STATE OF OREGON
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OREGON'S MINERAL INDUSTRY IN 1958

By
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The value of minerals produced in the State in 1958 was within a fraction of one percent of the all-time high reached in 1957 - despite a general business recession during the year. A preliminary estimate by the U. S. Bureau of Mines of the value of Oregon's mineral production is $42,118,000. Generally speaking, the Bureau bases its valuation figures on minerals as they leave the pit or mine. The value of the same minerals at point of use in the State or shipping point for out-of-State movement would be several times the above amount. If mineral production were reported in the same manner as other commodities in the State the value would be in the neighborhood of $100,000,000.

Chrome mining came to an abrupt halt in May; Harvey Aluminum Company energized its two potlines at The Dalles in August; cutbacks in zirconium production were announced by Wah Chang Corporation in September; the first pound of uranium "yellow cake" was produced by Lakeview Mining Company in December; and Government support for quicksilver terminated December 31. The diversified nature of the State's mineral and metallurgical industry survived these gains and losses and came out with the second highest total in the past 108 years. Exploration for oil and gas continued at about the same level as last year with seven major companies and several groups in the field. Drilling was done on seven tests during the year.

Industrial Minerals

Cement, lime, and limestone

Continuing a steep upward trend begun in 1954, the production of cement in Oregon increased approximately 17 percent over last year to an all-time high. Total production from the State's three cement plants amounts to approximately 3,700,000 barrels annually. Nearly $4,000,000 was earned by the 720 men employed during 1958. The great increase over 1957 figures reflected the plant improvements made last year at both the Lime and Dallas plants of

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Oregon Portland Cement Company. Ideal Cement Company continued in full production at its Gold Hill plant to which limestone is trucked from a company-operated quarry near Wilderville in Josephine County. Chemical Lime Company fired up its two rotary kilns at Wingville near Baker late in 1957 and produced burnt and hydrated lime. High-grade limestone for the plant comes from a company-owned quarry about 8 miles away. Crushed limestone was quarried near Enterprise in Wallowa County by Greeley Lime Company for the manufacture of calcium carbide by Pacific Carbide & Alloys Company at its plant in North Portland. Greeley subcontracted the quarrying to National Industrial Products Company and the trucking to railhead to Misander Brothers. National also produced various sizes of crushed limestone from its own quarry near Durkee in Baker County for heavy chemical and metallurgical industries in the Pacific Northwest. A nearby deposit of hot spring travertine owned by National was drilled during the year to determine grade and tonnage. The easily ground travertine represents a new product for the agricultural market. Union Carbide Metals Company produced calcium carbide at its plant in North Portland. Dewitt's Polk County Lime Company quarried and crushed agricultural limestone at its quarry near Dallas in Polk County. The adjacent quarry operated by Oregon Portland Cement Company shipped low-grade limestone to the cement plant at Oswego and sold some agricultural stone also. The Department published a tabulation of all known limestone deposits in the State together with index maps showing their location in the April and May 1958 issues of The Ore.-Bin.

Silica

Late in the year, Roy and G. D. Rannells shipped 1000 tons of silica from the newly discovered deposit on Quartz Mountain northeast of Tiller in Douglas County to the Hanna Nickel Smelter at Riddle for test purposes. Bristol Silica Company quarried and processed silica from a quarry near Rogue River in Jackson County. Bristol has been the only silica producer in the State for the past 20 years. In addition to supplying high-grade silica for metallurgical purposes the company produces poultry grit and other specialty products.

Lightweight aggregates

Oregon's two expanded-shale producers, Smithwick Concrete Products Company and Empire Building Materials Company, continued to enlarge their horizons in 1958. Smithwick, starting with a dozen sizes and shapes of concrete blocks 9 years ago, now produces 100 styles which find application in such diverse places as chimneys, walls, and ornamental pieces in window displays. Empire fabricated some 120-foot-long lightweight concrete pilings 20 inches square for the Commission of Public Docks. The pilings weigh 19 tons each and are pre-stressed to withstand the jar when driven. Empire is experimenting with an improved design for structural members to be used for floors and roofs, the demand for which is steadily increasing. The Company delivered five pre-stressed lightweight concrete beams 112 feet long, 6 feet high, by 2 feet thick, and weighing 85,000 pounds to a building in Eugene. Weight and load length restrictions for highway hauling will probably limit construction of beams much larger than this. Both Smithwick and Empire supply aggregate for monolithic pours, with some shipments going hundreds of miles. Expanded shale mixed with high-alumina cement has been found to withstand temperatures up to 2000° F. and Smithwick packages two-cubic-foot bags for use in brick plants, oil refineries, and fireboxes requiring an insulating refractory. Both companies reported increased business, due in part to general area growth and more importantly to a growing acceptance of lightweight aggregate as a prime construction material.

In central Oregon four companies were active in the production of pumice and volcanic cinders. Harney Concrete Tile Company quarried and sized an unusually hard pumice in Harney County for block aggregate and road metal for logging roads. In the Bend area, Cascade Pumice Corporation and Central Oregon Pumice Company produced pumice and scoria for block and monolithic aggregate. Cinder Hill Rock Quarry near Redmond quarried blocks of dark-red cinders for

garden rockeries and low retaining walls and crushed cinders for road metal. Leroy Grote, of the Cinder Hill Quarry, donated 2,000 yards of red cinders to the Portland Zoo Railway. The cinders are also used extensively for ballast on full scale roadbeds since they pack tightly and do not shift. Preliminary figures indicate that the value of pumice and cinders declined somewhat from the 1957 figure.

Building stone

Brightly colored volcanic tuffs were quarried and shaped for dimension stone and other uses by three operators in central Oregon. Pacific States Cut Stone Company at Willowdale in northern Jefferson County, Rainbow Rock Quarry near Pine Grove in Wasco County, and the Indian Candy Stone Quarry on the Warm Springs Indian Reservation in Wasco County were all active during the year. Natural Stone Company opened a quarry near Rome in Malheur County and cut a gray-white tuff with thin black banding. The Rocky Butte Quarry in Portland turned out a dark gray lava for fireplaces and patios, and Tuff Stone Company at Sublimity in Marion County sawed blocks of gray tuff for insulating walls. A quarry near Idanha in eastern Marion County was opened up by Harold Hills and Ted Geck who produced light-colored volcanic tuff blocks. At his quarry near Riddle in Douglas County, Melvin Parker installed a clipping machine to shape slabs of a blue-green fine-grained sandstone used for flagging and veneer. The Carver Quarry in Clackamas County produced rough blocks of gray andesite for walls and fireplaces. Northwestern Granite Quarry at Haines, Baker County, continued to produce a small amount of monumental granite.

Oregon's Mineral Industry at a Glance

	1957	1958
Chromite	$ 674,631	$ 375,030 -
Clays	265,556	300,000 +
Gold	118,335	57,750 -
Mercury	986,191	536,800 -
Sand and gravel	13,481,263	13,600,000 +
Silver	14,412	3,439 -
Stone	11,744,962	8,800,000 -
* Undistributed	16,153,541	19,445,000 +
Total	$42,820,000	$42,118,000 -

*Includes: Cement, diatomite, lime, uranium, and CO_2.

Sand and gravel, crushed stone

Production of sand and gravel and crushed stone continued at a high level to keep pace with the large road-building programs in progress throughout the State. Sand and gravel tonnages slightly exceeded the 1957 figures in preliminary estimates while crushed stone dropped about $2\frac{1}{2}$ million tons below the previous year. Decreased demand for rip-rap by the Army Engineers was cited as the principal cause for the decrease. Search for suitable quarry sites was intensified. Quarry sites once considered uneconomic by reason of their distance from point of use were being opened up as the result of improved loading and haulage equipment.

Bentonite

Central Oregon Bentonite Company core drilled its property in Jefferson County and stockpiled 500 tons of dried bentonite. A grinding mill was being installed at year's end. Crude bentonite was sold to ranchers and the Bureau of Land Management for sealing stock ponds.

Borax

Approximately 77,000 acres near Alvord Lake in eastern Harney County were leased by the U.S. Bureau of Land Management during the last half of 1958. Most of the leases were granted in T. 37 S., R. 33 E., but leases were also obtained for parts of 14 other townships in the vicinity. A brief history of the borax industry active in the 1900's at Alvord Lake appeared in the June 1958 Ore.-Bin.

Carbon dioxide

Gas-Ice Corporation produced dry ice from carbon dioxide obtained from wells south of Ashland in Jackson County. The Department began a State-wide inventory and study of carbon dioxide springs during the summer.

Perlite and vermiculite

Supreme Perlite Company popped raw perlite obtained from Arizona at its plant in North Portland. Vermiculite-Northwest Company exfoliated vermiculite at its Portland plant. Raw material was shipped from a deposit near Libby, Montana.

Metals

Uranium

Oregon became a full-fledged uranium producing State when on December 20, 1958, the first pound of "yellow cake" uranium concentrate was recovered from the filter press of Lakeview Mining Company's plant located just north of Lakeview. The 300-ton-per-day solvent extraction mill had started up November 29. Three weeks were required to build up the concentration of uranium in the circuit before the first production.

Ore for the mill comes from the White King mine which is about 15 miles northwest of Lakeview at an elevation of 6300 feet. A three-compartment shaft scheduled to be sunk to a depth of 700 feet was started in June and at year's end was progressing as planned. The new shaft will tap ore discovered by surface drilling and will connect with present underground workings now served by the No. 1 shaft. The deposit was discovered $3\frac{1}{2}$ years ago by two local prospectors who subsequently leased the property to Lakeview Mining. A detailed report on the mine and mill was published in the December 1958 Ore.-Bin

Thirty percent of the milling capacity of the Lakeview mill is reserved under terms of the AEC contract for the processing of ores from other properties which are amenable to treatment in the plant. Despite rather intensive exploration of the area surrounding the White King mine and the adjacent Lucky Lass mine, by the Lakeview Mining Company and others, no more deposits of commercial grade or size have turned up. The Department is making a detailed geological study of the area.

In Harney County, Timber Beast Mining Company secured a DMEA loan and carried on an exploration project during the year at its Steens Mountain property. Solar-X Corporation of Boise also explored its property on Steens Mountain. Minor work was also done in the Powell Butte and Bear Creek areas of Crook County.

Chromite

Production of chromite lump ore and concentrates came to an abrupt halt on May 19, 1958, when the General Services Administration announced closure of the Grants Pass chrome stockpile. First shipments to the stockpile were made in August 1951. Originally the program was to last only 5 years but subsequent revisions extended it until June 30, 1959, or until 200,000 long tons were received. More than 46,000 tons of ore and concentrates were shipped from Oregon mines in the $6\frac{1}{2}$-year period; the remainder came from California and Alaska. Value of the chromite produced in Oregon came to about $4,000,000. Nine chrome mills and 16 mines were active during the first few months of 1958. Several mines and mills had closed late in 1957 in recognition of the impending closure of the stockpile.

In March the Department of Geology and Mineral Industries and the Department of Planning and Development jointly authorized a study to determine the feasibility of establishing a ferrochrome plant to process local ores. If established the plant would provide a steady market for chrome which would then be converted into ferrochrome competitive with that made from foreign ores.

In September the California-Oregon Chrome Producers Association incorporated as a cooperative, with one of its prime objectives being to secure a ferrochrome plant for the area.

Nickel

Production of ferronickel at the Riddle smelter operated by Hanna Nickel Smelting Company was approximately 15 percent greater than in 1957. Ore for the smelter comes from the top of Nickel Mountain where a large open-pit mine is operated by Hanna Mining Company (formerly known as Hanna Coal & Ore Corporation). Hanna Nickel Smelting Company is now a wholly-owned subsidiary of Hanna Mining. This mine and smelter represent the only nickel production in the United States. The value of its production is a major item in Oregon's mineral picture and its employment, around 500, is an important factor in the area's economy.

The Nickel Corporation of America, which conducted an extensive trenching and sampling program in the Cave Junction area of Josephine County in the latter part of 1957, suspended activities in the spring of 1958. Pacific Nickel Corporation also curtailed its exploratory program in the Red Flat area of Curry County which was started last year. To further study the geology of the area, Pacific had colored stereographic aerial photographic transparencies made, probably the first of their kind to be used commercially in the State. The Department first examined and sampled the Red Flat area in 1946.

Mercury

In April the condenser tubes at the Horse Heaven mine in Jefferson County were broken up and run through the retort, signalling the end of one of the State's major quicksilver producers. The quicksilver deposit was discovered by A. J. Champion in 1933 and the first flask was produced in late 1934. Horse Heaven Mines, Inc., a subsidiary of Sun Oil Company, acquired the property in 1936 and operated it continuously until the plant was destroyed by fire in November 1944. A 20-ton rotary furnace was erected by Horse Heaven in December 1954 to furnace known reserves of ore and broken ore left underground when the plant burned. A total of 17,000 flasks was produced from the mine during its 14 years of operation.

The Bonanza Mine east of Sutherlin in Douglas County continued to operate during the year. A new drift was under development and some good grade ore was reported to have been cut. Production was somewhat below that of 1957, due in part to running development ore from the new drift through the furnace. Bonanza has a total recorded production of nearly 102,000 flasks which amounts to more than 35 percent of the State's total production.

The Bretz mine in southern Malheur County accounted for more than half of the State's estimated total production of 2,339 flasks in 1958. The Bretz, operated by Arentz-Comstock Mining Venture, employs a flotation circuit to upgrade its ore. During 1958 much of the mill feed came from low-grade dumps which, because of economic conditions, had been left by Bradley Mining Company when it operated the property from 1931 to 1944.

Several flasks of mercury were produced by Western Minerals, Inc., in a 20-ton Lacey rotary furnace at the Angel Peak mine in the Quartz Mountain area of southern Lake County. Ore from the Blue Ridge mine, operated by Mia Mines, Inc., in Crook County was concentrated in a small gravity mill and the metal recovered in a retort. Moneta Porcupine Mines, Ltd., explored the Elkhead mine in northern Douglas County with the aid of a DMEA loan. The Axehandle mine in Jefferson County was also explored, with DMEA assistance, by John D. Hoffman who acquired an interest in the property from International Engineering Company early in the year. Results of the exploration programs at both the Elkhead and Axehandle mines were reported to be disappointing. Werdenhoff Mining Company leased the Mother Lode property in Crook County and did considerable surface stripping.

Of considerable interest to mercury producers in the State was the announcement by Van Waters & Rogers Company, Portland, that it was buying and selling small lots of mercury, including fractional flasks of native quicksilver.

Bauxite

Harvey Aluminum Company's exploration of ferruginous bauxite deposits in the Salem Hills area of Marion County was reduced in 1958. Considerable interest in occurrences of bauxite in the northwestern part of the State was shown by several other companies during the year.

Iron

A token shipment of 5 tons of Scappoose limonite was sent to Japan for test purposes in 1958. Preliminary reports indicated that the ore was acceptable and a larger movement in 1959 is planned. Several iron and steel companies showed an interest in iron deposits in the State during the year. Direct reduction of iron ores, using local, low-grade coals, offers a possible method of treating Oregon ores since capital outlay is much less than that for conventional blast-furnace installations and no coking coal is required.

Gold

Gold production in the State declined 51 percent from 1957 due largely to decreased production at the Buffalo mine in Grant County. The Buffalo began driving a 1400-foot adit 230 feet below the lowest workings in the mine to intersect several ore-bearing veins. A flotation mill on the property is operated intermittently when sufficient ore has been accumulated.

The Warner mine in the Gold Hill district of Jackson County saw some production of high-grade ore. Frank Gelhaus also operated a small mill from time to time on the property. A small amount of mining was done by Earl Young at the Humdinger mine located about 25 miles south of Grants Pass, and the Reno mine in the Galice area was worked by Quentin Stone. R. C. Hanford leased the Daisy mine at the head of Jump-Off-Joe Creek in Josephine County and explored underground. Peridotite Metals, Ltd., leased the Braden Mine Extension in the Gold Hill area of Jackson County and was reported to have leased several other properties in the Waldo-Takilma area.

Placer mining during the winter months continued at about the same rate as it has for a number of years with principal activity centered in the Waldo-Takilma, Galice Creek, Wolf Creek, and Jump-Off-Joe Creek areas of southwestern Oregon.

Copper

Standard Milling Company operated the Standard mine near Prairie City in Grant County and a newly constructed 50-ton flotation mill. The concentrate contained a small amount of cobalt but this was not recoverable when shipped to the smelter. The Standard mine was discovered in the 1860's and was an important shipper of cobalt around the turn of the century. A historical summary of the mine appeared in the September 1956 Ore.-Bin.

Electro Process Products

Aluminum

Harvey Aluminum began operations at its 240-pot aluminum reduction plant at The Dalles on August 5th. The plant, located on the Columbia River 5 miles below The Dalles Dam, is rated at 100,000,000 pounds of primary metal annually. Alumina for the plant comes from Japan and is unloaded into rail cars at Portland. The plant will produce pigs, ingots, and billets for commercial outlets and for Harvey's own fabrication facilities.

Reynolds Metals Company operated its reduction works at Troutdale with one potline shut down from May through October due to a decreased demand for metal. Similar cutbacks were made at aluminum smelters all over the United States.

Reactive metals

The year 1958 saw a sharp change in the supply and demand picture for the "reactive metals" zirconium, titanium, and hafnium. Wah Chang Corporation began operating its zirconium plant near Albany on a reduced basis October 1, due in part to a curtailment in the demands for metal by the military. In June, Wah Chang ceased operations at the zirconium production facilities leased from the Atomic Energy Commission at the U.S. Bureau of Mines station in Albany upon expiration of a 2-year contract. Co-product hafnium from Wah Chang's zirconium purification plant was purified and processed into hafnium sponge by the U.S. Bureau of Mines until late in 1958 when a contract with the Atomic Energy Commission expired. Wah Chang stepped up activity in the separation and reduction of columbium-tantalum which had begun in 1957 on a trial basis. Columbite ore from Malaya was used as a raw material in the process. Oregon Metallurgical, also in Albany, continued to process zirconium and titanium sponge into ingots and castings. The company, which buys sponge from Wah Chang and other reduction works, announced a 2.5 million dollar plant expansion during the year.

Ferroalloys

National Metallurgical Corporation, which produces elemental silicon at its plant at Springfield, began construction of a new stationary hearth electric furnace which is scheduled to go on stream in June. Installation of the 4000 Kva furnace will cost about $500,000. Union Carbide Metals Company manufactured ferroalloys at its plant in North Portland.

Oil and Gas

Administration

The Department issued four new drilling permits and one deepening permit in 1958 as compared with seven new drilling permits issued in 1957. The total footage drilled during the year was 18,060 feet; this was a decrease of nearly 19 percent over the 6-year average from 1953 through 1958. Thirty-five trips were made to drilling sites last year by Department representatives, and field investigations were made on four reported oil seeps in western Oregon.

Exploration

Geologic field investigations by oil companies operating in Oregon were continued at about the same level in 1958 as in the previous year with seven major oil companies conducting geologic field studies and several small groups making limited studies. One company made seismic surveys in northwestern Oregon this fall and another took gravity readings in central Oregon during the summer.

Drilling was done on seven oil tests in 1958. Miriam Oil Company abandoned its "Bliven No. 3" test in January 1958, and Sunray Mid-Continent, operator, abandoned "Bear Creek Unit No. 1" in August 1958. Two oil tests were being drilled and work suspended on four others at the start of 1959.

Oil and gas shows

Oil has never been found in commercial quantities in Oregon and any oil seen so far has been only traces in drill cuttings and cores or droplets of oil found by prospectors and gem hunters in geodes from north-central Oregon. Traces of oil have been confirmed in the following test holes:

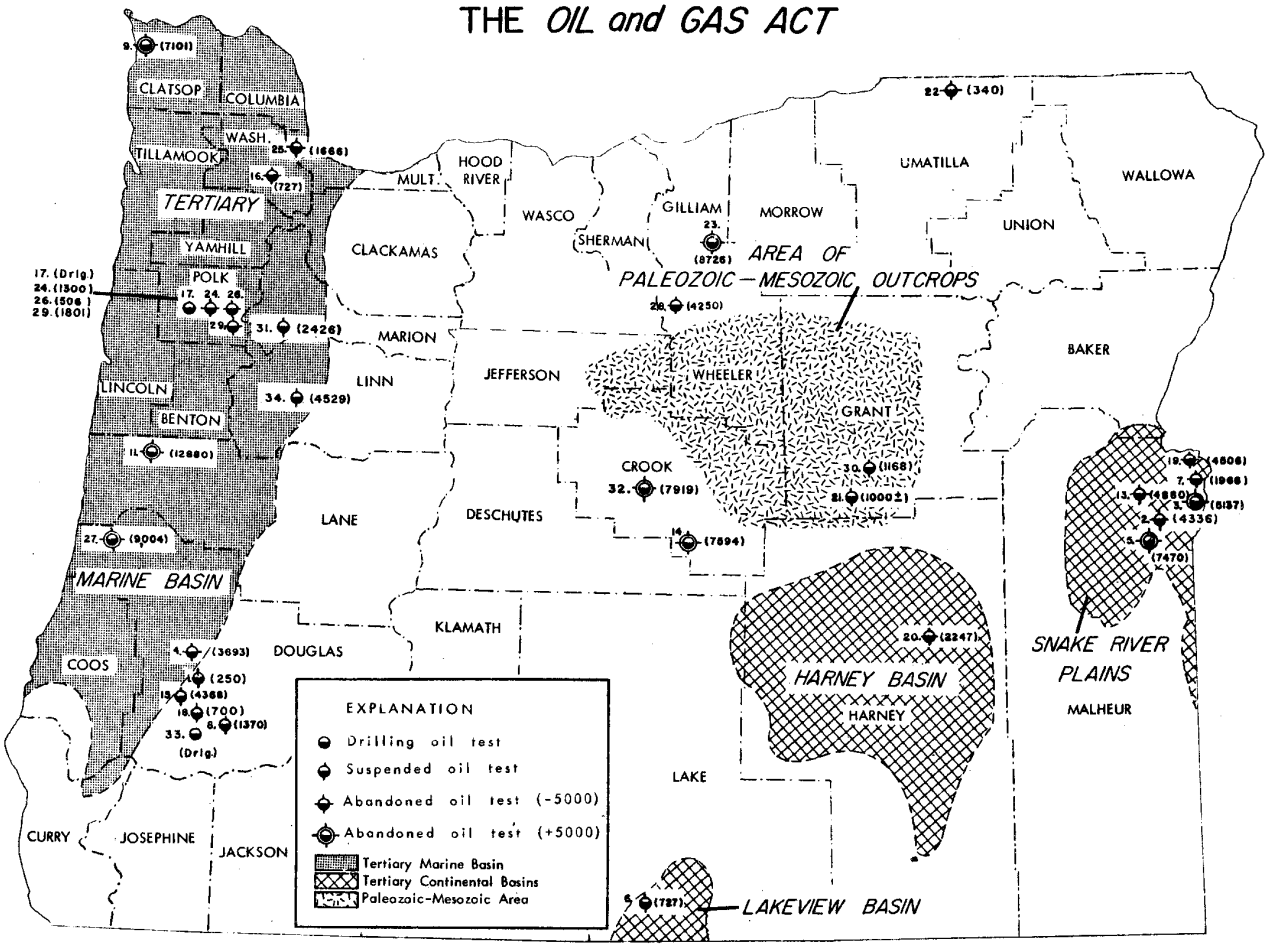
Columbia Oil Development Company*	Well No. 1	SW¼ sec. 4, T. 20 S., R. 44 E., Malheur County
Eastern Oregon Oil Company*	Well No. 1	Sec. 12, T. 20 S., R. 45 E., Malheur County

*U.S. Geol. Survey Bull. 431, Gas and oil prospects near Vale, Oregon, and Payette, Idaho, p. 36.

Linn County Oil Development Company	Barr No. 1	NW¼ sec. 32, T. 11 S., R. 1 W., Linn County
Oil Developers, Inc.	Scott No. 1	SW¼ sec. 5, T. 27 S., R. 6 W., Douglas County
Standard Oil Company	Pexco-State No. 1	NE¼ sec. 36, T. 20 S., R. 20 E., Crook County

Inflammable gas has been found at many places in Oregon, but so far it has occurred in too small a quantity for commercial development. Gas production for Oregon is mentioned in U.S. Geological Survey Mineral Resources of the United States, 1909, Part II, for the years 1907, 1908, and 1909. This was no doubt the gas used in eastern Oregon by several ranchers for heat and light. This gas was produced from water wells and is reportedly still being used.

OIL TEST WELLS DRILLED UNDER THE *OIL and GAS ACT*



News items

The joint drilling of a deep test southeast of Prineville this summer by Sunray Mid-Continent Oil Company and Standard Oil Company caused some speculation in that area. Costs of drilling were shared by several other companies besides the two mentioned. The test near Prineville was drilled on a Federal Unit Lease Agreement; the first of its kind in Oregon. The Unit Lease Agreement covers nearly 140,000 acres. No new test holes have been started since abandonment of "Bear Creek Unit No. 1" in August. Sinclair Oil & Gas Company closed its Portland exploration

office in September 1958 after having operated in the State for nearly 5 years. Sinclair drilled Oregon's deepest well near Mapleton in Lane County during 1955; total depth was 12,880 feet. Reports of an oil strike at Linn County Oil Development Company's "Barr No. 1" near Lebanon in December caused considerable excitement. Results of tests, however, were negative and early in January 1959 the drilling was suspended.

			Total Depth
Abandonments declared official in 1958			
Big Red Uranium Company	Richartz No. 1	NW¼ sec. 24, T. 6 N., R. 34 E., Umatilla County	340 ft.
Miriam Oil Company	Bliven No. 3	SW¼ sec. 10, T. 8 S., R. 5 W., Polk County	1801
Oregon Petroleum Corporation	Clarno No. 1	SE¼ sec. 27, T. 7 S., R. 19 E., Wheeler County	4250
Seneca Oil, Gas & Development Company	Lemmons No. 1	NE¼ sec. 18, T. 17 S., R. 29 E., Grant County	246
Sunray Mid-Continent Oil Company - Standard Oil Company	Bear Creek Unit No. 1	SE¼ sec. 30, T. 17 S., R. 19 E., Crook County	7919
Records released from the confidential files in 1958			
Miriam Oil Company	Elliott No. 1	SW¼ sec. 9, T. 8 S., R. 5 W., Polk County	1080
Oroco Oil & Gas Company	Portland Co. No. 1	NW¼ sec. 18, T. 24 S., R. 33 E., Harney County	2247
Sinclair Oil & Gas Company	Federal-Mapleton No.1	SE¼ sec. 12, T. 16 S., R. 10 W., Lane County	12,880

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SURVEYED LOCATIONS OF OIL TESTS

Linn County Oil Development Company - "Barr No. 1." Located 258.9 feet south and 791.4 feet east from the northwest corner of sec. 32, T. 11 S., R. 1 W., WM, Linn County. Elevation 355 feet. Six months suspension granted January 12, 1959.

V. V. Erntson - "Schermacher No. 1." Located 264.4 feet south and 345.3 feet west from the northeast corner of sec. 27, T. 9 S., R. 2 W., WM, Marion County. Elevation 322 feet. Hole was abandoned on January 14, 1959. Total depth 2426 feet.

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WATER SUPPLY INFORMATION AVAILABLE

Information on quantity and quality of surface waters in the State has been issued recently by the Surface Water and Quality of Water branches of the U.S. Geological Survey. Data presented include measurements of streams, lakes, and reservoirs in various drainage areas, and temperatures and chemical analyses of some of these waters. The information is contained in Water Supply Papers 1293, 1318, 1344, 1430, and 1447, and may be obtained from Superintendent of Documents, Washington 25, D.C.

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1958 DMEA ACTIVITY IN OREGON

The Defense Minerals Exploration Administration had four contracts in force in the State during 1958, details of which are shown in the accompanying box. At year's end all of the contracts had been either completed or terminated before completion. The DMEA program, in existence since 1950, ended June 30, 1958.

Name	Commodity	Government participation	Total
International Engineering Co. Axehandle Mine Jefferson County, Oregon	Mercury	$ 7,815.00	$ 10,320.00
Orion Exploration & Development Log Cabin, Ridge, and Camp claims Crook County, Oregon	Mercury	9,075.00	12,100.00
Timber Beast Mining Co. Timber Beast claims Harney County, Oregon	Uranium	18,579.00	24,772.00
Moneta Porcupine Mines Elkhead Mine Douglas County, Oregon	Mercury	2,599.25	5,198.50

The Office of Minerals Exploration succeeded it when the President signed Public Law 85-701 on August 21, 1958. The law establishes a domestic minerals exploration loan program. The Secretary of the Interior may designate minerals (excluding organic fuels) which he deems necessary for the national interest and provide loans on a participating basis to private companies for exploration for such minerals. Government participation is limited to $250,000 for any one contract and the applicant is required to prove that funds for the exploration are not available from commercial sources on reasonable terms. Loans would be at the current Treasury interest rate plus two percent for administration, and repayment of any loan, with interest, is required through payment of royalties on minerals produced from the project. Congress appropriated $4 million for the agency's use in the current fiscal year, with the proviso that loans may not exceed 50 percent of the cost of a project. Inquiries to OME should be sent to South 157 Howard Street, Spokane 4, Washington. Mr. A.E. Weissenborn is executive officer for the organization.

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KLAMATH RIVER BASIN DESCRIBED

The U.S. Geological Survey has just released an open-file report entitled "Preliminary Report on the Ground-Water Resources of the Klamath River Basin, Oregon." Authors are R. C. Newcomb and D. H. Hart of the Survey's Ground-Water Division in Portland. The report discusses the geography, geology, and hydrologic conditions of this large basin, and tabulates records for wells, springs, and chemical quality of the water. Included are two maps (4 parts each); one map shows the location of the representative wells and springs and the other shows the distribution of the geologic formations, which range in age from pre-Tertiary to Recent.

This report is not for distribution, but may be consulted at the following places in Oregon: Geological Survey, 1001 N.E.Lloyd Blvd., Portland; State Engineer in Salem; Klamath County Agricultural Agent in Klamath Falls; this Department in Portland and its branch office in Grants Pass; and local public libraries.

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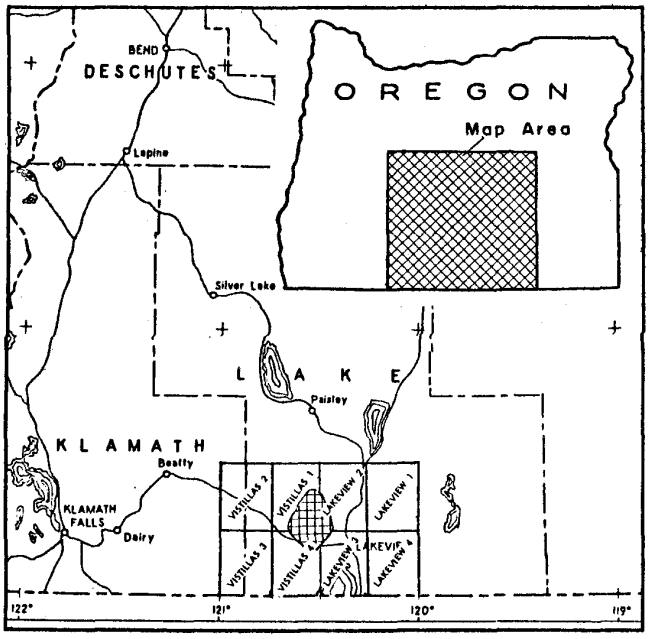
PRELIMINARY GEOLOGY OF THE LAKEVIEW URANIUM AREA, OREGON

By
Norman V. Peterson*

Introduction

This preliminary report is part of the Department's continuing uranium project intended both to enlighten and encourage the uranium prospector and to obtain basic stratigraphic information in areas of mineral significance that may lead to additional mineral discoveries. This basic information may also be used as needed to fill in gaps in the State Geologic Map.

The White King and the nearby Lucky Lass deposits of Lake County are the only economic occurrences of uranium so far discovered in Oregon. These deposits served as a starting point for the reconnaissance and semidetailed geologic mapping (see accompanying map) that was done during the summer field season of 1958. Mapping was begun in the vicinity of the uranium occurrences and extended in all directions to cover about 140 square miles.



Index Map showing location of area mapped.

Location

The Lakeview uranium area is in southwestern Lake County about 20 miles northwest of Lakeview. The area lies in the southern part of the Fremont Mountains just west of the northern edge of the Goose Lake Valley and within the Basin and Range physiographic province. Elevations vary from just over 5,000 feet above sea level at the base of the foothills northwest of Goose Lake to 7,925 feet at the top of Cougar Peak.

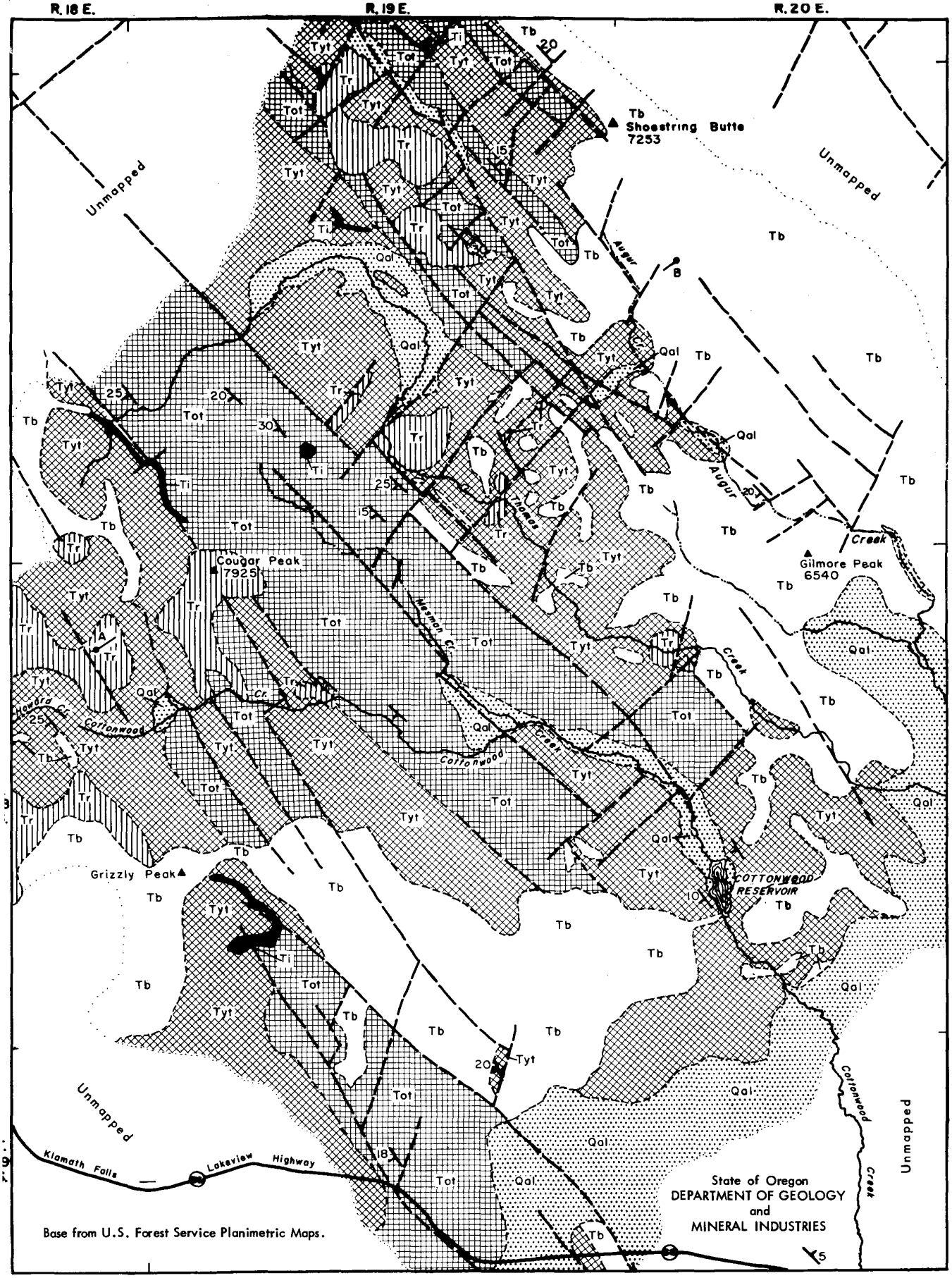
Northwest-trending fault-block ridges and their parallel streams that drain southeast into Goose Lake are typical of the topography in this part of the Fremont Mountains. Heavy soil cover and abundant timber are common throughout the area.

General geology

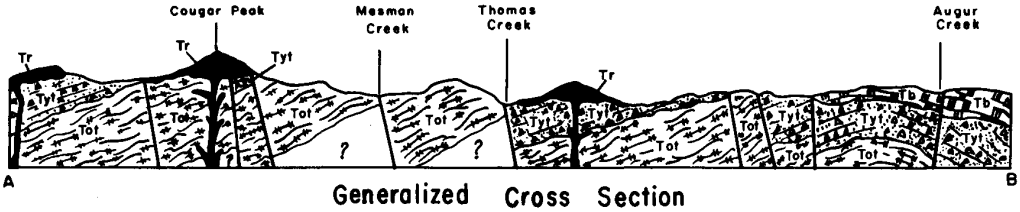
The general area is underlain by a great variety of volcanic rocks of Tertiary and Quaternary age. The oldest rocks are a series of indurated, light-colored, acid-to-intermediate tuffs, lapilli tuffs, and welded tuffs. For mapping purposes this series is called "Older tuffs."

These Older tuffs are overlain apparently conformably by another group of pyroclastic rocks mapped as "Younger tuffs" that are generally less indurated agglomerates, clayey tuffs, and a thick section of tuffaceous lake beds.

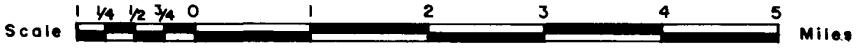
*Geologist, State of Oregon Department of Geology and Mineral Industries.



PRELIMINARY GEOLOGIC MAP LAKEVIEW URANIUM AREA



Generalized Cross Section



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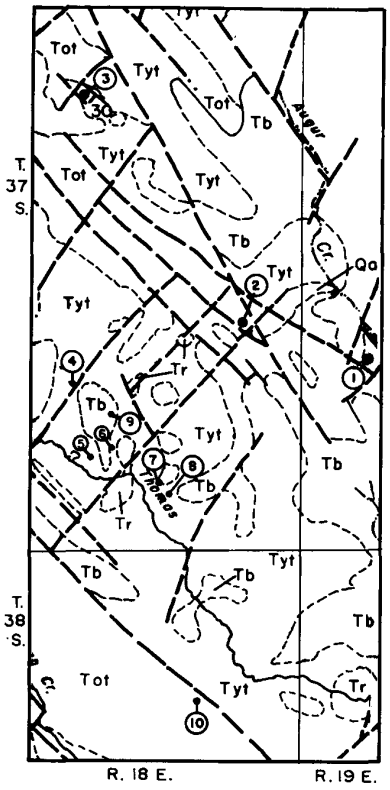
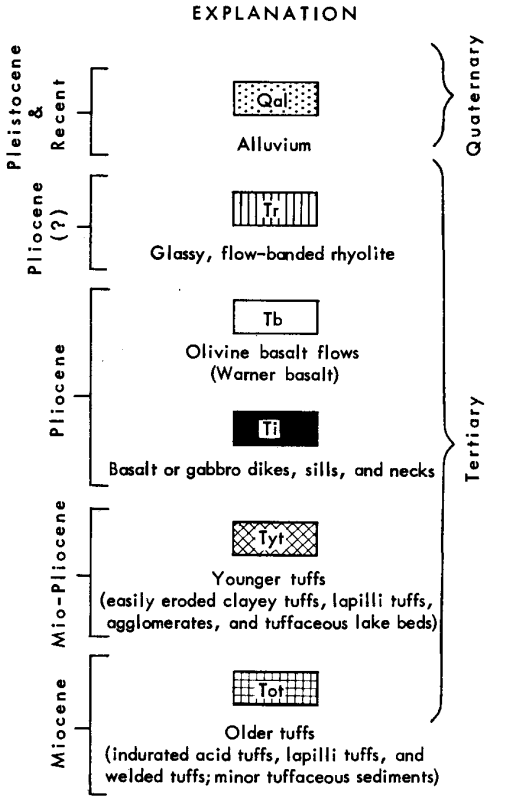


Section of Geologic Map Showing Radioactive Occurrences in the Vicinity of the White King Mine

1. White King
2. Lucky Lass
3. Marty K
4. Los Oros
5. Diamond Vee
6. Don Tracy Claims
7. Pie 1
8. Hammersley Claim
9. No Name
10. S & M #1

EXPLANATION



Dip and Strike 30

Fault

Contacts

Limit of Mapped Area

The Younger tuffs are in turn covered by a series of thin-to-thick olivine basalt flows (Warner basalt). The tuffs have been intruded by basalt dikes and sills that have a composition similar to the basalt flows.

The youngest rocks recognized in the area are light-gray glassy rhyolites that occur occasionally in dikelike masses and more commonly in conspicuous rounded to cone-shaped hills and elongate ridges.

Faulting is the dominant structural feature and controls both the topography and drainage. Field mapping has revealed a northwest-trending anticlinal fold in the northeastern part of the map area.

Stratigraphy

Older tuffs: The series of rocks that has been mapped as Older tuffs is at least 2,000 feet thick. It contains indurated light-colored acid tuffs, lapilli tuffs, welded tuffs, and a minor amount of dark red tuffaceous sedimentary beds. The color of the tuffs is variable but they are mainly tans, greens, and reddish browns. The Older tuffs occur in bold outcrops mainly in northwest-trending fault-block ridges. They are the most prominent rocks between Cottonwood Creek and Thomas Creek, and they form spectacular outcrops along U.S. Highway 66 in Antelope Canyon just west of the Goose Lake Valley.

In the lowest part of the Older tuffs there are about 250 feet of dark-red sedimentary beds. In these sedimentary beds a vertebrate tooth was found and later identified by Dr. J. Arnold Shotwell, of the University of Oregon, as being from a Diceratherium a rhinoceros of John Day age (lower Miocene). Several fossil leaves from the same fossil locality have been identified and compared to species in a flora that appears to be of Middle Miocene (Hemingfordian) age by Jack A. Wolfe of the University of California. Wolfe adds that an early or late Miocene age for these leaves would not be impossible.

Even though the lithology appears quite different this series may be correlative with a part of the Cedarville series as described by Russell (1928) in northeastern California.

Younger tuffs: The Younger tuffs are another group of highly variable pyroclastic rocks that appear to lie conformably on the Older tuffs. They are generally less indurated and consist of massive beds of clayey tuff, pumiceous lapilli tuff, agglomerates, and a thick section of thin-to-thick-bedded lacustrine sediments. The thickness of this group of tuffs is variable. As much as 1,000 feet have been measured in one section near the head of Howard Creek in the southwestern part of the mapped area. The rocks in this group are very easily eroded and usually do not form conspicuous outcrops. They are the predominant rocks northeast of Thomas Creek and underlie a large area in the vicinity of Cox Flat the largest upland meadow in the area. Along Howard Creek and to the northwest of the mapped area the lake bed section is exposed in sharp cliffs as much as 100 feet high. Fossil leaves were collected from several localities within the Younger tuffs and the one species identified is known elsewhere from late Miocene and earliest Pliocene. There is the possibility that this sequence may also correlate with the uppermost Cedarville series of Russell (1928), or with the Alturas formation in northeastern California described by Dorf (1930), and later by La Motte (1936), as having a Pliocene florule and a lower to middle Pliocene vertebrate fauna. Newcomb (1958) has recently described similar pyroclastic rocks as the Yonna formation of middle Pliocene age to the west in the Klamath Basin. No positive correlation of the Younger tuffs is proposed at this time.

Olivine basalt flows (Warner basalt): In the series of thin-to-thick olivine basalt flows that have been mapped as Warner basalt there are two distinct textural types. These textures appear to represent two periods of closely related volcanic activity. The lowermost flows are black porphyritic lavas with occasional large phenocrysts of feldspar (1 by 1-inch crystals are common) in a dense groundmass. The upper and most predominant flows are the typical light-

gray open-textured "diktytaxitic" variety of olivine basalt. Both types of basalt are highly fractured, show rough columnar jointing, and at tops and bottoms are highly vesicular. The total thickness of the basalt is variable from a few thin flows a few feet thick to many flows as much as 800 feet thick. Massive exposures of basalt are found east of Augur Creek and in the Camp Creek burn area. Residual fragments of basalt often form a thin layer on the Younger tuffs so that in most cases float cannot be used to map the underlying rocks.

The basalt appears to overlie the Younger tuffs conformably except in a few cases where the contact resembles an old erosion surface. Its stratigraphic position makes a correlation with the Warner basalt of Pliocene age plausible.

Basalt and gabbro dikes: Occasional dense to coarse-grained olivine basalt and olivine gabbro dikes and sills cut the Older tuff and Younger tuff sequences. Their composition is similar to the basalt and they are probably the source of the flows. The dikes range in size from 6 inches thick to more than 100 feet thick and some, like the prominent gabbro dike just north of Fish Lake in the southern part of the area, can be traced for more than a mile.

Rhyolite: The youngest Tertiary rocks recognized in the area are white to light-gray glassy flow-banded rhyolites that occur occasionally in dikelike masses and more commonly in conspicuous rounded to cone-shaped hills and domes. The domes appear to be accumulations of blocks and fragments of platy flow-banded rhyolite and are believed to be similar to the cumulo-domes described by Cotton (1952). Cotton describes them as being acid lavas extruded in such a highly viscid condition that they will not flow. They disintegrate explosively and while still hot are buried in debris. The highest peak in the area, Cougar Peak, is an excellent example of this type. It is a cone-shaped peak made up of rhyolitic rubble and is perched on a fault-block ridge of Older tuff. A cluster of smaller domes can be seen just north of Cox Flat.

The rhyolites appear to be in part intrusive and in part extrusive. They generally contain bands and irregular masses of white ashy material and, in most cases, intricate flow banding is highly developed. Perlite is well developed at the edges of many of the exposures and locally the rhyolite is partially to completely opalized. The age of the rhyolite is not known except that it is post-Warner basalt. The very slight erosional effects on the domes give them the appearance of being very young features and they may be of Pleistocene or even Recent age.

Structure

Waring (1908) suggested a major anticline extending from Silver Lake southward through the Goose Lake Valley. In the course of the present field work, the axis of an anticlinal fold trending about N. 35° W. to N. 45° W. was found just east of Augur Creek in the northeast part of the map area. Dips on the limbs of the fold range from 15° to 40° to the southwest and northeast.

Faulting is the dominant structural feature, in fact the whole area has been intricately faulted. The topography and drainage are controlled by prominent fault sets in three directions: N. 45° W., N. 45° E., and N. 15° E. The faults appear to be high-angle normal faults showing rather small displacements ranging from a few tens to a few hundred feet. There are at least two exceptions, however: the fault zone paralleling Mesman Creek where at least 2,000 feet of the Older tuff sequence is repeated, and again along Thomas Creek where 2,000 feet of Older tuffs are exposed in the upthrown block and the top of the Younger tuff is exposed on the northeast or downthrown side. The faulting does not appear to be of different ages, that is, one direction does not appear to consistently truncate another direction. Movements along the faults probably began contemporaneously in late Tertiary time and have probably continued sporadically up to the present.

Mineral deposits

Preliminary reports on the mineralogy and origin of the White King and Lucky Lass deposits by Schafer (1955, 1956) and Peterson (1958) show that the uranium was probably introduced into agglomerate and tuff beds of the Younger tuff unit along numerous fault and shear zones as a late phase of volcanic activity. Black uranium oxides (uraninite, sooty pitchblende, coffinite(?)) and associated realgar, stibnite, pyrite, cinnabar, molybdenum sulfides, galena, and chalcedony indicate a hydrothermal origin at relatively low temperature and pressure. Opalization and clay alteration are also prominent in the ore bodies especially in the vicinity of faults. The presence of the porous agglomerate bed with the large number of small faults probably accounts for the localized mineralization at the White King mine. Movement on the numerous faults occurred both before and after the uranium was emplaced,and ore bodies are offset by the later movement.

Although the age of mineralization has not been determined, bleaching and alteration of the Pliocene flow basalt near the White King mine and the occurrence of secondary minerals in vesicles of the basalt at the Lucky Lass deposit show that the mineralization is post basalt. The direct association with the younger rhyolite intrusive rocks makes a late Pliocene or younger age for the mineralization possible.

