usually by underground methods. Last work done at the mine was in 1941. According to a Department report, two carloads of ore were shipped in 1934 from which was received 44.81 ozs. gold and 229.83 ozs. silver.

Mr. Cannell purchased the mine from Messrs. O. S. Blanchard and Herman Schmidt of Grants Pass. Work is to be under the direction of Tom Cannell, Sunny Valley.

BONANZA MINES

The only producing quicksilver mine in Oregon at the present time is the Bonanza at Sutherlin in Douglas County. Total payroll includes about 20 men with from 4 to 6 men kept continuously on development work. The furnace is run from 10 to 12 days a month and production averages a little more than 100 flasks a month. New development planned includes drifting south on the 830 level to prospect for an orebody found on the 630 level in 1946. A new level at 1060 feet has just been started from a winze and it is believed the extension of the main orebody on this level will be cut after drifting about 50 feet.

HIGH METAL DEMAND FOR 1948

A digest of a Department of Commerce report appears in the December 11 issue of ENR Metal and Mineral Markets and is reproduced below.

Major industries in the United States will operate at a high rate throughout 1948 to meet continued high consumer demand, according to a report on industry and trade prospects issued by the Department of Commerce. The report, appearing in the Department's "Domestic Trade Digest," assumes that the boom will continue next year. The authors do not "predict" that it will and warn that their findings are "subject to the influences of the international economic and political situation."

In reference to the outlook for steel, the report points out that effective steel ingot capacity will be 1,000,000 tons higher in 1948 than it was this year. Supplies will be affected by the demands of the European recovery program. Tight finished steel products, such as sheet and strip, can be obtained in sufficient quantity only if raw steel is diverted from other products.

Demand for copper and copper products cannot be forecast, but domestic and foreign requirements combined may create a situation that could bring about the "expansion of a series of controls." Copper prices are expected to remain firm next year.

Lead continues in short supply. "While many are willing to concede that the current price for lead is inordinately high," the report said, "there appears to be every reason to believe that there will not be a substantial, if any, break in the price during 1948."

The zinc demand-supply-price situation is expected to continue almost unchanged next year, or "on an even keel."

Tin supply will remain short, owing to the failure of production to expand to a normal rate. Some restrictions on use of tin may be continued. Normal output is not expected before 1950.

Automobile production is expected to increase to 5,000,000 passenger cars in 1948, compared with 3,500,000 cars in 1947. Because of the vast backlog of orders for cars, the 5,000,000 rate should be maintained for several years.

Total new construction in 1948 is estimated at \$15,200,000,000, compared with \$12,665,000,000 in 1947. Private residential building will increase from \$4,800,000,000 in 1947 to \$6,000,000,000 in 1948. Public utility construction will increase from \$1,315,000,000 in 1947 to \$1,625,000,000 next year. Industrial construction, however, should decline from \$1,695,000,000 this year to \$1,350,000,000 in 1948.

PUBLICATIONS

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