From a study of the White King deposit there are several structural, lithologic, and mineralogic guides that may be used to indicate a favorable location for uranium mineralization:

1. Areas in which there are intersections of fault zones or a concentration of faults or shear zones.

2. The presence of near-surface intrusive bodies of rhyolite or acid rocks and especially the contact between the glassy flow-banded rhyolite and the Younger tuff unit.

3. Silicified and opalized zones within the rhyolite or Younger tuff unit.

4. Bleached or heavily iron-stained rock outcrops should be checked for evidence of metallic minerals such as pyrite, cinnabar, or secondary uranium minerals.

After determining favorable geological locations there are many geochemical prospecting methods such as soil sampling and testing of ground water or surface stream waters that may lead to the discovery of concealed deposits.

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GEOLOGY CONFERENCE TO BE HELD AT OREGON STATE COLLEGE

Oregon State College has been singled out by the National Science Foundation to conduct the 1959 Summer Conference in Geology for College Teachers. This conference is one of 19 to be sponsored this summer by the Foundation. Other conferences will cover the fields of biology, chemistry, engineering, mathematics, physics, and psychology, and will be held at various institutions in the United States.

The geology conference will be held from June 15 through June 27, 1959, on the campus of Oregon State College. It will consist of one week of lectures and discussions followed by two field trips. The topic selected for the conference is "Stratigraphy and structural development of the Mesozoic of the Pacific Coast with particular reference to the problems of the Pacific Northwest." Noted specialists in Mesozoic geology will be on the conference staff. The following program is planned:

June 15 - Triassic - Dr. Siemon Muller, Stanford University

June 16 - Jurassic - Dr. Ralph Imlay, U. S. Geological Survey

June 17 - Cretaceous - Dr. David Jones, U. S. Geological Survey
Dr. E. L. Packard, Oregon State College (Emeritus)

June 18-19 - Structural development - Dr. A. J. Eardley, University of Utah

June 20-22 - Regional Correlation - Dr. H. E. Wheeler, University of Washington

Field trips: June 21 - Oregon Coast - Oregon State College staff

June 23-27 - Central Oregon and Columbia River Gorge

W. D. Wilkinson - Oregon State College
T. P. Thayer - U. S. Geological Survey
Ralph Imlay - U. S. Geological Survey
J. E. Allen - Portland State College

Professor W. D. Wilkinson, who was responsible for securing the grant from the National Science Foundation to conduct the conference, will be in charge. Those interested in participating in the program may obtain information and application forms from Dr. Wilkinson, Geology Department, Oregon State College, Corvallis, Oregon. Applications should be submitted as promptly as possible. Only those applicants actively engaged in teaching undergraduate college geology who have had at least three years of experience will be considered. Most of the participants will have Ph.D. degrees, although some applicants having Masters' Degrees will be chosen if they are otherwise qualified. Selection of thirty college teachers will be made.

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U.S. BUREAU OF MINES CONTINUES OUTSTANDING NEW DEVELOPMENTS

The recent announcements by the U.S. Bureau of Mines Electrodevelopment Laboratory at Albany, Oregon, of the production of ductile yttrium metal and the shape-casting of molybdenum marks two more important achievements by its staff members. These metallurgical triumphs climax 15 years of dedicated research which has gone practically unnoticed by the general public.

The Laboratory was established in 1944 on the campus of the old Albany College, and here the Bureau assembled a topnotch staff of scientists, technicians, and engineers. Today this Laboratory is recognized throughout the world as a leading metallurgical research center. Originally the facility was to develop new uses for Northwest electric power through the beneficiation of the area's raw mineral materials. In the ensuing years the scope of activities has expanded far beyond this concept and it is now engaged in not only studying processes for upgrading ores and metals but in conducting pilot-plant operations designed to smooth the difficult transition from test tube to full-scale private commercial operation. The Bureau's Laboratory does a lot of "pure" research but it should not be called an "ivory tower."

Ductile yttrium metal was long considered an impossibility, as the metal formerly produced was brittle and could not be formed. The Bureau succeeded in developing special metallurgical techniques which enabled it to produce a tissue-thin yttrium foil.

The other Bureau "first" recently announced is the shape-casting of molybdenum. Molybdenum has a high melting point and for this reason has resisted being cast in conventional molds. The Bureau solved the problem with a water-cooled copper crucible and special procedures. The missile program uses molybdenum to combat extremely high temperatures developed in exhaust systems. The new availability of cast shapes will make fabrication much simpler since pieces will not have to be machined "out of the solid."

The production of ductile zirconium, using a process perfected by Dr. W.J. Kroll, was one of the first major developments at Albany. The Kroll process was the basis for the successful processing of ductile yttrium. Zirconium and yttrium are called "reactive metals" as they are useful in atomic reactors because of special nuclear properties. Pure hafnium, another reactive metal, was first prepared by the Bureau, which also perfected a process by which columbium and tantalum could be separated economically and in sufficient volume to make the metals commercially useful. The Bureau at Albany is still the world's only source of high-purity, ductile chromium which is drawn into fine wire, made radioactive, and used in cancer research.

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DEFINITION OF "COMMON VARIETIES" IS AMPLIFIED

In a letter to Senator James E. Murray, the Bureau of Land Management's definition of "common variety" materials as provided under Public Law 167 was amplified by Earl J. Thomas, acting director.

According to Thomas, the department believes that a "common variety" of material is one that has no special physical or chemical properties which differentiate it from other deposits of such material so as to give it a special or distinct value. By stressing the chemical or physical properties of the material itself, he said, the department has attempted to differentiate from geographical location as it is of the opinion that location alone would not be a determining factor as to whether a material is a "common variety" or not.

"Under our definition of the term," Thomas continued, "limestone, quartzite, or other material valuable for metallurgy, limestone suitable for cement making, stone suitable for cutting into blocks or naturally cleavable into slabs suitable for building, or silica sand suitable for glass manufacture or foundry use, for example, would not be a 'common variety.' Such materials would remain subject to location under the mining laws upon a valid discovery and would, as in the past, be subject to patent upon proper application."

The "common varieties" of sand, stone, gravel, pumice, pumicite, cinders, clay, etc., may be acquired only under terms of the Materials Disposal Act. Since enactment of Public Law 167 on July 23, 1955, these materials are no longer considered "valuable mineral deposits" within the meaning of the mining laws, and thus no longer subject to such locations.

In Circular No. 1961, giving general mining regulations and rights acquired by location pursuant to Public Law 167, the Department of Interior has stated:

> "Common varieties as defined by decision of the department and of the courts include deposits which, although they may have value for use in trade, manufacture, the sciences, or in the mechanical or ornamental arts do not possess a distinct, special economic value for such use over and above the normal uses of the general run of such deposits." (From Pay Dirt, December 19, 1958.)

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LEGISLATIVE COMMITTEES

In January 1959 the Eighty-sixth Congress of the United States and the Fiftieth Legislative Assembly of the State of Oregon convened. It is expected that both bodies will enact laws affecting the mining industry. For convenience a memorandum of both Federal and State Senate and House committees that would deal with mining legislation is listed below:

Congressional Committees

Senate Interior and Insular Affairs Committee

Murray (Mont.), Chairman; Anderson (N.M.); Jackson (Wash.); O'Mahoney (Wyo.); Bible (Nev.); Neuberger (Ore.); Carroll (Colo.); Church (Idaho); Gruening (Alaska); Moss (Utah); Dworshak (Idaho); Kuchel (Calif.); Goldwater (Ariz.); Allott (Colo.); and Martin (Iowa).

House Interior and Insular Affairs Committee

Aspinall (Colo.), Chairman; O'Brien (N.Y.); Rogers (Tex.); Pfost (Idaho); Haley (Fla.); Powell (N.Y.), Chairman, Mines and Mining Subcommittee; Edmondson (Okla.); Christopher (Mo.); Sisk (Calif.); Udall (Ariz.); Rutherford (Tex.); Baring (Nev.); Ullman (Ore.); Anderson (Mont.); Saund (Calif.); McGinley (Neb.); Morris (N.M.); Rivers (Alaska); Burdick (N.D.); Saylor (Pa.); Wharton (N.Y.); Berry (S.D.); Westland (Wash.); Hosmer (Calif.); Chenoweth (Colo.); Collier (Ill.); Withrow (Wis.); Wilson (Calif.); Cunningham (Neb.); Langen (Minn.); and Simpson (Ill.).

Senate Interstate and Foreign Commerce Committee

Magnuson (Wash.), Chairman; Pastore (R.I.); Monroney (Okla.); Smathers (Fla.); Thurmond (S.C.); Lausche (Ohio); Yarborough (Tex.); Engle (Calif.); Bartlett (Alaska); Hartke (Ind.); McGee (Wyo.); Schoeppel (Kan.); Butler (Md.); Cotton (N.H.); Case (N.J.); Morton (Ky.); and Scott (Pa.).

House Interstate and Foreign Commerce Committee

Harris (Ark.), Chairman; Williams (Miss.); Mack (Ill.); Roberts (Ala.); Moulder (Mo.); Staggers (W.Va); Dollinger (N.Y.); Rogers (Tex.); Friedel (Md.); Flynt (Ga.); Macdonald (Mass.); Rhodes (Pa.); Jarman (Okla.); O'Brien (N.Y.); Moss (Calif.); Dingell (Mich.); Kilgore (Tex.); Rogers (Fla.); Hemphill (S.C.); Rostenkowski (Ill.); Brock (Neb.); Bennett (Mich.); Springer (Ill.); Bush (Pa.); Schenck (Ohio); Derounian (N.Y.); Younger (Calif.); Avery (Kan.); Collier (Ill.); Glenn (N.J.); Devine (Ohio); Nelson (Minn.); and Keith (Mass.).

State Legislative Committees

Senate Natural Resources Committee

Naterlin (Tillamook, Lincoln), Chairman; Thiel (Clatsop, Columbia), Vice-Chairman; Cameron (Josephine); Hopkins (Union, Wallowa, Baker); Key (Umatilla); Leth (Polk); and Ziegler (Benton).

Senate Ways and Means Committee

Alfred Corbett (Multnomah), Chairman; Cook (Multnomah), Vice-Chairman; Durno (Jackson); Key (Umatilla); Lewis (Multnomah); Thiel (Clatsop, Columbia); and Ziegler (Benton).

House Forestry and Mining Committee

Monaghan (Clackamas), Chairman; Christopher (Multnomah), Vice-Chairman; Back (Coos, Curry); Bristol (Josephine); Fisher (Lane); Flegel (Douglas); Haight (Baker); Hoyt (Benton); and Metke (Deschutes).

House Planning and Development Committee

Benedict (Multnomah), Chairman; Turner (Columbia), Vice-Chairman; Goss (Multnomah); Heider (Marion); Kelsay (Douglas); Orr (Clackamas); and Chadwick (Marion).

House Ways and Means Committee

Skelton (Lane), Chairman; Annala (Hood River), Vice-Chairman; Barton (Coos); Cady (Grant, Harney, Lake); Chadwick (Marion); Davis (Washington); and Hansell (Umatilla).

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THREE NEW LAND WITHDRAWALS

The Portland office of the U.S. Bureau of Land Management has notified the Department that three applications for withdrawal of land in Oregon were made in February. Total land embraced in the three withdrawals is a little more than 4,000 acres. Applications have been submitted to the Bureau of Land Management by the U.S. Bureau of Reclamation, U.S. Department of Agriculture (Forest Service), and the U.S. Bureau of Sport Fisheries and Wildlife. All withdrawals are subject to valid existing rights and all would prevent location of mining claims under the general mining laws. General location and bureaus requesting withdrawals are as follows:

U.S. Bureau of Reclamation - proposes to use land for reclamation purposes in the proposed development of the Lower Grande Ronde and Catherine Creek areas of the Grande Ronde Project.

T. 2 S., R. 36 E., part of sec. 34.
T. 3 S., R. 36 E., parts of secs. 2, 3, 4, 8, 9, 10, 11, 15, 16, 17, 20, and 30.
T. 5 S., R. 41 E., part of sec. 7.
Approximately 3,917 acres.

U.S. Department of Agriculture - desires use of land for the Sunshine Bar Recreation Area.
T. 33 S., R. 14 W., part of sec. 13.
Approximately 55 acres.

U.S. Bureau of Sport Fisheries and Wildlife - desires the land for use by the Oregon State Game Commission for the purpose of developing and providing public access to the Wallowa River for fishing in connection with the Wallowa River Wildlife Management Area.
T. 2 N., R. 41 E., parts of secs. 19, 20, and 30.
Approximately 140 acres.

All persons who wish to submit comments, suggestions, or objections in connection with the proposed withdrawals have 30 days in which to present their views in writing to the State Supervisor, Bureau of Land Management, 809 N.E. 6th Avenue, Portland 12, Oregon.

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STONE CUTTING AND POLISHING DESCRIBED

"Stone Cutting and Polishing," by Oliver Bowles, has been issued by the U.S. Bureau of Mines as Information Circular 7863. The 26-page publication describes techniques and equipment for cutting and polishing stones for architectural, memorial, jewelry, and other varied uses. It contains photographs and a bibliography on cutting and polishing stones and gems. The publication is available only from the Superintendent of Documents, Washington 25, D.C., at 25 cents a copy.

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CENTURY OF OIL INDUSTRY DESCRIBED

The 100-year history of the petroleum industry is presented in a magnificent issue of The Oil and Gas Journal entitled "Petroleum Panorama." This commemorative number (vol.57, no. 5, Jan. 28, 1959) traces the development of exploration, drilling, production, transportation, and refining from earliest days to the present. It contains hundreds of illustrations, many of which are published for the first time. "Petroleum Panorama" may be obtained from The Oil and Gas Journal, Box 1260, Tulsa 1, Oklahoma. The price is $2.50.

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MINING IN BAKER COUNTY, 1861 to 1959*

By
Norman S. Wagner**

Introduction

Baker County mining began with the discovery of gold in Griffin Gulch in 1861. This and the development which followed at Auburn represent gold mining at its historic best. Since 1861, much water has flowed down the sluice boxes with respect to mineral resource development within the county. As a result, the discovery story is left for historians to tell, and the following paragraphs are devoted to the high points of the many kinds of mining endeavors that occurred in Baker County between 1861 and 1959.

Hydraulic and sluicing operations

All of the earlier placer operations have one thing in common with Griffin Gulch and Auburn. This is that they were carried out by means of ground sluicing and hydraulicking, using generous amounts of hand labor. These means of handling placer ground continued in exclusive use throughout the first forty years of Baker County mining history. It wasn't until the present century that the more familiar bucket-line dredges and other kinds of mechanized digging and washing plants made their appearance. Even yet the old methods are still employed on a small scale in circumstances where ground conditions permit.

The Rye Valley placers on Dixie Creek represent a notable example of an early discovery made shortly after 1862. This placer ground lay in the bed of Dixie Creek and also on high bars blanketing the foothills along both sides of the creek. Unlike Griffin Gulch and Auburn, where production fell off drastically after a few years of intensive mining, the Rye Valley placers supported operations more or less continuously until about 1914, and mining on a small-scale basis lasted even longer. Scarcity of water forced seasonal operations which accounts in part for the long life of these placers. The mining was done by hydraulicking and ground sluicing, and the yardage of ground that was moved over the years was tremendous.

The placers of the Sparta district were also found to be auriferous at a very early date, but lack of water precluded operations until completion of the Sparta ditch in 1873. Production then flourished until about 1890 when output diminished due to exhaustion of workable placer gravels.

Other placers, some early discoveries and some not so early, were found and worked by primitive methods in many parts of Baker County. Areas include the Sumpter district placers discovered in 1862, the Mormon Basin placers, and many different localities in the Eagle, Sanger, and Burnt River districts.

While interesting stories could be told about many of these areas, the Connor Creek and Pine Creek placers are singled out here because of their similarities and differences. For example, both creeks were exceptionally rich in heavy specimen or "nugget" gold. A great number of the spectacular specimens in the famous gold exhibit of the First National Bank in Baker came from Pine Creek, and many other Pine Creek specimens have gone to collections elsewhere. On the other hand, comparatively few specimens of Connor Creek gold exist today. The reason for this is that Pine Creek placer, discovered as recently as 1897, has supported virgin production up to within the past few years and has been a source of collector's specimens. But the Connor Creek placer was an early discovery that had already been "worked over twice" when seen by Lindgren in 1901, and the cream of its nugget crop went to the melting furnaces long years before specimen nuggets were held in esteem as collector's items. After all, there once was a time when our national currency was backed by coins made of gold, even though this too is now a matter of history. The melting pot was then more important than a showcase shelf.

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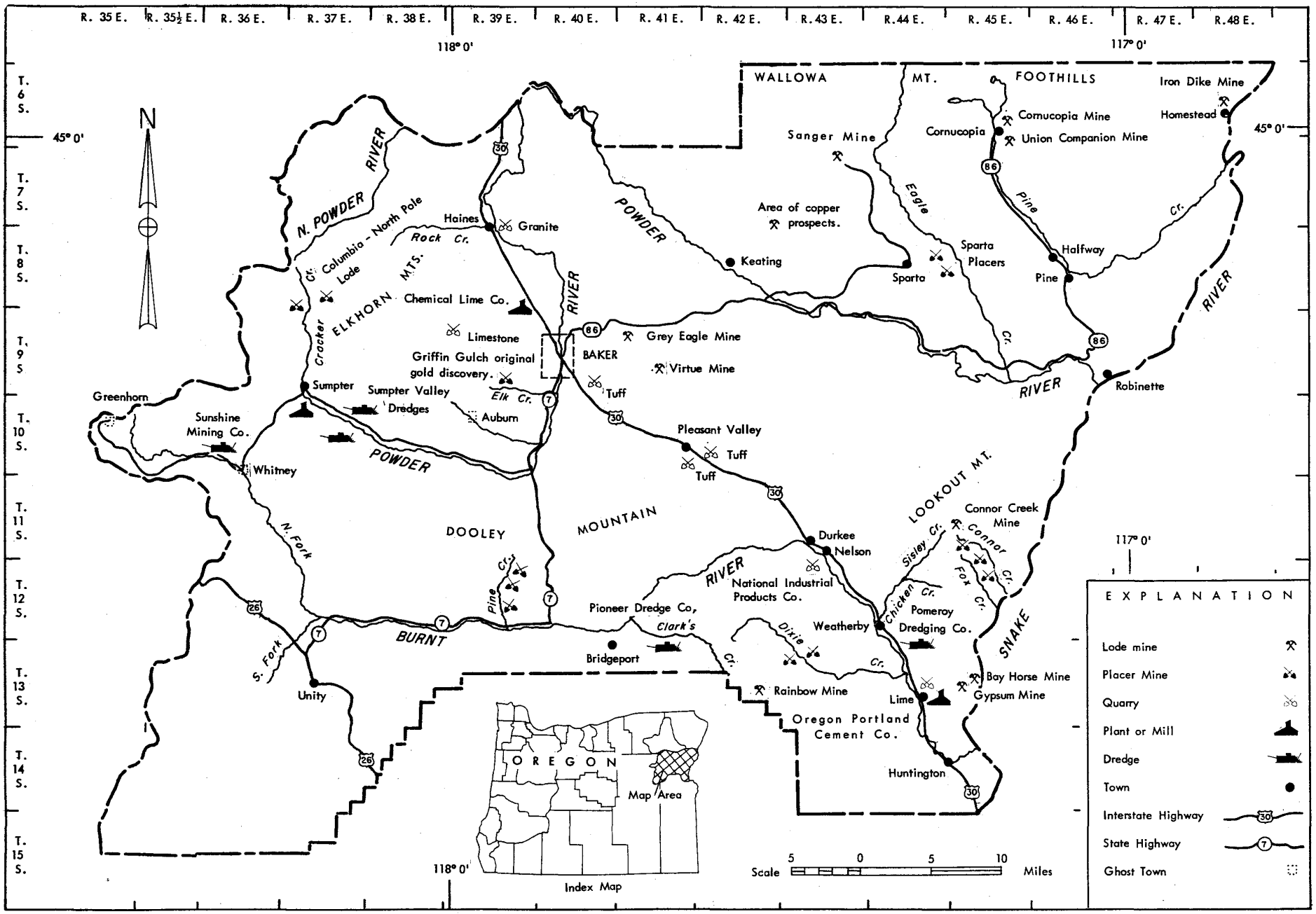
* This report was prepared for use as needed in the forthcoming Centennial Edition of the Baker Democrat-Herald, and is printed here in full with permission of the paper's editor, Mr. Bolinger.

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



BAKER COUNTY SHOWING LOCATION OF PRINCIPAL MINES 1861 - 1959

Dredging

Just when or where mechanized dredging began in Baker County is not known, but as early as 1900 a dredge of stupendous proportions was operating on the lower Burnt River at Weatherby. According to Lindgren (1901) (see list of references at the end of this report) the dredge, operated by the Pomeroy Dredging Company of Portland, was 100 feet long, 33 feet wide, of the "ladder-and-bucket chain type". The ladder was 76 feet long, equipped with 35 buckets of 5 cubic feet capacity each. Steam was the power to the tune of 6 tons of coal a day at $6 a ton and the digging capacity was 1500 cubic yards in 24 hours. Ten men were employed and total operating expenses were about $70 a day. The cost of the installations, including test prospecting, a trommel screen, and an elaborate "suspended sluice" system 140 feet long, with wooden riffles, was $68,000.

It is not known how long the Pomeroy dredge remained in operation, or with what success, but the indications are it didn't last very long or more would be known about it. During later years, several large bucket-line dredges and many other smaller shovel-fed washing plants were in successful operation at various places in the county. The number of small operations is far too great to permit individual description, although one may deserve mention for the reason that in 1940 it made headlines for the newspapers and headaches for its owners by capsizing in 15 feet of water. This was a boat operated by the Oregon Mining Company on Burnt River a few miles below Bridgeport.

The most notable of all Baker County dredging occurred in the Sumpter Valley area where a succession of both bucket-line dredges and "doodle bug" washing plants worked throughout much of the current century. Testing to determine the suitability of large-scale dredge operations in the main valley began in 1901, but it wasn't until January 7, 1913 that the first of the big bucket-line dredges went into operation. This was the "City of Sumpter" and its dedication was the occasion for a major celebration on the part of the citizens of Sumpter. The only difficulty experienced on this "beginning of the history of gold dredging in eastern Oregon" was ice on the dredge pond, according to the Blue Mountain American of January 19, 1913. From this time on until operations were discontinued in July 1954, the dredge payrolls constituted one of the principal economic mainstays to Sumpter's economy, particularly after the lode mines became inactive and local logging operations tapered off.

Operation of the first large bucket-line dredge in Sumpter Valley was begun by the Powder River Dredging Company. This company existed from1912 to 1924. In 1915 it put a second boat in operation. Whether by coincidence, or not, the last operating company was also known as the Powder River Dredging Company. This company operated from July 1950 to July 1954. Between these extremes other operating companies were: Sumpter Gold Dredging Company, 1919 to 1924; the Sumpter Valley Gold Dredging Company, 1935 to 1948, except during World War II; and the Baker Dredging Company, 1948 to 1950. About 30 men were employed by the last Powder River Dredging Company. Other bucket-line dredge operations took place in the county on Clark's Creek, near Bridgeport and near Whitney.

No total figure is available for the value of the output of these dredges, but the U. S. Bureau of Mines, Minerals Yearbook production statistics show quite clearly that this dredging contributed very substantially to Baker County's prestige as the leading gold producing county in the state.

No history of placer mining would be complete without reference to the great amount of small-scale sniper-type operations that took place during the depression. Men by the hundreds took to the hills at this time, and the hills rewarded many with what it took to keep skin and bones together until jobs in their normal fields once again became available. The Snake River in particular was dotted with the sluice boxes and wheelbarrows of these rugged individuals, some of whom worked bedrock crevices far out into the river while others centered their attention on remnants of high bar gravels plastered on the hills above the river.

Lode mines

Although some men were confirmed placer operators, there were others always interested in the nebulous "mother lode" from which the gold in the placers came. Thus it is that vein discoveries were made even during the earliest period of Oregon's mining history. The milling endeavors which followed lode discoveries included the erection of three arrastras and three stamp mills in Baker County by 1870, according to Raymond (1871).

The earliest of the stamp mills is described as being a 10-stamp mill, located on the eastern outskirts of Baker City. This mill was erected by Colonel Ruckles in 1864 to handle ore from the mine now known as the Virtue. By 1870 the Virtue had been worked so extensively that ore reserves had been largely depleted above the two tunnel levels, and the sinking of a 200-foot vertical shaft below the lowest tunnel level had reached the 50-foot mark. Between 1870 and 1898 this shaft was deepened to 800 feet. Since 1898 the mine has been inactive except for a few brief periods during which small amounts of ore have been recovered from above the drainage level.

The first mill at Sanger is understood to have been a single-bed arrastra, built by Colonel Clough on a site above the present Wendt cabin, according to Charlie Marks and the late Bert Sturgill, both old-time miners

well versed on the early mining history in the Eagle Creek district. This arrastra was replaced in 1865 by a 5-stamp mill brought in from San Francisco and erected about where the Wendt cabin now stands. The story is that Colonel Clough didn't like the mill and proceeded to build another arrastra, a large double-bed unit consructed entirely of hand-hewn timbers. Remnants of one section of this second arrastra still exist, as Mr. Marks salvaged it about 30 years ago and put it back into service at another, nearby location. The rest was destroyed during construction of the Goose Creek road which passes directly over the site where the original unit stood. According to Lindgren, the later, better known Sanger mill was a 10-stamp unit, built in 1887.

The first Connor Creek mill was a 5-stamp unit erected in 1872. In 1876, 15-stamps were in use and still larger mills were erected in later years. Incidentally, it is reported that a large part of the profits from this operation went as an endowment to Reed College. By and large, the main period of lode mining activity on Connor Creek ended by 1902.

During the ensuing years, the centers of maximum production from lode mines jumped from one district to another. For instance, the Rainbow mine in Mormon Basin is credited as the largest lode producer in the state in 1913, 1914, and 1915 (Gilluly, Reed and Park 1933). The most productive period of operation for the Cracker Creek district, above Sumpter, occurred between 1895 and 1910, ending three years before large-scale, consistent mining operations began in the Cornucopia district. During the late 1930's the veins of the Cornucopia district enjoyed the prestige of state-wide productive leadership, with the Cornucopia mine credited as being the producer of "60 percent of Oregon's output of vein gold in 1939" according to a report in the Mining Journal, January 30, 1941.

Although sporadic production began in the 1880's in the Cornucopia district it wasn't until a well-devised cyanide plant was erected at the Union Companion mine in 1913 that production got under way in earnest. From 1913 on, mining activity expanded in the area, coming to an end as recently as October 31, 1941, and then only because of operating hardships imposed by the abnormal labor and supply conditions which preceded World War II. The Cornucopia Gold mine was the last and largest of the operations active in the region at the time. About 350 men, including contractors and independent lessees, were employed during its heyday. Total production from the Cornucopia district as a whole for the period between 1870 and 1939, is estimated at $10,000,000 (Oregon Department of Geology and Mineral Industries, 1939).

The Cracker Creek district has a total production record of $9,000,000, almost all of which originated from veins and in particular from the mines located on the celebrated North Pole-Columbia lode. Although this production record is comparable to that from the Cornucopia district, the history is far different. Steam power was still in vogue when Cracker Creek was active, and the rock-drilling practices of the period would have made a 1940 miner shudder. Indeed, rock-drilling machines were so new in 1902 and 1903 that the newspapers gave headline space to stories announcing experimental introduction of this equipment by Cracker Creek operators.

Milling facilities were also crude during Cracker Creek time as compared to those available when Cornucopia was active. Thus, despite a total production of over $8,000,000 from lode sources, tailings losses of $4,000,000 were experienced by all the mills in the Cracker Creek district, according to Parks and Swartley (1916). These authors state further that $2,800,000 could have been saved in modern mills. It should be remembered, however, that their "modern mills" were based on 1916 standards, and their production statistics were calculated on the old $20.67 price of gold.

Several attempts have been made since 1910 to revive mining in the Cracker Creek lode, but none have thus far met with lasting success. Why this should be so today is easy to answer. Gold mining is at a virtual standstill throughout the nation due to the fact that the price of gold is still pegged at its pre-Pearl Harbor level while the costs of labor and supplies have risen to unprecedented highs.

Why attempts to reactivate the Cracker Creek mines didn't succeed before the war when the economic climate was favorable is another story, but reactivating old mines once they have been abandoned and caved is always fraught with abnormal difficulties. One all-too-common cause of failure is that new companies underestimate the cost of rehabilitating an old mine and exhaust their funds before getting in shape for well-established, sound operations. Other stumbling blocks in the path of reopening abandoned mines are legal complications which arise over the years with respect to titles, owners who won't lease on favorable terms, and hopeful operators who sometimes have more enthusiasm than judgment. Mining camps everywhere are faced with these difficulties and Oregon is no exception. Nevertheless, the productive history of the Cracker Creek district is such that it can be predicted that successful reactivation will surely click someday if favorable changes in the economy of gold mining ever occur.

One of the examples of attempted reactivation of the Cracker Creek mines was the erection in 1940-1941 of the modern 100-ton mill by the Ellis Company, on a consolidation of several of the important Columbia-North Pole properties. Unfortunately this endeavor was completed just prior to the start of the industrial upset brought about by the defense mobilization of World War II. As a result, the undertaking had to be discontinued before substantial production got under way. Another large-scale development program was started soon after the war when the restrictions on gold mining were lifted. This was conducted by the Solar Development Company, a subsidiary of the well-known Canadian Consolidated Mining & Smelting Company of British Columbia. The venture

was abandoned, however, when it became clear that the anticipated rise in gold price was not going to materialize. The company found it could realize far more for its development dollar in Canada where an enlightened government has always followed a realistic course of encouraging prospect development in all categories of mining endeavor. The late John Arthur of Baker is another who expended sound, ambitious efforts in fruitless attempts to reactivate the camp.

Mineral resources other than gold

Limestone: Utilization of Baker County's vast limestone resources had it humble beginning way back in the last century. This is manifest today by the remnants of small batch-type kilns at Nelson, Pleasant Valley, and Marble Creek. In these crude kilns limestone was burned with wood for fuel. Primitive though they were, the mortar made from the lime derived from these kilns was used in all the chimneys and the stone and brick buildings of the county. According to Lindgren (1901), the deposits at Lime supplied the larger part of the lime used in the state of Oregon during this period. Even the Marble Mountain limestone, which today supplies rock for the Chemical Lime Company, Baker County's newest mineral resource development and Oregon's only burnt lime plant, had its productive debut back in the 1800's.

Today, Baker County's limestone industry produces for industrial outlets never dreamed of during the last century. For example, the output of the National Industrial Products Corporation at Durkee goes primarily to the sugar-refining industry of Idaho and to various paper manufacturers. The burned-lime products of the Chemical Lime Plant have application in an even wider range of industries, one of the most important of which has to do with the manufacture of acetylene gas. Cement manufacture by the Oregon Portland Cement Company at Lime has been going on since the 1920's, and the quarries there have also been supplying raw stone to the company's plant at Oswego in Clackamas County. The Oregon Portland Cement Company recently completed a major enlargement and modernization of both its plants. Although the yearly value of all these limestone products cannot be determined very accurately, it can be stated that the annual output is several times higher than the value of Baker County's gold output during the best gold-production year on record, even with the value of the limestone figured as raw, unprocessed quarry rock.

Gypsum: Gypsum is a mineral resource closely allied to limestone in its industrial applications. No gypsum is mined in Baker County today, but it was mined extensively from the 1890's to about 1924 at an occurrence high above the Snake River below Huntington. A tramline conveyed the gypsum from the quarry to the plant. The original company in the 1890's was known as the Oregon Plaster Company. Later the Certainteed Products Company took over operations. The foundation of its large, elaborate plant was long a landmark on the old Huntington-Robinette road, but it is probably now flooded by waters of the Brownlee reservoir.

Building stone: Baker's old stone buildings are made out of blocks of volcanic tuff. Most of this rock came from quarries located at Pleasant Valley, but some also came from quarries near Baker. These quarries were operated around the turn of the century at which time the county also boasted a brick yard. Today the only stone quarried in the county is the granite extracted for monumental uses by the Northwest Granite Company from the quarries at Haines. This small but durable industry was started before 1900 and has been in continuous operation ever since.

"Coal": All mining ventures include some sad stories, and Baker County's experiences in "coal" mining are an example. Lignite, a low-quality form of coal, occurs in the county, interbedded with the Tertiary lavas and lake-bed formations which cover the older basement rocks in many places. Several attempts to mine this "coal" proved disastrous because of its high ash content, low heat value, and tendency to air slack into powder after being mined. The story goes that the Baker City school system was once talked into using this local coal, and the result was a major job of shoveling the slacked powder out of the bins. Whether this story is true or not, all geologic reports agree that good marketable coal is one thing which Baker County lacks.

Antimony: The United States chooses to rely upon imports for its source of antimony. Mining of domestic occurrences was important, however, during the emergencies created by both the first and the second World Wars. In Baker County the Koehler, or Gray Eagle mine as it was later known, yielded good, high-quality antimony ores during both emergencies. Operations during World War II were conducted by Anthony Brandenthaler, who was also responsible for the development of the Chemical Lime Company.

Manganese oxide: Baker County possesses small deposits of manganese oxide, which is also another mineral normally imported from foreign sources except during periods of national emergency. The first attempted development in the county occurred during World War I near Pleasant Valley. In recent years, limited shipments were again made from prospects in the Pleasant Valley area, from near Durkee, and most recently by Henry Spivey from an occurrence on Dooley Mountain near the head of Cornet Creek.

Copper: Copper is another mineral that has commanded much interest in Baker County. The most productive area to date has been that in the Homestead district. Gilluly (1931) states that "although the copper deposits of this region have been known for over 50 years, practically all the production thus far has come from the Iron Dike and adjacent mines at Homestead." These properties "have produced over 11,500,000 pounds of copper. They were operated vigorously for six or seven years but have been shut down since 1922." The value of the production

as given by Gilluly was "over $2,400,000". A considerable amount of new, deep-level exploration work was carried out on the Iron Dike property during World War II with the result that substantial reserves of good-grade ores were reportedly demonstrated to exist. The emergency demand for copper ended, however, before production could be gotten under way and, except for maintenance work, the mine has been inactive ever since.

The only other copper production in Baker County originated in the Keating area. This area was known way back in 1873 when, as indicated by the Raymond Report of 1873, "a furnace was erected and 4½ tons of copper were produced". Lindgren (1901), states that "100 tons of 12 percent ore" were subsequently shipped from this area. Gilluly, in his report of 1933, mentions that in 1923 some shipment was supposedly made to the Sumpter smelter. The biggest attempted development in the area started in 1926, when the Oregon Copper Company inaugurated an ambitious development program which lasted until about 1931. A vertical shaft was sunk to a depth of 1080 feet and many hundreds of feet of lateral drifting was done, but no production resulted. Between 1935 and 1938, a new company known as the Balm Creek Gold Mining Company made another operational attempt on a consolidation which included the principal prospects owned by the previous company. The old Oregon Copper Company shaft was dewatered and still more development work done. This time a 100-ton mill was erected and electrically operated by a specially built power line from Baker. Production between June 1935 and January 1938 amounted to 8,108 ounces of gold and slightly more than 4,000,000 pounds of copper, according to a letter to the stockholders dated January 11, 1938. Operating costs exceeded production values, however, and the company went out of business. There has been continued interest in prospecting in the area, but no subsequent production of any significance.

Smelters

Two smelters figure in the mining history of Baker County. Both were in Sumpter and both had their day during the opening decade of the present century. Their history has been preserved by Ed Hendryx, an early eastern Oregon newsman who never ceased to champion the cause of eastern Oregon mining until his death in 1954. Mr. Hendryx's files of newspaper clippings and other news material published between 1897 and 1909 contain a wealth of information on the early mining history of Baker County, and provided data for the following story about the smelters.

The first smelter was a 40-ton matte smelter erected by the "Union Smelter Manufacturing Company of St. Louis in the Spring of 1900", according to a clipping from the Baker City Herald of August 14, 1901.

The article goes on to state that tests of efficiency were made on ores from several different mines in the Greenhorns in Oregon and the Seven Devils area of Idaho, and that the plant was successful in turning out high-grade copper or iron matte, but that "attachments against the plant filed by ore sellers in various parts of the camp forced sacrifice at sheriff's sale". This article in the Baker City Herald, together with others in the Blue Mountain American, show that the smelter was moved to the Standard mine in Grant County in 1901, but was given up after a few months of service in favor of a concentration mill. The interesting point here is that most of the Cracker Creek mines were in active operation at the time the smelter was in Sumpter. Evidently the operators recognized that smelting was not the final answer to their milling problems.

First news of the big, better-known Sumpter smelter appeared in an account in the Sumpter Miner, April 9, 1902. In a long article, the editor explains how Professor W. S. Eberman had succeeded in interesting a wealthy eastern syndicate in the venture and that "he wants citizens (of Sumpter) to donate the site and the lime deposits... and the mine owners to give a certain amount of ore..." in return for which he would agree "to begin, practically immediately, on the erection of a 400-ton sampling plant... and a one-stack smelter of 100 tons daily capacity".

Evidently local people still did not back the smelter idea, for in an article announcing commencement of the work on the smelter, June 11, 1902, the Sumpter Miner emphasizes that the plant would be erected on 160 acres of land "paid for" by the smelter people. This article also states that "there has been an unaccountable reluctance on the part of the mine owners in contributing ore to the bonus asked for and the 3000 tons have not yet been subscribed".

A month later, on July 19, 1902, the Blue Mountain American advises that Dr. E. W. Mueller had arrived for permanent residence in Sumpter, that the company brick yard was already turning out 15,000 bricks a day, and that Dr. Mueller had stated the "mine operators are soon to learn what advantage arises from treatment of base ores at their very doors".

By May 11, 1903, the Mining Investor was able to carry a large picture of the finished smelter. The article accompanying this picture started out by chiding the "doubting Thomases" who previously "predicted" the smelter "would never be built". It concluded that the smelter would accomplish several ends: (1) "it will make many mines valuable which have before been idle on account of excessive railroad charges", (2) it would effect a saving of "thousands of dollars" for the operating mines then in existence, and (3) it will make a "handsome dividend for its stockholders". The assurance was that these benefits "will benefit Sumpter and the mines surrounding it" and will thus "add credit to the substantial reputation which Sumpter and eastern Oregon already enjoy".

In the above article it was stated that the prevailing rate of shipment to outside smelters was $7.00 a ton, that the Sumpter smelter would afford a saving of $6.00 a ton, and that, in view of the "great amounts of ore being produced" at some of the mines and the "great amounts blocked out and ready for production", it was surprising "that a smelter had not been built many years before".

The Oregon Smelting and Refining Company's plant was indeed a technically well-built plant. It was as modern and as efficient as most any smelter of its time, and was apparently staffed by competent, experienced smelter people - - from its 1800-ton capacity ore storage bins down to its 400-ton automatic sampling plant.

The Standard mine in the Quartzburg district, Grant County, is known to have been one of the smelter's biggest customers and it also is known that concentrate shipments were sent to the smelter from many other mines in eastern Oregon as well. Nevertheless, the amount of materials handled by the smelter was small during the three years its backers managed to maintain operation. This is shown by an article in the Blue Mountain American of July 30, 1910, which states that only "19,068 tons of ore, both crude and concentrates" were treated at the smelter between November 15, 1904 and November 15, 1907. Even here the article refers to the company as the "old" Oregon Smelting & Refining Company. By 1916 the Oregon Bureau of Mines and Geology (Parks and Swartley, 1916) had to report that the smelter had "been idle for several years" and had "been sold for taxes to J. A. Gyllenberg".

Not only did the smelter fail to reward its backers with the promised dividends, it also failed as the "gift of a lifetime" to the eastern Oregon mine operators. Thus ends the story of smelting in Oregon, except that the Sumpter smelter was reactivated for a short time in 1922 and 1923 by the operators of the Bay Horse silver mine near Huntington. It has since been completely dismantled, and the foundations and slag piles now remain as the only monument to this phase of the county's mining history.

Because available concentrates were far too inadequate to sustain a smelting operation of this size, even when the mines of the Cracker Creek and other neighboring Blue Mountain camps were making their best recorded productions, we raise the question of whether the building of a new smelter is really the answer to the problem of reactivating eastern Oregon's lode mines.

Every so often during recent years the citizens of Baker County have been subjected to proposals about building a smelter as a means of reactivating lode mining. If history has any lesson to teach, the answer should be quite self-evident from the record just cited. In any event, a drastic improvement must first occur in the economic climate of gold mining before a profitable reactivation of gold mining can be expected anywhere in the nation - - either with or without the aid of local smelters.

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ROCK CLUB EXHIBITS AT DEPARTMENT

The Mount Hood Rock Club of Gresham, Oregon, is exhibiting Oregon gem stones and other material in one of the Department's display cases in the State Office Building in Portland. This fine exhibit displays cut and polished agates and petrified wood, some of which are made into jewelry. Also shown are geodes, thunder eggs, and various rocks, minerals, and fossils. Localities are shown on labels accompanying the specimens. The exhibit will be on display for the next few weeks. Other rock clubs or groups who would like to show their collections are invited to do so.

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CHROME BILLS INTRODUCED IN CONGRESS

Companion bills have been introduced in the House and Senate that would provide incentive payments to domestic producers of chrome, beryl, and columbium-tantalum. Payments for commercial-grade metallurgical chromite (46 percent basis) would be $46 per long dry ton for the first 1,000 tons produced each year by each producer, and $35 per ton for each additional ton produced up to a maximum of 5,000 tons. Payments could not be made on more than 50,000 tons a year from all producers.

House Bill 5023 was introduced by Al Ullman of Oregon's Second Congressional District. "I think it is foolhardy for this country to continue the trend toward complete reliance on foreign chrome imports", Ullman stated. "We have substantial domestic chromite deposits but unless they are developed we may find ourselves totally lacking in readily available supplies of this essential metal."

Senate Bill 1245 was introduced by Senators Morse and Neuberger of Oregon and Senators Mansfield and O'Mahoney of Wyoming. Senator Morse, in introducing the bill, stated, "As a member of the Senate Committee on Foreign Relations, I feel that we should be prepared at all times to meet the Nation's needs for strategic metals and that we should not be called upon to rely solely on foreign sources and upon stockpiles that would dwindle swiftly under the pressure of defense requirements. Our reliance upon foreign sources of strategic metals is particularly shortsighted because I recall vividly the difficulties we faced during the early days of World War II when our shipping lanes were exposed to constant danger of submarine attack. Wise planning for defense emergency requires that we keep our domestic mining industry on at least a minimal operating basis to assure an existing and an expandable source of supply on short notice."

Incentive payments for beryl concentrates would be $70 per short ton for not more than 1,000 tons annually. Payments could not be made on more than 150 tons per year to any producer from his production in any one mining district. Payments on columbium-tantalum concentrates would be $2.35 per pound of contained combined pentoxides, up to 50,000 pounds per year. No producer could be paid for production exceeding 10,000 pounds annually from any one mining district.

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BIBLIOGRAPHY OF GEOLOGY THESES PUBLISHED

The Department has just published "Bibliography of Theses on Oregon Geology" as Miscellaneous Paper 7. Author is Herbert G. Schlicker, geologist with the Department. The 13-page booklet contains 191 entries representing all of the theses on Oregon geology known to have been written. Of these, 132 are the work of Oregon students; the remainder were done by students from colleges and universities in other states. Most of the theses are on file at the various college libraries.

Included with this bibliography is a large index map of Oregon showing, where possible, the location of each thesis area.

The publication is available from the Department's offices in Portland, Baker, and Grants Pass. The price is 50 cents.

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NEW OREGON MINERAL

The secondary uranium minerals from the White King mine that have previously been reported as autunite, novacekite, and/or lakeviewite have been officially described as heinrichite and metaheinrichite. The new minerals were described by Eugene B. Gross and Alice S. Corey of the Atomic Energy Commission, Richard S. Mitchell of the University of Virginia, and Kurt Walenta of Stuttgart, Germany, in the November-December, 1958 issue of the American Mineralogist in an article entitled "Heinrichite and metaheinrichite, hydrated barium uranyl arsenate minerals". These minerals have thus far been found at Lakeview, Oregon, and in the Black Forest of Germany. They are named for Professor E. William Heinrich, University of Michigan.

Heinrichite and metaheinrichite are found at or near the surface at the White King mine near Lakeview, Oregon. The crystals that coat fractures and line vugs in light gray, altered, silicified rhyolite tuff, are transparent to translucent and yellow to green in color. They have a vitreous to pearly luster and fluoresce bright green to greenish-yellow under short and long wave ultraviolet light.

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SOVIET FOREIGN MINERAL TRADE EXPANDING RAPIDLY

The U. S. Bureau of Mines, Division of Foreign Activities, recently published a resumé of the foreign mineral trade of the USSR in 1957. The review, part of which is given below, notes that the value of mineral exports increased in the 3-year period 1955-57 by more than 68 percent, while the value of all exports increased 26 percent. The greatest gains in the Soviet mineral export trade were made in the field of mineral fuels where the value of solid and liquid fuels doubled in the 3-year period. The principal export in the category of ore and concentrates was iron ore which was shipped exclusively to the Soviet's European satellites. Exports of ferrous metals increased at approximately the same rate as total exports, while nonferrous metal export showed a gain of over 80 percent. The greatest increase in nonferrous metal export was made in shipments of zinc, lead, aluminum, and tin. The value of Soviet foreign trade in nonmetals changed in step with overall trade. Apatite concentrates and asbestos headed the export list.

The Bureau report is to be found in Special Supplement 56 to vol. 48, no. 1 of Mineral Trade Notes, January, 1959. Those wishing the complete report should write to the U. S. Bureau of Mines, Publication Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pennsylvania. The foreign mineral trade of the USSR in 1956 by the Bureau was reprinted in part in the October 1958 issue of THE ORE.-BIN.

Soviet Foreign Mineral Trade - Evolving Patterns

The "Statistical Review of the U.S.S.R. Foreign Trade in 1957" has now been issued. This review, together with the Mineral Trade Notes, Special Supplement No. 55, Vol. 47, No. 3, covering the years 1955 and 1956, completes a 3-year statistical series in Soviet foreign trade. To the extent that trade statistics for any 3 consecutive years can reflect basic trends, certain patterns appear to be evolving in the Soviet Union's foreign-mineral trade. These patterns appear to be consistent with the reported Soviet economic expansion program and its drive towards greater mineral self-sufficiency.

Although some trends may not as yet be recognized, there can be no mistake about the great importance of minerals and metals in the Soviet foreign-trade picture and in Soviet relations to other countries within and without the bloc.

Overall mineral trade. - The growing mineral and metal self-sufficiency of the Soviet Union has enabled that country to increase its exports of mineral commodities. During the years 1955-57, the value of mineral and metal exports increased at a much greater rate than total trade. In fact, while the value of all exports during that 3-year period increased by 26 percent, the value of mineral exports increased by more than 68 percent. Thus, the proportion of mineral commodity exports expanded from approximately one-quarter of the total in 1955 to nearly 35 percent of the total in 1957.

However, the ruble value of mineral imports increased only 36 percent during the same 3-year period, and the proportion of these mineral imports remained at a more or less even level of about one-quarter of the total trade.

These trends are reflected in the following tabulations:

	In Million Soviet Rubles		
	1955	1956	1957
Exports:			
Total value of exports	13,874.3	14,676.8	17,526.0
Total value of mineral exports	3,615.8	4,553.4	6,078.6
Mineral exports as percent of total exports	26.1	31.0	34.7
Imports:			
Total value of imports	12,242.2	14,452.5	15,751.3
Total value of mineral imports	2,853.9	3,727.2	3,868.6
Mineral imports as percent of total imports	23.3	25.8	24.5

Note: The nominal commercial exchange rate is four Soviet rubles equals one U. S. dollar

Although Soviet-export statistics include re-exports, it is evident that an increasing quantity of indigenously produced minerals and metals are being exported. This trend undoubtedly will continue for some time as the USSR broadens its domestic mineral production base and seeks to demonstrate its mineral wealth and growing mineral output to economically underdeveloped nations.

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AIME TO HOLD PACIFIC NORTHWEST REGIONAL CONFERENCE

The American Institute of Mining, Metallurgical, and Petroleum Engineers will hold its Northwest Regional Conference at the Olympic Hotel in Seattle, Washington,on April 16 and 17, 1959. The Conference, sponsored by the North Pacific Section of AIME, will consist of addresses, field trips, and nine technical sessions. Originally, the Conference was devoted entirely to industrial minerals, but in succeeding years other sessions have been added until now every phase of the mining, metallurgical, and petroleum engineering fields is included.

The geology technical session will have the following papers: "Mercury in Oregon" by Howard C. Brooks, "Coal Resources Investigations in Washington" by Howard D. Gower, "Black Sands of Central Idaho" by C. N. Savage, and "Shales for Expanded Aggregate in the North Pacific Coast Area" by H. M. Harris. The various educational aspects of nuclear engineering will be discussed in four papers presented by University of Washington faculty members. There will be five papers on mineral beneficiation, five on extractive metallurgy, three on petroleum engineering, four on industrial minerals, and others on iron and steel, mining, and metals.

Speaker at the Thursday luncheon will be Dr. H. DeWayne Kreager, Director, State of Washington Department of Commerce and Economic Development, who will talk on the "Economic Factors Affecting the Growth of the Pacific Northwest". At the Friday luncheon Howard C. Pyle, President of AIME will be the speaker. Mr. Pyle has long been identified with the petroleum industry and is currently a director of the American Petroleum Institute and the Western Oil and Gas Association.

Two field trips have been planned for Thursday afternoon and evening. One trip will be to the Bethlehem Pacific Coast Steel Corporation plant where a new electric furnace will be inspected. The second tour will be to Boeing's Renton plant to see the new 707 jet passenger plane. A dinner dance Friday evening will wind up the Conference. The Women's Auxilliary has planned several social events for women attending the Conference. Women are also invited to attend the technical sessions, luncheons, and field trips.

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NEW HOUSE BILL ON SAND AND GRAVEL

Hearings on House Bill 472, which relates to removal of sand and gravel from streams, were held on Monday evening, March 9. The bill, introduced in the State Legislature by Representative Holmstrom (Clatsop County), provides that any person or any State or Federal agency desiring to remove gravel, sand, or other material from the bed of streams in the State of Oregon must notify the State Fish Commission or the State Game Commission. Within thirty days after the receipt of the notice, either of the commissions shall inspect the location to determine whether such operations will be injurious or destructive to food fish or game fish. If the study by the State commissions indicates that damage will be done, they shall so notify the operator and it would then be unlawful to remove material from the stream. As a result of the hearings, it is understood that amendments will be made and the bill brought to the House floor in the near future.

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WITHDRAWAL OF PUBLIC LANDS PROPOSED

The U. S. Bureau of Land Management notified the Department on March 19th of a proposed withdrawal of approximately 1,340 acres in Lake County, including all, or parts of, secs. 7, 8, 9, 10, 13, 14, and 15, T. 33 S., R. 18 E. The proposed withdrawal is requested by the Bureau of Land Management for the purpose of creating a stock driveway along the Fremont Highway (State Highway 31).

The withdrawal is subject to valid existing rights, from all forms of appropriation under the public land laws, including the general mining laws, but excepting the mineral leasing laws, grazing of livestock under the Taylor Grazing Act (48 Stat. 1269) as amended, and disposal of materials as provided for in the act of July 31, 1947, (61 Stat. 681; 43 U. S. C. 1185), as amended.

All persons who wish to submit comments, suggestions, or objections in connection with the proposed withdrawal have 30 days in which to present their views in writing to the State Supervisor, Bureau of Land Management, 809 N. E. 6th Avenue, Portland 12, Oregon.

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OIL RECORDS RELEASED FROM CONFIDENTIAL FILES

Records on Oroco Oil and Gas Company's "McBride No. 1" (Permit No. 19) were released from the confidential files on February 1, 1959. The well was drilled in the SE¼ sec. 19, T. 16 S., R. 46 E., Malheur County. Total depth was 4506 feet.

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HIGHLIGHTS IN THE HISTORY OF GOLD PRODUCTION IN THE UNITED STATES

By
Pierre R. Hines*

Introduction

While tracing the development of ore dressing in the United States, particularly before the time when flotation became prominent, plots were made showing the yearly production of gold, silver, copper, lead, and zinc in some of the famous mining districts. Plots of this kind were prepared as they reflect a number of factors, such as demand, price, cost, grades of ore, new uses, new mining discoveries, new processes, labor conditions, and managerial ability. When these data were assembled they attracted the attention of others. In the belief that the plots (Figures 1, 2, and 3) dealing with gold and silver would have general appeal, they were assembled and are presented here together with brief interpretations.

Although the future of the gold mining industry is uncertain at the present time, trust in gold as a basis for a sound currency has returned to the world after many years. The theory of Lord J. M. Keynes, the British economist, that gold was no longer necessary as a stable measure of value and a backing for currency has been disproved. The usefulness of gold as a universal means of exchange is not finished.

As a matter of interest it should be noted that plans are being made to devote a whole day at the April 1960 AIME Pacific Northwest Regional Conference to the discussion of the many problems of gold. It is hoped that authorities can be obtained to present the viewpoint of the gold miner as well as the opinions of those in domestic and international banking and national government.

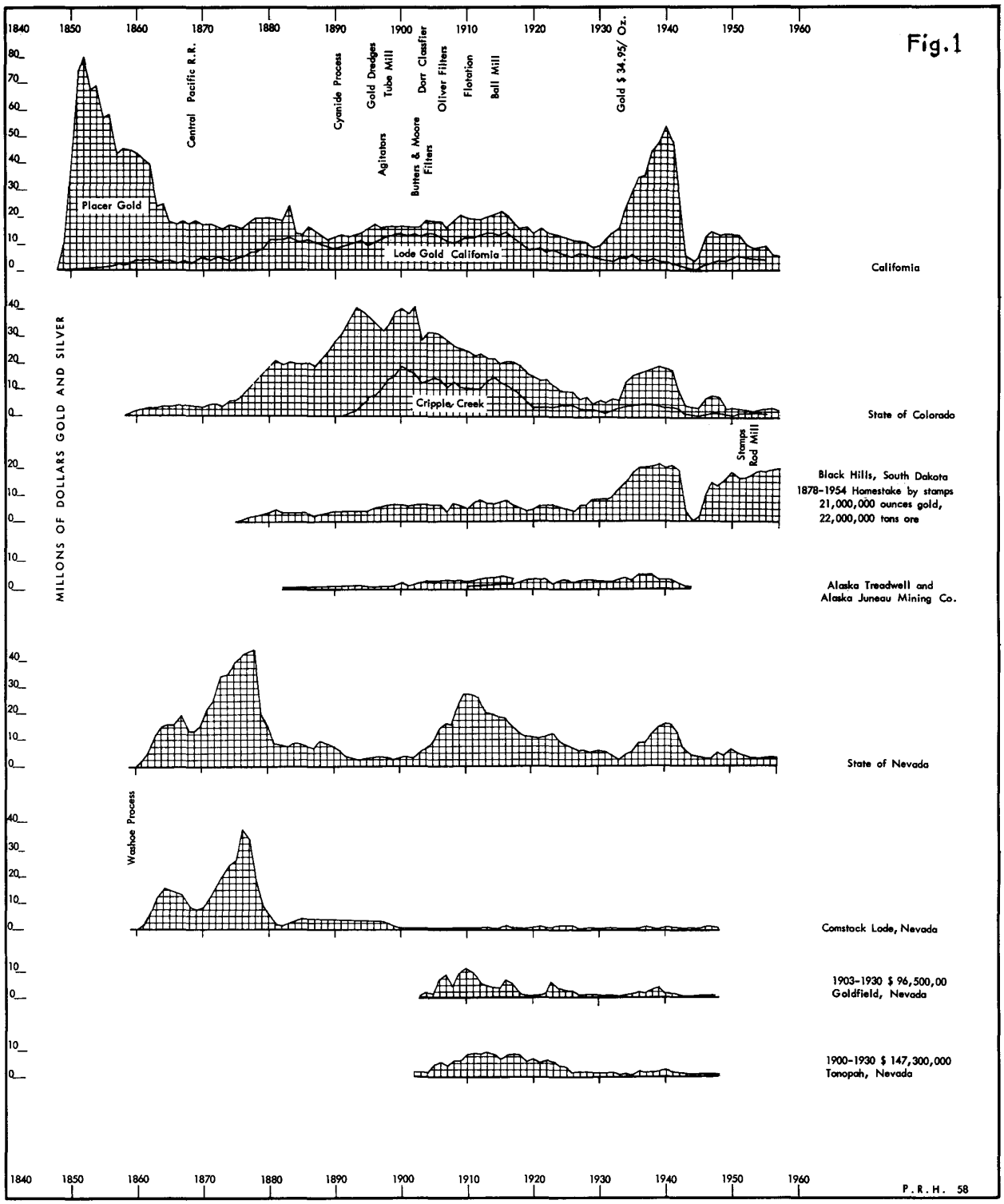
California

California ranks first in the United States in the total amount of gold produced. The plot for California (Figure 1, p. 32) shows graphically the relative amounts of gold which came from both placer and vein or quartz mining. Up to 1865, vein mining accounted for very little of the gold, as the discovery of the Comstock in Nevada in 1859 drew away the few California hard-rock miners. But in 1864, experienced hard-rock miners returned to California and from this date vein and quartz mining flourished as placer mining declined.

The persistence of the ore chutes, cheap water power, and low mining costs sustained the California gold mining industry for many years. Improvements in gold metallurgy did not have the pronounced effect they did elsewhere because early amalgamation and concentration methods gave high yields or recoveries.

The first gold dredge was built in 1896, and from that time on the ability of dredges to handle a large yardage of gravel at low cost prolonged the working of the placer deposits. The exhaustion of placer ground is responsible for the decline of gold dredging rather than the inability of dredges to operate under present high costs of labor and material.

*Mining Engineer, Portland, Oregon.



PRODUCTION OF IMPORTANT GOLD AND SILVER MINING DISTRICTS OF THE UNITED STATES

The increases in the price of gold starting in 1933 stimulated dredging and placer mining more than vein mining and resulted in the peak of 1933 to 1942. The order of the United States Government closing all gold mining operations in 1942 is shown on the graph by a deep valley. The pegging of gold at $35.00 an ounce, together with the rising costs of labor and material, has closed practically every underground gold mine in California today. Dredging continues where good gravel still remains.

Nevada

The State of Nevada plot (Figure 1) shows three peaks. The first peak was made by the discovery of the Comstock lode in 1859, followed by the discovery of the "Big Bonanza" in 1872. The ore contained about 55 percent silver and 45 percent gold in dollar value of that time, and was a gold-silver ore.

The Comstock advanced underground mining practice, particularly in mechanical equipment, such as hoists, pumps, and the first air compressor in the West. Philip Deidesheimer devised the square-set mining method there in 1860. Clarence King, the head of the Fortieth Parallel Survey, together with the Hagues and Emmons, studied the geology of the Comstock lode, one of the first applications of geology to mining. The Washoe amalgamation process was developed from the old Patio amalgamation process to treat Comstock ores. The stamp mill was greatly improved and Blake crushers were used by several mills, although crushing and feeding the stamps by hand was considered superior by many mill superintendents. There were 77 mills with 1433 stamps in operation in 1866, a few driven by water power but the greater part driven by steam. This vast output of gold and silver helped to restore the national credit after the Civil War.

The second peak in the Nevada plot was made by the discovery of the Tonopah and Goldfield mining districts, the last great gold strikes in the United States. During their relatively short life, these two camps made notable contributions to the development of the cyanide process and to the training of technical mill men. Machinery, equipment, and personel were factors in the success of the flotation process which was developed later on.

The third peak of the Nevada plot resulted from the increase in the price of gold.

Colorado

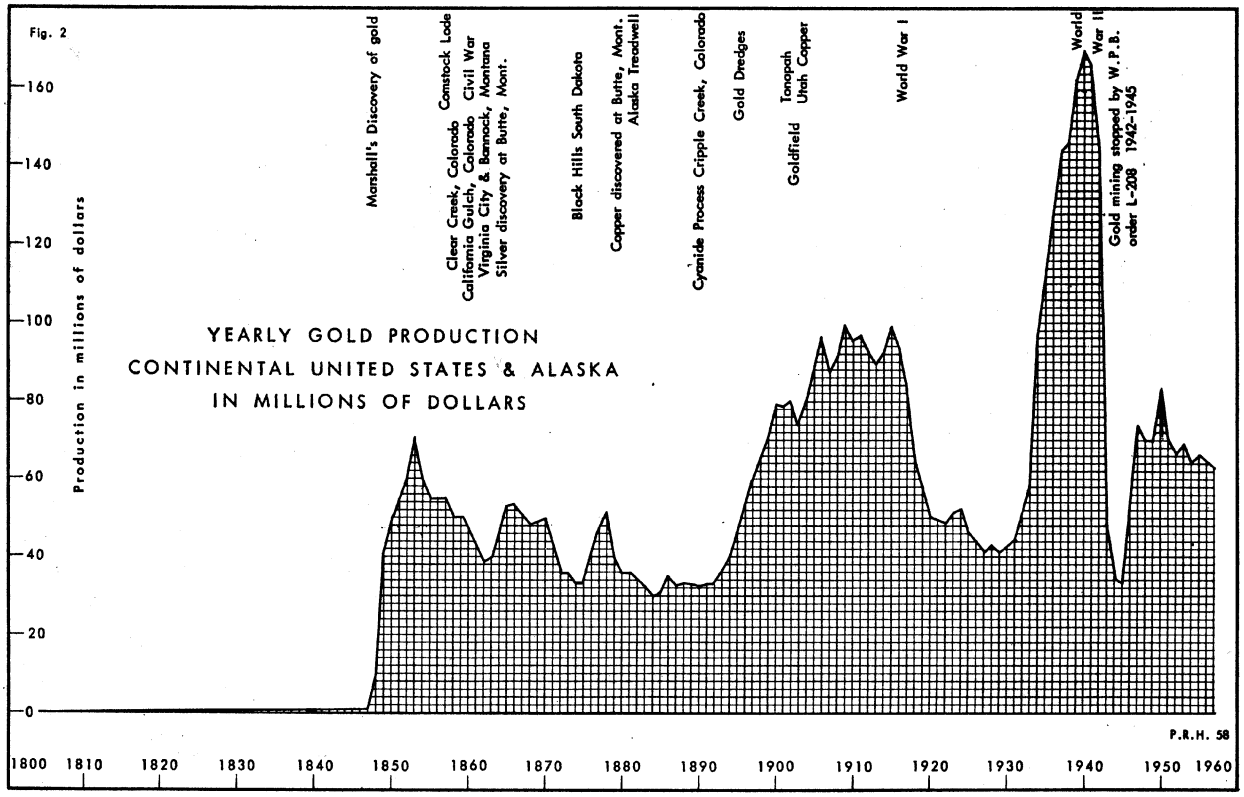
Colorado (Figure 1) has a number of gold and gold-silver mines and districts, as well as notable silver production from the lead-silver district at Leadville. Early gold production came from Gilpin County and Idaho Springs, some of it from placers and some from weathered overburden near the outcrops of veins. California Gulch was worked for placer gold from 1860 to 1875 when lead carbonate was found. Further search disclosed rich lead-silver ore and Leadvile was born. There is a long list of famous gold and silver mines, particularly in the "silvery San Juan," which were exhausted long ago. Cripple Creek was discovered in 1891 and was the great gold strike of Colorado. It is difficult to break down the Colorado production of gold and silver into a few plots or curves. Cripple Creek has been separated from the total of Colorado and shows its relative rank well. Cripple Creek's boom days are over but it continues to operate steadily in a small way and ever so often another new ore body is found.

South Dakota

Almost all of the gold on the South Dakota plot (Figure 1) came from the Homestake Mining Company in the Black Hills. The Homestake was a financial success from the start. The ore occurs over a wide area and is persistent; mining is only now, after 80 years, becoming deep. Milling started in 1878 with an 80-stamp mill, and operations were expanded at various times until 1000 stamps were operating in 1904 with a capacity of 4000 tons daily.

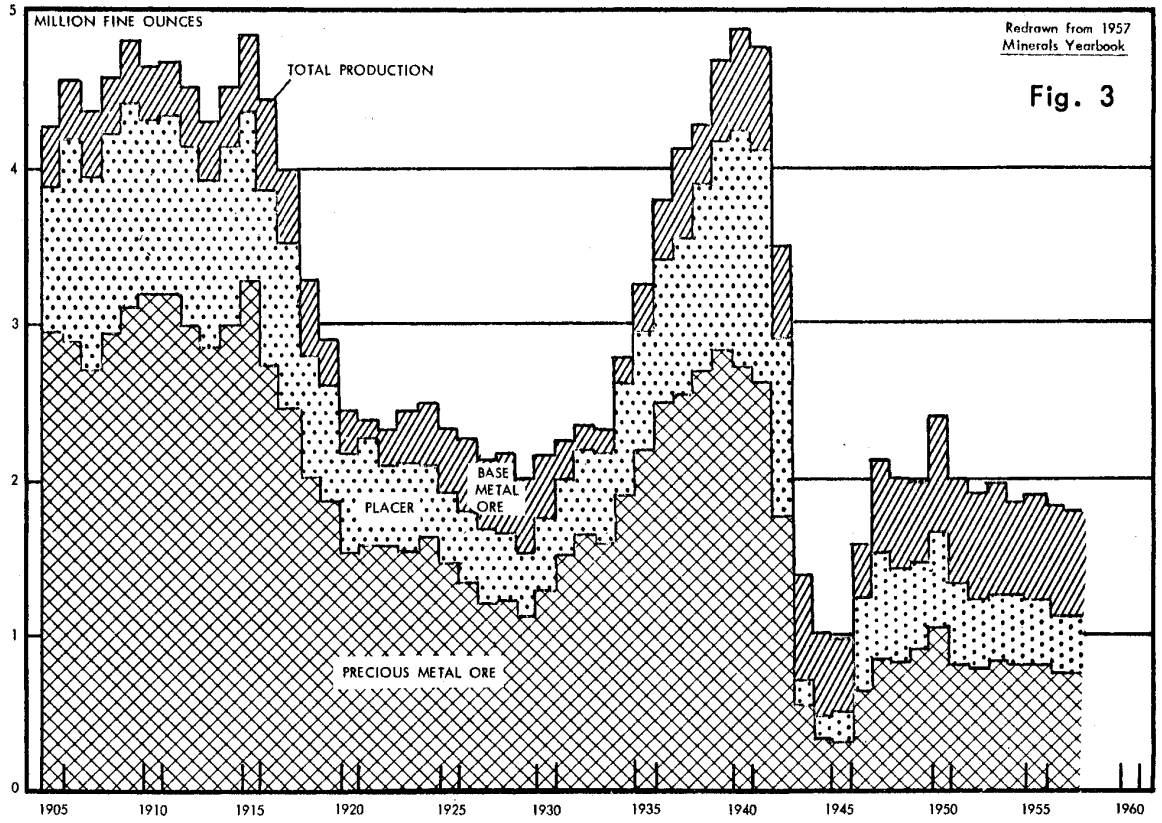
The gold recovery was 72 percent by amalgamation. The sands were cyanided in 1901 and the slime in 1906. As a result, recovery rose to around 94 percent. Although improvements and changes had been made in grinding, stamps were not retired in favor of a rod mill-ball mill grinding flow sheet until 1953.

The plot in dollars for the Homestake shows a very even line over a long period. The peak starting in 1932 is due in part to increased production but largely to the raise in price of gold from $20.67 to $35.00 an ounce. The valley is due to the Government order shutting down gold mines in 1942. The Homestake is one of the great gold mines of the world, and is remarkable because it has survived and is still operating at a profit in the face of the present increases in labor and material.



Alaska

The Alaska Treadwell, Alaska Juneau, and other mines in the Juneau district (Figure 1) produced gold for more than fifty years until they were closed by Government order in 1942. The ore bodies were large, extensive, and low grade, and could be mined by cheap methods. Milling and recovery of gold was simple as the ore was "free milling." The mines were on tide water with water transportation for supplies from Seattle and San Francisco and for return of concentrates. The tonnage mined and milled was large, but the yield low and so the plot does not show the prominence the district held in the mining industry. The costs of mining and milling still stand as the lowest over a long period of years. The Treadwell hanging wall collapsed in 1917, with fracturing extending to the channel, permitting salt water to enter and flood the mine. The Alaska Juneau never opened after World War II due to prohibitive costs of labor and material. There are still large tonnages in the Treadwell, Juneau, and Gastineau mines which would be classified as ore reserves under the economic conditions of the thirties.



GOLD PRODUCTION IN THE UNITED STATES, 1905-57.

Production

The yearly gold production for the continental United States (including Alaska) is shown in millions of dollars by Figure 2 and in ounces by Figure 3. Figure 3 shows also the relative amounts of gold from precious metal ore, placer mining, and from base-metal ore (copper, lead, and zinc).

These plots (Figures 2 and 3) show two peaks: the 1915 peak at 4,887,602 ounces valued at $101,035,700, and the 1940 peak at 4,869,949 ounces valued at $170,448,215. Two troughs are also indicated. The first trough starts at the beginning of World War I, and ends in 1933-1934 when the world price of gold went up and the United States Treasury raised its price upon newly mined gold. The bottom of this trough was in 1929 at 2,058,993 ounces valued at $41,179,860. The second trough, commencing in 1942 and ending on July 1, 1945, was created by War Production Board Order L-208 declaring gold mining nonessential to the war effort.

Wages and materials rose after World War II to a point where many gold mines could not operate profitably with the price of gold fixed. The continued rise in prices forced many of those who had resumed mining to quit. The production by 1957 had dropped to 1,793,597 ounces valued at $62,686,215.

Sources of production

The change in sources of gold before and after World War II is shown below.

Source	1940 Percent	1940 Ounces	1957 Percent	1957 Ounces
Precious metal ore	57	2,776,000	43	771,000
Placer mining	30	1,461,000	19	340,000
Base-metal ore	13	633,000	38	682,000

Unfortunately gold deposits rarely occur in a form suited to large-scale open-cut mining methods with a high tons-per-man shift output that would keep down rising costs. In the beginning, some deposits were mined by open-pit methods at the surface but now they are confined to deep underground methods with a small tons-per-man shift production and high mining costs. If the grade of ore can be raised, the high cost of mining and fixed price of gold can sometimes be met.

The gold dredge digs a high yardage-per-man shift and can operate profitably under today's conditions, particularly if the investment in the dredge was made prior to World War II. Yardage sufficient for large capacity dredges is difficult to find and the known yardage is being rapidly exhausted.

Gold production from the base-metal ores continues at about the same rate and as a by-product. The Utah Copper Company has been the second largest producer of gold for the past nine years and the leading producer in 1943, 1944, and 1945, crowding Homestake from first place. Although Utah Copper's ore yields only 0.011 ounce gold per ton, 31,000,000 tons of ore were mined and milled in 1957 and approximately the same for other years.

The gold and silver production of the United States has come from a few great mining districts. There were a number of short-lived "strikes" which produced notable amounts of gold and silver but they would not show up at the scale of these plots. It is significant that no great gold or silver "strikes" have been made since World War II. It appears that our future requirements of gold and silver will have to come more and more as a by-product of base-metal ores.

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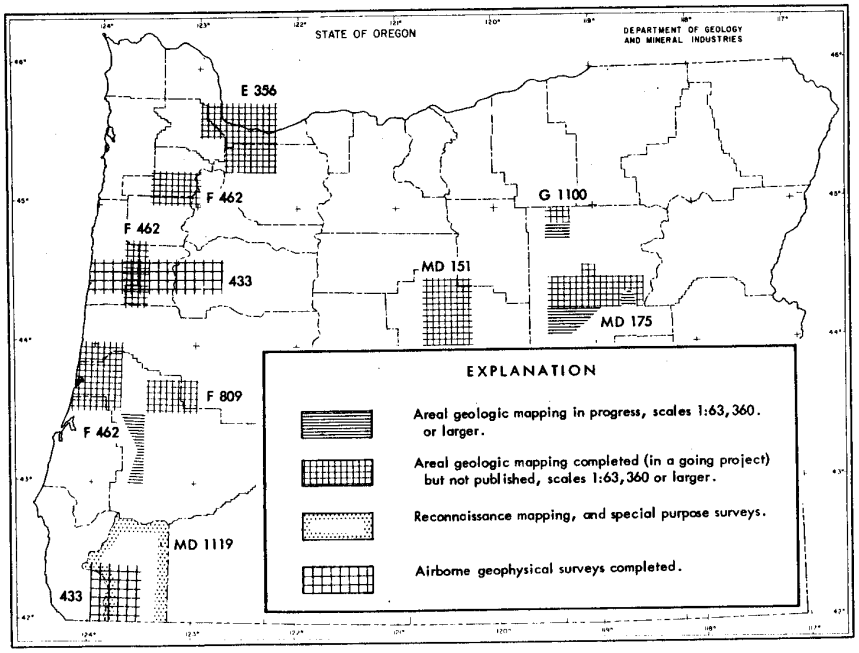
FIELD PROJECTS IN OREGON

The Geologic Division of the U.S. Geological Survey has released three index maps showing location of field projects in the United States and Alaska as of July 1, 1958. The maps are available for inspection in open files at western Survey offices in Denver, Spokane, Menlo Park, and Anchorage. Projects under way in Oregon are shown on the accompanying map and are listed below.



Map No.	Project and Chief
E 356	Portland industrial area (Trimble)
F 462	Coast Range (Baldwin)
F 809	Anlauf-Drain area (Hoover)
G1100	Geology of Monument 15-minute quadrangle (Wilcox)
MD 151	Oregon quicksilver (Waters)
MD 175	John Day chromite (Thayer)
MD1119	Klamath nickel (Hotz)

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NIEL R. ALLEN

Niel R. Allen passed away suddenly at his home in Grants Pass on April 13th, bringing to a close a career of wide interests and activities. Mr. Allen served on the Governing Board of the State Department of Geology and Mineral Industries from 1943 until 1957, and was chairman of the Board for six years. He had a great interest in developing the State's mineral resources, particularly those of southwestern Oregon.

Allen was prominent in civic, political, and veterans' affairs in many ways. He was a past Oregon Department commander of the American Legion and for the past 14 years had been national chairman and vice-chairman of the Legion's Civil Defense Committee. He also had served as a member of the National Citizens Committee for Government Reorganization.

Allen was born in Pullman, Washington, May 1, 1894, graduated from Stanford University in 1918, served as a second lieutenant in the infantry in World War I, and received his degree as Doctor of Jurisprudence from Stanford Law School in 1922. He had practiced law in Grants Pass for the past 37 years.

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GEOLOGY OF OREGON PUBLISHED

"Geology of Oregon," by Ewart M. Baldwin, Professor of Geology, University of Oregon, has just been published and is available from the University of Oregon Cooperative Book Store, Eugene, Oregon. The price including postage is $2.10.

This long-awaited and much-needed book is being greeted with considerable enthusiasm by all who see it, and no one could have been better qualified to write it than Professor Baldwin. The book is abundantly illustrated with photographs, geologic maps, charts, cross sections, and line drawings. It is paper-bound, has 138 pages, and measures 8½ by 11 inches. Pen and ink sketches of prehistoric scenes, such as appear on the cover, were done by artist Harold Cramer Smith.

In this book, Professor Baldwin has brought together in a very readable manner, a great deal of information that was formerly scattered through numerous published and unpublished reports. The book is concerned mainly with stratigraphic geology, which is presented regionally according to the eight main physiographic divisions of Oregon. These are: Coast Range, Willamette Valley, Cascade Range, Klamath Mountains, Deschutes-Umatilla Plateau, Blue Mountains, High Lava Plains, and Basin and Range-Owyhee Upland. Resumes of physical and historical geology as they pertain to Oregon are included to give the reader a basic understanding of these aspects of geology.

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WHITE KING URANIUM MINE CHANGES TO OPEN PIT

On April 12, the Lakeview Mining Company entered into a contract agreement with the Isbell Construction Company of Reno for open-pit production of uranium ore at the White King mine, it was announced by James F. Poulos, LMC general manager. The Isbell company is to be on the site in about four weeks with a full crew to begin expanding the stripping area already opened by LMC. The initial stripping will cover an area 700 by 400 feet.

Underground mining operations were discontinued on Monday, April 13, and the men are engaged in salvaging the rails, pipe, machines, ore cars and other equipment used below ground. The change from underground ore production was made necessary by the problems presented by heavy ground conditions.

Operations at the reduction plant will continue without change, and the ore haul from the White King will be made by the Lakeview Logging Company as in the past.

(From The Ore Bucket, April 20, 1959.)

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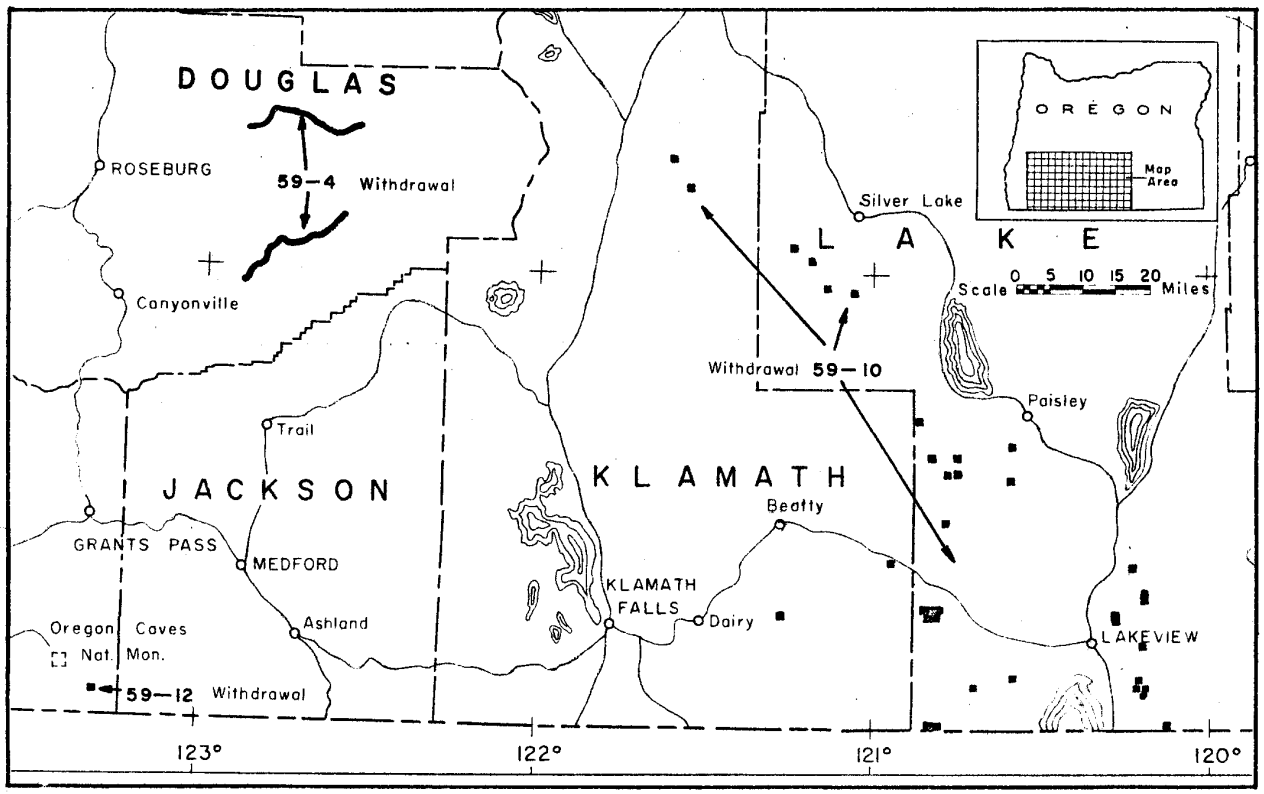
LAND WITHDRAWALS ANNOUNCED BY BUREAU OF LAND MANAGEMENT

Three more notices of proposed withdrawal and reservation of lands were received by the Department from the U.S. Bureau of Land Management during April. Location of the various tracts involved in the proposed withdrawals are shown on the accompanying index map. Withdrawal 59-4 includes 3,540 acres along the North Umpqua Forest Highway No. 47 and the South Umpqua Forest Development Road No. 284 in the Umpqua National Forest. The withdrawal would create a strip 330 feet wide on both sides of the roads and would be used "to protect and preserve the aesthetic values" and for the eventual establishment of camp and picnic grounds. Withdrawal 59-10 would set aside 2,781 acres for administrative sites and public recreation areas in the Fremont National Forest. A total of 30 sites is included. Withdrawal 59-12 would be for a 190-acre camp ground on Steve Fork in the southeastern corner of Josephine County.

The Department has been getting notices for withdrawals in Oregon since April 1957. In this 2-year period, 21 separate notices have been received proposing single-purpose use of 70,899 acres. These withdrawals are in 16 of the State's 36 counties.



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QUICKSILVER PRICE INCREASING

The price of quicksilver on April 23 was $242-247 per flask, New York, according to E&MJ Metal and Mineral Markets. This is the highest price quoted for quicksilver since July 25, 1957, when the price was $255. The highest price in 1958 was $240 on September 3. From September 1958 until December 24, the price declined steadily until a low of $218 per flask was reached. This price remained until March 12, 1959, at which time the market increased gradually to its present high.

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TREASURY REAFFIRMS ITS POSITION ON GOLD

As in past years, the Treasury Department -- with the full concurrence of the State Department -- has advised Congress that "Our goals of economic stability and sound money require a continuation of our policy of maintaining the price of gold at $35 per ounce," thus dampening the hopes of the gold mining industry for legislation permitting a realistic re-apprasial of the value of gold in terms of today's depreciated dollars.

In reporting to the Senate Banking and Currency Committee on a bill (S.532) which would permit the buying or selling of gold on the open market without restriction, the Treasury noted that "This would involve a second, unofficial price for gold which would fluctuate at variance from the official price depending upon the demand for a relatively small amount of new gold production."

The report continued: "The value of the dollar is firmly linked to gold; the official value of $35 per fine troy ounce was established in 1934. This relationship has contributed to the maintenance of a stable and strong financial structure in this country and to the soundness of our domestic economy. Foreign countries have also come to rely on the dollar as a strong and secure currency firmly fixed in value in terms of gold.

". . .Accordingly, the Treasury Department is opposed to the enactment of legislation which would have the effect of creating variable prices for gold in terms of the dollar in domestic and foreign markets. We believe that the adoption of any such proposals would tend to undermine confidence in the currency and thus would be a step away from a sound monetary policy."

Treasury's view was seconded by the State Department in reports on S. 532 and on a similar measure (S. 590) which would also require the Treasury to pay $70 per ounce for domestically mined gold. "We believe that a rise in the official price of gold or the establishment of a different and fluctuating price for domestic gold would adversely affect the United States economy and not be in the best interests of this country," the State Department said.

The Interior Department, in reporting on the same bills, made no recommendation regarding enactment, on the basis that their impact "would be on the monetary and fiscal policies of the United States, which are matters outside the jurisdiction of this Department."

Similar reports were filed with the House Banking and Currency Committee on companion legislation introduced in that body. (From American Mining Congress Bulletin Service, April 20, 1959)

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OLD WASHINGTON WELL TESTED

Sunshine Mining Co.'s persistent efforts to make Washington at least a two-well oil state might finally pay off.

Sunshine has completed and shut in the old 4 Hawksworth well originally drilled in the Ocean City region of Grays Harbor County in 1951 by another operator. It flowed some gas and condensate for a short while but was never considered commercial and was finally abandoned.

Last January, Sunshine deepened it from 3,711 to 4,523 feet. For its recompletion, it was selectively perforated between 3,601-3,996 feet. On a short test, it flowed gas at a rate of 1,490 M.c.f. daily with 3½ barrels of 56°-gravity condensate through a 10/64-inch choke. It is now shut in.

If this well proves commercial, it will be Washington's second oil well. Sunshine's 1 Medina, the Ocean City discovery well, is currently making about 10 barrels daily. Both wells are in Section 15-18n-12w. (From the Oil and Gas Journal, v. 67, no. 16, April 13, 1959).

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PRODUCTIVITY IN ARIZONA COPPER MINING HAS NOT KEPT PACE WITH INCREASE IN WAGES

The Arizona Department of Mineral Resources is issuing a report covering a study of wage statistics and copper output in Arizona copper mines. A comparison has been made of the copper miner's wages in the year 1958 with those of the base period, 1947-1949, and their relation to the production of mineral wealth.

In spite of the collapse of copper prices in 1957 and 1958, when the price dropped from a high of 36 cents in January of 1957 to a low of 24.2 cents in March of 1958, the copper miner's base hourly wage has continued to rise, due to a three-year union contract made in June of 1956, when copper was selling for 46 cents a pound. This contract resulted in a total increase of 32.4 cents an hour for the three years, during the time the price of copper was dropping from 46 cents to less than 25 cents per pound.

Comparing results for the year 1958 with the base period, 1947-1949, and summarizing briefly, it was found that the tons of ore mined per man increased 18.7 percent, or from 3,377 tons per man-year in the base period, to 4,008 tons per man-year in 1958. The annual wage of the copper miner, not including fringe benefits, has increased 52.3 percent, or from $3,496 to $5,326, during the same period.

The annual pounds of equivalent copper produced per man-year has increased only 5.3 percent during the 9-year period, or from 66,329 pounds copper per man-year to 69,839 pounds. The Consumer Price Index has increased 23.5 percent from the base period to the end of 1958.

Disregarding the matter of whether increased productivity has been due to the miner or to technological improvement, the increased wealth created has the same bearing on the nation's economy, and it is plainly evident that productivity has not kept pace with the past wage increases. For example, in Arizona's case, the base hourly wage has increased 76.5 percent, or from $1.359 per hour, in the base period, to $2.399 in 1958; while the value of equivalent copper production has increased only 63.1 percent, or from $155,731,417 in the base period, to $254,067,000 in 1958. Moreover, converting the 1958 figures to "constant dollars," or the same purchasing power of the 1947-1949 dollar, we get $1.942 hourly wage in 1958, an increase of 42.9 percent; and the value of equivalent copper of $205,718,000 (constant dollars) in 1958, an increase on only 32.1 percent.

Productivity, no matter how you look at it, has not kept pace with the increase in wages.
(From Arizona Department of Mineral Resources press release, April 1959.)

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FOREIGN STEEL IMPORTS INCREASING

Foreign steel producers, paying relatively low wages compared with those in the United States, are claiming an increasing share of this country's market for many steel products, according to the April 1959 issue of Steel Facts, the monthly publication of the American Iron and Steel Institute. The latest available data from six foreign nations - each a major source of steel imports to this country last year - show that foreign steel workers' wages range from 66 to 86 percent below those of their American counterparts. During 1957, more than 50 percent of the barbed wire, more than 20 percent of the nails, and more than 10 percent of the woven wire fences sold in this country came from abroad. West Germany was the leading source of steel pipe and tubing imports during 1958. Belgium and Luxemburg together constituted a major source of wire and concrete reinforcing bars. The United Kingdom was a high ranking source of pipe and wire. Japan led as a source of nails. Australia ranked second as a source of pipe and tubing imports.

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GOLD AND OREGON'S SETTLEMENT

By
Helen B. Rand

In observance of Oregon's 100th year as a State, many articles are being published recounting the "good old days." Celebrations are planned for this summer by communities all over the State, and a Centennial Exposition and International Trade Fair is to be held in Portland from June 10 to September 17.

The following article on early-day mining camps in Oregon is the second to appear in The Ore.-Bin this year. The first article was by N. S. Wagner and dealt with Baker County. The present article is by Helen B. (Mrs. Irving) Rand and is principally concerned with Grant County. Mrs. Rand has been compiling a story of her grandparents. Her story is essentially an early history of Grant County and she has furnished this short bit on its mining phase. Mrs. Rand has a more than ordinary interest in Oregon mining and history as the G. I. Hazeltine mentioned in the text was her grandfather. In Mrs. Rand's possession are a number of letters from her grandfather to his bride in California describing in great detail the Canyon Creek mining camp. These have presented an unusually clear record of a period for which facts are not now easily obtained. Mr. Rand, a Portland attorney, is also a descendant from pioneer Oregon mining people. His grandfather, W. H. Packwood, was very active in developing the mines in northeastern Oregon and prepared the account of the early settlement and character and development of the mines of Union and Baker counties appearing in the 1870 report by R. W. Raymond, U.S. Commissioner of Mining Statistics at that time.

Editor

Introduction

One of the odd quirks of history is the fact that situations so well known to one generation are soon forgotten, overlooked, or never known to later generations. A good example of this is the discovery of gold in the Inland Empire (eastern Oregon, eastern Washington, and Idaho) which proved to be a major incentive to its settlement and to the progress of Oregon as a whole during the decade from 1860 to 1870. The importance of this fact seems not to be generally known today.

For thirty years emigrants to Oregon passed through the vast interior on their way to the Willamette Valley. Many admired the high valleys but no one tarried. There were several reasons for this, among which were fear of Indians and severe winters, the wish to be near ocean transportation, the desire to become part of an already settled community, and, not least, to gain the protection of the Hudson's Bay Company. In 1845 one ill-fated company, headed by Stephen Meek, departed from the usual route and dared to cross through central Oregon. Their sufferings were so great that when one member of the party discovered gold on a small stream it went almost unregarded at the time. This strike, now known as the Blue Bucket legend, while ignored then, assumed importance in later years.

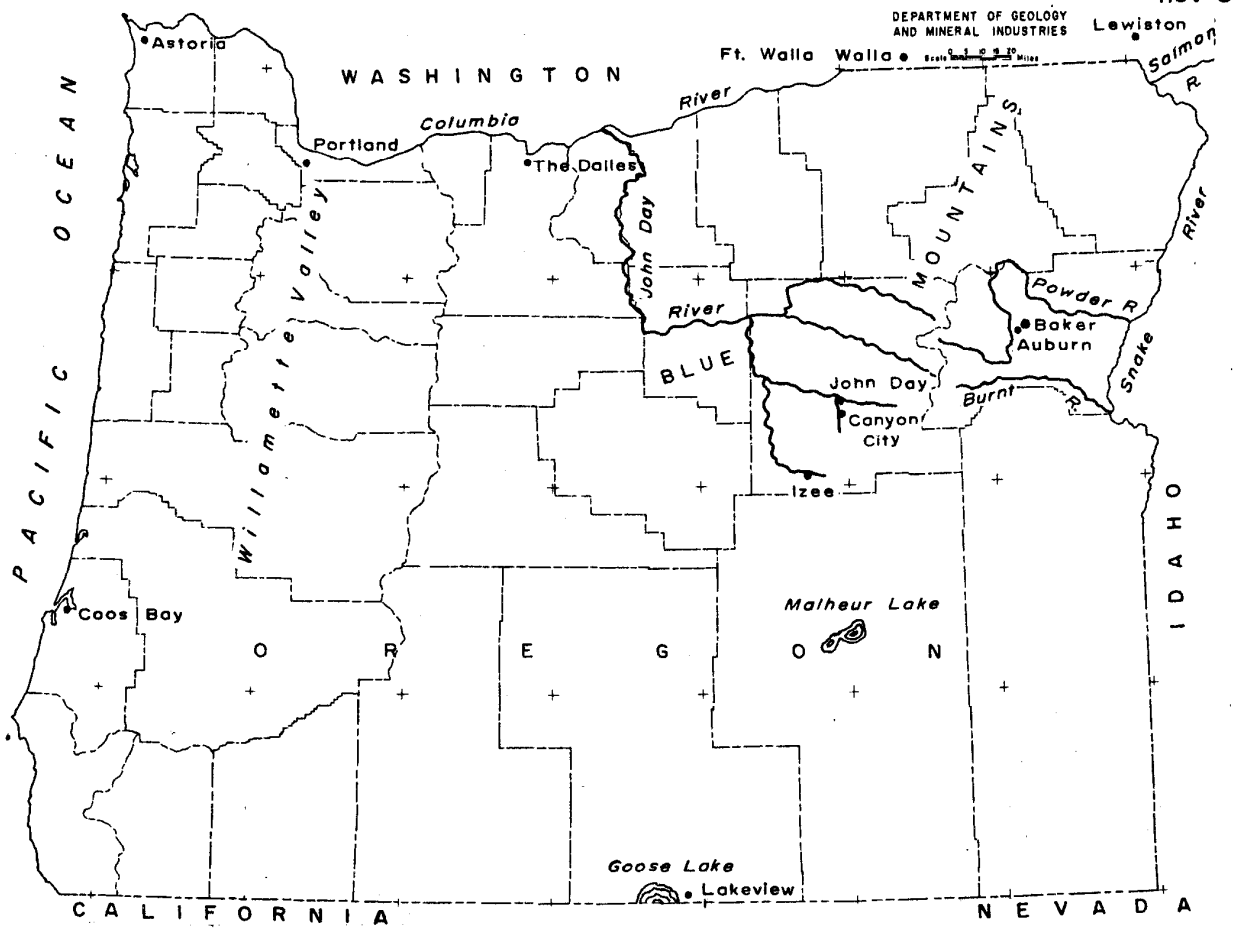

Fig. 1 Oregon Showing Places Named In Text.

The settlements along the Willamette River struggled along, making no great gains in population until about 1855. Leslie Scott* has said that early progress in Oregon proceeded at ox wagon speed and Oregon was "a district proverbial for retarded growth."

The search for gold turns from California

Value of gold production reached its peak in California in 1851, and by 1855 had dropped more than $20,000,000 due to exhaustion of the easy pickings. As a result, the search for new gold-rich areas was rapid and widespread. One of the first major discoveries was made in British Columbia. Not only miners but carpenters, merchants, and laborers of all kinds rushed from California to Victoria. It took all the available ships to carry them north, and many could get passage only as far as Portland with the hope that other ways could be found to get them to the new camps. Fares from San Francisco to Portland were $60 for the "nobs" and $30 for the "roughs." Supplies were bought in Portland, and this gave local trade a big lift.

A few hardy souls tried their luck on the John Day and Bumt rivers of northeastern Oregon in 1855 and sent word to Portland that gold was found, but nothing came of their discovery at that time.

Due to Indian troubles, General Wool, then Commander of the Department of the Pacific at Fort Vancouver, had discouraged settlement east of the Cascades, but he had excepted miners because the Indians considered them to be temporary and not likely to pre-empt their lands. In 1856 Fort Walla Walla was established near the confluence of the Snake and Columbia rivers.

* See selected bibliography at end of article.

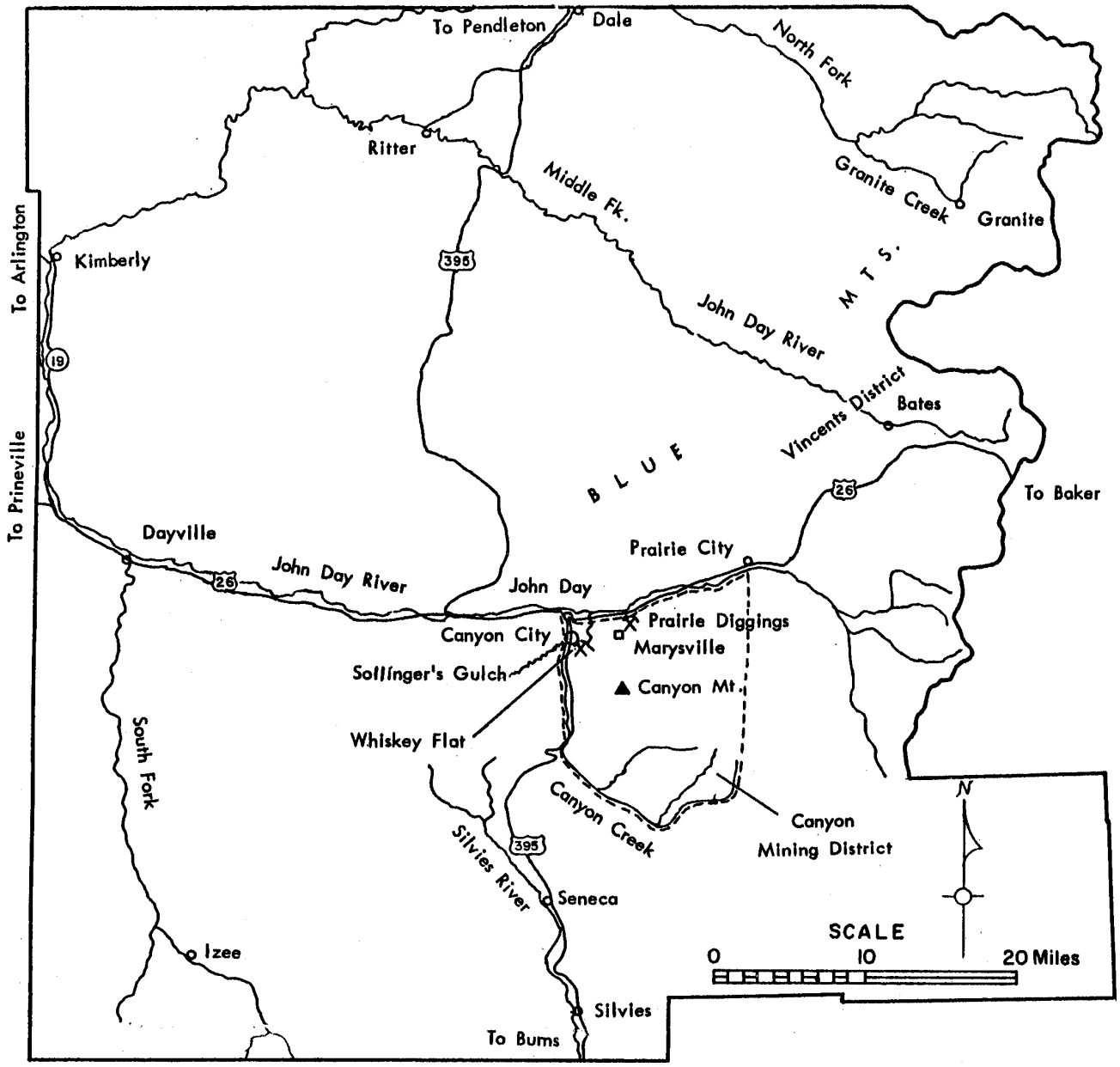

Fig. 2 - Grant County Showing Places Named in Text.

Two parties prospected in eastern Oregon in the summer and fall of 1861. Both were in search of the stream where the Blue Bucket find was made. One party was led by a man named Adams who claimed to know its location. Soon after the start of the expedition the men realized that their leader knew no more than they did about the location. The angered men turned on Adams and he barely escaped with his life. This party, consisting of four men, one of whom was named Griffin, went east toward the Snake River through the Blue Mountains. Gold was discovered in what is now Baker County, and the locality was given the name Griffin Gulch, later named Auburn camp. (See The Ore.-Bin, March 1959.) Two men from this group went to Fort Walla Walla for supplies and from there the news reached Portland that gold had been found on a triburary of Powder River.

The other party prospecting along the John Day River was set upon by Indians who killed all but two of the group. These two made their way back to The Dalles and told of finding gold.

Part of the journey had been made through the present Wheeler County and the men told of building a bridge of juniper logs across a small stream. This little bridge was a landmark for later travelers who gave the name Bridge Creek to the stream.

Joined with the talk about these two strikes came a much greater piece of news. It was the word of the big gold strikes in the Idaho country at Oro Fino and on the Salmon River. In the following spring (1862) the miners burst into the Inland Empire, almost, it seemed, by spontaneous combustion. Some came from the Willamette Valley by way of the Columbia River and others from California by the overland route.

Miners "rush" Canyon Creek

The Canyon Creek and John Day mines of Grant County were discovered by two parties converging, one from Portland and another from California. The California party was on its way to the Salmon River in the Idaho country. When gold was found on Canyon Creek it seemed to be so plentiful that many of the men stopped right there without going any farther. The experienced California miners took charge of the camp management and in a few days the first comers were joined by many others.

G. I. Hazeltine,* writing from Canyon Creek (then spelled Canon) on July 5, 1862, estimated by the number of animals and tents that there must be a thousand men camped on a two-mile stretch between Whiskey Flat, where gold was first found in June 1862, and the confluence of the creek with the John Day River. Mr. Hazeltine and his brother-in-law, Van Middlesworth,* with a party of about twenty men, had left Shasta County, California, in May and were on their way to the Idaho mines. Following a route up the Pit River, entering Oregon near Goose Lake, and going north by the Malheur lakes and Silvies River, they reached the Blue Mountains. They continued along the Silvies River through the present Izee country to the head of Sollinger's Gulch and dropped down onto Canyon Creek from the west.

This party had been preceded a few days earlier by another containing many old friends and acquaintances of Hazeltine, among them George Woodman. These old hands among the miners had organized the new camp along the lines used in the California camps, and Mr. Woodman had been made recorder of claims. Mining laws had been drawn up and copies posted on trees up and down the creek. In part they were as follows:

> "This district shall be known as the John Day's district, the limit of which shall be as follows:
>
> "Commencing at the mouth of Canon Creek and running south to the head of the canon including all of its branches and tributaries, thence north to the Middle Fork of the John Day's River, thence west to the place of beginning and shall be governed by the following laws, to wit:-
>
> "Article 1 - Each person in the district shall be entitled to two claims by location, one in a ravine, hill, gulch, creek, or flat as the case may be and one in the river and one by purchase. Every claim located or purchased shall be represented.
>
> "Article 2 - Claims in Canon Creek shall be 75 ft. up and down and from bank to bank, present occupants or owners to have choice of ground and to have until 10 o'clock Monday the 7th inst. to make such selection.
>
> "Article 3 - Bank claims shall be 75 ft. face and running back to centre of hill.
>
> "Article 4 - A creek claim shall be considered workable from the first of June until the first of November except Canon Creek which shall not be deemed workable until the twentieth of July.

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* Descendants still living in Grant County.

"Article 5 - A ravine claim shall be 150 ft. in length by 100 in width running up and down the ravine gulch and creek. Claims to have the same limits and boundaries except Canon Creek.

"Article 6 - A hill claim shall be 150 ft. face and extend back to centre of hill.

"Article 7 - Quartz claims shall consist of 100 ft. on the vein or lead with all its widths, depths and angles, the discoverer to hold 50 ft. extra."

Article 14 was as follows: "Chines or Tartars are hereby prohibited from working these mines under any and all circumstances."

Since it was assumed that the mines could not be worked during the winters and that miners would leave the camp until spring, this provision for holding a claim (a forerunner to the "assessment work" provision in our present mining laws) was included: "Article 8. No claim shall be deemed forfeited from the first day of November until the twentieth of June A.D. 1863."

Article 19 acknowledged other conditions of pioneer life: "No person disabled by sickness or absent in any Indian wars shall be deemed to have forfeited his claim by reason of service or sickness." (In recent years "moratoria" have been granted for doing assessment work on claims during the war years and for other emergencies.)

All told there were thirty articles. These articles, or laws, spelled out the "do's" and "don'ts" for the miners quite completely.

Merchants follow miners

The rapidity with which news of a new mining camp spread in a remote wilderness never fails to astonish us. Already in July of 1862 people were on hand to provide service to the miner and enrich themselves. Mr. Dye had come in from Coos Bay, a seaport in southwestern Oregon, with a small herd of cattle to furnish meat for the miners. Mr. Sharp, who had a contract carrying freight over the portage below The Dalles on the Washington side of the Columbia, immediately went to The Dalles and bought a stock of goods to pack in to Canyon Creek. This train was attacked by Indians along the banks of the John Day River and most of the goods lost. What remained, Mr. Sharp took into camp and it became the first merchandise sold on the Creek. Mr. Cosart, another merchant, was almost as early as Sharp.

While the route from The Dalles via the John Day River was the main road in to Canyon Creek, it was always a dangerous one. The brush-covered banks of the river and its tributaries afforded excellent cover for the Indians, and many trains were attacked. But because of the high profit involved, danger proved to be no deterrent and goods kept coming in. As always, the saloons and "hurdy-gurdy" houses appeared as if by clairvoyance and were soon running full blast.

Ranchers follow merchants

Almost at once the possibilities of the fertile John Day Valley were recognized. B.C. Trowbridge,* Charles Belshaw,* Henry and William Hall,* and others went to farming and cattle raising. The Olivers* came in later. What is said to be the first claim for farm land was made by Stephen Burdge. He said "I claim possession of . . . a certain tract of land . . . which I take up for farming purposes being a man of family."

At an early date John Herburger* stated that he got a fine crop of potatoes and offered them for sale at 25 cents a pound. He was forced to limit the sale to any one person to 4 pounds so that all might have some.

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* Descendants still living in Grant County.

Surrounding area explored and settled

William H. Packwood called Auburn "the mother of mining camps" in Baker County, and this was true also of Canyon Creek in Grant County. From these two bases men fanned out in all directions looking for "color." They explored streams, mountains, and sage-covered hills. They penetrated into locations which seem almost inaccessible today, dependent as we are on the gasoline engine. Some had horses but many more were on foot. Practically every inch of the Blue Mountains was explored in the first few weeks. Mr. Hazeltine said, "Men are coming and going in all directions."

One of the first gold discoveries made near Canyon Creek was on Little Pine Creek a few miles east of the present Canyon City. This led to the settlement of Marysville, quite a hamlet in its own right in the early days but now just a school district. The Prairie Diggings camp was another. The finders of this camp included F. C. Sels, a long-time resident of Canyon City and owner of the first brewery. One of the first ditches in the district was constructed here and a joint stock company formed. It has been said that the original stockholders cleared $10,000 each in the first year.

These early miners usually worked in companies. There were not enough good claims to go around so they formed partnerships. Men who had no claims worked for the others as day laborers.

The first ditch, appropriately called the Raw Hide, constructed on Canyon Creek was flumed with raw hide because of the lack of lumber. Other ditches were the Lone Star, built by Texans, and the Humboldt which was used for many years.

Another good strike was made on Dixie Creek, a tributary of the John Day River. Good strikes were made at Granite Creek, Olive Creek, Vincent's district, and the North Fork of the John Day River by miners working out from both Auburn and Canyon Creek.

Permanent residence established

Mr. Hazeltine spent the winter of 1862-63 on Canyon Creek writing homesick letters to his bride whom he had left at Oak Run, Shasta County, California. These letters went by way of Wells Fargo express or were taken by anyone who happened to be returning to California. Practically all reached their destination safely.

Mr. Hazeltine kept careful account of his expenses. Not only food was listed, but supplies such as lumber for sluice boxes for which he paid $3.36, a rocker iron for $1.25, horseshoe nails for 50 cents. Gloves cost him $2.50, boots $8.50, and a comforter when the weather got cold, $2.00. He bought 100 pounds of "spuds" for $16.00, beef at 25 cents a pound (which he considered high), 500 pounds of flour for $20.00, and a bake oven for $2.75. He remarked that coffee and sugar were very scarce. A few luxuries included 50 cents for tobacco and $5.75 for whiskey and "segars." There were entries for medicine and several listed merely as "charity."

In the fall of 1862 he and Middlesworth decided to build a house. They hired a man named Hudson to work on it and leave them free to mine. Mr. Hudson was paid $37 for hewing logs and five days' work on the house. When completed, it cost $350 and was the best on the Creek. Although the two owners continued to live in the house, it was rented to a merchant.

In the spring of 1863, Hazeltine and Middlesworth brought in their families and spent the rest of their lives in Canyon City and John Day.

The later years

Search for the "mother lode" on Canyon Mountain was to go on for many years, but the mountain seemed to consist of "pockets" only. Around the turn of the century the whole site of the first strikes on Canyon Creek was dredged and this was the last gold that has been extracted from this famous district.

A few romantics still look for the legendary Blue Bucket mine but many old timers were sure it had been found on Canyon Creek. The late George H. Himes, Curator of the Oregon

Historical Society for many years, quoted a statement made to him by William F. Helm who, with his father, mother, brothers, and sisters, was a member of the Stephen Meek party that made the Blue Bucket discovery. Mr. Helm was on Canyon Creek in 1863 and always insisted that Canyon Creek or another tributary of the John Day was the site of the finding of the Blue Bucket gold. Support is given this by letters from pioneers writing to the Oregonian newspaper in the spring of 1919 who agreed that location of the fabled discovery was somewhere in the John Day country. J. N. Barry, Portland, well-known authority on Oregon history, also holds this view.

By the end of the decade the easy workings were over, although quartz and hydraulic mining went on for a long time. The "Chines" were permitted to come in to work over the tunnels and tailings piles. The late J. L. Kraft of the Kraft Cheese Company has advanced the theory in his book, "Adventure in Jade," that the Chinese were looking for jade as well as gold. He knows that jade was found in a northern California mountain. Perhaps it was found in other places too. Who knows?

By 1870 the first boom was over. But it had served its purpose. Eastern Oregon, Idaho, and Montana had permanent settlement. The founding of Boise and Lewiston, Idaho; Baker, Oregon; Helena, Montana; and many other cities was the direct result of the gold rush. An additional benefit was that the railroads came in sooner than they otherwise would have.

As for Portland, the impetus created by the search for gold carried this city forward toward the metropolis which it now is. By 1867 the total production of gold in Oregon, since the beginning of working, was $20,000,000. But Portland was also the receiving station for gold from other fields. During the same period, Idaho produced $45,000,000, Montana $65,000,000, and Washington $10,000,000. Even this does not tell the whole story as it applies only to gold on its way to the mint. Surely as much gold again must have gone for food, supplies, investment in land, livestock, and other materials and services needed by the miner, to say nothing of what was lost in gambling and saloons.

Probably the greatest source of wealth to early-day Portland came from the proceeds of the Oregon Steam Navigation Company. This company was organized to handle transportation and trade to the Inland Empire. It had a monopoly on Columbia River travel and some of the solid fortunes of Portland were founded on the proceeds of its operation. Money was also made by packers and stage coach companies.

Today, gold mining in Oregon is at an all-time low. Mining for other metals, such as uranium, nickel, chrome, and mercury, and building materials, such as limestone, sand and gravel, and pumice, have taken its place. There are some who say that present domestic gold production must be increased as our monetary stock is being depleted and that there is insufficient gold to back the increasing amount of currency that will be needed in coming years. There is still gold in Oregon and, if conditions ever permit, the old mines may be reopened and possibly new discoveries will be made. If this happens, rest assured gold mining once again will work to the benefit of the State.

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DEPARTMENT SPECTROGRAPH AIDS IN POISON IDENTIFICATION

The Department's spectrographic laboratory recently assisted in the cure of four men who were hospitalized after breathing cadmium fumes. The workmen, all now recovered, had been cutting up torpedo casings at a local scrap yard and were sent to the hospital after developing extreme shortness of breath. Samples of the metal being cut into scrap were obtained by the Oregon State Board of Health, and the coating was quickly analyzed by T. C. Matthews, spectroscopist, on the 3-meter Baird equipment of the Department. The coating was found to contain a high percentage of cadmium. Therapy was started immediately and within a few days the men were all back at work. Cadmium, a tin-white, ductile, metallic element, gives off fumes when burned which are highly toxic if inhaled. Cadmium is often used for marine hardware because of its resistance to salt water.

The services of the spectrographic laboratory are used by a diverse group of private firms and public organizations in the Portland area for varied types of analyses. The State Police Crime Detection Laboratory and the Portland Police Laboratory find it useful in comparing evidence. Coatings, alloys, and corrosion products are identified for the Materials Laboratory of Bonneville Power Administration. Unusual materials checked this year for private firms included slags, alloys, oyster shells, mirror coatings, welding flux, electronic parts, and thorium concentrate.

The spectrographic laboratory was established by the 1941 Legislature. It is the only Department laboratory facility that can do custom work or make analyses on materials originating outside the State. Unlike the free assay service of the Department, the spectrographic laboratory must make a charge for its analytical work.

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PORTER INTRODUCES BILL LIMITING PATENT

Representative Charles O. Porter (Ore.) has introduced a bill (H.R. 7100) in Congress which would provide that each patent issued after January 1, 1959, under the United States mining laws on lands within national forests "shall reserve to the United States all title in or to the surface of the lands and products thereof, and no use of the surface of the claim or the resources therefrom not reasonably required for carrying on mining or prospecting shall be allowed except under the rules and regulations of the Department of Agriculture."

Porter's bill would also provide that (1) any valid mining claim existing on January 1, 1959, within a national forest and maintained thereafter in compliance with the laws under which it was initiated could be perfected under this bill or under the laws under which it was initiated, as the claimant desires, and (2) nothing in the bill would affect existing provisions of law which relate to mining locations made under U.S. mining laws on lands within particular national forests, or designated parts thereof.

Senator Richard L. Neuberger (Ore.) introduced a similar bill except that it would apply to patents issued after January 1, 1960. Senator Neuberger's bill is S. 1920.

(From American Mining Congress Legislative Bulletin No. 6, May 22, 1959.)

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CORRECTION

The University of Oregon Cooperative Book Store, Eugene, Oregon, informs the Department that Professor Ewart Baldwin's "Geology of Oregon" requires 15 cents for mailing fees rather than 10 cents as quoted in The Ore.-Bin, April 1959. Price for "Geology of Oregon," including postage, is now $2.15.

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BANTA APPOINTED TO GOVERNING BOARD

Harold Banta, senior member of the Baker law firm of Banta, Silven and Horton, was appointed to the Governing Board of the Department of Geology and Mineral Industries by Governor Mark Hatfield on May 14, 1959.

Since coming to Baker in 1929, Banta has been a legal representative for many of the major mining operators in northeastern Oregon. These include Porter Bros. Corporation, which operated a dredge at Granite; Northwest Development Company, operator of dragline dredges in Sumpter Valley; and the Sumpter Valley and Baker dredging companies. Currently he represents National Industrial Products Company, the Morrison-Knudsen subsidiary which has a limestone operation near Durkee, and the new Chemical Lime Company, whose plant and quarry are just north of Baker. Mr. Banta's appointment to the Department's Governing Board is to run until March 16, 1963. He replaced Miss Nadie Strayer of Baker, whose term expired this past March.

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ASSESSMENT WORK NOT DUE UNTIL SEPTEMBER

The Congressional bill that became law in August 1958 and changed the annual date for completion of assessment work from July 1 of each year to September 1, is reproduced below in its entirety. Many requests have been received by the Department asking for clarification of the new law, and as it is self-explanatory and rather short, this means is used to get the official word to the mining industry. It will be noted that no change has been made in the amount of assessment work required. It still remains at $100.

PUBLIC LAW 85-736
85th Congress, S. 3199
August 23, 1958

AN ACT

To amend section 2324 of the Revised Statutes, as amended, to change the period for doing annual assessment work on unpatented mineral claims so that it will run from September 1 of one year to September 1 of the succeeding year, and to make such change effective with respect to the assessment work year commencing in 1959.

BE IT ENACTED BY THE SENATE AND HOUSE OF REPRESENTATIVES OF THE UNITED STAT OF AMERICA IN CONGRESS ASSEMBLED, That section 2324 of the Revised Statutes, as amended (30 U.S.C. 28), is amended by striking out "1st day of July" and inserting in lieu thereof "1st day of September".

Sec. 2. Notwithstanding the amendment made by the first section of this Act, the period commencing in 1957 for the performance of annual assessment work under section 2324 of the Revised Statutes, as amended, shall end at 12 o'clock meridian on the 1st day of July 1958, and the period commencing in 1958 for the performance of such annual assessment work shall commence at 12 o'clock meridian on the 1st day of July 1958, and shall continue to 12 o'clock meridian on September 1, 1959.

Approved August 23, 1958.

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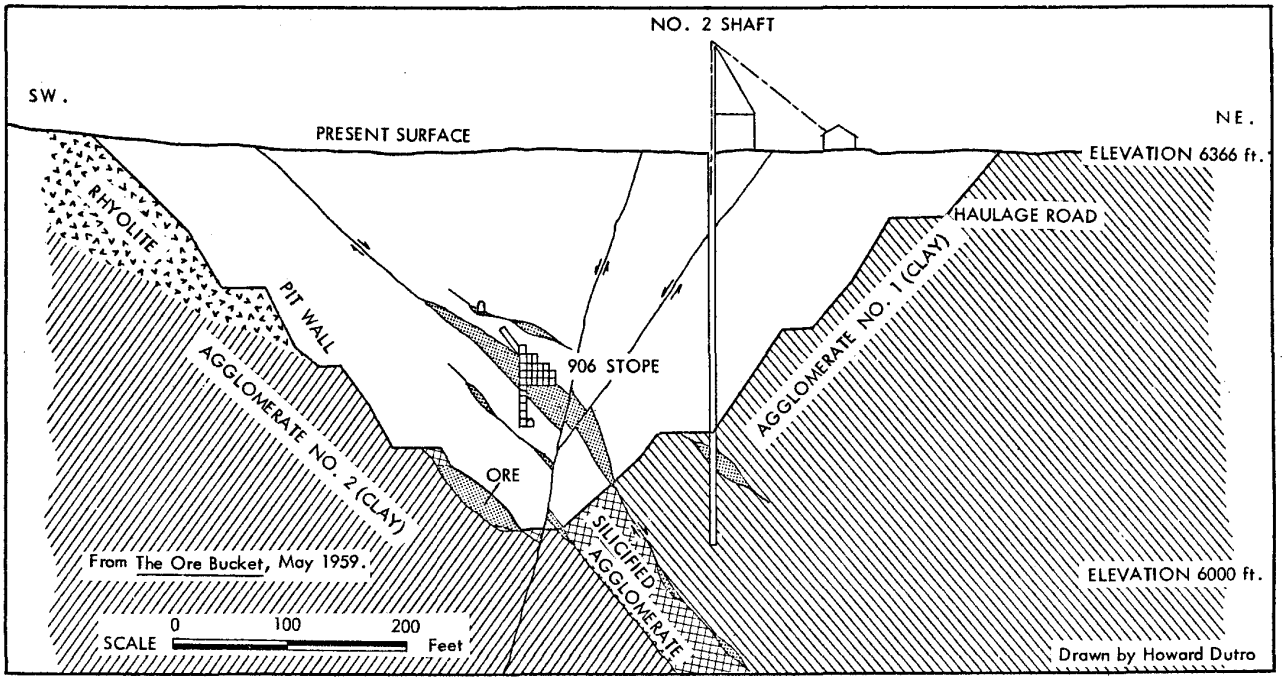
PROGRESS MADE AT WHITE KING OPEN PIT

Development of the new open pit operation at the Lakeview Mining Company's White King uranium mine is progressing very well according to the Isbell Construction Company's superintendent on the job, John Wright. The work should assume its full stride in about 2 weeks, he said.

On April 12, a contract was signed between the Lakeview Mining Company and the Isbell Construction Company, of Reno, calling for the development of an open pit at the White King. The contract involves the removal of approximately 6,500,000 cubic yards of overburden and ore during the next 3 years, and permits development of the White King deposit to a depth of about 370 feet. All work will be done by Isbell under the supervision of the Lakeview Mining Company. Initial work under the contract was begun May 8. According to the present schedule, overburden will be removed by motor scrapers and ore will be extracted by power shovels and trucks.



Vertical section across the proposed White King open pit, showing the present No. 2 shaft and a part of the existing underground workings in the 906 Stope area.

The completed pit will be approximately 1500 feet long and 1000 feet wide, going to a depth of about 370 feet. Upon completion of open pitting, underground work will be resumed to develop and mine ore remaining in the deposit below the open pit and outside the pit walls, said Howard Dutro, LMC chief geologist and assistant general manager. LMC began a pit operation early in March, to augment ore then coming from underground workings, and when the Isbell contract was signed, all underground operations were discontinued. Dr. Garth Thornburg is LMC president and general manager is James Poulos. (From The Ore Bucket, May 25, 1959)

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LAND WITHDRAWALS IN MAY

The U.S. Bureau of Land Management has notified the Department that one land withdrawal has been filed during May. This withdrawal, Oregon 06764, No. 59-14, is for the purpose of preserving 200 acres in four separate parcels for scenic and recreational use. Mining and other land use will not be allowed. The lands are located in Marion, Douglas, and Jackson counties and take in most of the sections as follows:

Sec. 9, T. 9 S., R. 3 E.
Sec. 1, T. 27 S., R. 2 W.
Sec. 25, T. 39 S., R. 2 W.
Sec. 23, T. 39 S., R. 4 W.

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FOSSIL LOCALITIES OF THE SALEM-DALLAS AREA

By
Margaret L. Steere*

Location

The Salem-Dallas area lies in the center of the Willamette Valley in Polk and Marion counties (see accompanying map). Within this area there are a number of scattered rock outcrops where fossils may be found. The 12 localities described in this report are easily reached by paved highways or good secondary roads.

Geologic History

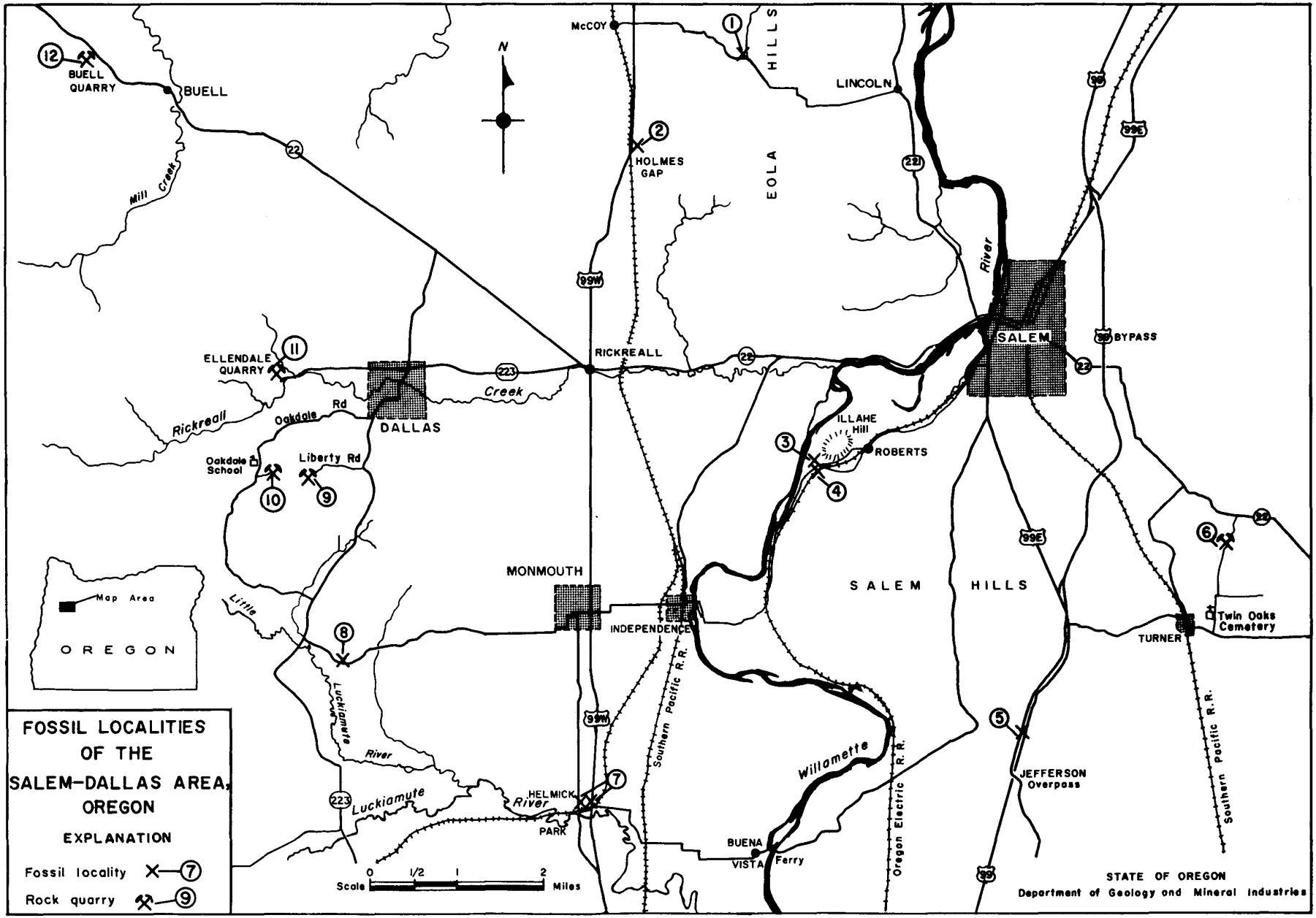
Thousands of feet of fossiliferous marine strata underlie the Salem-Dallas area. These rocks were deposited in seas that covered most of western Oregon during Eocene and Oligocene times. The beds have been tilted eastward; thus the older rocks (Eocene) crop out along the western side of the area in the vicinity of Dallas while to the east the overlapping younger rocks (Oligocene) crop out in the vicinity of Salem.

Eocene formations

The earliest fossil record in the area goes back about 50 million years to the time when submarine volcanoes were exceedingly active on the floor of the Eocene sea. As the sea floor subsided, a thick series of basaltic lava flows accumulated together with occasional interbeds of sediments, some of which contained shells of marine animals. Today these uplifted rocks, known as the Siletz River volcanics, form the core of the Coast Range west of Dallas. They are exposed along the far western edge of the Salem-Dallas area, and one of the interbeds of fossil-bearing sediments crops out in the Ellendale quarry (Locality 11). A rare gastropod "Pleurotomaria" has been found here, as well as oysters and other mollusks, brachiopods, bryozoa, and foraminifera.

Later in the Eocene epoch, after submarine volcanism had lessened in intensity, many hundreds of feet of thickly bedded sandstones and siltstones were laid down over the lavas in this area. These rocks now crop out in the foothills of the Coast Range west of Dallas and are known by various formation names such as Tyee, Burpee, and Yamhill. The formations are generally unfossiliferous except for plant fragments. Locally, however, they contain thick bodies of limestone in which marine fossils such as the nautilus, crabs, pelecypods, and gastropods are found. One such limestone deposit occurs near Dallas (Localities 9 and 10) and a smaller one near Buell (Locality 12). Quarry operations in both deposits continually open up fresh fossiliferous rock.

*Geologist, State of Oregon Department of Geology and Mineral Industries.


FOSSIL LOCALITIES OF THE SALEM–DALLAS AREA, OREGON
EXPLANATION
Fossil locality
Rock quarry
Map Area
OREGON
N
McCOY
LINCOLN
HILLS
EOLA
HOLMES GAP
BUELL
BUELL QUARRY
Mill Creek
ELLENDALE QUARRY
RICKREALL
DALLAS
Rickreall Creek
Oakdale Rd
Oakdale School
Liberty Rd
ILLAHE Hill
ROBERTS
SALEM
BYPASS
River
MONMOUTH
INDEPENDENCE
Little Luckiamute River
Luckiamute River
HELMICK PARK
Southern Pacific R.R.
Willamette River
Oregon Electric R.R.
BUENA VISTA Ferry
SALEM HILLS
JEFFERSON Overpass
TURNER
Twin Oaks Cemetery
Scale 0 1/2 1 2 Miles
STATE OF OREGON
Department of Geology and Mineral Industries

Between Dallas and the Willamette River is an area of later Eocene marine strata composed mainly of thin-bedded micaceous siltstones and shales containing occasional hard, massive layers. These beds are called the Nestucca formation north of Dallas and the Helmick beds south of Monmouth. Similar beds extend southward into the Corvallis and Eugene areas where they are known as the Spencer formation. In fresh outcrops these rocks are gray and contain many marine fossils, including shark teeth and mollusks. On exposure to the weather, however, the thin-bedded material turns rusty brown and disintegrates (Localities 7 and 8).

Oligocene formations

Early in Oligocene time, about 40 million years ago, the sea again invaded western Oregon. Massive beds of fossiliferous siltstones known as the Keasey formation accumulated on the sea floor. The type locality for these deposits is in the Sunset Highway area northwest of Portland where the beds contain a great variety and abundance of fossil shells. In the Willamette Valley, the extent of the Keasey formation is not well known due to scarcity of outcrops, but where found the beds contain a characteristic Keasey fauna.

By middle Oligocene time, the slowly rising Coast Range began to form a highland or row of islands to the west of the Salem-Dallas area. In the gradually subsiding basin of the Willamette Valley region, there accumulated several thousand feet of tuffaceous sandstones containing an abundance of shallow-water marine shells. Today these sandy, buff-colored beds, known as the Eugene formation, are widely distributed in the Willamette Valley. Although the name "Illahe formation," was given to beds in the Salem area by Mundorff in 1939, the name "Eugene formation," is now preferred. The Eugene formation contains a variety of pelecypods and gastropods (Localities 1 to 6).

Miocene to Recent formations

Uplift of the land some time in late Oligocene or early Miocene caused the sea to retreat permanently from the Salem-Dallas area. The middle Miocene epoch was a time of major volcanism. Basaltic lava flows, known as the Stayton lavas and contemporaneous with the great Columbia River basalt extrusions, blanketed the marine formations in the Salem area. Since Miocene time, the Willamette River and its tributaries have carved wide valleys in the volcanic and sedimentary rocks. Remnants of the basalt flows can be seen capping the Salem and Eola hills, while the underlying fossiliferous sandstones of the Eugene formation crop out beneath. Prolonged chemical weathering of the Stayton lavas has altered the basalt to clay and bauxite, which may be recognized by its red color.

For the past 10,000 years or more the Willamette River and its tributaries have been depositing a thick cover of sand, silt, and mud over the broad Willamette Valley. Occasionally fossil bones and teeth are found in these sediments in river banks and excavations. Because the location of such fossils is unpredictable, no localities are described in this report. Fossils which have been discovered include elephant, mastodon, ground sloth, and camel, all inhabitants of the Salem area at the close of the Ice Age, and now extinct or no longer native to this region.

Where to Look For Fossils

The places to look for fossils in the Salem-Dallas area are where sedimentary beds are either recently exposed or sufficiently well cemented to have resisted many years of weathering. Favorable localities may be man-made excavations such as quarries and road cuts, or they may be natural outcrops on hillsides and along the banks of streams. The following 12 localities are good places to find fossils:

*1. Eola Hills locality

Fossil beds of the Eugene formation crop out beneath Stayton lavas in a number of places in the Eola Hills. The locality described here is near the top of the divide on the road that crosses Eola Hills from McCoy to Lincoln. To reach the locality, start at Rickreall, go north on U.S. 99 W toward Amity for 8 miles to the Lincoln road (graded dirt road). Turn right and go east 3 miles to road junction at top of hill. A hard, fossiliferous layer of the Eugene formation crops out in a brushy pasture a short distance west of the road junction. Various other outcrops in the vicinity are reported to expose fossils.

2. Holmes Gap locality

Holmes Gap is the narrows between the hills where U.S. Highway 99 W crosses the Southern Pacific railroad 5 miles north of Rickreal. Coarse, dark-gray fossiliferous sandstone crops out in two places in a pasture on the east side of the highway about 0.2 mile northeast of the railroad crossing. One outcrop is on the bank of a shallow gully about 200 feet west of a farmhouse. The other outcrop is on the side of a small ravine in the steep bluff near the highway. This coarse sandstone contains a variety of well-preserved shells of middle Oligocene age and may represent the base of the Eugene formation. Typical fossils are the pelecypods Acila and Pitar, and the gastropods Bruclarkia and Molopophorus.

3. Illahe Hill locality

Fossils are numerous in a weathered exposure of the Eugene formation at the south end of Illahe Hill about 5 miles southwest of Salem. To reach the locality, follow South River Road to Roberts and continue 1.4 miles to driveway at farmhouse. The outcrop is behind farm buildings at the base of the hill about 500 feet north of the road. The entire hill is composed of the Eugene formation. Fossils at Illahe Hill are similar to those directly across the road at Finzer Station (Locality 4). The two localities were probably continuous strata before being separated by erosion.

4. Finzer Station locality

Fossils are abundant at Finzer Station on the Oregon Electric railroad 5 miles southwest of Salem. This locality is directly across the road (South River Road) from the Illahe Hill locality (Locality 3). To reach it climb up to the tracks at the railroad overpass and walk along railroad for about 100 feet to a deep cut through the hill. Here the Eugene sandstone of Oligocene age forms the vertical walls on each side of the tracks. Fossil casts, particularly pelecypods, are exceedingly abundant. The sandstone weathers rapidly and fossils are well preserved only when freshly exposed. Some of the typical genera are: the pelecypods Solen, Spisula, Yoldia, and Nuculana, and the gastropod Bruclarkia.

5. Frontage Road locality

Chalky-white mollusks in gray sandstone and siltstone are abundant in a recent road cut on Frontage Road about 10 miles south of Salem. To reach the locality from Salem, start at City Center and drive south on U.S. Highway 99 for 11 miles to the Jefferson overpass. Turn right (west) onto Frontage Road and drive back toward the north (parallel to the main highway) for 1 mile to road cut. The Eugene formation of Oligocene age is exposed here dipping northeastward under the Stayton lavas. Although the original shells are still preserved, they quickly disintegrate on exposure to the air leaving internal casts in the rock. The locality is about 3.5 miles south of the junction of U.S. 99 through Salem and the By-pass.

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*Numbers refer to localities on index map.

6. Turner quarry locality

From center of Turner (about 9 miles southeast of Salem), go east on county road ½ mile to Oaks Cemetery road (graded dirt road). Turn left (north) and go north on Oaks Cemetery road toward Witzel for 2.3 miles to old, shallow quarry and dump on west side of road. The quarry exposes well-cemented brown tuffaceous sandstone of the Eugene formation of Oligocene age in which casts and molds of Spisula and other pelecypods are well preserved. An upper quarry a short distance to the west exposes the overlying Stayton lavas of Miocene age.

7. Helmick Hill locality

A new section of U.S. Highway 99 W makes a long deep cut through the north bank of the Luckiamute River 4.5 miles south of Monmouth. The cut exposes northward-dipping Helmick beds of upper Eocene age. This exposure is similar to the cut through Helmick Hill on old Highway 99W a third of a mile due west. The new highway cut is not as deeply weathered as the old one and fossils can still be found in the more indurated layers. Among the fossils that have been collected from these cuts in the past are the pelecypods Spisula, Tellina, and Volsella, and the gastropods Ampullina and Acrilla. Shark teeth have also been found.

8. Cooper Hollow road locality

A road cut in a low bank on the Cooper Hollow road exposes upper Eocene sediments that are presumably a continuation of the Helmick beds. The outcrop is on the north side of the highway where the highway rises up out of the Luckiamute Valley. It is 6.5 miles west of U.S. Highway 99W in Monmouth and 1.2 miles east of State Highway 223 (Kings Valley road). When the Cooper Hollow road was under construction, a number of kinds of fossil mollusks similar to those at Helmick Hill were collected from the freshly exposed dark-gray shale. Weathering has since obscured much of the outcrop, but a few fossils can still be found. These are generally hard and fairly well preserved and can be combed out of the soft shale.

9. Polk County Lime quarry

The Polk County Lime quarry is about 1 mile east of the Oregon Portland Cement quarry in an extension of the same limestone deposit. It may be reached from the Dallas Court House by following State Highway 223 south for a distance of 2.2 miles to Liberty Road and continuing west on Liberty Road 1.5 miles to the quarry. Fossils of middle Eocene age, particularly Ostrea, are numerous in certain horizons of the Tyee formation.

10. Oregon Portland Cement quarry

The Oregon Portland Cement Company has a large quarry in a deposit of massive gray limestone southwest of Dallas. The quarry may be reached from the Dallas Court House by following State Highway 223 for 1.0 mile south to the intersection with Oakdale Road. Turn west on Oakdale Road and go 3.7 miles to quarry sign and private road. The quarry is in the bottom of a valley 0.3 mile east of Oakdale Road. Permission to hunt for fossils may be obtained at the quarry. Fossils are of Eocene age and are fairly numerous in certain horizons of the Tyee formation at this locality. Among those found are the crab Raninoides, pelecypods, a large species of nautilus, shark teeth, sea urchins, and foraminifera.

11. Ellendale quarry

Fossils of Eocene age may be found in the Ellendale basalt quarry. The quarry is on Ellendale road, 3.0 miles west of the junction in north Dallas with State Highway 223. Basaltic rock of the Siletz River volcanic series comprises most of the material in the quarry, but a sedimentary bed of grit containing many broken fossil shells is exposed over a fairly wide area near the top of the quarry and is easily accessible from the south side of the hill into which the quarry is dug. Among the fossils that have been found are the gastropods Calyptraea, Turritella, and the rare Pleurotomaria; the pelecypods Barbatia, Ostrea, and Pecten; several kinds of brachiopods; and bryozoa.

12. Buell Limestone Quarry locality

Fossils are abundant in the Buell limestone quarry 2 miles west of Buell on State Highway 22. The entrance to the quarry is marked by a sign at a gate on the south side of the highway. The quarry (not operating at present) is plainly visible about 1/8 mile to the southwest in the bottom of a valley. Limestone of the Yamhill formation (Eocene) is exposed in the quarry. A layer of coquina composed of shells and shell fragments contains Ostrea, Lima, and other mollusks. Overlying this layer is a bed of black basaltic grit containing large round foraminifera (easily seen without a hand lens) and brachiopods.

Fossils To Look For

Pelecypods and gastropods are the most abundant and the most varied fossils in the marine formations of the Salem-Dallas area. Other marine animals reported from these formations are scaphopods, brachiopods, cephalopods, echinoids, corals, bryozoa, foraminifera, crabs, and shark teeth. Fragments of poorly preserved leaves and wood are abundant in the Eocene strata. Once in a while bones and teeth of fossil mammals, particularly mastodons, are found in the Pleistocene and Recent sediments of the Willamette Valley.

The names of some of the characteristic fossils of the Eocene and Oligocene marine formations in the Salem-Dallas area are listed below, and many additional fossils are listed in publications cited at the end of this report.

Eocene fossils:

Siletz River Volcanic Series

Pelecypods:
- Barbatia cf. B. cowlitzensis (Weaver and Palmer)
- Lima sp.
- Ostrea n. sp.
- Pecten cf. P. interradiatus Gabb
- Spondylus carlosensis Anderson

Gastropods:
- Acmaea n. sp.
- Calyptraea sp. indet.
- Turritella andersoni cf. subsp. susanae Merriam
- Pleurotomaria sp. indet.

Brachiopods:
- Terebratulina (several species)

Bryozoa

Foraminifera
- Discocyclina sp. (large disk-shaped foram)

Tyee Formation

Pelecypods:
- Crassatellites dalli Weaver
- Pitar cf. P. dalli (Weaver)
- Ostrea sp.

Crustacea:
- Raninoides oregonensis Rathbun

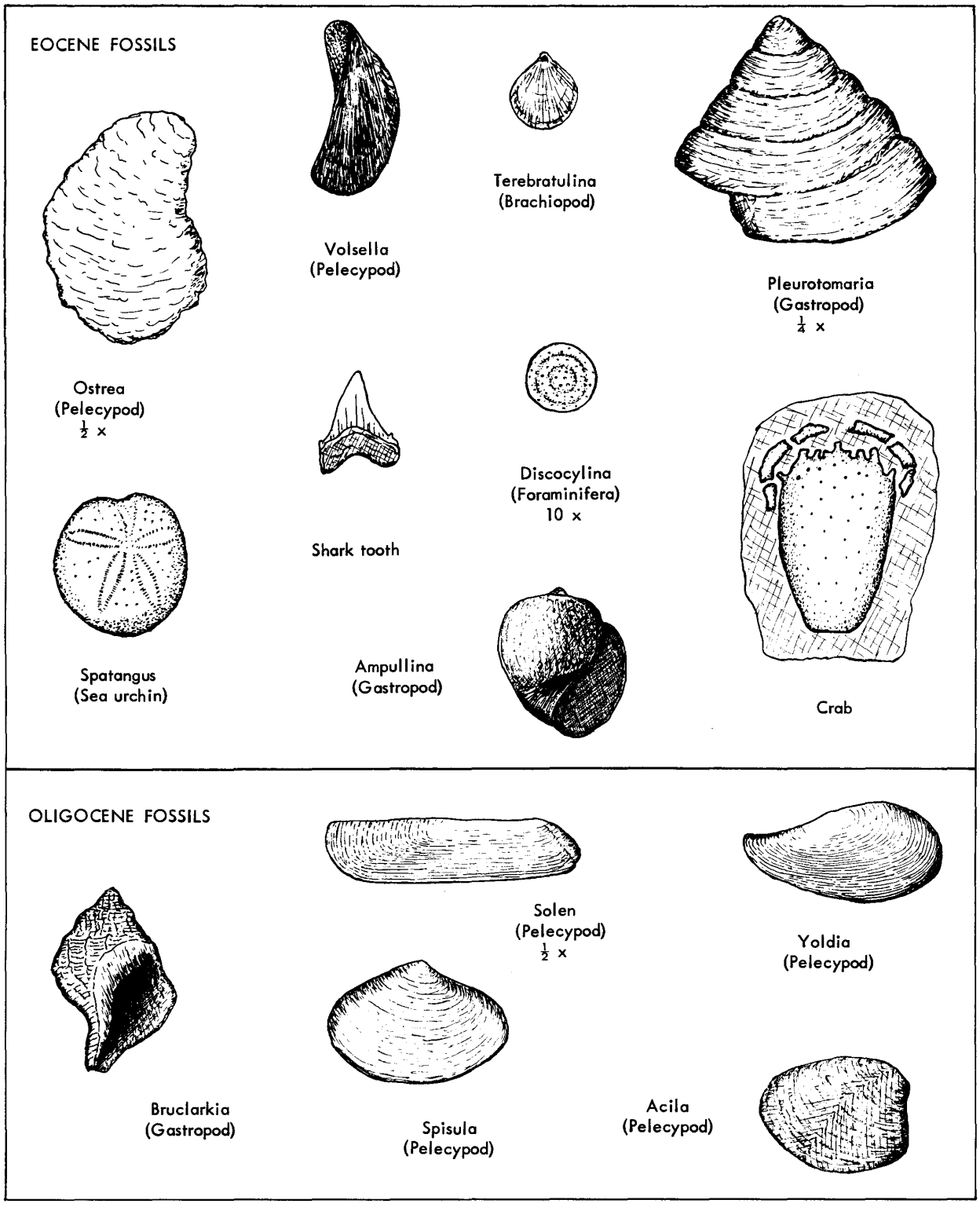
Cephalopods:
- Nautilus (several species)

Echinoderms (sea urchins):
- Spatangus tapinus Schenck

Foraminifera

Shark teeth

Fossil plants:
- Cinnamomum
- Ferns



Approximately natural size except where indicated.

SOME TYPICAL FOSSILS OF THE SALEM-DALLAS AREA, OREGON

Eocene fossils (cont.)

Helmick Beds

Pelecypods:
- Spisula (several species)
- Tellina (several species)
- Nuculana gabbi (Gabb)
- Volsella cowlitzensis (Weaver and Palmer)
- Acila decisa (Conrad)

Gastropods:
- Ampullina andersoni (Dickerson)
- Acrilla aragoensis (Turner)
- Ficopsis cowlitzensis (Weaver)
- Exilia cf. E. dickersoni (Weaver)

Foraminifera

Scaphopods:
- Dentalium sp.

Shark teeth

Plant fragments

Oligocene fossils:

Eugene (Illahe) Formation

Pelecypods:
- Acila shumardi (Dall)
- Solen sp.
- Pitar oregonensis (Conrad)
- Nuculana washingtonensis (Weaver)
- Spisula pittsburgensis Clark
- Yoldia oregona (Shumard)
- Tellina eugenia Dall

Gastropods:
- Polinices cf. P. washingtonensis (Weaver)
- Perse sp. indet.
- Crepidula sp. indet.
- Molopophorus dalli Anderson and Martin
- Bruclarkia columbiana (Anderson and Martin)

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GRANITE MINING DISTRICT BULLETIN PUBLISHED

"Lode Mines of the Central Part of the Granite Mining District, Grant County, Oregon," has just been published by the State of Oregon Department of Geology and Mineral Industries as a contribution to the knowledge of the State's mineral resources. The publication is designated as Bulletin 49. George S. Koch, Jr., Assistant Professor of Geology at Oregon State College is the author.

Since its discovery in 1861, the Granite mining district has been one of the State's leading producers of gold and silver from lode mines. The Buffalo mine, largest producer in the district, is one of the few gold mines in the United States that was able to reopen after Government closure in 1942 and continue to operate to the present day. In Bulletin 49, Dr. Koch has described the operation of the Buffalo mine and has presented the available information on the underground workings of eight other mines in the district. Included in the Bulletin are descriptions of the mineral deposits and the geology of the area. A discussion on rock alteration at the Buffalo mine by S. H. Pilcher is appended.

Bulletin 49 is paper bound, has 49 pages, numerous mine maps and sections, photographs, and a geologic map. It may be obtained from the Department offices in Portland, Baker, and Grants Pass. The price is $1.00.

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MINING ADVISORY COUNCIL TO MEET

The Western Governors Mining Advisory Council will meet July 8 and 9 at Sun Valley, Idaho. The meeting was called by Governor Robert Smylie of Idaho, Chairman of the Western Governors Conference, because of the serious situation facing the nonferrous and strategic metal mining industries of the western states, including Alaska. Governor Mark Hatfield, Oregon, was an advocate of this meeting and early in the year urged Governor Smylie to call the Council into session.

The Council will study the problems and make recommendations for presentation to the board of directors of the Advisory Council. These recommendations will then be submitted to the various governors for their information and guidance prior to the meeting of the Conference of Western Governors September 24 to 27.

The Western Governors Mining Advisory Council is composed of delegates appointed by the various governors. Oregon members named by Governor Mark Hatfield are: Hollis M.Dole, Portland; Lester R. Child, Grants Pass; William Kennedy, Portland; Harold Banta, Baker; Rep. Fayette Bristol, Grants Pass; William Gardner, Canyon City; Earl S. Mollard, Riddle; Dr. Garth Thornburg, Lakeview; Pierre R. Hines, Portland; Rep. Clinton P. Haight, Jr., Baker; and Bruce J. Manley, Medford.

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OIL RECORDS RELEASED FROM CONFIDENTIAL FILES

Records on Miriam Oil Company's "Bliven No. 1" (Permit No. 24) were released from the confidential files on June 1, 1959. The hole was drilled in the $SW\frac{1}{4}$ sec. 11, T. 8 S., R. 5 W., Polk County. Total depth was 1300 feet.

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GUIDEBOOK TO GEOLOGY ALONG OREGON HIGHWAYS PUBLISHED

"Guidebook to Geology along Oregon Highways" has just been published as Bulletin 50 by the State of Oregon Department of Geology and Mineral Industries. This publication was designed to serve a dual purpose. Its immediate use is for the College Teachers of Geology Conference, sponsored by the National Science Foundation, held in Corvallis June 15 to 27, 1959. Its more permanent use is for the interested layman or geologist who wishes to drive over the Oregon highways to see the geology described.

The Guidebook contains the logs of seven field trips to areas in the State where geologic formations of special interest are exposed along the highways. The first two trips pass over Tertiary marine formations of the Willamette Valley, Coast Range, and coastal region. The third trip crosses the volcanic rocks of the Cascade Range and takes in the Bend area. The fourth and fifth trips visit Cretaceous and Tertiary formations in central Oregon between Prineville and John Day. The fifth and sixth trips go through areas of Paleozoic, Triassic, and Jurassic rocks between Canyon City and Suplee. The seventh trip crosses the northern part of central Oregon and follows the Columbia River Gorge to Portland.

Accompanying the trip logs are numerous strip maps showing the geology along the route. Four correlation charts show the stratigraphic relationships of the geologic formations in Oregon, many of which are described in detail. The publication contains a number of scenic photographs, four of which are in color. An extensive bibliography accompanies the text.

Although many persons contributed to the text and illustrations in the Guidebook, W. D. Wilkinson, Professor of Geology at Oregon State College and Director of the Geology Conference, was responsible for compiling and organizing the material.

Bulletin 50 has 152 pages and is paper bound. It may be obtained from the Department's offices in Portland, Baker, and Grants Pass. The price is $1.50.

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GEOLOGY CONFERENCE DRAWS COLLEGE PROFESSORS

A total of twenty-nine college geology professors selected from schools all over the United States attended the Summer Conference in Geology sponsored by the National Science Foundation at Oregon State College June 15 through June 27. Dr. W. D. Wilkinson, professor of geology at the College, secured the grant from the Foundation, arranged the various symposiums and field trips, and compiled a field guidebook covering seven trips through areas of particular geologic interest in the State.

Symposium discussions were led by Dr. Siemon Muller, Stanford University; Dr. Ralph Imlay, U.S. Geological Survey; Dr. E. L. Packard, Oregon State College (Emeritus); Dr. H. L. Popenoe, Jr., Shell Oil Company; Dr. A. J. Eardley, University of Utah; and Dr. Harry Wheeler, University of Washington. Following the symposiums the group went by bus to Newport and Depoe Bay, then across the Cascades to Bend, Newberry Crater, the Ochoco Mountains, John Day and Bear valleys, Picture Gorge, Fossil, Arlington, and down the Columbia River Gorge to Portland.

One of the objectives of the Symposium, aside from providing those attending with an opportunity to discuss new trends in geologic instruction, was to acquaint them with some of the State's geological provinces which are largely unpublished. The Department of Geology and Mineral Industries assisted the Conference by publishing the field guidebook used on the firld trips. The guidebook is described elsewhere in this issue.

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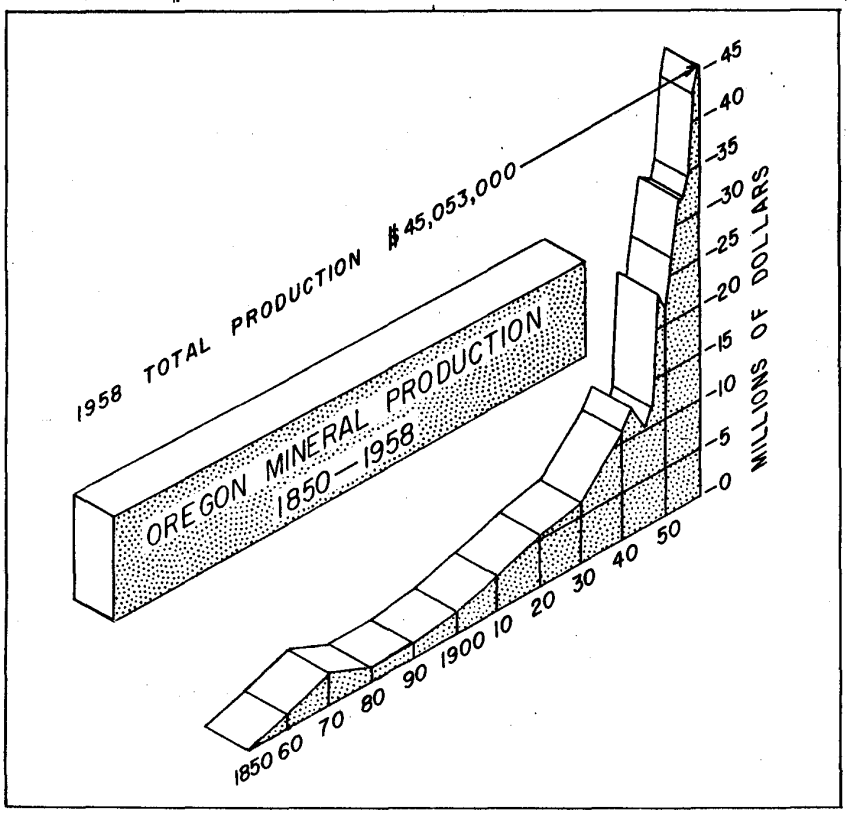
STATE MINERAL PRODUCTION AT ALL-TIME HIGH

By Ralph S. Mason*

The value of Oregon's mineral production for 1958 increased slightly more than 5 percent over the 1957 figure (see Table 1, p. 62), raising the total to the highest point in the State's history. Figures released by the U.S. Bureau of Mines give a total value for Oregon minerals produced in 1958 of $45,053,000, which is $2,233,000 more than for 1957. Employment in the mining and metallurgical industries in the State rose to 9,700, an apparent increase of 1,100 over 1957. Most of this increase was due to changes in the industrial classification system. Mineral industry payrolls for the State totaled $55,733,000 for the year. The employment figure does not, however, include all of the wage earners who are employed full time in the mining and metallurgical industries, since firms with fewer than two employees, and those who are self employed are not reported. Table 2 shows the comparison between mineral and metallurgical industry payrolls for 1957 and 1958. The apparent discrepancy between total value of minerals produced and the payrolls for the same period is due in part to the exclusion of the value of metals mined and refined in the State, such as nickel, and those imported and refined, such as aluminum, zirconium, titanium, and elemental silicon. The addition of the value of these products would greatly swell the total reported in Table 1.



Not all segments of the mining and metallurgical industry showed gains during the year. Sand and gravel production decreased by about $3.2 million, and clay for brick and tile was down for the year. Chromite production ceased in May with the closing of the stockpile, and

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

all but one of the mercury mines were closed at the end of the year. Increases in crushed stone, cement, diatomite, building stone, lightweight aggregates, nickel ore, and lime more than overcame the losses, however.

Distribution of the mineral industry over the entire State is graphically shown on the accompanying map which gives the value of the minerals produced in each county and lists the minerals in order of their importance.

Table 1.

Mineral Production in Oregon, 1957-1958 [1]

Mineral	1957 Short tons (unless otherwise stated)	1957 Value (thousands)	1958 Short tons (unless otherwise stated)	1958 Value (thousands)
Chromium ore and concentrate - gross weight	7,900	$ 675	4,133	$ 379 -
Clays - thousand short tons	240	266	252	293 +
Copper (recoverable content of ores, etc.)	23	14	10	5 -
Gold (recoverable content of ores, etc.) - troy ounces	3,381	118	1,423	50 -
Lead (recoverable content of ores, etc.)	5	1	1	[2]
Mercury - 76-pound flasks	3,993	986	2,276	521 -
Nickel (content of ore and concentrate)	12,276	[3]	12,697	[3]
Pumice and volcanic cinder - thousand short tons	123	294	138	331 +
Sand and gravel - thousand short tons	12,843	13,481	10,464	10,265 -
Silver (recoverable content of ores, etc.) - thousand troy ounces	16	14	3	2 -
Stone - thousand short tons	[4] 10,583	[4] 11,745	15,004	15,483 +
Value of items that cannot be disclosed: Carbon dioxide, cement, diatomite, gem stones, iron ore (1957), iron oxide pigments (1957), lime, tungsten (1957), uranium (1957), and values indicated by footnote 3		16,154		18,932 +
Total [5]		[4] 42,820		$45,053

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Less than $500.
3/ Figure withheld to avoid disclosing individual company confidential data.
4/ Revised figure.
5/ Total adjusted to eliminate duplicating value of clays and stone.

Table 2.

Oregon Mineral Industry Employment and Payrolls*

	1957 Employment	1957 Payrolls	1958 Employment	1958 Payrolls
Mining	1,216	$ 6,150,380	1,330	$ 7,381,345
Mineral manufacturing	1,663	8,482,287	2,500	13,139,764
Primary metals	4,985	28,728,266	5,023	30,814,502
Miscellaneous	701	3,641,569	801	4,398,000
Totals	8,565	$ 47,002,502	9,654	$ 55,733,611

* Oregon State Unemployment Compensation figures. Only firms hiring two or more employees are included.

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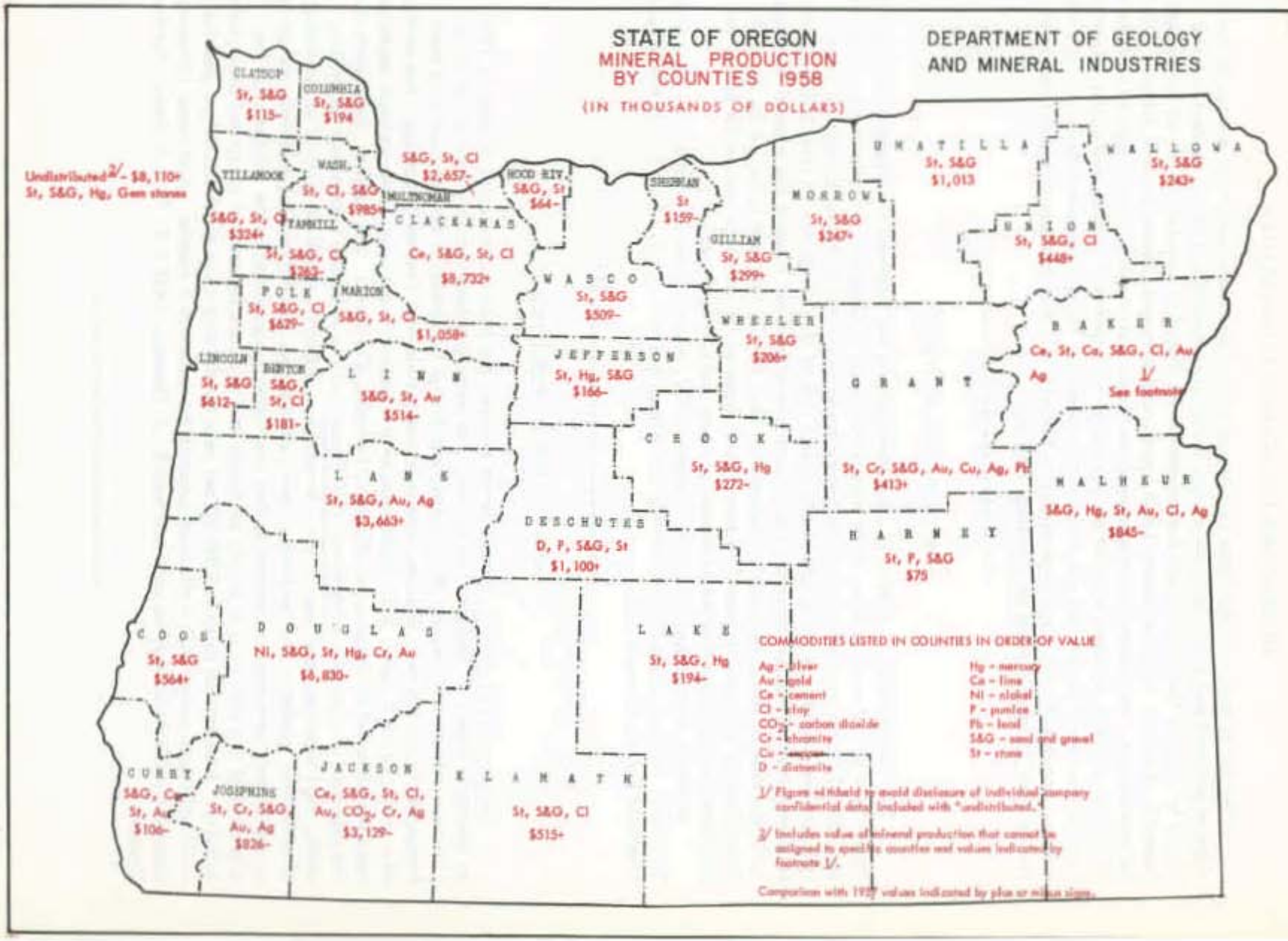
STATE OF OREGON
MINERAL PRODUCTION
BY COUNTIES 1958
(IN THOUSANDS OF DOLLARS)
DEPARTMENT OF GEOLOGY
AND MINERAL INDUSTRIES
Undistributed 2/ - $8,110+
St, S&G, Hg, Gem stones
CLATSOP
St, S&G
$115-
COLUMBIA
St, S&G
$194
S&G, St, Cl
$2,657-
TILLAMOOK
WASH.
St, Cl, S&G
$985+
MULTNOMAH
HOOD RIV.
S&G, St
$64-
SHERMAN
St
$159-
UMATILLA
St, S&G
$1,013
WALLOWA
St, S&G
$243+
MORROW
St, S&G
$247+
S&G, St, Cl
$324+
YAMHILL
St, S&G, Cl
$262-
CLACKAMAS
Ce, S&G, St, Cl
$8,732+
GILLIAM
St, S&G
$299+
UNION
St, S&G, Cl
$448+
POLK
St, S&G, Cl
$629-
MARION
S&G, St, Cl
$1,058+
WASCO
St, S&G
$509-
WHEELER
St, S&G
$206+
BAKER
Ce, St, Cu, S&G, Cl, Au
Ag
1/
See footnote
LINCOLN
St, S&G
$612-
BENTON
S&G,
St, Cl
$181-
L I N N
S&G, St, Au
$514-
JEFFERSON
St, Hg, S&G
$166-
G R A N T
C R O O K
St, S&G, Hg
$272-
St, Cr, S&G, Au, Cu, Ag, Pb
$413+
L A N E
St, S&G, Au, Ag
$3,663+
DESCHUTES
D, P, S&G, St
$1,100+
H A R N E Y
St, P, S&G
$75
M A L H E U R
S&G, Hg, St, Au, Cl, Ag
$845-
C O O S
St, S&G
$564+
D O U G L A S
Ni, S&G, St, Hg, Cr, Au
$6,830-
L A K E
St, S&G, Hg
$194-
CURRY
S&G, Cr
St, Au
$106-
JOSEPHINE
St, Cr, S&G
Au, Ag
$826-
JACKSON
Ce, S&G, St, Cl,
Au, CO2, Cr, Ag
$3,129-
K L A M A T H
St, S&G, Cl
$515+
COMMODITIES LISTED IN COUNTIES IN ORDER OF VALUE
Ag - silver
Au - gold
Ce - cement
Cl - clay
CO2 - carbon dioxide
Cr - chromite
Cu - copper
D - diatomite
Hg - mercury
Ca - lime
Ni - nickel
P - pumice
Pb - lead
S&G - sand and gravel
St - stone
1/ Figure withheld to avoid disclosure of individual company confidential data; included with "undistributed."
2/ Includes value of mineral production that cannot be assigned to specific counties and values indicated by footnote 1/.
Comparison with 1957 values indicated by plus or minus signs.

MINING LAW ON COUNTY LANDS REVISED

The latest session of the State Legislature revised and made easier the manner of obtaining right to prospect and hold claims on county lands. The Senate bill which became law was introduced by Senator Dan Dimick and Representative Al Flegel of Douglas County at the request of Robert E. Kischel, Douglas County Land Agent, and amended Oregon Revised Statutes 275.294. As now written, the County Court may execute leases and contracts upon a royalty basis for the mining of valuable minerals without the necessity of competitive bidding and public advertisement. Lands to be leased for oil and gas still must be submitted for bids and advertised for two successive weeks. Senator Dimick's and Representative Flegel's bill bore the emergency act and so became law on May 26 upon signing by Governor Hatfield.

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WITHDRAWAL ACTIVITY

This month the U.S. Bureau of Land Management has informed the Department that the Forest Service has made another of its strip withdrawals in Oregon. This particular withdrawal, No. 59-13, is for approximately 2,340 acres in the Deschutes National Forest. It takes a strip of land 330 feet on each side of the center line of U.S. Highway 97 (The Dalles-California Highway) from appropriation under the general mining laws but excepts the mineral leasing laws. As in the case of the 2,781-acre withdrawal of No. 59-10, this land is for use by the U.S. Forest Service as roadside zones "to protect and preserve the aesthetic values for public use and enjoyment and for eventual establishment of camp and picnic grounds."

Proposed withdrawal Serial No. Oregon 04707, made in February 1956, has been terminated. This land, which included approximately 200 acres, was in T. 24 S., R. 6 E., of the Deschutes National Forest, Klamath County.

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NEW OIL REPORT PUBLISHED

Northwest Oil Report, a news-letter service, has been started up as of July 7, 1959, by geologist Robert J. Deacon. At present, the letter is a semi-monthly summary of oil exploration activity in Oregon, Washington, and British Columbia; it may be published more frequently in the future. Deacon, who received his Master's Degree in geology, has worked as a geologist for 8 years, 6 of which were with a major oil company. His geologic experience has been obtained in Oregon, Washington, Nevada, California, and Alaska. He reports that the principal service of his Northwest Oil Report will be to supply information on drilling wells, well histories, and lease plays. In addition, subscribers will be advised of availability of well data, geologic and land maps, new publications, legislation, log releases, and changes in exploratory personnel in companies that are currently operating in the Northwest. The objective of this service is to supply an honest and accurate summary of all phases of exploratory activity. Subscription price is $300.00 per year for the first copy and $150.00 per year for each additional copy, with a minimum subscription period of 6 months. Additional information about the publication may be obtained from R. J. Deacon, 3437 S.E. Francis Street, Portland 2, Oregon.

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USGS SUMMER FIELD WORK IN OREGON

The U.S. Geological Survey has announced the following field studies in Oregon during the present season.

R. E. Wilcox will continue the field work started in 1958 in the Monument quadrangle of Grant County. Mr. Wilcox is combining his geologic studies with remanent magnetism investigations on the basalts. Thomas P. Thayer, assisted by C. E. Brown, has resumed his mapping in the Prairie City quadrangle, Grant County. Dr. Thayer has in preparation a report on the Upper Triassic rocks in Aldrich Mountain, Grant County. Robert Q. Lewis, who has been doing reconnaissance mapping for the State geologic map in northeastern Oregon, will continue this work. George Walker, who started systematic reconnaissance mapping in southeastern Oregon in 1958, will extend his work northward. Mr. Walker's work will be used for the State geologic map. Aaron C. Waters is completing the geologic maps and text of the Mount Hood and Dufur quadrangles, north-central Oregon, for publication in the Survey's MF series. Dr. Waters is also completing the maps and text for a report on the quicksilver deposits of the Ochoco Mountains area.

The Survey's Fuels Branch has P. D. Snavely, Jr., and W. W. Rau working in the western Coast Range this summer. Snavely is continuing a project started in 1958 in the Yaquina, Alsea, and Siletz river basins. Dr. Rau is continuing his measurement of stratigraphic sections and collections of foraminiferal samples.

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DEPARTMENT FIELD ACTIVITIES

Norman S. Wagner and Dr. David A. Bostwick have started a 2-year program on the stratigraphy and paleontology of the Paleozoic rocks of Oregon. Dr. Bostwick, professor of paleontology at Oregon State College, will work for the Department during the summer months, and Wagner, geologist in charge of the Department's field office in Baker, in addition to working with Bostwick, is continuing his field mapping studies for the State geologic map in northeastern Oregon.

Howard C. Brooks, field geologist, Baker, is completing the mapping of quicksilver deposits in Oregon. Brooks' work, which will replace Department Bulletin 4, "Quicksilver in Oregon," will be completed this field season.

Norman V. Peterson, field geologist, Grants Pass, is extending the mapping done last year in the vicinity of the White King uranium deposits, Lake County, westward to include the quicksilver deposits near Quartz Mountain. Peterson will also do reconnaissance work in southern Lake County for use in the State geologic map.

Len Ramp, field geologist, Grants Pass, is mapping and cataloging several limestone, silica, and iron ore prospects and occurrences in southwestern Oregon. Ramp completed his study on the chromite deposits of southwestern Oregon early this year.

Herbert G. Schlicker, field geologist, Portland, is continuing his reconnaissance work on the intrusives in the Coast Range. Schlicker's work will be coordinated with that of P. D. Snavely, Jr., of the U.S. Geological Survey.

Margaret L. Steere, geologist, Portland, is finishing her bulletin on western Oregon fossil localities and the third supplement (1951-1955) to the bibliography of geology and mineral resources of Oregon.

R. E. Stewart, micropaleontologist, Portland, will complete his studies on Oregon micropaleontology. This will be published as Part IX of Department Bulletin 36.

Vernon C. Newton, Jr., petroleum engineer, Portland, is completing the dry-hole map of western Oregon. The dry-hole map of eastern Oregon was finished earlier this year.

Dr. George S. Koch, Jr., professor of economic geology, Oregon State College, is mapping in the area of the Clover Creek greenstone in Baker, Union, and Wallowa counties of northeastern Oregon. This work is in connection with a study on copper deposits in the State. Dr. Koch is assisted by Harold J. Prostka, graduate student from The Johns Hopkins University, Baltimore, Maryland.

H. J. Buddenhagen, consulting geologist, is working for the Department in central Oregon. Mr. Buddenhagen's work is largely in Grant, Wheeler, and Crook counties and is concerned with the structure and stratigraphy of the pre-Tertiary with emphasis on the Mesozoic.

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DEPARTMENT GEOLOGIST RETIRES

Roscoe E. Stewart, better known as "Doc," will retire July 31, 1959, from the State of Oregon Department of Geology and Mineral Industries where he has been a geologist since 1944. His work with the Department has dealt primarily with micropaleontology, and he is regarded as one of the foremost authorities in this field on the West Coast. Petroleum geology in the search for oil and gas has also received much of his attention.

A graduate of the University of Chicago in 1923, he received his Master's degree from the University of Southern California. He studied also at Columbia University and at the Cushman Laboratory for Foraminiferal Research, Harvard University, and taught petroleum geology for several years in California. Between 1923 and 1944 he was employed in California by the Chanslor-Canfield Midway Oil Company, first on drilling crews and later as resident oil-field geologist and petroleum engineer.

Most important of his publications for the Department is his Bulletin 36, Parts 1-8, on Tertiary Foraminifera. The bulletin is co-authored with his wife, Katherine C. Stewart, and the late Dr. Joseph A. Cushman. Part 9 of Bulletin 36, to be published soon, will be a revision of a paper which appeared in three parts in the Ore.-Bin under the title, "Stratigraphic Implications of some Cenozoic Foraminifera from Western Oregon." In 1954 Mr. Stewart compiled a record of oil and gas exploration in the State. This was published by the Department as Miscellaneous Paper 6.

"Doc" says that after retirement he plans to do a little consulting, a little research, and a lot of living and loafing that had to be postponed way back in 1923 when he graduated from a diploma to a job.

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TUALATIN VALLEY GEM CLUB EXHIBITS

The Tualatin Valley Gem Club of Forest Grove, Oregon, has been displaying a fine exhibit of agates, minerals, and petrified wood in one of the Department's display cases at 1069 State Office Building in Portland. The agate material consists of cut and polished slabs, cabochons, and jewelry. Types of agates displayed include polka dot, plume, Holley blue, white plume, Carey plume, sagenite, and morrisonite. One of the interesting features of the display is the arrangement showing both the finished gem stone and the rock from which it was cut. Other specimens in the exhibit include gold ore, garnets, amethyst-filled geodes, thunder eggs, and polished sections of petrified wood.

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EASTERN OREGON MINING NEWS

Lode mines (gold, silver, copper)

The Boaz Mining Company, operator of the Buffalo Mine at Granite in Grant County, is driving a new working adit designed to intercept the veins at a depth of approximately 230 feet below the present lowest level. When completed the tunnel will be approximately 1,400 feet long and will intersect all known veins on the property. The Buffalo has been Oregon's top lode gold producer since World War II.

The Gold Star Mining and Milling Company, Baker, Oregon, has a crew engaged in diamond drilling at the Phoenix mine near Greenhorn in Grant County. The work is being done under the direction of Lawrence Banta. Some drilling was done by the company last season.

Cobalt-Gold Mines, Inc., of Boise, Idaho, has leased the Tri-County Mining and Milling Company mill in John Day and is milling gold ore from a company-owned property north of Prairie City, on Dixie Creek in Grant County. Milling was started during the last week in June. The company is headed by H. F. Stevens, Boise, president; James Evans, Boise, vice president; and Atty. J. D. Lane, Ontario, secretary. B. A. Bailey, Prairie City, is in charge of operations. The company has been doing exploratory work on the property for several years, and developed stoping ground in a 310-foot drift last year. Three men are employed at the mine.

The upper workings of the Bay Horse mine, an old silver lode on the Snake River below Huntington in Baker County, have been reopened recently for examination. The operators, Messrs. Franz and Traver of Ritzville, Washington, plan to do some exploratory drifting.

T. D. French, Spokane, recently purchased the Ward Hill lease on the consolidation of the Columbia, E & E, Tabor Fraction, and North Pole lode-mining properties in the Cracker Creek mining district, Baker County. A few men have already been hired and put to work at the Columbia mine and on renovating jobs in the mill, but Mr. French's ultimate development plans are not known at the present time.

Placer mines

The Suksdorf placer in the Mormon Basin district of Baker County is being worked by a Tulsa, Oklahoma, company known as the Oil-Minerals Operation. Mining is being done by a dragline-washing trommel set-up and is under the direction of Calvin Suksdorf, Baker, Oregon. Water for the operation is being pumped from the old Humboldt mine. This is the third season that this company has been active in the Basin.

A sizeable section of the Cracker Creek channel below Bourne, Baker County, is being readied for hydraulic placering by F. A. Ramsey, A. M. Rowe, and Associates, Box 80, Sumpter, Oregon. Water for the operation originates from Cracker Creek. Mining will be done by a 7-inch Giant with dozer and slusher assist for boulders. The present stage of development is such that a bedrock pit and full face of gravel should be exposed for productive washing by mid-July.

Placer gravels on the Mohawk claims on Vincent Creek, in the Greenhorn area of Grant County, are being washed by Messrs Haskins and Fleming, Bates, Oregon. Pocket gold has been found on this ground in the past and it is therefore possible that the present placering will lead to new lode discoveries.

Frank Mayo, Sumpter, Oregon, has leased a group of placer claims on Burnt River above Whitney and is currently engaged in setting up a 75-yard-per-day skid-mounted washing plant. This ground is adjacent, on the up-river side, to a large tract dredged by the Murphy-Sunshine interests prior to World War II.

A high bar placer on the old Fullbright homestead on Burnt River, below Cave Creek, in Baker County, has been developed for hydraulic placering by Charles Griffin, Durkee. This bar was drift-mined in the early days. Water for the new operation will be pumped from the river. H. A. Upton and Associates of Durkee are testing the river channel on this property with a float-mounted suction pump.

Quicksilver

Exploratory trenching and test pitting is being done on two new quicksilver finds in Baker County. One, owned by James Anderson, James Dickerson, Albert Smith, and Jack Pittman, lies two miles west of Hereford and half a mile north of Oregon Highway 7 on the slopes of Wood Gulch, a tributary of Burnt River. Cinnabar occurs in an area of hot-spring activity along fractures cutting early Tertiary dacite. The prospect was discovered in February 1958.

The other discovery, owned by Robert Hulin and Carl Bowman, lies on the slopes of a tributary of Cave Creek, about $2\frac{1}{2}$ miles by road from its junction with Burnt River. Cave Creek enters Burnt River from the south about 9 miles by road upriver from U.S. Highway 30. The prospect, discovered in March 1959, occurs in a silicified "reef" of Paleozoic Burnt River schist.

Molybdenum - copper

W. W. Serrine and W. W. Decker, 102 Atlas Building, Salt Lake City, and Robert Hulin, Baker, are erecting a small flotation mill on a molybdenite-copper prospect in the Rock Creek district of Baker County to process ore recovered during the course of development work last year. The operators plan to start a shaft and to continue surface exploration with a dozer again this season.

Miscellaneous

Tailings impounded from the mill of the old Cornucopia gold mine in Baker County are being utilized for concrete mix and grout at the Idaho Power Company's Brownlee and Oxbow dams on the Snake River above Homestead. The tailings were purchased and are being trucked to the dam sites by the N.C. Jones Company of Halfway.

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SOUTHERN OREGON MINING NEWS

Lode gold mines (Jackson County)

Operations at the Warner gold mine, sec. 4, T. 33 S., R. 4 W., were discontinued May 1. The mine had been under lease to Ben Baker, Bob Hanford, and Clarence Ford. The mine is owned by A. M. Ropp and J. C. Wells of Albany, Oregon. Frank Gelhaus, Rogue River, operated the mine between 1954 and 1959, during which time small amounts of high-grade gold ore were produced.

Excavation and trenching work at the Braden mine, sec. 27, T. 36 S., R. 3 W., has been carried on by R. D. Grabar and H. V. Burgard. Mr. Grabar reported that they are installing a mill in the old Birdseye Creek mill building to concentrate ore from the Braden mine. Mill tests of the ore made earlier at the Waldo mill in Josephine County were somewhat discouraging.

Stanley Smith, Bend, Oregon, is working the Queen of the Hills gold mine on a part-time basis. The mine is located in sec. 34, T. 36 S., R. 4 W. Co-owner of the mine is Archie Bell, Grants Pass. They have installed a small test mill at the Homa mine site near the Birdseye mill.

Lode gold mines (Josephine County)

Some development work and a minor amount of mining were done on some of the lode gold mines in Josephine County. Notable among these was construction of a small mill and some drifting by Wes Pieren at the Greenback mine, secs. 32,33, T. 33 S., R. 5 W.

A small mill was installed at the Howland mine, sec. 24, T. 35 S., R. 7 W., by owners Harry Commers, C. W. Robertson and Jim McClellan. A shallow shaft was sunk and at present diamond drilling is being done.

At the Humdinger mine, sec. 21, T. 38 S., R. 5 W., Earle Young and Walter Lonnon have cleaned out the No. 1 and No. 2 tunnels and put in a raise in the No. 1. They have installed a small mill. Equipment includes a crusher, ball mill, amalgamation plates, a table, and a small cyanide plant.

George Slade has recently constructed a small gold mill at his Snow Bird (Tip Top) mine on the road west of the Humdinger mine. He has extended the drift to about 300 feet in length and put in a raise.

A gold prospect located in the SE¼ sec. 28, T. 33 S., R. 5 W., and recently developed by Les Hudson and Ed Bowling, Grants Pass, is being worked by Frank Kolkow. The gold occurs as thin films on shears of a talcky serpentine and finely disseminated in the talc.

Lode gold mines (Douglas and Curry counties)

The Zinc Creek Mining Corporation has added equipment to the old Waldo Milling Company mill on French Flat and is running a mill test on about 75 tons of material from a mineralized zone on the Zinc Creek logging road about 10 miles northeast of Tiller in Douglas County.

A new gold prospect near Canyon Peak in sec. 1, T. 39 S., R. 10 W., Curry County, is being developed by Bert and Ernest McTimmonds, Grants Pass, and Russell Calhoun, Wilderville. They are installing a small mill to recover free gold and concentrates.

Placer mines

At least two dozen small placer mines were active intermittently during the winter and spring months in Jackson, Josephine, and Douglas counties. Twelve operations are known to have been active in Josephine County alone.

Shortage of water this year forced many of the mines to shut down early. Placer mines along Bull Run Creek, Hogum Creek, Cow Creek, Foots Creek, Humbug Creek, Palmer Creek, Pleasant Creek, Sterling Creek, Ward Creek, Josephine Creek, Althouse Creek, Democrat Gulch, Louse Creek, Grave Creek, Wolf Creek, Coyote Creek, Rocky Creek, and Galice Creek were active during the 1958-1959 season.

Uranium

White King uranium mine, Lake County, is proceeding with conversion of underground mining to open pit mining on schedule. Overburden is being removed at a rate of 10,000 yards per day and ore is being mined as stripping advances. The operation so far has been highly successful as sufficient ore has been removed to keep the mill in operation and in addition ore is being stockpiled at the mill and mine. The deepest part of the pit is now at elevation 6,344 feet, 45 feet below the collar of the No. 1 shaft. Howard Dutro, chief geologist and assistant manager for the Lakeview Mining Company, resigned in July.

Quicksilver

The Gray Cinnabar property in the Coyote Hills, Lake County, has been leased to a Grants Pass group headed by Albert Schiermeister and Frank Melvin.

The Bonanza quicksilver mine in Douglas County has been in operation during the year. Production was slowed down for a period last year during repair of the main haulage winze. Bert Avery, former mine superintendent, has taken a new job at the Sonoma quicksilver mine near Guerneville, California. Tom W. Bidwell, Jr., who has worked at the mine for several years, was promoted to mine superintendent in November 1958. Mr. Bidwell reported that both the mine and furnace are in full operation. Development work is currently being carried on at the 1400-foot level.

Lime

Work has been started at the Jones marble quarry near Williams, sec. 31, T. 38 S., R. 5 W., Josephine County, by the Pacific Northwest Lime Inc. This is a newly formed corporation including Mr. and Mrs. Mabry Ogle and Gene L. Brown, attorney, Grants Pass. They have improved the road and started drilling for blasting down rock. They plan to produce paper rock, ag lime, and possibly building stone.

Silica

The Bristol Silica Company plant at Rogue River in Jackson County is to be moved to a new location in the near future due to routing of U.S. Highway 99 through the present site. The new site for the plant, which is used to crush, wash, and screen both quartz and granite, has not yet been announced.

Exploration and development work is continuing at the Big Quartz silica deposit on Quartz Mountain, sec. 2, T. 28 S., R. 1 E., Douglas County. The claims are owned by Roy and G. D. Rannells. Geologic maps of the area are being prepared by Walter A. Foster, Hanna Mining Company geologist, and Len Ramp, field geologist at the Department's Grants Pass field office. A thorough sampling program planned by the Hanna Mining Company is being carried out by Mr. Foster.

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MINING ENGINEER GETS FOREIGN ASSIGNMENT

Jean W. Pressler, Consulting Mining and Metallurgical Engineer, of Grants Pass, Oregon, has accepted a foreign assignment with the U.S. Bureau of Mines and the I.C.A. Mission in Taejon, Korea. He will be Metallurgical Advisor to the government of Korea and will be in charge of the Mineral Dressing Station at Taejon. After a 3-week orientation course in Washington, D.C., he will depart with his family for Korea about September 15.

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AFRICAN CHROME PRODUCERS HIT

Salisbury (McGraw-Hill World News): Chrome producers in the Federation of Rhodesia and Nyasaland are alarmed at the amount of chrome ore the United States is buying from Russia. It was reported locally that in January and February this year the United States bought 80,000 tons of chrome ore from Russia and 53,000 tons from the Federation. The Federation's chrome industry has asked the Federal Minister of Commerce and Industry to take the matter up with the U.S. Government. The industry complains that it was able to supply the 80,000 imported from Russia. The industry further complains that their export market is already depressed without the additional handicap of competing with Communist countries.

(From: E&MJ Metal & Mineral Markets, June 25, 1959.)

P.S. - Domestic chrome producers are shut down because of African, Turkish, etc., imports. (Ed.)

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ANALYTICAL LABORATORIES OF THE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

By
L. L. Hoagland* and T. C. Matthews**

Laboratory Services

The analytical laboratories of the Department of Geology and Mineral Industries are the chemical, fire assay, and spectrographic laboratories. These services are set up to aid Oregon's prospectors and to help any resident who is interested in the analysis of rocks, minerals, or ores of the State. Figure 1 (page 72) shows the routing procedure for samples received by the Department for analysis.

Samples to be analyzed may be brought in or mailed either to the Department's laboratories in Portland or to the field offices in Grants Pass and Baker. Each sample submitted, except those for spectrographic work, must be accompanied by a "Request for Sample Information" form or a statement giving the name of the sender, location where the sample was taken, the analysis desired, and other pertinent information. Forms to accompany the samples may be obtained from any of the Department's offices. All services, except those of the spectrographic laboratory, are performed in exchange for the information requested and no charge is made. The spectrographic laboratory, according to law, operates under a schedule of charges. The various types of analytical service provided by the Department are briefly described below.

(1) Fire assay: The fire assay furnace is used to determine the values of gold, silver, or platinum-group metals present in a sample.

(2) Chemical analysis: The chemical laboratory is equipped to make qualitative and quantitive chemical analysis of rocks, minerals, and ores submitted by the public and by Department staff members assigned to examine mineral deposits.

(3) Spectrographic analysis: The primary use of the spectrograph is to determine qualitatively all the major, minor, and trace elements in a sample. It is often used to determine which metallic elements are present before performing chemical analysis. It is also used to identify very small samples or unknown inorganic materials.

(4) Petrographic determination: Major minerals, or rock type of the sample, are identified through visual examination. If warranted, the petrographic microscope is used to make more exacting determinations of minor or unusual minerals.

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*Assayer-Chemist, State of Oregon Department of Geology and Mineral Industries.
**Spectroscopist, State of Oregon Department of Geology and Mineral Industries.

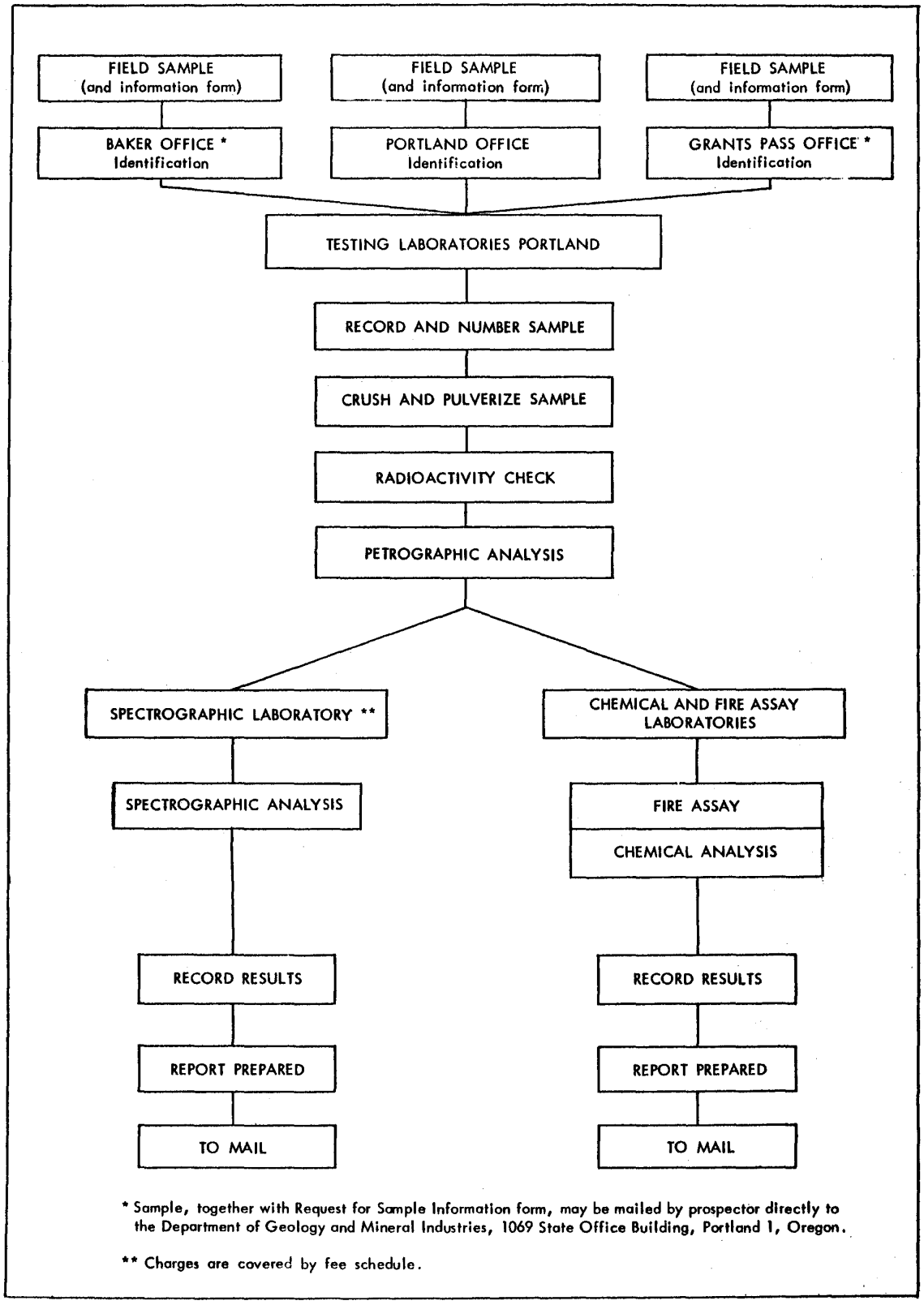

Figure 1 - Sample Routing Procedure.

(5) Radiometric test: Since 1954 all samples sent to the Portland laboratory have been scanned by a sensitive Geiger counter. Samples brought in to the offices can be tested on a counter immediately if requested. A radioassayer, on loan from the Atomic Energy Commission, is available for more accurate qualitative tests in the range of .01 percent to .15 percent uranium equivalent.

(6) Fluorescence test: A short wave lamp is used to identify the presence of minerals, such as scheelite, autunite, etc., which give diagnostic fluorescence. A sensitive and quick qualitative test for mercury makes use of the fact that mercury vapor is opaque to ultraviolet light.

(7) Differential thermal analysis: This procedure is used to help identify the minerals in clays, shales, and similar materials. It is used only after other tests have indicated that the material has possible economic value.

Authority for Performing Analytical Services

Chemical and fire assay service

The law establishing chemical and fire assay work in the Department is quoted in part from Oregon Revised Statutes as follows:

> "516.040 Assays for the public. The department shall make or have made quantitative determinations of ores and minerals when submitted for the purpose, that are from original prospects or properties within the state, and shall mail to the sender the results obtained within 10 working days after receipt of samples. This service shall be performed by the department without charge to the sender and shall be rendered in exchange for information 1/ for the records of the department, stating the name and residence of the sender, together with a history of the ore or mineral, giving as nearly as possible the location from which the sample was taken, including the name of the county, and any other matters that may be beneficial touching the same. All determinations made pursuant to this section shall be performed under the following rules, regulations and restrictions:
>
> "(1) No samples submitted by engineers sampling prospects or mines for the purpose of evaluation, or submitted by operating mines milling or shipping ore or hiring labor, shall be accepted by the department for assay or analysis, unless taken in the field by members of the department staff in conducting the work of the department within the scope of this chapter.
>
> "(2) The number of samples which any single person or group of persons may submit shall be limited to two in any 30-day period and all samples shall be assayed or analyzed by the department in the order received, as far as possible.
>
> "(3) All information received and results of determinations sent out shall be open to public inspection and may be published by the department.
>
> "(4) Before any work is done on the material submitted, all information required must be possessed by the department and the 10-day limit for reports will count from the time such data are received by the department."

Spectrographic service

The spectrographic laboratory was established by the 41st Legislative Assembly. Under the direction of Earl K. Nixon, former Department Director, and Dr. Harold C. Harrison, former head of Department laboratories, a 3-meter Baird spectrograph was purchased and put in operation in 1942. The law establishing this service states:

1/ Underlining by authors.

"516.050 Spectrographic laboratory; establishment and operation. The Department shall establish, equip and operate a spectrographic laboratory."

"516.060 Spectrographic laboratory; duties. The laboratory shall:

"(1) Make spectrographic determinations at the request of any department, institution or other agency of the state, without any charge in excess of the actual cost thereof.

"(2) Make other spectrographic determinations at a reasonable charge in excess of the actual cost thereof."

"516.070 Spectrographic laboratory; disposition of money. All money received by the department from charges for spectrographic determinations shall be paid over to the State Treasurer and by him deposited in the General Fund."

Operation of the Chemical and Fire Assay Laboratories

General

In 1943 the State assay laboratories were moved from the Grants Pass and Baker field offices and combined in the Portland office. Since that time, 24,000 samples have been received in the chemical and fire assay laboratories. The number of analyses requested on each sample varied from one to six with an average of over two per sample, requiring a total of some 54,000 analyses in this 16-year period. Determinations have been made for sixty different elements. Because of the high cost and length of time required for a complete chemical analysis, this is performed only for a few critical Department projects or in special instances for prospectors when their samples warrant a complete analysis.

Sample preparation

Information received with each sample accepted for analysis, fire assay, and identification is copied in a record book. A permanent number is assigned to each sample and its information form. The sample, which should be a minimum of one pound in weight, is examined by a geologist, who may make additional requests for analysis. Rock type or principal minerals are indicated on the sample information form in a space marked "Sample description." After visual examination, samples are crushed to approximately $\frac{1}{4}$ inch in size and separated into portions by passing through a Jones sample splitter. A quarter-pound portion of the sample is then pulverized to the point where 95 percent will pass through a 100-mesh screen (each opening .0058 inch on a side). The rejects (nonpulverized portion) from the sample splitter are sacked, checked for radioactivity, and placed in storage for possible future reference. After one year the rejects are discarded. The pulped (pulverized) portion of the sample is then ready for either chemical analysis or fire assay. After tests are completed the pulps are held in storage for at least one year before discarding.

Fire assaying

Pulverized samples received in the assay office are analyzed by the "fire method" for the determination of gold, silver, platinum, and other precious metals of the platinum group. In the fire method the weighed sample is mixed in a fire clay crucible with a flux composed largely of silica (silicon dioxide), soda ash (sodium carbonate), borax glass (fused borax), and litharge (lead oxide). The fluxing mixture will be varied depending on the composition of the ore to be assayed. A known but small quantity of silver is added to insure a modest surplus of silver over gold in the final bead so that the parting (described later) will proceed to completion. After the sample and its flux have been thoroughly mixed the crucible is placed in a gas-fired assay furnace and heated gradually to a temperature of about 1150° C.(2100°F.).

The samples are placed in a muffle which insures an even distribution of heat around the samples and protects them from direct contact with the gas flame. During the early part of the heating period, part of the litharge in the flux is reduced to fine globules of lead. These lead globules move through the gently boiling mass of rock sample and flux to dissolve the precious metals. As the molten mass subsides and the fused mixture becomes quiet the lead, with its dissolved precious metals, settles to the bottom of the crucible. While still molten, the contents of the crucible are poured into a cone-shaped iron mold where the lead-precious metal mixture separates from the slag.

After cooling, the slag is discarded and the lead button is returned to the furnace in a preheated bone ash cupel where it is gradually heated to a temperature near 850°C. (1560°F.). The lead in the button is partly absorbed in the cupel and the remainder volatilized and drawn off in the furnace gases. When all the lead is removed the remaining bead of precious metal is cooled, removed from the cupel and weighed. This weight is the total weight of all the precious metals.

The gold is "parted" from the silver and platinum group metals by treatment with acids. The gold is then washed, dried, annealed (heated to coalesce the gold sponge), and weighed. The quantity of silver is found by difference except when determination of the platinum group metals is needed. In this case the metals dissolved in the acid are individually precipitated with suitable chemicals and weighed after separation. All precious metals are reported to the prospector as ounces per ton of ore.

Chemical analyses

The chemical laboratory is equipped to make determinations for practically all the elements found in rocks and minerals in the State of Oregon. The determinations most commonly requested for chemical analysis are chrome, iron, silica, mercury, alumina, nickel, copper, lead, and zinc Pulverized portions are analyzed by standard methods given in manuals covering analytical procedure. These methods are recognized by all leading chemical laboratories as the most accurate known today.

All analytical results are recorded in a permanent record book and on the sample information form sent in with the sample. This information is then copied on duplicate forms, one copy of which is mailed to the sender and the other mailed to the branch office nearest the locality where the sample originated. The original form is placed in a permanent file in the Portland office.

Operation of the Spectrographic Laboratory

General

Spectrographic analysis is used to identify the chemical elements of inorganic materials by interpretation of the light emitted when the test specimens are heated. Every chemical element can be made to give off light by subjecting it to a temperature high enough to vaporize it. As no two elements emit light having the same characteristics, each element can be identified from its known spectrum. The light from a complex mineral sample or metal alloy will exhibit the characteristics of each of the elements in the mixture. Qualitative analysis reveals the presence of each element through the identification of lines of its characteristic wave lengths in the total emitted light. Quantitative analysis determines the approximate amount of the element present through measurement of the intensity of the selected lines.

The basic instrument for spectrochemical analysis is the spectrograph. This apparatus receives the light emitted by the specimen, sorts or disperses it into its component wave lengths, and records the spectral lines corresponding to these wave lengths on a photographic plate (see

Figure 2 - Section of a Spectrographic Plate.

Figure 2). These lines are arranged in order on the plate according to their wave-length value and are identified by comparison with known charts and tables.

The Baird 3-meter grating spectrograph at the Department is a wide-range instrument capable of photographing the spectrum from 1,800 angstroms to 21,000 angstroms. It is contained in a case 2 feet square and 11 feet long, with the optical bench and arc stand extending an additional 5 feet. The use of electric motors for focusing, racking, grating rotation, and plate swing, gives unusual flexibility (see Figure 3). The grating element, which is the heart of the spectrograph, consists of a concave glass mirror, coated with aluminum, and ruled with very fine lines, 15,000 to the inch. Direct current for the arc is supplied by a 5-h.p. Reliance motor-generator set. During 1960, the installation of a new arc stand and other equipment will make the high-voltage spark procedure available for use on metallic alloys.

The spectrograph provides a semiquantitative analysis for most of the inorganic elements, except the gases and a few other elements such as sulphur, selenium, phosphorus, and carbon. Its most useful range is that below 1 percent, as contrasted to chemical analysis, which is best at higher ranges. Sensitivities for many elements go down to .0001 percent, but some others are only sensitive to .1 percent.

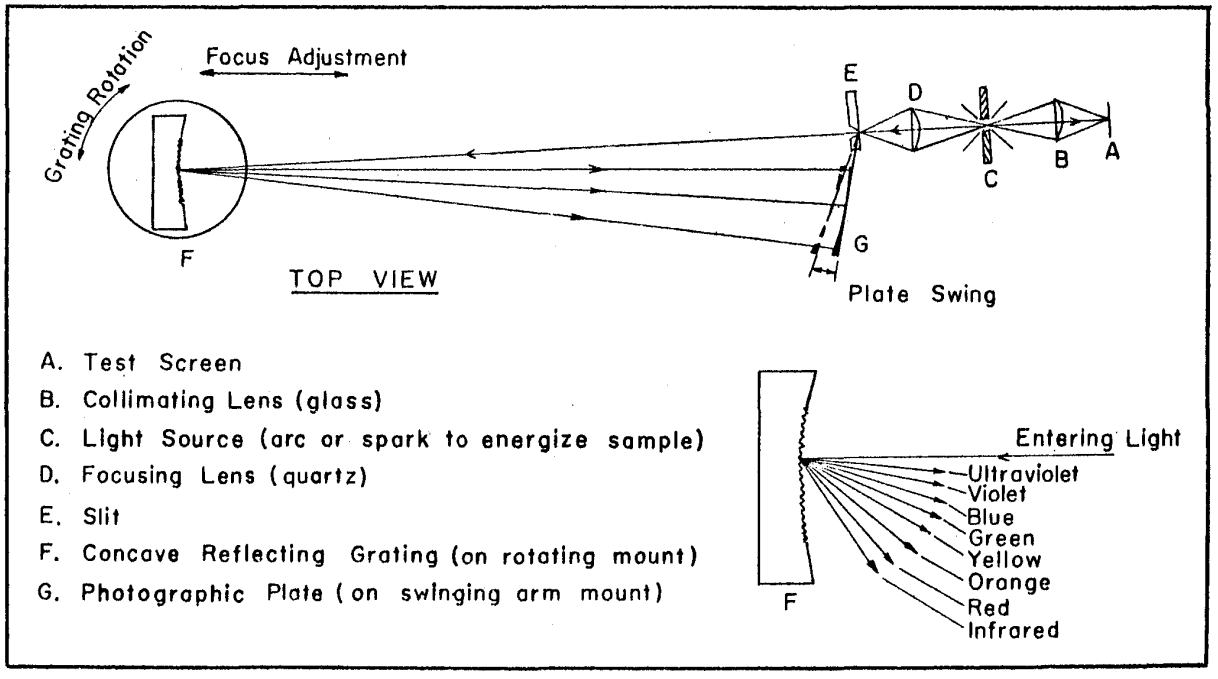

Figure 3 - Diagram of Baird grating spectrograph, using Eagle mounting.

Submission of samples

Samples submitted for spectrographic analysis should be one pound in weight if possible and representative of the whole material to insure accurate information. Samples may be as small as 1 or 2 milligrams, but accuracy will be impaired and quantitative results difficult to obtain.

Any person, whether or not a resident of the State of Oregon, may send in samples for analysis, and it is unnecessary to include the location from which the sample was taken. Each sample should be accompanied by the form "Price List for Spectrographic Analysis," giving the name and address of the sender and indicating the type of analysis desired. As soon as received, the sample is given a number and this number should be referred to if future correspondence becomes necessary. The form includes a list of all elements determined; so that only a few may be checked if desired, but the most common type of analysis is to search for all elements listed. Prices include the following:

1. Qualitative and estimated quantitative analysis for 66 elements $7.00
2. Qualitative and estimated quantitative analysis for any 2 or 3 elements on the list 3.00
3. Oregon citizens may obtain a 20-percent discount if the sample originated in Oregon and the covering affidavit at the bottom of the form is signed and submitted with the sample.

Analytical procedure

To analyze a sample of ore, the crushed and pulverized material is thoroughly mixed to make sure that it is homogeneous. A weighed amount, usually 50 milligrams, is packed into the cup of a carbon electrode, which is placed in the direct current arc and vaporized. A lens focuses the arc flame on the slit of the spectrograph, as shown in Figure 3. The beam of light from the slit falls upon the grating, from which it is reflected onto a glass photographic plate. The plate, after developing, is placed in a Model 2000 Jarrell-Ash microphotometer in which the spectrum of the sample is magnified and projected so that it can be compared with standard spectrographic plates displaying the spectrum of known elements. The spectra on the standard plates are made up from samples of known quantity, such as 10%, 1%, .1%, .01%, .001%, and .0001%. The final report places each element from the original sample in one of these brackets, as nearly as can be read from the density of the spectral line.

Examples and Uses of Spectrographic Analysis

Material Analyzed	Use of Analysis
1. Metallic ores	Assists in prospecting
2. Process samples from mills	Tests efficiency of separation
3. Slags and waste products	Finds economic uses
4. Boiler and pipe scale	Determines impurities in water or liquids
5. Manufactured parts	Checks alloy composition
6. Glass or paint particles	Identifies for crime laboratories
7. Engine crank case drainings	Checks bearing wear or dirt
8. Commercial fertilizers	Finds advantageous trace elements
9. Metal platings	Checks for poisonous metals
10. Rare earths	Identifies elements easily
11. Oyster shells	Determines fertilizer possibilities
12. Thin metallic coatings	Identifies composition

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PORT OF PORTLAND ADDS ORE-HANDLING EQUIPMENT

The Port of Portland has captured the bulk of inbound ore shipments on the Pacific Coast despite the fact that it lies 110 river miles from salt water. In the past five years shipments of ores from overseas have increased more than five times. The table below shows movement through the Port of Portland for 1957 of various ores, concentrates, and metals. To provide

MINERAL-COMMODITY FREIGHT TRAFFIC, PORT OF PORTLAND, OREGON, 1957 *
(Short Tons)

Commodity	Total	Foreign		Domestic (Coastwise)	
		Imports	Exports	Receipts	Shipments
Anthracite coal	10,017	----	10,017	----	---
Bituminous coal, lignite	550,382	----	550,382	----	---
Coke, including petroleum coke	7,385	----	7,385	----	---
Building cement	118,766	142	----	104,251	---
Stone and manufactures	99	48	----	51	---
Glass, glass products	4,133	3,599	----	452	82
Raw clays, earths	2,655	----	----	----	---
Brick, tile	600	62	4	435	7
Other clay products	964	640	----	312	12
Sulphur	30,852	----	----	15	---
Salt	65,814	----	----	65,784	---
Iron, steel scrap	179,220	----	178,676	180	364
Iron, steel, semifinished products	15,868	281	1	15,279	137
Manganese	36,648	35,690	958	----	---
Chrome	12,501	12,490	----	11	---
Other ferroalloys, ores, metals	1,071	----	1,071	----	---
Aluminum ores, concentrate, scrap	7,357	7,064	293	----	---
Aluminum metal, alloys	10,133	35	9,825	14	259
Copper ore, concentrate, scrap	1,489	----	1,489	----	---
Lead ores, concentrate, scrap	58,483	58,483	----	----	---
Lead and alloys	----	8	----	2	---
Tin metal forms	----	11	----	----	---
Zinc ore, concentrate, scrap	44,109	44,030	57	22	---
Zinc forms	136	----	----	136	---
Other nonferrous ores, metals, scrap	776	440	30	131	159
Nitrogenous fertilizer materials	3,961	3,911	50	----	---
Phosphate fertilizer materials	1,821	----	1,821	----	---
Potash fertilizer materials	31	31	----	----	---
Other fertilizers and materials	266	218	1	16	31

* Source: "Waterborne Commerce of the Pacific Coast, 1958," U.S. Army Engineers.

for future increases in imports and speedier turn-around time for vessels, the Portland Commission of Public Docks has announced that added facilities will be installed shortly. The following article, which appeared in Grow With Oregon, July 1959, describes the project:

"The Portland Commission of Public Docks has awarded a $2,249,400 contract to the C. M. Corkum Co. for construction of a new bulk cargo discharging pier at Terminal No. 4.

"The new facility will be first of its kind on the Pacific Coast, and will be in operation by the middle of next year. It is designed to handle imports of ores, ore concentrates, and other bulk commodities moving over the Portland public docks. A 900-ton per hour bulk unloading tower, now being built by Dravo Corp., Pittsburgh, will be erected on the finished pier.

"The project will give Portland two additional deep-water berths with a minimum depth of 35 feet and will include a 100-car capacity rail holding yard adjacent to the pier, and several acres of open storage. While the initial project is designed for overland transportation of incoming ocean cargoes, plans contemplate a future barge basin with a conveyor belt to discharge cargo directly onto barges. The full project will cost an estimated $3,150,000, all financed by general obligation bonds already voted by the people and funds in the commission's reserve account.

"The tower will project 130 feet above the pier deck and the operator will ride a cab 80 feet in the air, high enough to permit positioning directly over ships to observe operation of the 13-ton capacity clam shell bucket. The dock will carry three rail tracks, two under the tower and the other along the pier edge. Cargo will be deposited in a 2,000-cubic foot receiving hopper delivering to two apron feeders depositing into weigh hopper that will automatically weigh the cargo and dump it into rail cars or trucks. One feeder will be equipped with a conveyor belt."

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GEOLOGY OF ANLAUF AND DRAIN QUADRANGLES ON OPEN FILE

"Geology of the Anlauf and Drain quadrangles, Douglas and Lane counties, Oregon," by Linn Hoover has been issued as a preliminary, open-file report by the U.S. Geological Survey. It is not for distribution, but may be examined at the Department library, 1069 State Office Building, Portland, and also at the Survey's offices in Denver and Menlo Park. The report consists of 95 typewritten pages, photographs, a geologic map, cross sections, a columnar section, and a check list of foraminifera.

Geologic studies in the Anlauf and Drain quadrangles were undertaken principally to evaluate the petroleum possibilities and tie this previously unmapped area with the Survey's oil and gas investigation mapping in western Oregon. On the basis of surface data, no source beds or reservoir rock suitable for the formation and accumulation of petroleum are indicated. Subsurface information is lacking for this area.

The Anlauf and Drain quadrangles are underlain by about 20,000 feet of lower Tertiary sedimentary and volcanic rocks which include the Umpqua, Tyee, and Spencer formations, all of Eocene age and chiefly of marine origin. These formations have been folded and are overlain in part of the area by nonmarine volcanic and waterlaid materials of the Eocene-Oligocene Fisher formation dipping gently eastward. Small basaltic and diabasic bodies intrude most of the rocks. Mineralization accompanying intrusions deposited cinnabar and other sulfide minerals, carbonates, and silica.

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ASSESSMENT DEADLINE SEPTEMBER FIRST

Annual assessment work on mining claims which have not been patented should be completed not later than noon, September 1st. Public Law 85-736, passed by the 85th Congress and signed by the President on August 23, 1958, establishes this new date for the beginning and ending of the assessment year. There has been no change in the $100 which must be expended on each claim annually.

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NEW OIL AND GAS DRILLING PERMITS

Permit No. 35 was issued to Ross R. Mitchell, Canby, Oregon, on July 23, 1959. The drilling is located 492.3 feet south and 3110.3 feet west from the N.E. corner sec. 15, T. 8 S., R. 5 W., Polk County. Surveyed elevation is 317.9 feet, ground. The lessors are Walter and Arthur Bliven. This test hole will be called Bliven No. 1.

Permit No. 36 was issued to the Oregon Oil and Gas Company of Albany, Oregon, on August 4, 1959. The drilling is located in the NE¼ sec. 25, T. 10 S., R. 8 W., Lincoln, County. The lessor is Edward Roberts. Mr. A. M. Ropp, Route 1, Box 412, Albany, Oregon, is president of the company. The test hole will be called Roberts No. 1.

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CAMP HANCOCK ATTRACTS YOUNG SCIENTISTS

A total of 106 boys and girls, ranging in age from 12 to 17 years, attended Camp Hancock this summer. The camp, located near Clarno on the banks of the John Day River in Wheeler County, Oregon, is the only one of its kind in the United States. It is designed to acquaint youngsters with the various natural sciences, and each summer three 2-week sessions are sponsored by the Oregon Museum of Science and Industry. Instruction in geology, biology, paleontology, and general science is provided by hard-working staff members who volunteer their time and energy, usually for a 2-week period. The guiding spirit for the camp is furnished by Mr. and Mrs. A. W. Hancock who spend their entire summer here each year. "Lon" Hancock has been engaged for many years in unearthing mammal bones from a site nearby, and the material recovered from this locality has added immeasurably to knowledge of the life of the past in Central Oregon. Not far from camp are the world-famous "nut beds" where fossilized nuts, seeds, and fruits of many plant species now extinct are dug by the youthful scientists.

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OME ISSUES NEW PAMPHLET ON MINERALS EXPLORATION PROGRAM

The Office of Minerals Exploration has issued a new pamphlet in question and answer form on the Minerals Exploration Program. The pamphlet relates to the OME program of Federal assistance in financing exploration for domestic mineral deposits. Under this program the Government will pay up to 50 percent of the cost of exploration which uses recognized and sound procedures including standard geochemical and geophysical methods to obtain pertinent mineralogical and geological information. Copies may be obtained from OME, Department of the Interior, Washington 25, D.C., or from the field office, Region 1, South 157 Howard Street, Spokane 4, Washington.

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NOW IT'S OFFICIAL

The U. S. Board on Geographic Names has just issued List No. 5901 containing decisions on names in the United States, Puerto Rico, and the Virgin Islands. These names represent decisions rendered by the Board from April 1957 through December 1958. The list for Oregon is as follows:

Ackerley Lake: the smallest lake in a chain of four lakes, about 3 miles northeast of Florence; Lane County; SE¼ sec. 11 and SW¼ sec. 12, T. 18 S., R. 12 W., Willamette meridian; 44°00'54" N., 124°04'54" W. Not: Ackerly Lake, Allison Lake, Little Lake.

Celilo, Lake: lake about 28 miles long, formed by The Dalles Dam in the Columbia River; Sherman and Wasco Counties, Oregon, and Klickitat County, Washington; 45° 37' N., 121°08' W.

Elbow Lake: lake with an area of about 10 acres and an elbow-shape, immediately west of Waldo Lake, in Willamette National Forest; Lane County; unsurveyed sec. 13, T. 21 S., R. 5½ E., Willamette meridian; Lane County; 43°45'00" N., 122°04'20"W. Not: Klovdahl Lake.

Grassy Creek: stream about 5 miles long, heading southwest of Grasshopper Mountain and flowing west-northwestward to Christy Creek, in Willamette National Forest; Lane County; sec. 11, T. 19 S., R. 4 E., Willamette meridian; 43°55'40" N., 122°17' 30" W. Not: Mossy Creek (name sometimes applied to the lower course of the stream).

Harvey Lake: lake with an area of about 20 acres, on the township line north of Lake Kiwa and about 1.5 miles north of the north end of Waldo Lake, in Willamette National Forest; Lane County; sec. 5, T. 21 S., R. 6 E., and unsurveyed sec. 32, T. 20 S., R. 6 E., Willamette meridian; 43°47'15" N., 122°02'15" W. Not: Lake Kiwa (q.v.).

Kiwa, Lake: lake with an area of about 20 acres, on the section line south of Harvey Lake and about 1 mile north of the north end of Waldo Lake, in Willamette National Forest; Lane County; secs. 5 and 6, T. 21 S., R. 6 E., Willamette meridian; 43°46'45" N., 122°02'30" W.

Martie Creek: stream about 1.5 miles long, flowing southwestward into Eighth Creek about 1 mile above its mouth, in Willamette National Forest; Lane County, sec. 7, T. 20 S., R. 4 E., Willamette meridian; 43°50'30" N., 122°23'00" W.

Marys Creek: stream about 5 miles long, heading on the northeast side of Coffin Mountain and flowing generally northward to the North Santiam River about 1.5 miles below Misery Creek, in Willamette National Forest; Linn County; sec. 23, T. 10 S., R. 6 E., Willamette meridian; 44°41'15" N., 122°02'00" W. Not: Coldbrook Creek, Macy Creek.

Owyhee, Lake: lake about 55 miles long, formed by damming the Owyhee River about 20 miles upstream from its mouth; Malheur County; 43°30' N., 117°20' W. Not: Owyhee Reservoir.

Salal Creek: stream about 1.5 miles long, heading between Huckleberry Creek and Eight Creek and flowing southwestward into Huckleberry Creek, in Willamette National Forest; Lane County; sec. 8, T. 20 S., R. 4 E., Willamette meridian; 43°50'30" N., 122°22'00" W. Not: Martie Creek (q.v.).

Second Creek: stream about 1.5 miles long, flowing generally westward into First Creek about 1 mile above its mouth, in Willamette National Forest; Linn County; sec. 26, T. 20 S., R. 3 E., Willamette meridian; 43°47'50" N., 122°24'35" W.

Squaw Creek: stream about 2 miles long, in Mount Hood National Forest, heading in Squaw Lakes and flowing generally southward to Roaring River; Clackamas County; secs. 13, 14, 23, 24, and 25, T. 4 S., R. 6 E., Willamette meridian; 45°12'05" N., 122°01' 15" W. Not. Clemens Creek.

Timothy Lake: reservoir about 2 miles across, in Mount Hood National Forest, made by damming the Oak Grove Fork of Clackamas River and inundating Timothy Meadows; Clackamas County; secs. 12, 13, 14, 23, 24, 25, and 26, T. 5 S., R. 8 E. and secs. 11 and 14, T. 5 S., R. 8½ E., Willamette meridian; 45°07' N., 121°47' W
Not: Timothy Lake Reservoir, Timothy Reservoir.

Umatilla, Lake: lake about 77 miles long, formed by the John Day Dam in the Columbia River; Gilliam, Morrow, Sherman, and Umatilla counties, Oregon, and Benton and Klickitat counties, Washington; 45°43' N., 120°42' W.

Wallula, Lake: lake about 45 miles long, formed by the McNary Dam in the Columbia River; Umatilla County, Oregon, and Benton, Franklin, and Walla Walla counties, Washington; 45°56' N., 119°18' W.

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LAKEVIEW MINING COMPANY REORGANIZES

The operational staff of Lakeview Mining Company has been reorganized effective August 8. The new President, replacing Dr. Garth W. Thornburg, is George A Nicoud, Jr., of Dallas, Texas. The General Manager is John L. Robison, who will also maintain his position as Manager of Gunnison Mining Company, Gunnison, Colorado, a companion operation of Lakeview Mining Company. The mine staff has been replaced by engineers from the recently closed Howe Sound mining venture at Cobalt, Idaho. Kenneth Kutz is Mine Superintendent, and Thomas L. Wilson, Assistant Superintendent. Two new geologists, J. Y. Greene and Verne Garten, have also been brought in from Cobalt, Idaho.

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NEW OFFICERS ELECTED

The Eastern Oregon Mining and Mineral Association elected new officers at a meeting held in Baker on August 4. Carl Suksdorf of Oil and Mineral Operators, Inc., Mormon Basin, was named President. Ward Hill of the Greenhorn and Bourne mining properties was named Vice President; Jim Dickerson, Hereford, Second Vice President; Ben Bailey of John Day, Vice President for Grant County; Harley Haskins, Baker, Vice President for Union County; Jim Anderson, Hereford, Secretary; and Fred Moes, Baker, Treasurer. Trustees will be Ivan Thompson, Durkee, and Chester Christenson, Baker. Goff Smith, Carl Bowman, and Culley Trickel of Baker were named directors.

Harold Banta, Baker, Board member of the Department of Geology and Mineral Industries, spoke before the group on the sad plight of the gold miner. The Eastern Oregon Mining and Mineral Association is preparing resolutions to be presented to the group at its August 18 meeting on gold, imports "prejudicial to the welfare of mining," and land policies of the U.S. Bureau of Land Management.

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VANCOUVER CLUB EXHIBITS GEM STONES

The third in a series of exhibits by local rock clubs is on display in the Department's Portland office, 1069 State Office Building. This exhibit is by the Fort Vancouver Gem and Mineral Club, which has its headquarters in Vancouver, Washington. The exhibit, arranged by club president Mrs. Pat Harmanson, consists of an excellent variety of agate material, jewelry, petrified wood, geodes, and fossils. All of the material is from Washington and much of it from the Vancouver area. The exhibit will be on display through September.

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DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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LAKE COUNTY'S NEW CONTINUOUS GEYSER

By
Norman V. Peterson*

Introduction

At 1:55 p.m. on July 1, 1959, a new geologic phenomenon was born in Lake County. A spectacular geyser erupted on land owned by Charles Crump, near the community of Adel in southern Lake County. Since that hour, the geyser has continuously sent a column of steam and water in the air to a height in excess of 150 feet.

By definition this geologic phenomenon is not a true geyser. A geyser is defined as an intermittent eruptive hot spring in which the discharge is caused at more or less frequent intervals by the expansive force of highly heated steam. It perhaps more closely fits the description of smaller continuous eruptions in Yellowstone National Park that Allen and Day (1935) called "perpetual spouters."

The Crump Geyser, as it has been named, resulted from a well drilled by the Nevada Thermal Power Company, the exploratory division of the Magma Power Company of 631 S. Witmer Street, Los Angeles 17, California. This company is conducting a systematic drilling program in Oregon, California, and Nevada in its search for natural superheated steam (300°F.) that may be harnessed for the generation of power.

After drilling to a depth of 1,684 feet and not finding sufficiently hot water, the company abandoned the well on June 29, 1959, and released it to Mr. Crump. The well remained quiet until sometime between 12:00 and 1:15 p.m., July 1. Mr. Crump arrived at the well just after 1:15 and could see that the hole had been cleared of drilling mud and debris by an eruption that had barely ceased. Boiling water was present at the top of the well casing. At 1:55 p.m., as Mr. Crump and a neighbor watched, the geyser erupted again with a terrific rumbling and since then has been continuously active.

Well data

Measurements of the temperature, flow, and velocity of the Crump Geyser have been obtained from the Oregon State Engineer's Office. Analysis of the water was provided by the State Sanitary Authority. Statistics on the well, drilling history, and well cuttings were submitted by the Nevada Thermal Power Company. Some of these data are given as follows:

Depth of well: 1,684 feet.

Type rig: Rotary.

Spud date: 6/21/59. Completion date: 6/29/59.

Size of hole: 12¼ inches to 335-foot depth.
8-3/4 inches to 1,684-foot depth.

Casing: 15 feet of 20-inch casing.

Height of eruption: 150 to 200 feet.

Velocity of flow: Average - 67 ft./sec.

Water temperature at edge of casing: 200°±F.

Water flow: 400 to 600 gal./min.

Radioactivity: U_3O_8 - trace (determination by Lakeview Mining Company).

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*Geologist, State of Oregon Department of Geology and Mineral Industries.

Water analysis: (determination by State Sanitary Authority)

Turbidity	4*
Color	3
Total solids	956
Suspended solids	9
Carbonate alkalinity	30.3
Bicarbonate alkalinity	73.7
Hardness (as $CaCO_3$)	23.2
Chloride (Cl)	235
Sulfate (SO_4)	130
Arsenic	0.5
Copper	1.0
Nitrate nitrogen	0.37
Phosphate (PO_4)	0.58
Iron (Fe)	1.0
Manganese (Mn)	1.0
pH	8.75

*All results except for pH are in parts per million.

Temperature record: (determination by Nevada Thermal Power Company)

Date	Depth	Temperature
6/22/59	40 ft.	170° F.
6/24/59	199	215
6/26/59	660	230-250
6/27/59	1,004	160
6/28/59	1,618	not determined
6/29/59	1,684	hole bridged

Bottom-hole temperatures using maximum recording thermometers.

Additional measurements made on September 10, 1959, show the continuous activity of the "perpetual spouter" to be very much the same as when it began on July 1. The temperature was 210° at the top of the casing, the height of eruption about 195 feet, and the flow of water estimated to be 500 gal./min. A noticeable white siliceous material was beginning to coat boulders and pebbles around the well.

Distribution of hot springs and geysers

The Crump Geyser, located in sec. 34, T. 38 S., R. 24 E., is at the base of the prominent fault scarp along the western edge of Warner Valley between Pelican and Crump lakes. It is 3.8 miles north of Adel and 200 feet west of the Adel-Plush road. Besides this geyser there are several warm and hot springs in the area. They occur in an elongate north-trending zone which is shown on the accompanying geologic map. Extinct hot springs are indicated also by low mounds of calcareous and siliceous tufa, especially at the north edge of Pelican Lake. It is interesting to note that the new geyser has inactivated a hot spring about 100 yards due east and a true geyser about 100 feet to the north.

A group of similar, exceptionally hot springs and man-made geysers occurs just north of Lakeview, 35 miles to the east, at the base of the Goose Lake scarp. Two geysers in this group (Hunters Hot Springs) resulted from shallow wells and are probably "perpetual spouters." "Old Perpetual," a familiar landmark in the Lakeview area, is a 50- to 60-foot spouter. "The Teakettle" to the east at the base of the hill has been controlled for use in heating a housing development.

The association of a narrow thermal-spring belt and a fault scarp is a characteristic pattern for most of the thermal springs in this region including those in the northern parts of California and Nevada (Stearns, Stearns, and Waring, 1935).

Source of thermal waters

The source of heat for thermal springs has been studied in some detail (Sosman and others, 1924) and is generally believed to be from hot igneous rock that lies at a moderate depth beneath the surface. The heat is derived both from contact with the hot rock and from superheated steam and gases that mingle with and heat meteoric water (rain water) which has percolated downward. Still another source of heat is that generated by friction during shearing and crushing in zones of major faults. Chemical reactions and contained radioactivity have been considered as another source but are believed to be minor.

The source of the water if flow is large can be another problem. From studies made in both Yellowstone National Park and at Lassen Volcanic National Park, Allen and Day (1935) and Day and Allen (1925) concluded that the water in hot springs is chiefly from surface water which has percolated downward and returned to the surface, but that a small portion of the water is derived from an underlying magma or batholith in the form of superheated steam and gases.

Geology of the map area

Warner Valley, in which the Crump Geyser and other thermal springs occur, is near the northern limit of the Basin and Range Province, a region of fault block mountains and valleys. This long, undrained basin-type valley has resulted from late Tertiary to Recent block faulting and is bounded on both east and west by large tilted fault blocks. The geology for this report was based on a reconnaissance of the steep east-facing fault scarp along the western edge of the valley. The only significant canyon in the scarp occurs just west of Adel where Deep Creek, which drains the area to the southwest, has cut a deep valley almost at right angles to the rim. The Deep Creek canyon also exposes the same volcanic rock sequence that is found in the escarpment.

All of the rocks exposed in the scarp face are Tertiary volcanics. There are three definite units: a lower sequence of basalt flows; an overlying tuff unit consisting of a thin lapilli tuff layer and a welded tuff flow; and about 400 feet of capping basalt flows. These rocks appear to overlie one another conformably. In general they strike nearly north and dip about 5° to the west.

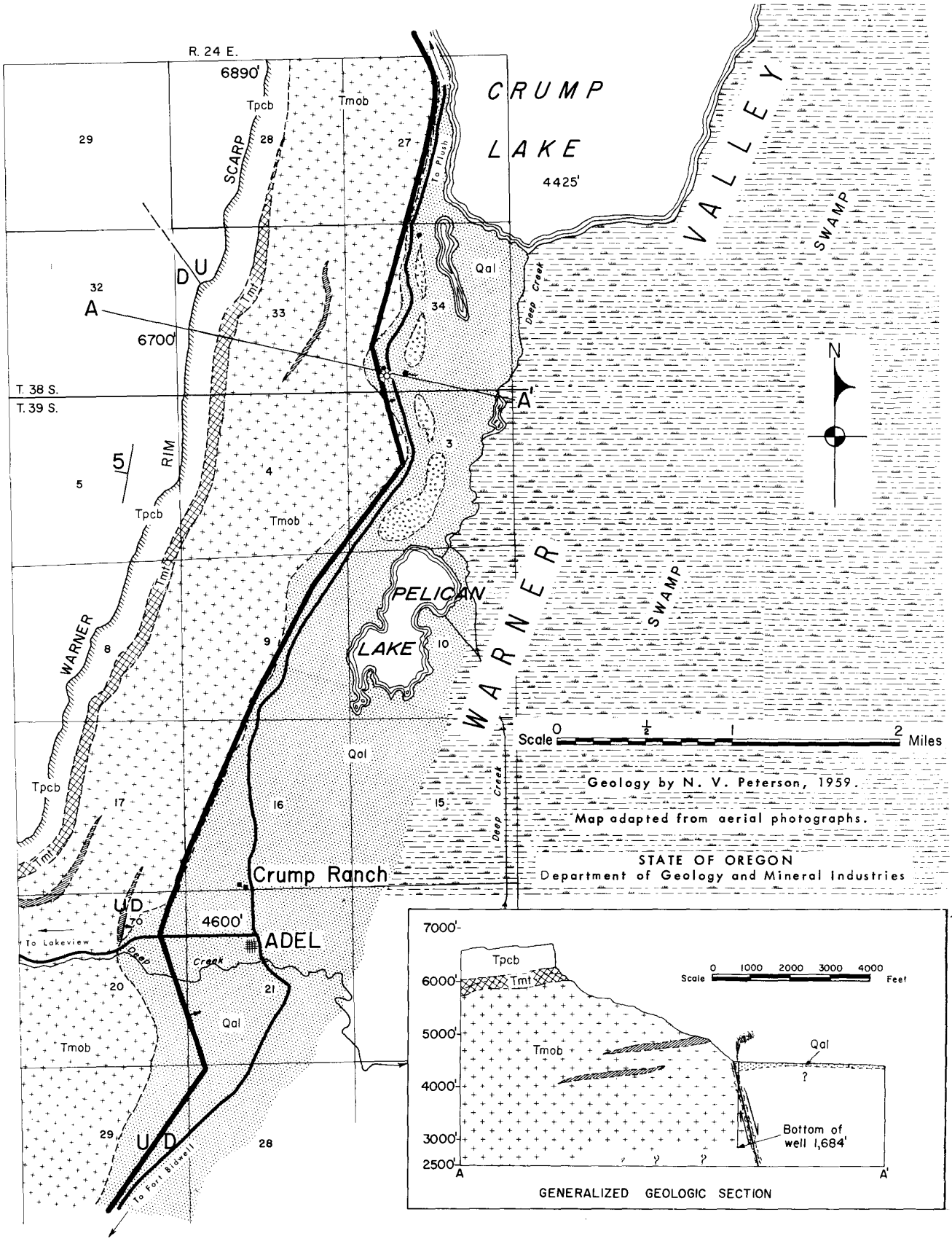
Older basalt: The basalt flows that make up this thick unit crop out from 4,525 feet in elevation on the valley floor to about 6,000 feet in elevation high up on the steep scarp. Massive black, dense, coarse-grained olivine basalt flows make up about 50 percent of this unit. The rock has a diabasic texture and weathers easily to a granular black sand. Interbedded with these flows are thin to thick, dark-gray to reddish vesicular and amygdaloidal flows, many of which are scoriaceous to ropy on flow surfaces. Within the sequence of older basalt there are at least two horizons of pumice lapilli tuff and tuff breccia. From a check of the ditch samples of the Crump well it appears that, except for the first few tens of feet of alluvium and rubble, the entire hole is drilled in rocks similar to the older basalt. This unit may contain as much as 3,000 feet of basalt flows with minor pyroclastic rocks. (See Section A-A'.)

Tuffs: Above the older basalt sequence is a persistent unit comprising a massive light-tan pumice lapilli tuff and an overlying gray welded tuff. The thickness of this unit is variable and from isolated outcrops in the scarp face is estimated to be from 100 to 200 feet thick. In the Deep Creek canyon to the west, however, it appears to thicken considerably. George Walker of the U.S. Geological Survey (personal communication) has reported finding vertebrate fossils from this horizon that have been identified as a Mascall fauna equivalent, making these rocks of probable upper Miocene age.

Capping basalt: Above the tuffs are the cliff-forming capping basalt flows or "rim rocks." These light-gray, massive, olivine basalts make up the topmost 400 feet of the scarp rim. Individual flows vary from 10 to 50 feet in thickness, are vesicular, and have a diktytaxitic texture similar to many of the late Tertiary basalt flows in this part of Oregon. A rude columnar jointing in the thicker flows facilitates breakage of the rocks into large rectangular blocks that form steep talus piles from which some blocks roll all the way to the valley floor. (Early Indians used these large, smooth-surfaced blocks on which to carve their petroglyphs, and many fine examples can be seen along the Hart Lake narrows just north of Crump Lake.)

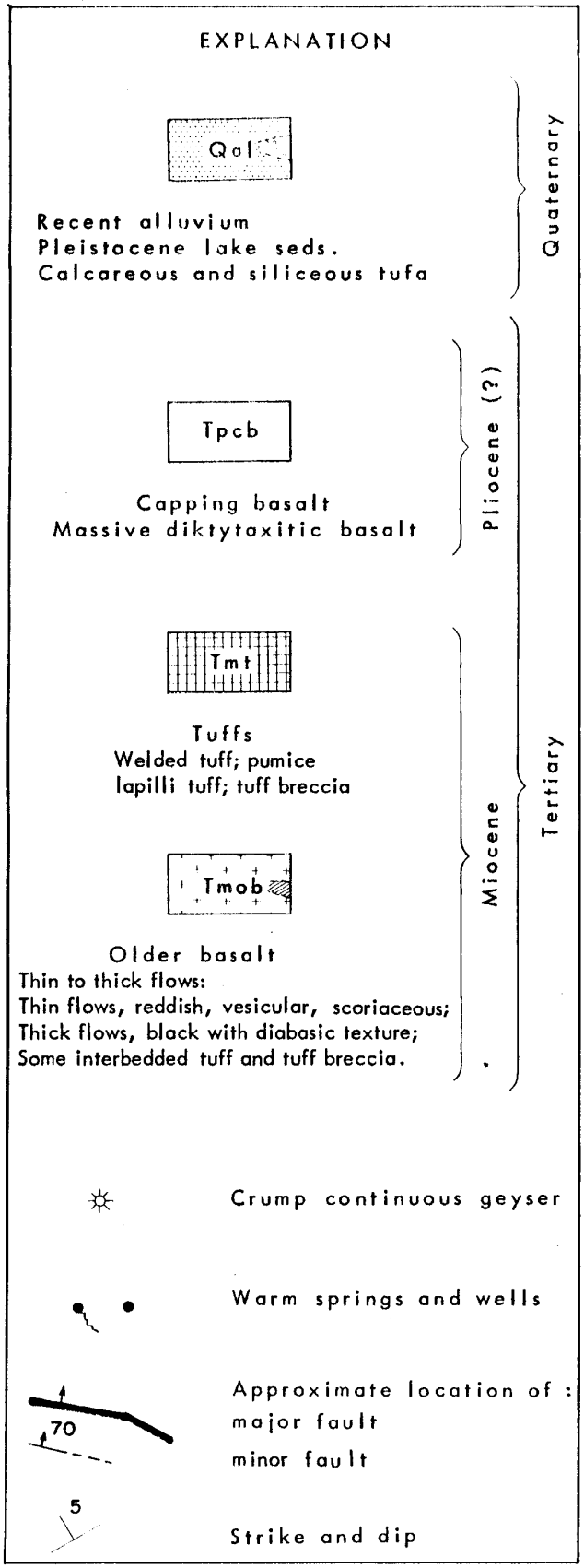
Quaternary alluvium: Lacustrine sediments that include gravels, sand, and silt cover the floor of Warner Valley. These horizontal beds (from a fraction of an inch to a few feet in thickness) can be seen in road cuts in the vicinity of Adel. The Quaternary lake in which the sediments were deposited was much larger than the small lakes that are now found in the valley. This is shown by former terraces and shorelines as much as 100 feet above the valley floor. No information is available on the thickness of the sands and gravels except that beds totaling at least 60 feet were measured in the vicinity of Adel. Adel, however, is located on the alluvial fan resulting from the entry of Deep Creek into the Warner Valley and the sediments at this point may not be representative of thickness in the whole valley. Former sites of hot springs are indicated by local mounds of white to light-gray siliceous sinter and calcareous-coated pebbles and boulders within the alluvium.

Structure: Tertiary volcanism accompanied by faulting as late as Recent times is responsible for the present topography of the region. There are two predominant fault directions, one trending northwest and the other northeast. Most previous workers in the region, Donath (1958), Nolan (1943), Fuller and Waters (1929), and Russell (1928), have interpreted the faults to be normal high-angle with dominantly dip-slip movement. During the brief reconnaissance for this report, slickensided fault planes were found at two locations about 2 miles apart. At both locations the faults are normal. They strike N. 10° E. and dip from 70° to 75° to the east. The major fault along the western edge of Warner Valley is believed to be a high-angle normal fault and its approximate location as interpreted from topography and aerial photographs is shown on the geologic map.



GEOLOGY OF AREA ALONG THE WARNER VALLEY ESCARPMENT

NEAR PELICAN AND CRUMP LAKES, LAKE COUNTY, OREGON



Origin of Crump Geyser

From a study of the well cuttings and the log of the drilling history of the well it appears that the geyser is just east of the fault zone. Circulation was lost and temperature increased from 180 to 200 feet. This zone was interpreted as the location of the fault at depth. After passing through this fault zone the hole appears to penetrate altered rocks very similar to the older basalt and pyroclastic sequence. A second hot zone which was encountered at 660 feet could be either a scoriaceous or vesicular interbed or possibly another fracture within the complex fault zone. Most of the heat probably originates from a cooling lava mass, and the faulted and sheared zone provides a conduit for superheated water to escape upward from considerable depths. The ropy scoriaceous surfaces of the thin reddish flows within the older basalt should make excellent aquifers through which surface waters could easily percolate. It appears that the volcanic rock sequence east of the fault dips gently to the west beneath Warner Valley and these dipping flows may provide an adequate source of water for the geyser and hot springs.

Future of Crump Geyser

Much has been written about the value of this spectacular geyser as a scenic attraction and, even though it is remote from well-traveled highways (35 miles east of Lakeview), if it continues to spout, its fame should grow. At the present time the runoff water is irrigating a small pasture area before draining into Crump Lake through a system of canals. Further usage of the water for irrigation and domestic animals is being considered by Mr. Crump pending a complete interpretation of the chemical analysis of the water by agricultural experts.

Acknowledgments

Grateful acknowledgment is made to Mr. Charles Crump for his assistance which was given freely and in many ways. Acknowledgment is also made to the State Engineer, Mr. Lewis A. Stanley, and to Mr. Jack Sceva, groundwater geologist on his staff, for their fine cooperation in furnishing well data, advice, and other information.

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NEW MANGANESE REPORT BY BUREAU OF MINES

"Manganese deposits of northeastern Oregon," by Richard N. Appling, Jr., has been published by the U.S. Bureau of Mines as Report of Investigations 5472. It is a companion to R.I. 5369, "Manganese deposits of southwestern Oregon," also by Appling, published by the Bureau in 1958.

The northeastern Oregon report presents maps, assays, and examination data on ten manganese deposits, nine of which are in Baker County and one in Grant County. This includes all deposits in the region that have undergone substantial exploration or have a record production. All of the deposits occur in Pre-Tertiary rocks of the Blue Mountains. Seven are in the form of small, irregular pods or lenses in Elkhorn Ridge argillite; two occur as narrow veins in Burnt River schist; and one deposit is in greenstone and serpentine. All of the deposits are composed of manganese oxides, intermixed with abundant quartz and chert. Rhodonite in small amounts was noted at several occurrences.

Report of Investigations 5472, a 23-page paper-bound publication, is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Price is 25 cents.

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OREGON PORTLAND CEMENT EXPANDS HOLDINGS

Oregon Portland Cement Company has announced the acquisition of the National Industrial Products Company operation at Durkee, Baker, County. The cement company, which operates plants at Lime in Baker County and at Oswego in Clackamas County, intends to diversify its production, presently confined to cement, and supply a complete line of chemical lime-rock products for sugar mills, paper plants, steel mills, and other industries in the Northwest. National, a wholly owned subsidiary of Morrison-Knudsen Company, explored the high-grade limestone deposit near Durkee early in 1954 and began producing a variety of sizes and grades of limestone a few months later. The property is less than a mile from the main line of the Union Pacific Railroad and U.S. Highway 30.

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GOVERNOR ENDORSES COMMITTEE'S STUDIES

Governor Mark Hatfield pledged his support of the resolutions and recommendations of his Mining Advisory Committee at a conference in the State Capitol September 22. The resolution and recommendations of the Committee were prepared at a meeting of the Western Governors Mining Advisory Council in Sun Valley July 8 and 9, and put in final form at a second meeting in Denver on September 15. The summary of the resolution, as presented to the Governor, stated:

> BE IT RESOLVED that the maintenance of a healthy metal mining industry in the United States is of the utmost economic importance to the Western States, both for themselves and as major markets for Eastern States' manufacturers, and is as well, of the utmost importance to the national security, and that such a healthy industry may be maintained by joint action of the Administration and the Congress by:
>
> (1) Adopting and implementing without delay an adequate national minerals policy which would assure the maintenance of a healthy domestic mining industry, and
> (2) Taking all steps which may be needed to assure to the domestic mining industry at least one-half of the domestic market, or the present proportion of the domestic market (whichever is higher) either by adequate tariffs, excise taxes, or quotas, or, for the minor metals, allocation of import receipts, or such combination of these as may be most suitable.

Recommendations for 20 domestically mined metals were discussed with Governor Hatfield. Of immediate concern to Oregon's mining industry were the recommendations on quicksilver and chrome. These were:

> Mercury: That an annual quota (or tariff) be imposed on imports to preserve something over one-half of the domestic market.
>
> Chrome: That small excise taxes (or tariffs) be imposed on foreign imports, the proceeds from which should be sufficient when distributed among United States producers to maintain a healthy nucleus of domestic production.

Governor Hatfield was instrumental in convening the meeting of the Western Governors Mining Advisory Council in Sun Valley. In April he addressed a letter to Governor Smylie, Chairman of the Western Governors Conference, suggesting a meeting of the mining people of the western states in order that recommendations could be formulated which might correct the low ebb of mining activity current throughout the West. Appointees to Governor Hatfield's Mining Advisory Committee are: Hollis M. Dole, Chairman, Portland; Harold Banta, Baker; Fayette I. Bristol, Grants Pass; Les Child, Grants Pass; William W. Gardner, Canyon City; Clint P. Haight, Jr., Baker; Pierre R. Hines, Portland; William Kennedy, Portland; Bruce J. Manley, Medford; Earl S. Mollard, Riddle; and Dr. Garth W. Thornburg, Lakeview. Officers of the Western Governors Mining Advisory Council elected at the Denver meeting September 15 are: Chairman Clark L. Wilson, Vice President, New Park Mining Company, Salt Lake City, Utah; Vice Chairman, W. G. Maloney, Manager of the Mining Association of Montana, Butte, Montana; and Sec.-Treas. Frank P. Knight, Director of Department of Mineral Resources, Phoenix, Arizona.

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MIKE BROWN WINS TROPHY

Michael Brown, a senior at Washington High School and a student assistant for the Department, won the Barclay Adult Fossil Trophy at the National Gem Show which was held at the Annual Convention of the American Federation of Mineralogical Societies in the Portland Public Auditorium September 5, 6, and 7. This is the first time the Barclay Adult Trophy has been awarded. Mike, who has won a number of top awards for his fossil displays, qualified for the national competition by winning first place in fossil exhibits at the Northwest Federation of Mineralogical Societies show in Pasco last year. His display at the National Gem Show consisted of vertebrates, invertebrates, and plants.

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GOLD MINERS CAN'T WIN

It will be recalled that the gold miners, after more than ten years in the court, were turned down by the Supreme Court for relief as the result of War Production Board Order L-208 which declared that gold was a nonessential material and therefore not to be mined during World War II. Miners felt that relief was due them, as the closure made it prohibitive to reopen their properties after the war.

Another avenue of attack which might have brought relief to the miners has been traveled by the law firm Seitz, Easley & Whipple, Portland. This firm, under the guidance of attorney Norman L. Easley, has been challenging the legality of the United States Treasury establishing the price of gold at $35 per ounce under the Gold Reserve Act of 1934. Mr. Easley has furnished the Department a brief summary of the actions he has taken in pursuing this legal battle.

> On August 10, 1954, we filed in behalf of Mrs. Gladys Laycock a damage action under the Tucker Act against the United States for damages. The action was filed in Oregon upon an implied contract for compensation for property taken in violation of the due process clause of the United States Constitution. The action was dismissed, an appeal was taken and on June 11, 1956, the Court of Appeals affirmed the dismissal. We thereupon took out a writ of certiorari to the Supreme Court of the United States, without success.
>
> The foregoing action was a damage action at law and the result conclusively showed that plaintiff was without a remedy at law. Thereafter, on June 28, 1956, we filed a declaratory judgment in a suit for injunctive relief against Mr. George Humphrey, Secretary of the Treasury. After having been served in Washington, D. C., Mr. Humphrey refused to make an appearance and therefore we did not have jurisdiction. Thereafter, on August 30, 1956, we filed the same against Mr. Humphrey's representative in Oregon, Frank J. Kenney, asking the court to enjoin him from enforcing the Gold Reserve Act of 1934 and the Gold Regulations issued thereunder. Since an act of Congress was involved, the statute required a three judge court. On April 8, 1957, our motion to convene the three judge court to decide the constitutionality of the Gold Reserve Act was denied. We thereupon applied to the Supreme Court of the United States for a writ of mandamus to enforce the calling of a three judge court. That writ was denied. Thereafter, we amended the complaint against Mr. Kenney, who incidentally is the head of the Secret Service in Oregon, and eliminated any reference to the Gold Reserve Act of 1934. Rather we challenged the constitutionality of the Gold Regulations which are promulgated by the Treasury Department of the United States. Upon exhaustive hearings the motion allowing dismissal of that complaint was entered. Thereafter, we appealed to the Court of Appeals in San Francisco, with the result noted in the news item (see below). It will be our next step to appeal to the Supreme Court in the hope that our justiciable claim will be recognized.

The news item referred to by Mr. Easley is given below. It was an Associated Press dispatch dated September 2, 1959.

> The U.S. Court of Appeals ruled Tuesday that Congress and the secretary of the treasury were acting within constitutional powers in regulating the sale and processing of gold in the United States.
>
> The appeals court's opinion, written by Gilbert H. Jertberg, said Congress acted within its constitutional powers authorizing it to provide a "sound and uniform currency for the country." Mrs. Laycock's allegation "that the price has ruined the gold mining industry, even if true, is beside the point," the appeals court said. "The act was not intended to encourage gold mining; it is concerned only with the monetary system of the United States. Under it the secretary is not required to consider the condition of the gold mining industry in setting the price; he need only be concerned with carrying out the policy of Congress as expressed in the act." The appeals court said that this policy "may be found wanting in a purely political matter, the wisdom of which is not for this court to decide. Our concern ends upon a showing that Congress in adopting a policy acted within its constitutional authority."

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MINERALS RESOLUTION APPROVED

A resolution (House Concurrent Resolution 177) requesting the President to review present government minerals policy and report promptly to Congress on steps he proposes to aid depressed branches of the mining industry, was approved August 26 by the House of Representatives and September 1 by the Senate Interior Committee. Rep. Wayne N. Aspinall (Colorado), the sponsor of the resolution, stated in House debate that the hearings held before his Committee contained statements of 21 members of the House, 2 State Governors, and 67 other persons. (William W. Gardner, President of the Grant County Miners Association, and Hollis M. Dole, Director of the Oregon Department of Geology and Mineral Industries, testified on mineral conditions in Oregon.) The hearings showed, according to Aspinall, that the health of most segments of the mining industry was "desperate." Aspinall said the rising unemployment in mining areas is disturbing and added, "Perhaps more disturbing is the seeming excessiveness to which our government has gone in sacrificing the well-being of our mining and mineral industries and the workers who compromise them to accomplish our foreign policy objectives. When our foreign policy conflicts with our domestic mining policy, it seems that the latter has been sacrificed at times, ruthlessly."

Rep. Al Ullman (Oregon), who testified before the Committee hearings, stated on the House floor:

> As a sponsor of identical legislation and as a member of the Interior and Insular Affairs Committee, I urge prompt enactment of this legislation. It is indeed paradoxical that our mining industry has been allowed to languish at the very time when the mineral needs of the Nation are expanding. Nearly everyone agrees that our country stands on the threshold of an era of unparalled economic expansion. All agree that natural resources will be required for this economic development. Yet, mines continue to close, domestic production continues to fall and chronic unemployment continues as the norm for the Nation's miners. I believe this is a serious situation requiring immediate remedial action. From the standpoint of a sound economy, it is essential that a stable domestic mining industry be fostered; from a standpoint of our national defense, it is equally essential to develop domestic mineral reserves adequate for any foreseeable national emergency. We in the West are proud of the role mining has played in the development of our section of the Nation. We are confident that mining can be of equal importance to our present economy. Rich deposits of mineral wealth exist throughout the West. Small independent mining operators stand ready to insure the proper and expeditious development of these natural resources. All that is lacking is a national policy providing necessary incentives for the expansion of this essential industry. Passage of the legislation now under consideration will effectively declare congressional dissatisfaction with the lack of a mining program and congressional support for a policy of encouragement for the discovery and development of mineral wealth.

Many other Congressmen supported the legislation, among whom was Mr. Simpson of Pennsylvania who stated in part:

> The debate that has occurred in connection with this resolution must point up to each member present that this legislation purports to deal with a very limited field in which the great difficulty confronting the employees in the mining industry finds a similar relationship in many industries in the country. Reference was made to the reciprocal trade agreements program, to which I personally attribute a great many of the ills that are reflected in unemployment in industrial and mining areas of the Nation. With the reciprocal trade agreements program and the so-called commitments we have made under that program, we are limited in the relief which Congress can give to the unemployed miner and to the unemployed worker in many of our industries. While we might want to exercise our jurisdiction as legislators in the Congress of the United States and pass a law directing that this or that be done to help the unemployed miner by safeguarding his job against destructive imports or to help the gentleman who is unemployed in industry because of cheap foreign imports, we find that we cannot do it without paying a penalty through compensatory tariff cuts. Very often we forget that these alleged reciprocal trade agreements in fact have not proved to be reciprocal, and we are the ones who make the sacrifice and the other nation does not abide by its concession made to us. Time after time it has been proved that when these negotiators of ours make their agreements abroad and come back home, we find that unhappily the other country, hardly before the ink is dry on the agreement, through depreciating their currency or voiding the

agreement, have, in effect, wiped out the concession which they made to us. In fact, instances exist where the foreign country raised more barriers against American exports abroad than there were at the time we started with the reciprocal trade agreement program. American manufacturers today cannot ship many American produced articles into Western Europe because quota barriers and other trade restrictions have been raised against our exports. Today Congress is called upon to consider legislation which will authorize American business to send our dollars abroad to build plants, under the promise of preferential tax treatment so that we can service markets from factories we are to build abroad. Under the reciprocal trade agreements program, where we undertake to protect an industry providing domestic jobs, we have to, in effect, obtain permission of the GATT (Geneva Agreement on Tariffs and Trade) member countries and, if a member country asks us to make concessions in some other area as compensation, we have to pay dollar for dollar for the protection we have bought for the American worker. This reciprocal trade program, I repeat, is not reciprocal because we do not get the concessions that are promised. We do not insist on them. We sit back and let the other countries have their way with us. And then if and when - and a case in point is in front of us right now - if and when we want to protect the jobs of our own workers, if we want to reopen certain mines which under the reciprocal trade program are facing unfair competition, we have to pay the other country by making concessions in some other field of industrial output.

Even though Congress approves the resolution, which seems likely, the Administration could continue to take no action. A resolution of this type does not have the force of law. It merely expresses the desire of Congress. Interior Secretary Seaton recently reiterated that the Administration, rebuffed by the House last year when it defeated the Seaton minerals stabilization plan, would let Congress initiate any new minerals program.

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SEPTEMBER LAND WITHDRAWALS

The U.S. Bureau of Land Management has notified the Department of two withdrawals this month. Withdrawal No. 60-1 is an application from the U.S. Forest Service for the withdrawal of 6,470 acres in strips 330 feet each side of the center line of the following highways:

Willamette State Highway 58 - T. 23 S., R. 6 E.; T. 24 S., R. 7 E.; T. 25 S., R. 7 E.; T. 25 S., R. 8 E.; and T. 26 S., R. 8 E.

Fremont State Highway 31 - T. 23 S., R. 11 E.; T. 24 S., R. 11 E.; T. 25 S., R. 12 E.; and T. 25 S., T. 13 E.

Santiam U.S. Highway 20 - T. 13 S., R. 7½ E.; T. 13 S., R. 8 E.; T. 13 S., R. 9 E.; T. 14 S., R. 9 E.; T. 14 S., R. 10 E.; and T. 15 S., R. 10 E.

McKenzie U.S. Highway 126 - T. 14 S., R. 8 E.; T. 14 S., R. 9 E.; T. 15 S., R. 8 E.; T. 15 S., R. 9 E.; and T. 15 S., R. 10 E.

Cascade Lakes Forest Road 46 - T. 18 S., R. 8 E.; T. 18 S., R. 9 E.; T. 18 S., R. 10 E.; and T. 18 S., R. 11 E.

This is the third withdrawal this year by the U.S. Forest Service for roadside zones to "protect and preserve the aesthetic value of the highways." As usual, these withdrawals are subject to valid existing rights but will prevent appropriation under the general mining laws. Total acreage proposed for withdrawal this year by the Forest Service for roadside strips now amounts to 11,591 acres.

The second application for withdrawal (No. 60-2) of land is for 115 acres in T. 11 S., R. 12 E., Jefferson County. This withdrawal notes as an exception the general mining laws and mineral leasing laws. All other forms of land appropriation will be banned.

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WAH CHANG STARTS ELECTRON-BEAM MELTING

By
T. C. Matthews*

A revolutionary new furnace** that works like an immense X-ray tube was installed this summer at the Wah Chang Corporation plant near Albany, Oregon. It is used to melt and refine the refractory metals columbium, tantalum, zirconium, and hafnium by electron bombardment of the metal itself. The purification of the melted ingot is accomplished by devolatilization and evaporation of the impurities in a high vacuum. Since the only material that is heated is the ingot itself, all parts of the furnace are cool and the operator may view the melting operation through a large glass window.

The 225-kw electron-beam melting furnace now installed, manufactured by Stauffer-Temescal Company, Richmond, California, will produce 4-inch diameter ingots of 160 to 200 pounds in weight. It is the first model of this new type installed in a production plant in the United States, and it will add one more important step to the integrated processing of special metals in the Willamette Valley. The present production rate is 5 tons per month for metal of average purity and a second similar unit, which has been ordered, will more than double this amount.

Operation

The concentrated columbite-tantalite ore is received at the Wah Chang plant in drums, which are valued at as much as $5000 each when the ore contains 35 percent or more tantalum oxide. After separation and processing to almost pure metal, the sponge or powder is brought to the electron-beam furnace for final refining. Traces of oxygen, hydrogen, nitrogen, and carbon, either alone or in combination with various other metals, tend to make the refractory metals so hard that adequate fabrication is impossible. Passage through the electron beam reduces these impurities, thus increasing the workability, so that these special metals may be formed into the required shapes for reactor parts or space vehicles. One melting will reduce the Brinell hardness number of columbium to 85 and remelting the same ingot will reduce the number to 50. Metal in the form of sponge, bar stock of sintered powder, or premelted ingot is charged into the furnace through an air-tight entrance lock as shown in Figure 1 on page 94. The material is fed into the bombardment area of the electron gun where it fuses and then drips into a water-cooled ingot mold. The gun or cathode is in the form of a concentric ring around the lower end of the raw ingot, and may be removed and replaced through an entrance lock, when the need arises. The molten pool into which the metal drips is intensely stirred to bring

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* Spectroscopist, State of Oregon Department of Geology and Mineral Industries.

** Smith, H. R., Hunt, C. d'A., and Hanks, C. W., Electron-bombardment melting: Journal of Metals, February 1959.

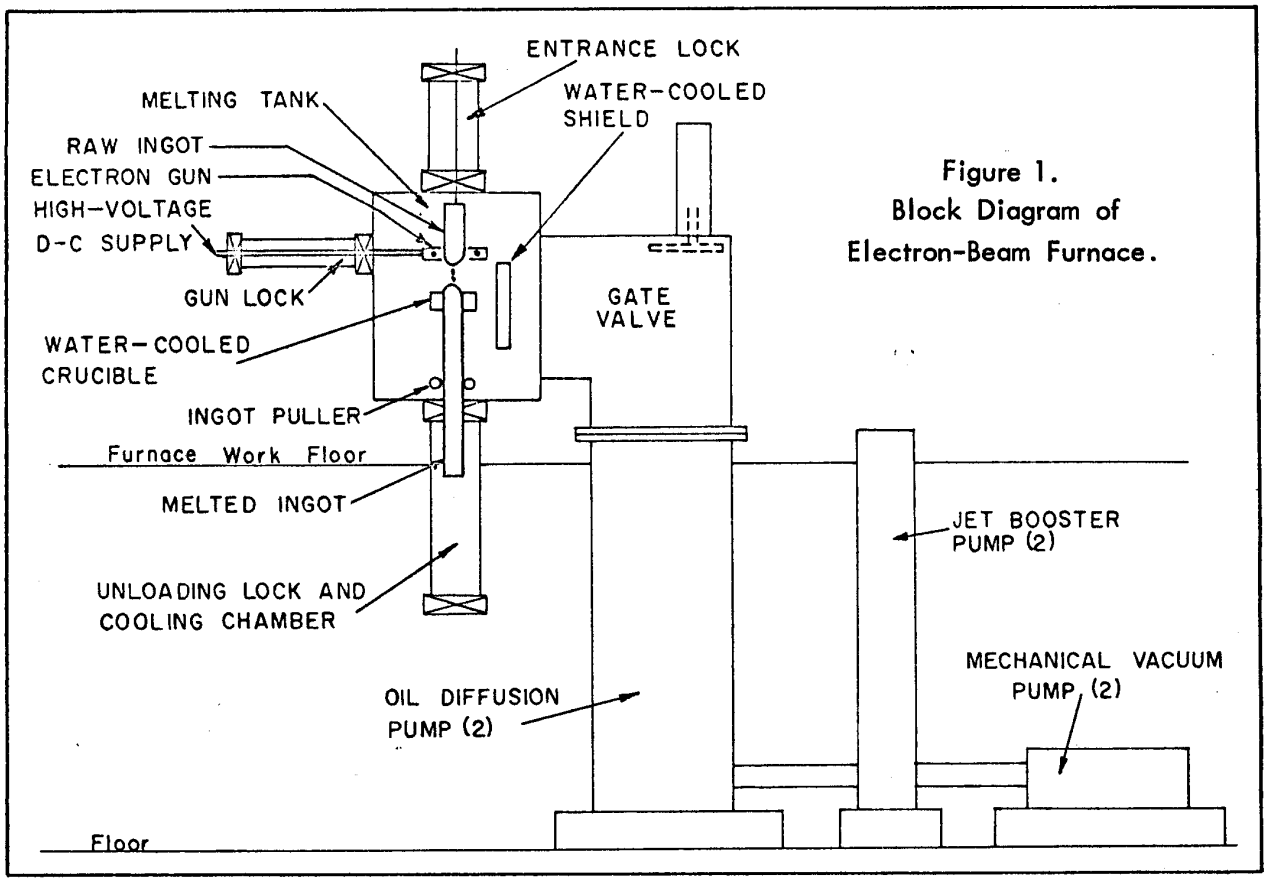

Figure 1.
Block Diagram of
Electron-Beam Furnace.

the volatile impurities to the surface rapidly. As the material solidifies, it is extracted from the mold at a selected rate to maintain a constant level in the molten pool. After a sufficient length of ingot is cast, it is dropped through a gate valve into the ingot removal lock. Here it is allowed to cool while another ingot is started in the melting chamber.

Equipment

Although the size of the melting chamber itself is only that of a 5-foot cube, its accessories fill a large room. Two mechanical vacuum pumps reduce the air pressure to approximately 1 mm Hg. Two jet booster pumps then reduce this to .025 mm Hg., or 25 microns. The two large oil diffusion pumps with a combined capacity of 60,000 liters per second are then able to evacuate the furnace down to .005 microns if left running without opening any valves. The usual melting pressure is .015 microns with a maximum allowable of .2 microns during short gas bursts. After cleaning the furnace and starting the pumps, $1\frac{1}{2}$ hours are required to evacuate down to melting pressure. Thereafter changes of electron guns or raw or melted ingots are made through the air locks; so that only 15 or 20 minutes are needed to pump down after each change.

Power for melting is supplied as conventional three-phase, full-wave rectified, high-voltage direct current (Figure 2). The power requirements for general operations vary considerably, depending both on the melting point of the metal and on its evaporation rate above that melting point. Independent voltage and current controls are provided and the system is divided into three independent units, so that operations may continue even with

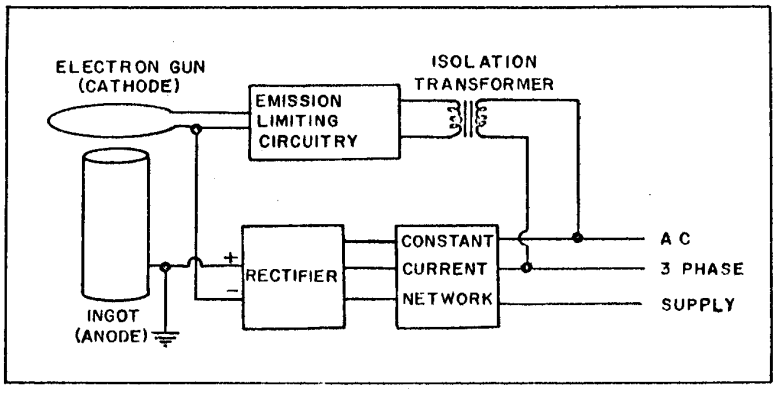

Fig. 2 - Block Diagram of Power Circuits (from Journal of Metals, Feb. 1959).

one unit out of service. The 4-inch columbium ingots being melted at present require 5 amperes at 15,000 volts. Tantalum with a melting point of 2850° C, as shown by the table below, requires about 33 percent more power.

Cooling is provided by 22 water circulating lines, each with individual control, and provided with automatic cutout features that would shut down the furnace in case of failure or drop in pressure. High-pressure air is used to empty and dry out any line which must be broken to open an air lock into the melting chamber.

High-Temperature Metals

	Specific Gravity	Melting Point	Boiling Point
Nickel	8.9	1452°C	2900°C
Cobalt	8.9	1480	2900
Chromium	7.1	1615	2200
Zirconium	6.4	1700	2900
Vanadium	5.8	1715	3400
Titanium	4.5	1800	3000
Columbium	8.4	1950	3300
Hafnium	13.3	2207	3200
Molybdenum	10.2	2620	3700
Tantalum	16.6	2850	4100
Tungsten	19.3	3370	4727

Alloy composition

Changes in the composition of metals and alloys occurring during electron-beam melting are different from changes occurring in other melting systems. This is attributed to the much higher vacuum existing at the surface of the molten pool, which causes devolatilization to proceed more rapidly. With respect to the evaporation of alloy metals from columbium, results show that vanadium and all other metals with a greater volatility than vanadium, such as chromium, iron, nickel, and aluminum, evaporate rapidly to concentrations of a few hundredths of a percent. Since the zirconium in a columbium-1 percent zirconium alloy evaporates faster than the columbium, the usual procedure in alloy work is to refine each metal to the required purity and then combine the metals for the final alloy in a vacuum-arc furnace. The vacuum-arc furnace is also used for remelting the smaller ingots into larger ones of 12 inches or more in diameter for forging large pieces. A 3,000-pound ingot may cost as much as $150,000 before entering the forging press. Besides the columbium-zirconium alloys used primarily in reactor construction, a tantalum-10 percent tungsten alloy has been run and a number of experimental alloys have been tried. It would appear that the field is very promising for the production of molybdenum and tungsten and their alloys for space vehicles.

Acknowledgment is gratefully made to Mr. Stephen Yih, Vice President and General Manager of the Albany Division, Wah Chang Corporation, for the information furnished on the equipment and expected operations. Acknowledgment is also made to Mr. James McClain, Manager of Manufacturing, for his assistance and description of the new furnace.

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ALLOY ORE IMPORTS INCREASING*

The number of foreign countries sending steel alloying elements to the United States has increased sharply in recent years. Forty-five nations sent one or more ores of alloying elements to this country in 1957, compared with 33 sources in 1947 and 26 just prior to World War II. The increase apparently is the result of a number of factors. Alloy users say that some of the new or smaller source-nations sell ores a little cheaper than sources of longer standing. The problem of obtaining shipping space for alloy ores at certain ports is another factor. Monetary exchange factors also have had an effect on ore sources.

The most important elements for the purpose of alloying are, in alphabetical order: boron, chromium, cobalt, columbium, copper, manganese, molybdenum, nickel, silicon, titanium, tungsten, vanadium, and zirconium. The United States is the world's largest producer of five of these, accounting for about 95 percent of total mine output of boron, 25 percent of all copper; 90 percent of all molybdenum; more than 35 percent of all titanium; and about 85 percent of all vanadium. Like all other countries, the United States also has large domestic supplies of silicon.

The three alloying elements used in greatest quantity by the steel industry are manganese, chromium, and nickel, for which the United States relies almost entirely on imports. In recent months domestic production of these ores has declined at such an alarming rate that our dependence on imports is approaching 100 percent.

The United States brings in manganese ore from 27 foreign nations, as against 10 in 1947. Since August 5, 1959, domestic production has essentially ceased. Russia, once the leading source of manganese ore, no longer supplies this country. India, a prime importer, is proving very difficult to do business with. Barter contracts of manganese for surplus agricultural commodities have been "in the fire" for more than a year and a half and are still not close to consummation. Present major sources of supply include Brazil, Ghana, Union of South Africa, and Mexico. All steel requires manganese in its manufacture - an average of approximately 13 pounds for each ton of steel.

Imports of chrome ore to the United States have risen threefold over the 1947 level when Russia supplied 46 percent of the total. In 1950 Russia summarily cut off all imports to the United States. The bulk of the chrome used in the United States comes from Turkey, Southern Rhodesia, Union of South Africa, and the Philippines. Since May 1958 United States production of metallurgical chrome has been shut down.

Canada remains the principal source of nickel imports in the form of ore, matte, and metal. Other possible sources are Cuba, Burma, New Caledonia, and Union of South Africa. Russian nickel, a pre-1947 source, is no longer available. The only United States production of nickel is at the Hanna Nickel Smelter, Riddle, Oregon; its 1958 production was equivalent to 15 percent of 1958 national consumption.

China, the largest source of tungsten ore and concentrates in 1947, no longer ships to the United States. China's ore was lost to us at the beginning of the Korean war, which worked severe hardship on our efforts in this conflict. Now western hemisphere sources account for more than two-thirds of total imports. Domestic production, which amounted to greater than 150 percent of the nation's needs in 1957, is completely closed down except for some by-product material.

Most of the world supply of cobalt is produced as a by-product with other metals and the two principal sources of imports are the Belgian Congo and Canada. Other producers include Australia, Federation of Rhodesia and Nyasaland, and Morocco. The United States has been producing slightly less than 50 percent of its cobalt requirements, part as a by-product but the bulk from a single mine in Idaho. The government contract with this mine terminated June 1959 and, although the price was only slightly above the world market, no steps have been taken to preserve this operation.

Imports of columbium in the past have come from eleven foreign nations, with Nigeria supplying 56 percent of the total. In 1958, Idaho produced 99 percent of the domestic columbium. Government contracts covering the Idaho production are near completion and, following the pattern of cobalt, it seems that the bulk of domestic production of this strategic mineral will soon be lost.

Australia is the largest source of zirconium ore imports. The United States is the world's second largest producer but requires 75 percent more than it mines.

Many other ores, metals, and miscellaneous products used in steel manufacture are also imported but are not considered in this article. For example, iron ore, iron and steel scrap, aluminum, tin, palm oil, and ferroalloys are not included.

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* Adapted from Steel Facts, August 1959.

Alloying elements, used singly or in combination, are added to molten steel either in the furnaces or in a ladle after refining. Usually they are added in the form of ferroalloys - manufactured products containing the desired element and iron.

Some of the more important properties imparted to steel through the use of alloying elements are listed below. Combinations of the elements are often used to produce entirely different properties. In addition, many of the elements listed are used in the making of alloys having useful strength at elevated temperatures. These may contain little or no iron but are manufactured largely by steel companies.

A large portion of ferroalloy production is in electric furnaces. Since the end of World War II, the Willamette Valley and Lower Columbia River area has become an important center for electroprocess materials. As long as low cost power is available, it seems likely that this form of industrial development will continue to increase in Oregon.

Boron is alloyed with steel to enhance the hardening properties of the finished product. Small amounts are enough to reduce the quantity of other hardening elements which might otherwise be required and are scarcer or more costly.

Chromium, in small amounts, is used to impart hardenability. In larger amounts, usually in conjunction with nickel, it helps impart corrosion resistance to stainless steels.

Cobalt, a somewhat magnetic element, is used with iron in making magnet steels and alloys. It is also used in high-speed tool steels where hardness at high temperatures is desirable, in addition to abrasion resistance.

Columbium is used in some stainless steels designed to be welded or used at high temperatures. The element helps prevent unwanted changes in the crystalline structure of the steel.

Copper, as an alloying element, serves to retard corrosion in some steels. The addition of copper is usually made in metallic form.

Manganese has two different functions as an alloying element. In relatively small percentages, it aids the strength and toughness of steel. In larger amounts, it increases the toughness and the resistance to wear and abrasion of steels in heavy-duty service.

Molybdenum is another of the elements used to impart hardenability to steel and to increase resistance to impact. In some alloys, it imparts high-temperature strength. It is also used in stainless, heat-resisting, and tool steels.

Nickel, like copper, is added to molten steel in metallic form. It increases toughness, strength, and ductility in steel and, in large amounts, it increases resistance to heat and acids. With chromium, it is one of the principal alloying elements used in making stainless steels.

Silicon improves the magnetic characteristics of steel, making the product desirable for some electrical equipment.

Titanium is used in steels designed for high-temperature applications to prevent unwanted changes in crystalline structure, particularly of stainless steels.

Tungsten helps impart hardness and toughness to steels at high temperatures. It is found in many high-speed tool steels.

Vanadium improves the toughness, mechanical properties and heat-treating characteristics of some steels often used in engine and motor parts.

Zirconium reacts with sulphur, nitrogen, and oxygen to cleanse the steel of certain impurities. Steels containing zirconium in various quantities are used in some tough, high-strength parts such as axles, crankshafts, and rock drills.

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UNUSUAL MINERAL EXHIBIT ON DISPLAY

The Oregon Agate and Mineral Society is displaying an unusually colorful and attractive exhibit of minerals at the Department's office in Portland. On display is a wide variety of crystals and polished slabs from various parts of the world, including agate material from Oregon. The exhibit was arranged by Mrs. Elda Hall and may be seen through December.

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STEEL IMPORTS INCREASE - EXPORTS DECREASE

Drastic changes in the import and export of iron and steel mill products during the last few years have cost Americans the equivalent of 30,000 jobs in our steel industry, according to the September issue of Steelways, a publication of the American Iron and Steel Institute. Imports of foreign steel-mill products in the United States rose to 1.7 million tons in 1958. This represented a 48-percent import increase over 1957, while domestic output in the same period dropped 24 percent. The first six months of this year continued to show the same discouraging trend. In that period imports exceeded exports by about 2 to 1, in sharp contrast with the years 1953-57 when the industry's exports exceeded imports 3 to 1. Based on 1958 investment per-ton-of-steel ingot capacity, imports last year idled about 146 million dollars' worth of production equipment.

While imports waxed, exports of steel mill products waned. From 1957 levels, exports dropped 48 percent to 2.7 million net tons in 1958. The reasons for this imbalance in trade are several and complicated, according to Steelways. The United States is the largest steel market area in the world and is essentially a free market with nominal tariffs and no trade restrictions on steel. We are the only such "free market" area in the world. Through both financial and technical assistance, we have helped rebuild, modernize, and expand the war-destroyed and outmoded production facilities of Europe and Asia. These new plants embody our own most forward advances in technology. We undertook this in large part to gain staunch allies in the face of our new antagonist, the Soviet Union, as well as in the belief that healthy economics would bring about an increase in the overall level of general world trade and well-being. As a result of our policies, a trebling of steel production has occurred since World War II in at least 20 countries. The United States' share of world steel production has dropped from 54 percent in 1946 to 35 percent in 1957, with recession-ridden 1958 dragging our share of world production down to 29 percent.

In the past, despite our higher wage rates, we have been able to manufacture at competitive total costs. We could do this because of heavy capital investment; size of market; mass production; and the technical, productive, and managerial know-how on which that is based. Now we have handed over these advantages through our aid programs and we stand in world trade on a more common technological plateau, while foreign wages continue well below our own. Average total hourly employment costs of our steel workers in 1957 stood at $3.22 against $1.01 in West Germany, 81 cents in Italy, and 46 cents in Japan. Our tax laws stretch depreciation over 20 to 25 years, by which time the original costs recovered have been far outdistanced by inflationary price increases. By contrast, Germany, for example, has a depreciation rate on new investment of 25 percent in each of the first two years, or a 50-percent recovery of original cost in the first 24 months of use. It is no wonder that our exports in 1958 are down 37 percent and our 1958 imports are up 467 percent over 1949, and the end is still not in sight.

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NOTICE TO SUBSCRIBERS OF THE ORE.-BIN

A number of complaints have been received by the Department from subscribers who have not been receiving the Ore.-Bin. The reason, in most instances, is that these people have moved and have not notified us of their change of address. The Ore.-Bin is sent by second-class mail which cannot be forwarded by the post office. Therefore, if you move, be sure to send us your new address so that you will not miss any issues.

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ANDERSON NAMED CHIEF GEOLOGIST FOR GEOLOGICAL SURVEY

Recently announced is the advancement of Dr. Charles A. Anderson from Geologist, Mineral Deposits Branch to Administrative Geologist, and Chief of the Geologic Division, United States Geological Survey. This is the position recently vacated by Dr. Wilmot H. Bradley who was appointed in 1944.

As Chief Geologist and head of the Geologic Division, Dr. Anderson will assume direction of the Survey's program for a systematic inventory of the Nation's mineral resources investigating and mapping the geologic patterns of the country; ascertaining, through research, the geochemical and geophysical relationships that determine the location of yet-undiscovered deposits of petroleum, metallic ores, and nonmetallic minerals; providing subsurface information required by civil engineers in the planning stages of construction projects; and conducting broad programs of fundamental research in the principles of geologic and related sciences and their applications to a wide variety of scientific and engineering problems.

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BUREAU OF MINES NORTHWEST REGION REORGANIZED

A reorganization of U.S. Bureau of Mines Region I, comprising Alaska, Idaho, Montana, Oregon, and Washington, has been announced. The regional office at Albany, Oregon, will retain its status with Mark L. Wright as director. Wright has been with the Bureau since 1940 and acting director of Region I since 1956. Under the reorganization plan there will be five major units:

1. Division of Administration, Albany, Oregon, will be headed by Robert W. Myers.

2. Division of Mineral Resources, headquarters at Albany, Oregon, will have Ottey M. Bishop as chief. Under this new division will be an Albany Office headed by A. J. Kauffman, Jr.; an Alaska Office at Juneau headed by J. A. Herdlick; and a Spokane Office with Richard N. Appling, Jr., in charge.

3. Spokane Office of Mining Research, formerly a field office of the old division of mineral technology, will continue under the direction of Wing G. Agnew.

4. Seattle Coal Research Laboratory, a new designation for the Northwest Experiment Station, will continue on the University of Washington campus under the direction of Dr. H. F. Yancey.

5. Albany Metallurgy Research Center, which takes over the work of the Northwest Electrodevelopment Experiment Station, will be headed by A. H. Roberson.

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NEW OIL AND GAS DRILLING PERMIT

Permit No. 37 was issued by the Department to Ross R. Mitchell, Canby, Oregon, on October 2, 1959. The site is located on the Samuel Paige ranch 1304.5 feet north and 930.8 feet west from the south $\frac{1}{4}$ corner sec. 11, T. 8 S., R. 5 W., Polk County. Mr. Mitchell abandoned drilling on the Bliven ranch before moving to the present location. The new test will be called Paige No. 1.

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SIGNS OF THE TIMES

Fluorspar Relief Denied - The Office of Civilian and Defense Mobilization denied a fluorspar industry request for relief from the depressing effects of foreign imports. OCDM, empowered by Congress to make decisions concerning effects of imports on national security, noted that imports have exceeded domestic production since 1952 and have more than doubled in volume since 1951. The report nevertheless stated definitely that it is not in the interest of national defense to change the situation.

Cobalt Plea Rejected - OCDM also rejected a plea from Calera Mining Company (a Howe Sound Company subsidiary) for protection from imports of cobalt. For several years Calera has mined cobalt at its Blackbird Mine, Cobalt, Idaho, and processed it in a Salt Lake City refinery. Leo A. Hoegh, OCDM's director, said that the increase in price necessary to keep the Calera operation on a profitable basis would mean an additional annual cost to consumers exceeding the combined payroll and taxes paid by the company. He added, concerning the vulnerability of foreign sources to political and military interference: "Cobalt sources are becoming increasingly widespread geographically and politically and denial of sources of supply is unlikely." (From Management Digest, Utah Mining Association, October 7, 1959.)

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KENNETH HAMBLEN

Kenneth E. Hamblen, consulting mining engineer of Portland, died suddenly October 13, 1959. Mr. Hamblen, a 1922 graduate of Oregon State College in mining engineering, made his offices in Portland all of his professional life and was one of Oregon's best known engineers. He had been associated with and helped develop several important Oregon mining properties including the Oriole gold mine in Josephine County, the Blue Ridge quicksilver mine in Crook County, and the Oregon King silver mine in Jefferson County. In addition, he helped develop several nonmetallic properties in the State. Mr. Hamblen's work carried him to all parts of the North American Continent. He was a partner in the development of the Red Mountain chrome property in Alaska. For several years he was on a Federal advisory board for procurement of strategic minerals. Mr. Hamblen was a member of the Oregon Section of the American Institute of Mining, Metallurgical and Petroleum Engineers and was active in the Pacific Northwest Metals and Minerals Conference.

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GARTH THORNBURG

Dr. Garth W. Thornburg, formerly President of Lakeview Mining Company, Oregon's only uranium mine and mill, died October 18 as the result of a hunting accident near Grand Junction, Colorado. Lakeview Mining Company took over the Lucky Lass mining claims in 1955 and, under the direction of Dr. Thornburg, developed the mine and obtained a contract for construction of a uranium mill at Lakeview. The Thornburg interests also had a uranium mine and mill in Colorado. Dr. Thornburg was a member of Governor Hatfield's Mining Advisory Committee.

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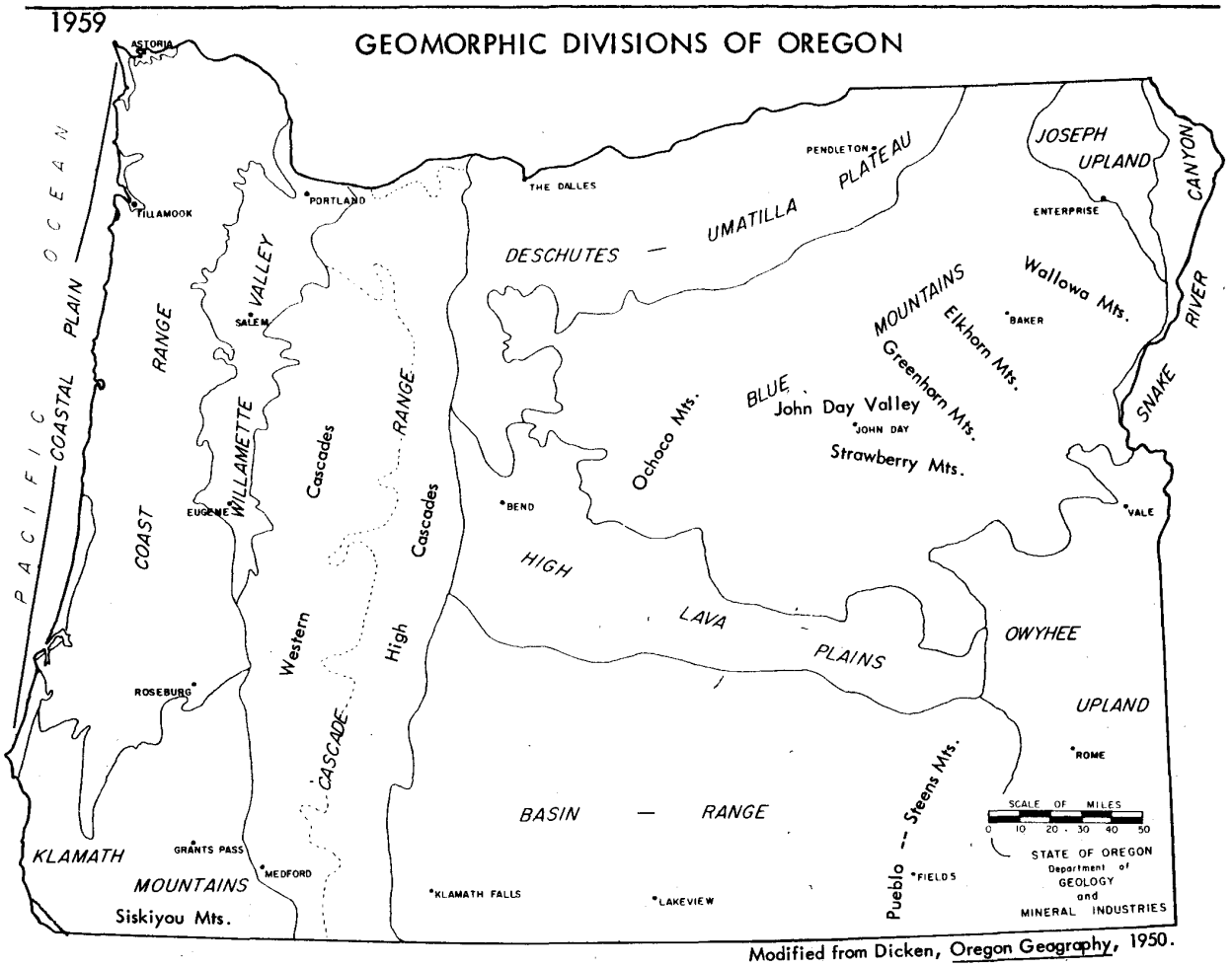

Modified from Dicken, Oregon Geography, 1950.

Coastal Plain - Unconsolidated sands and gravels of Quaternary age deposited as a thin veneer on the eroded surfaces of older Coast Range rocks. Marine terraces extend along coast at elevations from a few feet to 1500 feet above sea level. They are well demonstrated between Port Orford and Coos Bay. Sand dunes cover wide areas and are especially large between the mouths of Siuslaw and Umpqua rivers. Many dormant dunes now support a heavy cover of brush and timber. Drowned valleys and exhumed drowned valleys partially filled with sediments are characteristic.

Coast Range - A structural anticlinorium which has its main north-south axis superimposed on earlier folds trending northeast to east. Northern part is composed of submarine volcanic rocks, mainly pillow lavas and palagonitic tuffs and breccias, flanked by Tertiary marine sandstones, tuffaceous shales, and mudstones. Total thickness of volcanics is at least 10,000 feet. Most of the sedimentary rocks are of Eocene and Oligocene ages. Thickness varies from a few feet to 7000 feet. Intrusive rocks are of late Oligocene to Miocene age and are mostly gabbroic sills from a few tens to 3000 feet thick with dikes from 5 to 50 feet wide. Sills and dikes of nepheline syenite and dikes of camptonite are present. Southern part of Coast Range almost entirely marine Eocene sandstones and shales. Calapooya Mountains, an east-west trending ridge and a part of Coast Range, grade into nonmarine rocks of Western Cascades. Southernmost Coast Range rocks unconformably overlie or are in fault contact with the older rocks of Klamath Mountains. Crest of Coast Range averages about 1500 feet in elevation. Marys Peak, the highest point, is 4097 feet. Topography generally rugged especially in the volcanic areas.

Klamath Mountains - A region of rugged topography with elevations from sea level to 7500 feet. Streams are numerous, canyons deep, and ridges narrow. A core of pre-Triassic schists underlies a thick sequence of interbedded marine and nonmarine Mesozoic volcanic and sedimentary rocks (Applegate group; Dothan, Rogue, and Galice formations) which are tightly folded, faulted, intruded by ultramafic to acid plutonics, and uplifted. Low-grade regional metamorphism is widespread. Schists and gneiss occur in areas of greater movement and adjacent to the larger intrusive masses. Regional structure trends northeast. Slightly deformed uppermost Jurassic and Cretaceous marine sediments occur in troughs, grabens, and along borders.

Willamette Valley - A valley flood plain with isolated hills, lying between the Cascade and Coast ranges. Underlain by marine Eocene and Oligocene sandstones and shales (Spencer and Eugene formations). Formations dip eastward from Coast Range foothills, crop out in hills within the valley, and again along parts of Cascade foothills. Miocene lavas (Columbia River basalt) cap marine sediments in northern Willamette Valley. Basic dikes and sills form buttes in southern part. In the Portland area consolidated sands and gravels of Pliocene age fill structural basin; local occurrences of Plio-

Geomorphic Divisions of Oregon (cont.)

Pleistocene lavas. Silts and gravels deposited by Willamette River and major tributaries have filled the valley up to several hundred feet. Terraces representing several periods of rejuvenation have been developed.

Cascade Range - Divisible into Western Cascades and High Cascades and best described as a great pile of volcanic rocks. The older Western Cascades are maturely dissected. Rocks range in age from late Eocene to possibly early Pliocene. Along western margin, formations dip gently eastward and broad open folds, sizable faults, and disconformities are present. Eocene to lower Miocene rocks are chiefly pyroclastics with interbedded lava flows and lenses of waterlaid sediments. Include tuffs, volcanic conglomerates, tuff breccias, welded tuffs, and rhyolitic to basaltic flows. Middle Miocene rocks are predominantly basaltic lavas which cap higher ridges and may be remnants of shield-type volcanoes. Younger rocks vary from pyroclastics to basalts.

The High Cascades are the majestic volcanic peaks, cinder cones, and relatively undissected lavas on east side of Range. Original constructional form of most central vent volcanoes has been severely modified by glaciation. Most peaks are Plio-Pleistocene in age; Recent flows and cinder cones are common. Lavas are dominantly basaltic andesites and olivine basalts. Some rhyolite and obsidian flows are present. Pumice blankets large areas. Intracanyon basalts of Pliocene age extend into Western Cascades from High Cascades. Highest peak is Mount Hood, 11,245 feet. Highways crossing the Range go through passes at elevations of about 5,000 feet.

Deschutes-Umatilla Plateau - A north-sloping lava plateau or monocline bounded on north by Columbia River. Elevation 600 to 3000 feet above sea level. Surface deeply dissected by youthful streams separated by broad, gently rolling interstream areas. Scabland channels eroded by glacial flood waters occur in northern part. Region underlain by thousands of feet of Miocene basalt flows (Columbia River basalt); in places gently warped into large open folds. Surface blanketed in part by Pliocene lake beds and river gravels (Dalles and Shutler formations), Pleistocene ice-rafted boulders and torrential flood-deposited alluvium, and loess.

High Lava Plains - Young, uneroded surface with few established streams; largely interior drainage. Elevation 3500 to 6000 feet above sea level. Region underlain by thick accumulation of Cenozoic volcanic rocks, dominantly Pliocene lava flows. Quaternary rocks blanket western part and consist of lavas, pumice, obsidian, and many small cinder cones. Tertiary rocks include basaltic, andesitic, and rhyolitic lavas; tuffs; welded tuffs; and minor amounts of interbedded waterlaid sediments. Region highly fractured, with dominantly northwest-trending pattern.

Basin-Range - Young fault block mountains separated by broad graben valleys with interior drainage; occasional volcanic peaks. Elevation 4000 to 9000 feet above sea level. Shallow alkaline lakes and playas in graben valleys are remnants of much larger Quaternary lakes. A thick sequence of Tertiary rhyolite, andesite, and basalt flows with interbedded tuffs and tuff breccia underlies all of the area except the Pueblo Mountains. Here a small body of pre-Tertiary schists, greenstone, and granite is exposed below the Tertiary volcanic rocks near the base of the large Pueblo-Steens escarpment. Faults of the typical Basin-Range topography trend northeast and northwest. Occasional undissected Recent volcanic cones and flows are found in the northern part.

Owyhee Upland - Moderately to highly dissected surface with few perennial streams. Elevation 2000 to 6000 feet above sea level. Region underlain by middle Tertiary to early Quaternary basalts, rhyolites, and associated pyroclastics interbedded with lake and stream deposits. Late Quaternary lavas of limited extent occur north and west of Jordan Valley. No known marine formations are exposed at the surface. Major faulting of middle Tertiary formations is generally north-south with typical fault block structures developed. Late Tertiary and early Quaternary lava flows and sedimentary rocks are only slightly deformed. Merges into the Basin-Range region to the south and west. Northern border sharply defined where it lies on the intensely deformed pre-Tertiary rocks of the southern Blue Mountains. Northern and northeastern areas dominantly terrestrial sediments associated with the late Tertiary filling of the Snake River area to the east.

Blue Mountains - A complex region of mountain ranges and mountainous areas, canyons, plateaus, and basins. Elevations range from 2,000 to 10,000 feet. High mountains glaciated. Region drained by John Day River and other streams tributary to Columbia and Snake rivers. A wide variety of rock types ranging in age from Paleozoic to Recent. In central and eastern parts: core of Cretaceous granitic rocks intrusive into folded and in places metamorphosed marine sediments, greenstones, and basic intrusives that may range in age from Devonian (?) to Cretaceous; Triassic and Jurassic marine and volcanic rocks predominate. In many places pre-Tertiary rocks occur as islands surrounded by Tertiary lavas and pyroclastics. In northern, western, and extreme southern parts: largely Tertiary pyroclastics and lavas from central vents and fissures and their associated tuffaceous sediments. Tertiary rocks warped by large, broad, probably deep-seated folds. Major faults are common and have formed basins and valleys now partially filled with late Cenozoic lake beds and alluvium.

Joseph Upland - Underlain almost exclusively by a thick succession of essentially flat-lying Miocene basalts with but few thin sedimentary interbeds. Deeply eroded by numerous streams draining for the most part northward in narrow canyons with steep gradients. Elevations on upland surface average between 3000 and 5000 feet. Creeks have cut downward to nearly 1500 feet along northern margin of area.

Snake River Canyon - The Snake River has carved a deep (5652 feet at Hat Point), narrow, V-shaped, and locally precipitous canyon with an average gradient of approximately 10 feet per mile over an airline distance of 110 miles. It has cut through basalts of Joseph Upland and on into basement rocks of Blue Mountains to reveal a narrow, ribbonlike exposure of pre-Tertiary rocks throughout nearly entire course of canyon bottom. Older formations are principally Permo-Triassic metasediments and metavolcanics. Imnaha River has cut a deep canyon exposing similar pre-Tertiary rocks but in fewer places.

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NATURAL SOURCES OF CARBON DIOXIDE IN OREGON

By
Norman S. Wagner*

On looking over maps of Oregon, one frequently comes across names such as Soda, Dry Soda, or Fizz applied to springs, creeks, mountains, and even towns (Sodaville in Linn County). These names owe their origin to the presence of springs emitting soda water - that is, water having a high content of dissolved carbon dioxide. The large number of soda-water or carbon-dioxide springs in Oregon is not readily apparent from maps, however, because many of the springs either have no names or have names that are not descriptive.

Soda-water springs, or soda springs as they are commonly called, occur at many places in the State, from the Willamette Valley to the Snake River. Locations of thirty of these springs are shown on the map on page 104. At some of the springs the discharge of water is accompanied by the escape of free carbon dioxide gas. But whether free gas is present or not, all of the springs represent a leakage of natural carbon dioxide and some a potential source of this commodity.

Carbon dioxide industry

Carbon dioxide (CO_2) is an odorless, colorless, tasteless, inert and noninflammable gas. It can be converted to a liquid or a solid and held in that form with comparative ease. The liquid and solid forms retain the properties of the gas, but have additional properties of their own. For example, the solidified material, dry ice, has a temperature of -109.3° F. It also has a relatively high specific gravity and it evaporates back to gas without liquifying to a noticeable extent.

Because of its properties, dry ice is used extensively as a refrigerant in the storage and transportation of various foods, one pound substituting for 15 to 20 pounds of water ice. Dry ice is also used in the shrink fitting of machine parts and for hardening steel alloys. Liquified CO_2 is employed in some types of mechanical refrigeration and as an explosive in coal mines. The gas is popularly known for its use as the "sparkling agent" in carbonated beverages. It is also used in fire extinguishing and for food preservation in ways other than refrigeration. Both liquid and gaseous CO_2 are used as packaged power for inflation of collapsible life-saving gear and for spray application of canned insecticides, paints, and an ever-growing number of food products and housekeeping aids.

National production of CO_2 for 1953 was 743,368 short tons valued at 41.3 million dollars, according to the U. S. Bureau of Census, 1954. The bulk of this production represents by-product gas reclaimed from waste fumes from various industrial plants. However, approximately 40,000 short tons, or 5.3 percent of the national production having a gross value of 2.2 million dollars was derived from natural sources. Later figures in the U. S. Bureau of Mines Minerals Yearbook for 1957 indicate that CO_2 production from natural sources climbed from 670,600,000 cubic feet in 1953 to 704,276,000 cubic feet in 1957.

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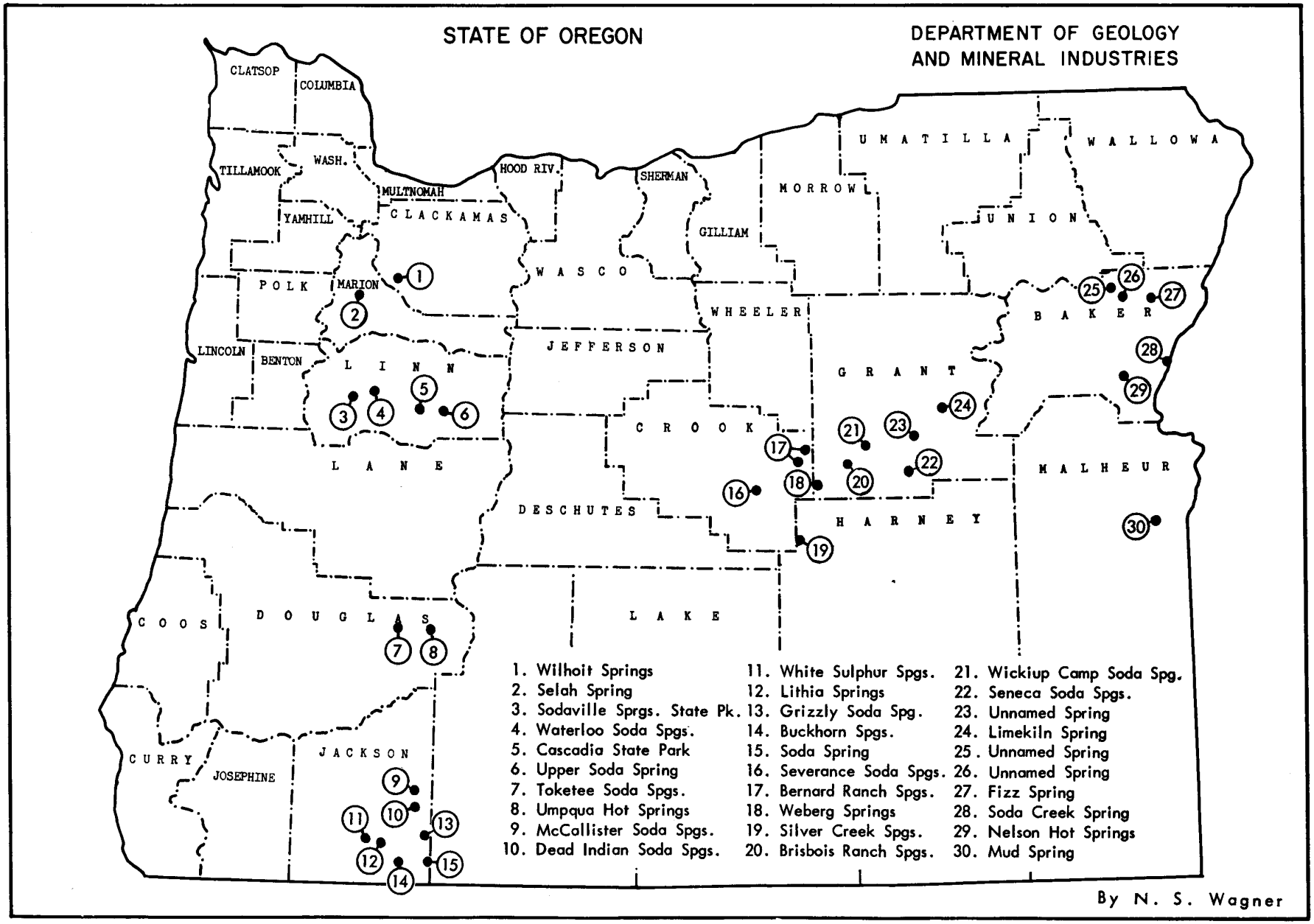
*Geologist, State of Oregon Department of Geology and Mineral Industries.



MAP SHOWING LOCATION OF CARBON DIOXIDE SPRINGS IN OREGON

The by-product production of CO_2 originates from industrial plants throughout the nation, but only six states are listed as having production from natural sources in 1957. These states are Oregon, California, Colorado, New Mexico, Utah, and Washington.

Origin of carbon dioxide

Both manufactured and natural CO_2 are derived by the burning or chemical treatment of: (1) organic matter, (2) materials of organic derivation such as coal, oil and the hydrocarbon gases, and (3) rocks composed of carbonate minerals. The manufactured CO_2 is liberated in plants where fuel is combusted, where cement and lime are burned, where ammonia and nitrogen are manufactured, where hydrocarbons are treated, and where alcohol fermentation is accomplished. A similar generation of CO_2 takes place in the earth's crust when natural materials containing carbon are subjected to: (1) magmatic assimilation, (2) heat generated by faulting, igneous intrusion, and metamorphism, (3) the action of acid ground waters on carbonate rocks, and (4) the kinds of decay and fermentation that occur during the transformation of buried organic matter into coal and hydrocarbons. Natural CO_2 is therefore found in varying degrees of concentration in gases of volcanic origin, in areas of recent volcanism where uncooled magmas remain in contact with limestones and sediments containing organic matter or materials of organic derivation, and in association with deposits of coal and hydrocarbons.

Once formed, natural CO_2 is subject to the same structural and physical controls that govern the entrapment, migration, and leakage of petroleum and the hydrocarbon gases. Thus while tremendous quantities of CO_2 are discharged annually from the vents of the world's volcanoes, and from lesser fumaroles and bedrock fractures in areas of recent volcanism, large accumulations also exist in subsurface traps from which there is little or no leakage. For this reason many CO_2 occurrences have been discovered accidentally during the course of drilling exploratory wells for oil. Several of the New Mexico occurrences are notable examples.

Uses of natural CO_2 in Oregon

Dry ice is being produced from natural CO_2 recovered from wells in a soda-water spring zone on Emigrant Creek, 3 miles east of Ashland. The operation is owned by the Gas-Ice Corporation of Seattle, Washington, one of the first companies on the West Coast to use natural CO_2 for ice-making purposes. Production at Ashland began in the summer of 1945, and through 1957 has totaled approximately 47 million pounds of dry ice.* At the rate of 10 cubic feet of gas for each pound of dry ice, this amounts to a recovery of 470 million cubic feet of gas from the field - an average somewhat in excess of 31 million cubic feet per year. For 1958, plant output was nearly 210 eighty-pound cakes of ice per 24-hour working day with a two-month shutdown of operations during the winter.

The only other way these natural "soda" springs are being utilized today is for drinking or bathing purposes at campgrounds, parks, and health resorts. During past decades, however, especially during the forepart of the century, several attempts were made to market natural soda water in bottled form. Most of these operations were short-lived and financially unrewarding. Artificial carbonation, brought about by the development of the carbon dioxide industry, now serves the same purpose in a much more effective and efficient manner.

Characteristics of Oregon's soda-water springs

All soda-water springs contain enough dissolved CO_2 to give the sour, fizzy taste of carbonic acid (H_2CO_3). Other characteristics generally present to some degree include a bluish, soapy cast to the water in semistagnant pools, patches of orange-brown coating in the bed of the discharge channels, abundant growths of deep-green, mosslike algae in both the springs and the discharge channels, and a graying of otherwise green grass in the area of the spring.

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*R. B. Newbern, President, Gas-Ice Corporation: personal communication.

Soda-water springs differ considerably among themselves with respect to size, shape, flow temperature, content of dissolved CO_2, and amount of associated free gas. For example, some springs consist of a single, clean-cut discharge orifice and nothing more, while others have several flowing discharge centers accompanied by zones of seepage. In some places a single-orifice spring, or a small compound spring, will occur in an area devoid of other known CO_2 leakages; in other places many clusters of springs and seepages occur in a compact area of considerable acreage, or extend for an appreciable distance in alignment with a fault or bedding trend. Deposits of calcareous tufa (travertine) occur at most springs, but are absent at others. The rate of flow varies likewise, although no definite flow figures can be given here because field conditions rarely permitted measurement. In fact, several of the larger springs discharge directly in the beds of rivers and creeks. On the whole, however, the flow at most sites is quite small, and in several instances it is negligible. Water temperatures range from 48° F. to 121° F. Thus some of the springs are hot, most are tepid, and a few are cold.

The CO_2 content of the water is strong in some springs and weak in others, due undoubtedly to mingling and dilution of the spring water with fresh ground water. A discharge of free CO_2 gas occurs at some sites along with the water, and is lacking at others. Its presence appears to bear no fixed relation to the CO_2 content of the spring water, however, as some springs with a high content of dissolved CO_2 show no observable discharge of gas while some springs with a low content show a conspicuous amount of gas.

When free gas is discharged from within the confines of a spring pool, or from points in the bed of a creek channel, its escape is manifest by bubbles rising through the water. Such bubbles are emitted in coarse bursts at some sites and in a steady succession of fine beads at others. In some places, emission is continuous but punctuated by surges of greater activity. At other places, periods of escape alternate with periods during which there is no observable discharge. There are also areas in which free gas escapes directly from the earth's surface to the atmosphere without passing through any pools of standing water. It is, of course, virtually impossible to determine the extent of areas of "dry" leakage. In fact, their existence can be recognized only when the ground is covered by puddles of standing water after prolonged rains or springtime thaws. Some sites of "dry" leakage are reportedly indicated by a tendency to be relatively snow-free during the winter.

Descriptions of individual CO_2 springs

Due to the prevalence of volcanic activity in Oregon and the rather commonplace by-product association of CO_2, it is reasonable to conclude that many of Oregon's numerous CO_2 springs are seepages of little significance. However, the Gas-Ice Corporations's operation at Ashland, and another owned by the same company and located in a spring area near Klickitat, Washington, about 30 miles north of The Dalles, Oregon, show that commercial quantities of natural CO_2 occur at some spring sites in the Northwest. This suggests that other leakage areas would warrant careful investigation should future market demands give rise to the need for developing additional supplies.

While a far more detailed study must be made before the full geologic picture can be determined in most instances, the following descriptions summarize the data presently available for the springs and seepages shown on the map. All water and gas analyses were made by Dr. R. E. Moser, Oregon State Board of Health.

1. Wilhoit Springs: A cluster of soda-water springs on northeast bank of Rock Creek in sec. 16, T. 6 S., R. 2 E., Clackamas County. Very light discharge of free CO_2 occurs sporadically from these springs and also at intervals in Rock Creek over a distance of about three-eighths of a mile, beginning at a point about one-eighth of a mile above the springs and continuing on downstream past the springs. Additional free gas leakage reportedly observed in meadow in vicinity of springs to distances of 300 to 400 feet east of creek when terrain is saturated,

according to Albert Schoenborn, property owner. Full extent of area over which such "dry" leakage occurs is unknown. Due to development and landscaping of campgrounds, springs are now boarded over and equipped with hand pumps. Original setting presumably consisted of boggy seepage with three or four separate flowing discharge centers in an area of about 50 by 100 feet. Temperature in one accessible spring measured 48° F. Water contained 3.1 volumes CO_2 per volume of H_2O at 25° C. Free gas sample from leakage in creek contained 80 percent CO_2; 3.5 percent O_2; and 15.5 percent N_2. No hydrogen or methane were detected. Springs emanate from Oligocene series of coal-bearing terrestrial and marine sediments with a presumably thick underlying sequence of older Tertiary sediments and volcanics. Leakage area traversed by axis of broad anticline with a strike roughly normal to the course of Rock Creek, according to mapping by Oregon Department of Geology and Mineral Industries (1944-1948) and Harper (1946). Because of this, jointing probably serves as the escape channelways, and "dry" leakage may occur along anticlinal axis over a far greater distance than has been currently observed.

2. Selah Spring: On west bank of Pudding River near center of the SW¼ sec. 5, T. 7 S., R. 1 W., Marion County. Consists of a solitary spring enclosed in a concrete tower erected years ago as part of bottling works project. Water stands in tower an estimated 2 feet above ground surface and escapes in small flow from cracks near ground level. Gas given off almost continuously in numerous small bubbles, but total yield is small, and water is only mildly carbonated by taste. Temperature 52° F. Spring issues from "older (Pleistocene) alluvium and terrace deposits" in area underlain by Tertiary sediments and volcanics, according to Piper (1942).

3. Sodaville Springs State Park: This spring is in Sodaville in the SE¼ NE¼ sec. 36, T. 12 S., R. 2 W., Linn County. It is housed in the basement of an establishment originally erected as a commercial venture but now operated as a public fountain by the Parks Division of the State Highway Department. As the spring was padlocked and the Park Service was unable to furnish any analysis, all that can be stated here is that the water from a fountain spigot was cold and had a very strong carbonated taste. Several local residents report that strong soda water has been encountered in several wells drilled for fresh water elsewhere in the Sodaville area, but no further details can be given as the wells have been plugged. The Sodaville area as a whole is underlain by a presumably thick series of sediments and volcanics of Tertiary age, according to available geologic mapping by Piper (1942).

4. Waterloo Soda Springs: Two very small springs on opposite sides of South Santiam River 400 to 500 feet upstream from bridge at Waterloo, about center of the W½ sec. 28, T. 12 S., R. 1 W., Linn County. Reported as having been persistently flowing 20 years ago, but flow from each is barely a trickle now. Both springs issue from crevices in a Tertiary basalt and both are subject to flooding during periods of high water.

5. Cascadia State Park: This is an attractive park built around three natural soda-water springs located on the north side of South Santiam River at mouth of Soda Creek, in the NW¼ sec. 32, T. 13 S., R. 3 E., Linn County. Original springs are now buried under a rock terrace and piped to spigots and to an open piece of culvert about 10 inches in diameter set vertically in the terrace floor. Observable flow is small and probably only a portion of that available. Gas is emitted continuously and at a fairly constant rate from the culvert pool in the form of an abundance of small bubbles. Pool temperature is 49° F. Gas and water samples taken at the time of examination were lost because of defective capping, but water can be described as having had an exceptionally strong carbonated taste. However the park caretaker reports that the CO_2 content varies, making the water almost too strong to drink at times. Much difficulty in the form of bottle

breakage due to gas pressure is reportedly experienced by those who attempt to bottle the water. Many small springs, observable only during periods of low water, are said to occur in the river bed in the vicinity of the park, with other occurrences at less frequent intervals all the way to Waterloo. Tertiary lavas constitute the bedrock in the park area but no data on structural conditions are presently available due to lack of detailed geologic mapping in the region.

6. Upper Soda Spring: A seepage from a nearly vertical bluff on the north bank of the South Santiam River, 300 to 400 feet below the mouth of Soda Fork and within 6 to 8 feet of river in the SE¼ sec. 26, T. 13 S., R. 4 E., Linn County. Stagnant water fills a small, three-compartment trough built against bluff but the seepage-moistened face of cliff represents the only observable source of supply at this now deserted relic of a spring site. Tertiary volcanic area.

7. Toketee Soda Springs: Four small springs and much related seepage in a small cove on north side of Toketee Falls - Glide road on North Umpqua River a quarter of a mile downriver from Soda Springs dam, in the southwest corner of the NW¼ sec. 17, T. 26 S., R. 3 E., Douglas County. One spring, situated on steep hillside along trail to Indian Caves, issues from a picturesque, mug-shaped travertine cone 30 to 35 feet in diameter at base, while others issue from bench-type deposits in cove bottom at base of hill. Aggregate flow is small. Temperature 55° F. Tertiary volcanic bedrock.

8. Umpqua Hot Spring: On north bank of North Umpqua River in unsurveyed area about 3 miles northeast of Toketee Reservoir, Douglas County. Hot water with a faint odor of sulphur and a questionable CO_2 content trickles from cracks and several very small circular craters in top of a travertine mound perched on steep valley side. Temperature 106° F. Tertiary volcanic bedrock.

9. McCallister Soda Springs: A picnic area in the Rogue River National Forest on the North Fork of Little Butte Creek, about at the center point of the NW¼ line, sec. 3, T. 37 S., R. 3 E., Jackson County. Principal spring issues from a concrete box with a pool area about 10 by 12 inches situated within a fenced enclosure adjacent to creek. A seepage zone in a brushy, cattle-trampled area extends upstream about 200 feet along creek bank. Both areas are subject to flooding during high water periods. Water has a strong carbonated taste and a temperature of 50° F. Bubbles of free gas given off constantly from spring pool but only sporadically in seepage zone. Volume small. Tertiary volcanic bedrock.

10. Dead Indian Soda Springs: Two soda-water springs in the channel of Dead Indian Creek a scant half mile above mouth, and a seepage near mouth, in the SE¼ sec. 22, T. 37 S., R. 3 E., Jackson County. The uppermost spring issues from crevices and a concrete-lined vent in an area of about 15 by 20 feet on the east bank of the creek. The second spring seeps from a small travertine mound about 500 feet downstream on the west bank. The seepage area at the creek mouth is 30 to 40 feet in length and occurs in the gutter of the logging road to Poole Mountain, just above bridge. Combined flow is small. Carbonic acid taste is only moderately strong, but strongest in uppermost spring. Temperature measurements range between 50° F. and 56° F. A constant but small discharge of gas at uppermost spring only. Tertiary volcanic bedrock.

11. White Sulphur Springs: On outskirts of Ashland in about the center of the W½ sec. 4, T. 39 S., R. 1 E., Jackson County. Hot water developed years ago for bath house and swimming usage. Principal source is one natural spring now confined within a rocked 10 by 10-foot enclosure and a drilled artesian well 150 feet deep. Gas given off continuously from 6-inch casing is reported to be CO_2, but odor indicates contamination by sulphur. Occurrence in area mapped by Wells (1956) as Umpqua (Eocene) sediments.

12. Lithia Springs: A chain of springs along Emigrant Creek principally in the SW¼ sec. 7, T. 39 S., R. 2 E., Jackson County, about 3 miles east of Ashland. This is the site of the Gas-Ice Corporation's operation at which about ten producing wells drilled between 200 and 300 feet deep have yielded the production cited earlier. Drilled along an inferred fault in nonmarine sediments of the Umpqua formation (Eocene) with a 30° + regional dip to the northeast. Normal flow no longer observable due to lowering of water level by pumping. Travertine present at some spring sites. The Umpqua formation contains no known limestone beds in the spring area but does contain coal and interbedded volcanics and is presumably underlain by an intrusive diorite which is exposed about 2½ miles from the spring area on both the southern and northwestern sides. If the CO_2 is migrating up the dip of the sediments to the fault zone, the originating source could be far to the northeast. Mapped by Wells (1956) and Schafer (1955).

13. Grizzly Soda Spring: Located in the northeast corner of sec. 7, T. 39 S., R. 4 E., Jackson County, but reportedly flooded by waters impounded behind diversion dam. Not visited.

14. Buckhorn Springs: A mineral-water health resort on Emigrant Creek near the center of sec. 12, T. 40 S., R. 2 E., Jackson County. Consists of a drilled well on one bank of the creek and a bath house constructed over a natural spring on the opposite side, with a strong gas leakage from the creek bed in between. Travertine exposed in cut behind bath house. Carbonic acid taste is strong. Free gas discharge is constant and many times more vigorous than that seen at any other spring in the State. Volcanic flows of the Roxy formation (Oligocene?) constitute the prevailing bedrock in the area. Two major faults intersect near the spring area according to mapping by Wells (1956).

15. Soda Spring: On Jenny Creek in the SE¼ SE¼ sec. 8, T. 40 S., R. 4 E., Jackson County. Not visited.

16. Severance Soda Springs: Two areas of gas discharge in an isolated canyon of the South Fork of the Crooked River near the common western corner between secs. 24 and 25, T. 18 S., R. 22 E., Crook County. Both springs issue from discharge points in the river bed and are manifest only by chainlike strings of rising bubbles. The largest area, and also the one with the greatest density of discharge points, measures roughly 8 by 50 feet. This parallels the western bank of the river. The second area is approximately 300 feet upstream, and also on the west bank except for a narrow line of leakage that runs diagonally across the river to the opposite bank. Discharge takes place continuously in both areas but varies greatly with bubbles issuing at times from comparatively few discharge points in each area, while at other times they issue simultaneously from a great number of places. One very small seepage of weak, undoubtedly diluted, soda water issues from bank at upstream area. Temperature here measured 58° F. Abundance of plant life in main spring areas suggests discharge of warm water to river. "Dry" leakage probably present on banks. Volcanic tuffs of Tertiary age constitute bedrock in canyon.

17. Bernard Ranch Springs: Principal spring is a locally well-known landmark on Camp Creek in the SW¼ NW¼ sec. 23, T. 17 S., R. 25 E., Crook County. Spring issues from bottomless 10-gallon crock located on the north bank of creek about one foot above water level. Spring water temperature 48° F. Contains 2.2 volumes CO_2 per volume H_2O at 25° C. Sporadic, light output of gas observable in spring and at random places in creek over a distance of 75 feet. Tested 72 percent CO_2; 3 percent O_2, and 25 percent N_2. Spring area underlain by Cretaceous sediments. Three small, essentially dormant seepages occur near the Bernard residence in the E½ sec. 11. One yields palatable water with a mild carbonated taste. Other two are undrinkable, strong in sulphur, and have thin, eroded travertine shelving.

18. Weberg Springs: An 80-acre tract of seepages and springs in bottom land adjacent to Warm Springs Creek, in the S½ sec. 18, T. 18 S., R. 26 E., Grant County. Two natural springs and a drilled well flow from a low travertine mound on the margin of meadow farthest removed from creek at point where valley-fill alluvium thins out to expose bedrock. Intervening meadow contains approximately 25 boggy seepage areas and small springs and is underlain, at least locally, by travertine. Yield at flowing springs small but steady. Water temperature 116° F. and 122° F. Temperature at well 60 feet from hottest spring is 108° F. Temperatures in springs in meadow range downward to 85° F. and undoubtedly reflect dilution by cold ground water. Gas given off continuously and fairly vigorously from both flowing springs and the drilled well and from a nearby cluster of springs in meadow below where sediment mantle is thinnest and back pressure of contained ground water is least. Additional discharge also noted at ten to twelve spring sites elsewhere in meadow but this is spasmodic and becomes progressively less to point of vanishing in portion of meadow nearest creek, where sediment mantle is thickest, ground water saturation greatest, and escape impeded the most. Analysis shows water from hottest spring to contain 1.8 volumes CO_2 per volume of H_2O at 25° C. The gas contains 64 percent CO_2; 5 percent O_2; and 31 percent N_2. Bedrock in spring area mapped by Lupher (1941) as Colpitts formation of Middle Jurassic age. The Colpitts is composed of limestones, sandstones, and shales. Jurassic section probably underlain by Paleo-Triassic section with similar lithology.

19. Silver Creek Springs: In the SW¼ SW¼ sec. 25, T. 19 S., R. 25 E., Harney County. Silver Creek flows directly over spring but minor soda water discharge is observable on both banks to maximum height of one foot above August water level. Only moderately carbonated by taste. Temperature 58° F. Gas discharged weakly at numerous places in both springs. Two dormant springs nearby on west bank and a small, near-dormant seepage 100 feet downstream suggest spring area is in dying-out phase. Exposed bedrock at east bank spring is highly vesicular Tertiary basalt.

20. Brisbois Ranch Springs: Several small springs, several nearly dormant seepages, and a few dormant springs occur at intervals for about 3 miles through the E½ secs. 13 and 24, and the N½ sec. 25, T. 17 S., R. 27 E., Grant County. Located along Dry Soda Creek, which flows south to South Fork of John Day River, and along Brisbois Gulch, which flows northeast, entering River a quarter of a mile downstream from Dry Soda Creek. Travertine present as shelf of very restricted size at most sites, but in larger quantity near mouth of Brisbois Gulch where it occurs: (1) as prominent cone on hillside a quarter of a mile southwest of River, (2) in deeply eroded creek channel directly below hillside cone, and (3) on north bank of River above creek mouth. Largest spring located by River. Water temperature is 72° F. Contains 79 percent CO_2; 3 percent O_2; and 12 percent N_2. Yields gas containing 3.0 volumes CO_2 per volume H_2O at 25° C. Similar analysis obtained for water and gas samples from spring on hillside cone. Water temperatures in other springs range downward to 56° F., and several show no associated discharge of free gas. However, free gas is given off persistently from River bed at several places over a distance of about 500 feet and is especially prominent in pool adjacent to the river-bank spring described above. Re-examination of area after prolonged rain when ground was saturated and puddles lay on surface showed "dry" leakage to be widespread in River area and even present in roadbed (old road) adjacent to the site of two very small, dormant springs located in the S½ SW¼ SE¼ sec. 24. Bedrock composed of upper Triassic sediments with calcareous members and limestones. Springs are located at northeastern end of the Mowich anticline according to mapping by Wallace and Calkins (1956).

21. Wickiup Camp Soda Spring: Near the northern quarter corner of sec. 10, T. 16 S., R. 29 E., Grant County. Shown on older Forest Service maps but not on recent ones. Spring issues

from bed of Wickiup Creek and reportedly had strong flow 20 years ago. Perceptible now only as a seepage on bank during periods of low water. A few float fragments of travertine in soil above bank. Location is near contact of Triassic-Jurassic sediments, as mapped by Wallace and Calkins (1956).

22. Seneca Soda Springs: On Silvies River, 2.4 miles by road south of Seneca and about on the line between the S½ secs. 11 and 12, T. 17 S., R. 31 E., Grant County. Two springs in meadow on east side of River and one on west bank adjacent to railroad tracks. Reportedly a much-used source of soda water during Prohibition days, but now unkept and with negligible flow. Temperature of the east bank springs 58° F., and 60° F. Travertine present but exposed only around the spring orifices. Otherwise springs issue from a veneer of recent stream sediments underlain by sediments of Jurassic age (Lupher, 1941).

23. Unnamed spring: On steep hillside above the East Fork of Canyon Creek in the NW¼ sec. 29, T. 15 S., R. 32 E., Grant County. Issues with weak flow from a large, bottomless pottery crock cemented in what was originally a natural discharge vent in a thin travertine shelf. Temperature 48° F. Bedrock of Triassic sediments (Thayer, 1956). Other small flows of soda water reportedly present at intervals in the bed of main Canyon Creek above East Fork junction, but observable only when the creek is nearly dry.

24. Limekiln Spring: On Indian Creek in the N½ sec. 10, T. 14 S., R. 33 E., Grant County. One well-defined spring and two boggy seepage areas in a 6- to 8-acre tract of travertine deposited in a sheet on older creek sediments. Water temperature 70° F. Only 0.16 volumes of CO_2 per volume of H_2O by analysis. A consistent but very light gas discharge which tested 94.5 percent N_2 and only 1.5 percent CO_2. These analyses show that a CO_2 content is not always found in travertine-rimmed springs. Spring area located on the contact of a large area of Triassic peridotite, but separated from it in part by a thin wedge of Eocene volcanics. Bounded on the opposite side by Miocene basalt. Mapping by Thayer (1956) shows a major fault along the base of Canyon Mountain passing through the spring area.

25. Unnamed spring: Small travertine deposit with minor seepage, on the north side of the Collins road in sec. 5, T. 7 S., R. 43 E., Baker County. Reportedly a "soda" spring but placarded "Poison". Bedrock of Triassic clastics and limestone.

26. Unnamed spring: On the south bank of Goose Creek, in the NW¼ NE¼ sec. 15, T. 7 S., R. 43 E., Baker County. Moderate soda-water taste. Discharges from creek alluvium underlain by Clover Creek greenstone of Permian age according to mapping by Ross (1938).

27. Fizz Spring: In small gulch on northeast side of Little Eagle Creek near southwest corner of NW¼ sec. 30, T. 7 S., R. 45 E., Baker County. Small seepage from cattle-trampled spring issuing from Tertiary basalt near exposure of Permian greenstone (Ross, 1938).

28. Soda Creek Spring: Now flooded by water of Brownlee Reservoir but formerly on a bluff above west bank of Snake River in NE¼ sec. 19, T. 11 S., R. 46 E., Baker County. A prominent slightly radioactive (thorium) travertine cone. Reportedly discharged soda water and free CO_2. Steeply dipping bedrock of Permo-Triassic slates close to limestone contact according to Livingston (1923).

29. Nelson Hot Springs: Above west bank of Burnt River in SE¼ NW¼ sec. 11, T. 12 S., R. 43 E., Baker County. Eroded remains of several travertine deposits surmounted by large, recent cone with near-dormant spring in crater on summit. Underlain by steeply dipping

Triassic(?) schists and limestone and Tertiary basalt dikes. Area now occupied by office and shop section of crushing operation for limestone quarry owned by Oregon Portland Cement Company.

30. Mud Spring: At foot of a travertine bench in sec. 29, T. 20 S., R. 45 E., Malheur County. Described by Washburne (1911) as a spring with a pool surface about 15 feet in diameter from which "an odorless, inflammable gas escapes copiously" in a "constant and extremely vigorous" manner. The water was described as "62° F. and drinkable, having only a slightly salty taste". Examination revealed that water yield was still substantial but that gas output is today negligible to the point of being almost nonexistent. Area mapped by Corcoran as occupied by Chalk Butte member of upper Idaho formation of Pliocene age. Chalk Butte formation composed of loosely consolidated sediments with occasional limestone lenses.

Geologic significance of Oregon's springs and seepages

Although all seepages of any of the "mobile minerals"; namely petroleum, natural gas and ground water, reflect a subsurface source of the escaping material, seepages do not constitute a yardstick for appraising the development potentialities of the area in which they occur. There are several reasons for this. One is that a seepage can represent the tail-end dregs of discharge from a nearly depleted source just as much as it can represent overflow from a source that is loaded to capacity. Second, a seepage can originate from a source of very modest proportions as readily as it can from a large source. Third, in the instance of gases, it is possible under some circumstances for generation and seepage to occur almost simultaneously so that the observable output of gas at discharge sites would constitute approximately the maximum amount ever available. Finally, the size of a seepage does not constitute a reliable criterion for judging the size of the subsurface body of the escaping material because the rate and extent of seepage are regulated primarily by the size and nature of the escape channels rather than the size of the source.

Despite the importance of seepages as indicators, the fact should be kept in mind that wholly concealed accumulations of CO_2 can also occur in areas where no seepages are known. The chief value of seepages is that they alert an interested observer to the fact that subsurface occurrences of the seeping material can be anticipated in the general area. Beyond this, the task of evaluating the commercial potentialities of an area entails studies of the structural and stratigraphic factors normally recognized as essential to the subsurface storage of fluid materials. Such study may even entail exploratory drilling.

On the basis of available information, the CO_2 springs and seepages described in the previous section can be briefly appraised. Some of the springs have a geologic setting that is clearly negative insofar as commercial potentialities are concerned. For some spring areas the geology is not well enough known to warrant any conclusion as to the value of the occurrence. There are four areas in the State, however, where the geologic setting suggests that additional study may be worthwhile. These areas are: (1) the axis of the anticline in the vicinity of Wilhoit Springs, (2) the South Santiam River area in the vicinity of Sodaville and Cascadia State Park, (3) the Emigrant Creek area between Ashland and Buckhorn Springs, and (4) central Oregon in the vicinity of the Weberg and Brisbois ranches.

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NORTHWEST MINING ASSOCIATION OUTLINES SPOKANE SESSION

Big names in mining are on the varied program for the Northwest Mining Association's 65th annual convention December 4-5 in Spokane. They include:

E. I. Renouard, vice president in charge of western operations for the Anaconda Company, who will discuss his firm's operations at "the richest hill on earth" in Butte, Montana. Renouard was national program chairman for the recent American Mining Congress convention in Denver.

Bruce W. Gonser, technical director for Battelle Memorial Institute, Columbus, Ohio, who will report on "New uses for old metals." During his 25 years at Battelle, Gonser has initiated and guided much of the research which has contributed so greatly to the Institute's stature in the field of nonferrous metallurgy. He also is the author of more than 100 published articles and papers.

Howard I. Young, St. Louis, president of American Zinc, Lead & Smelting Company, who will tell of the big new zinc deposits opened by his firm in Tennessee. Young was president of the American Mining Congress for many years.

John D. Bradley, San Francisco, president of the Bunker Hill Company, who will discuss the Kellogg, Idaho, firm's position in the lead-zinc industry and its future plans. Bradley also is chairman of the board and president of the National Lead Industries Association.

The Honorable W. K. Kiernan, British Columbia Minister of Mines, who will discuss the province mining outlook.

Franc R. Joubin, discoverer of Canada's famed Blind River uranium field and now president of Bralorne-Pioneer Mines, Ltd., with headquarters at Vancouver, B. C., who will talk on "A Canadian producer looks at gold."

R. R. McNaughton, Trail, B. C., manager of metallurgy for Consolidated Mining & Smelting Company of Canada, who will report on Cominco's operations. McNaughton is slated to move up to presidency of the American Institute of Mining, Metallurgical and Petroleum Engineers in 1961.

The program, prepared under the direction of Frank C. Armstrong, Spokane geologist with the U. S. Geological Survey, will be mailed to NMA members in about 10 days. It lists 34 speakers in eight sessions, compared to 32 speakers in seven sessions last year.

In addition to a general opening session, sessions on metallurgy, economics of metals, new developments, mining and government, exploration, mine operating, and geology are scheduled. (From The Wallace Miner, November 12, 1959.)

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GROWNEY ELECTED PRESIDENT OF RAW MATERIALS SURVEY

Louis P. Growney, Industrial Development Engineer for Pacific Power & Light Company of Portland, has been elected president of the Raw Materials Survey Board. Growney has been a Survey director for the past six years. Raw Materials Survey, which was established in 1947, investigates sources of raw materials that appear feasible for profitable use by industry in the Lower Columbia River Basin.

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PACIFIC CARBIDE TO MAKE VINYL ACETATE

Pacific Carbide & Alloys Company of Portland has started construction of a half-million-dollar plant to produce vinyl acetate, a basic chemical product. The acetate will be made from acetylene manufactured by Pacific Carbide and acetic acid obtained from the Gulf states. The major market for the acetate will be California, but eventually it is hoped that local markets will develop.

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NEWCOMB TO STUDY HYDROLOGY OF COLUMBIA RIVER BASALT

Reuben C. Newcomb, formerly District Geologist, U. S. Geological Survey Ground-Water Branch in Portland, has accepted the position of Research Geologist for the Ground-Water Branch in a 5-year research project on the hydrology of the Columbia River basalt. Mr. Newcomb reports that the project is intended to further the public information on the ground-water resources and general hydrologic aspects of the Columbia River basalt. The project will include the entire 55,000 square-mile area in Oregon, Washington, and Idaho occupied by this extensive volcanic unit. Mr. Newcomb states:

> "The main objective of the study is to determine and describe the water-bearing characteristics of the basalt and the allied features of significance to the occurrence and development of these ground-water resources.
>
> "A preliminary paper on the ground water in the basalt has been published in Northwest Science. A plan for development and use of ground water reservoired behind fault barriers is now in preparation. Other sub-units of the project concern the effect of tectonic structures on the occurrence of ground water, the quantitative factors that govern the ground-water movement and the extraction of water through wells, erosion of the basalt in The Dalles type of river channel, and the construction of wells in the basalt."

Mr. Bruce L. Foxworthy, former acting District Geologist of the Tacoma office, is the new District Geologist in Portland.

****

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
Head Office: 1069 State Office Bldg., Portland 1, Oregon
Telephone: CApitol 6-2161, Ext. 488

Field Offices

2033 First Street
Baker

239 S.E."H"Street
Grants Pass

****

HALF A STATE

Unlike states east of the Rocky Mountains, where the public lands were given to the settlers and all of the Federal Government's ownership was divested in one way or another, more than half of Oregon's 96,000 square miles is still Federally owned and controlled. The policy of State-Federal ownership of land within a state was established by Congress at the time the West was being settled. It affected only the western states and has given rise to the name "public-land states". Previous to the adoption of this policy, it was generally believed that the Federal Government held title to the public lands as trustee for the people of the new states and that these lands should get on the tax rolls as quickly as possible after the states were admitted to the Union.

Starting with the homestead laws and the mining acts in the period 1860-1875, special and then general land laws were passed by Congress to parcel out the western public lands for use of special interests. Soon laws were enacted which related to national parks; to water and power development; to reclamation of arid lands and to flood control; to management of timber and forage, fish and wildlife; and to recreation resources on the public lands, as well as to other forms of entry such as stock raising and desert-land homesteads.

Conflicts in land use, of course, were inevitable and a breakdown of special interest use began in 1920 with an exception to the Mining Act. This law withdrew certain minerals such as coal, phosphate, oil and gas, and oil shale from location and possible patent and made them subject to leasing; actual ownership of the land was retained by the Federal Government. Some time later another special use was curtailed when the Taylor Grazing Act became law. To all intents and purposes private acquisition of land through homesteading was thus suspended. Since that time more minerals have been taken from the "locatable" category and placed in the "leasing" list, and timber resources have been exempted from mining patents in special instances such as in the Mt. Hood National Forest and on Oregon and California Railroad revested lands.

Two conflicting trends of western public-land utilization have developed in the past ten years. From 1953 to 1955, three important changes were made in the mining laws and one in the power-site withdrawal laws. These changes allowed for duplicate use of the same piece of land for "locatable" minerals and "lease" minerals; provided for use of the surface of mining claims for timber harvest by the Government; granted access for roads, hunting, fishing, and almost anything else to the public as long as it did not materially affect mining operations; restricted still more the minerals that could be located; provided for surface management by the Government of claims located prior to passage of the law; and allowed staking of claims with controlled mining on power-site withdrawals. In short, a principle of "multiple use" of land was initiated.

In contrast to the laws for the multiple use of public land, there has been a rash of special-use withdrawals that are destined to lock up control of public land in some particular Federal agency for a single use. Some of these actions have already been taken under provisions in laws for land use given to Federal agencies and others are proposed in new legislation. There is hardly a state in the West that does not have a new national park, monument, or some such reservation of land pending, and all the western states have the Wilderness Bill to contend with. The total amount of land involved in all these withdrawals runs into the tens of millions of acres.

The outcome of the conflict between the Multiple Use proponents and the Locking Up advocates will be of great economic importance to all the western public-land states. It will certainly go a long way in determining if they are to become fully developed or just half a state.

Hollis M. Dole, Director

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PROGRESS REPORT OF AREAS IN U. S. NATIONAL FORESTS APPROVED FOR DETERMINATION OF SURFACE RIGHTS

Forest	Name of Area	Acres Nat'l Forest Land	Acres Examined	Approved for Examination	Date of First Publication	End of 150-day Period
Deschutes	Chemult	45,500	45,500	5- 4-56	2-27-57	7-29-57*
	Bend	29,760	29,760	5- 1-57	12-24-59	5-23-60
	Tolo	9,750	9,750	5- 1-57	12-24-59	5-23-60
	Ground	1,120	1,120	5- 1-57	12-24-59	5-23-60
Fremont	Chemult	8,500	8,500	5-17-56	2-27-57	7-29-57*
	Fremont	31,200	31,200	3-25-59	12-24-59	5-23-60
	White King-Thomas Cr.	50,000		8-11-59		
	Mill Flat	29,000		5-19-59		
Malheur	Twin	39,600		7- 5-56		
	Dixie	36,070	36,070	7- 5-56	9-25-58	2-23-59*
	Baldy	47,830		7- 5-56		
	Canyon	22,680	22,680	4-25-57	12-24-59	5-23-60
Ochoco	Round "A"	10,440	10,440	7- 5-56	11-20-57	4-21-58*
	Round "B"	14,015	14,015	7- 5-56	9- 4-58	2-23-59*
	Marks	21,900	21,900	7-31-57	12-24-59	5-23-60
	Green Mountain	22,920	22,920	7-31-57	12-24-59	5-23-60
Rogue River	Applegate "A"	17,785	17,785	7- 5-56	9-24-58	2-23-59*
	Applegate "B"	35,660	35,660	7- 5-56	12-23-59	5-23-60
	Applegate "C"	59,865		7- 5-56		
	Union "A"	39,295	39,295	4-25-57	9-17-58	2-16-59*
	Union "B"	191,105		4-25-57		
	Ashland "A"	28,184	28,184	4-25-57	12-23-59	5-23-60
	Ashland "B"	946		4-25-57		
	McLoughlin	368,640		9-21-59		
	Panhandle	74,880		9-21-59		
Siskiyou	Wildhorse	53,000	53,000	2- 2-56	2-21-57	7-22-57*
	Elk "A"	14,570	14,570	7-11-56	9-12-57	2- 9-58*
	Elk "B"	110,706	110,706	7-11-56	9-11-58	2- 9-59*
	Elk "C"	4,487	4,487	7-11-56	2-26-59	7-27-59*
	Elk "D"	8,457		7-11-56		
	Fuller	8,800	8,800	7-11-56	2-21-57	7-22-57*
	Taylor	34,230	34,230	7-11-56	9-11-57	2- 8-58*
	Illinois "A"	26,880	26,880	7-11-56	3- 4-59	8-24-59*
	Illinois "B"	18,470		7-11-56		
	Pistol	39,950	39,950	7-11-56	3- 5-59	8- 3-59*
	Galice "A"	27,280	27,280	7-16-58	12-17-58	5-16-59*
	Galice "B"	111,440	111,440	7-16-58		
	Foster	23,220	23,220	9-11-58		
	Agness	45,007		3-25-59		
	Taggart	83,187		3-25-59		
	Smith	53,302		3-25-59		
	Rough	61,713		3-25-59		
	Chetco	133,321		3-25-59		
	Eden	32,618	32,618	3-25-59		
	Bolan	76,793	76,793	3-25-59		
	Silver	97,230		3-25-59		
Umatilla	John Day "A"	8,942	8,942	7-11-56	9-25-57	2-23-58*
	John Day "B"	20,223	20,223	7-11-56		
	Desolation	92,560		4-16-59		

* Determination completed (time expired for submitting verified statements).

Forest	Name of Area	Acres Nat'l Forest Land	Acres Examined	Approved for Examination	Date of First Publication	End of 150-day Period
Umatilla (Cont.)	Olive Lake	61,400		5- 5-59		
	Silver Butte	62,960		5- 5-59		
Umpqua	Bohemia	157,000	157,000	7- 5-56	9-17-58	2-16-59*
	Steamboat	24,000	24,000	7-31-57	12-24-59	5-23-60
	Cow Creek	58,000		7-31-57		
Wallowa-Whitman	Dooley Mtn.-Buffalo	44,000	44,000	6- 1-56	2-21-57	7-29-57*
	Pine	82,230	82,230	7- 5-56	2-21-57	7-29-57*
	Woodley	35,250	35,250	7- 5-56	2-27-57	7-29-57*
	Unity	37,500	37,500	7- 5-56	2-21-57	7-29-57*
	Baker "A"	79,120	79,120	3-22-57	5-28-58	10-27-58*
	Baker "B"	63,557	63,557	3-22-57	12-24-59	5-23-60
	Baker "C"	119,093		3-22-57		
	Bull Run	22,200	22,200	3-22-57		
	Whitney	53,300		3-22-57		
	Eagle	89,600		3-22-57		
	Limber Jim-Sheep Cr.	39,780	39,780	3-22-57	5-21-58	10-20-58*
	Snake River	31,750	31,750	3-22-57	5-22-58	10-20-58*
	Summit	35,720	35,720	3-22-57	12-24-59	5-23-60
Willamette	Little N. Fork Santiam	22,600	22,600	2-21-56	2-27-57	7-29-57*
	Quartzville	28,000	28,000	2- 2-56	11- 1-56	4- 1-57*
	Blue	17,600	17,600	7- 5-56	9-25-57	2-22-58*
	Blue River	170,200		7- 8-57		
	Cascadia	218,000		7- 8-57		
	Detroit	281,950		7- 8-57		
	TOTAL	4,228,841	1,688,225			

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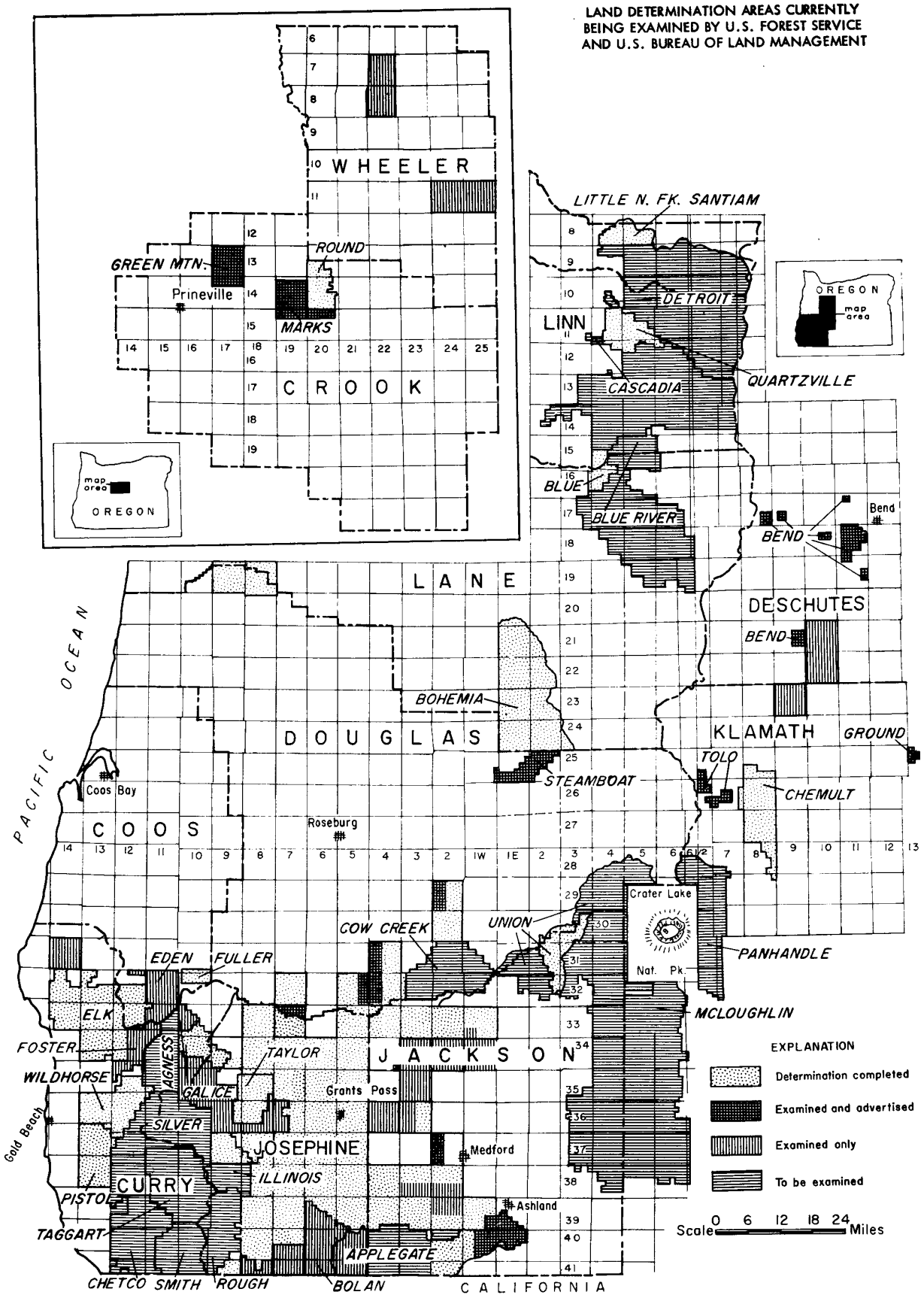
DETERMINATION OF RIGHTS OF GOVERNMENT TO MANAGE SURFACE RESOURCES ON MINING CLAIMS
(Bureau of Land Management Lands and National Forests)
(Act of July 23, 1955, Public Law 167)
(As of June 30, 1959)

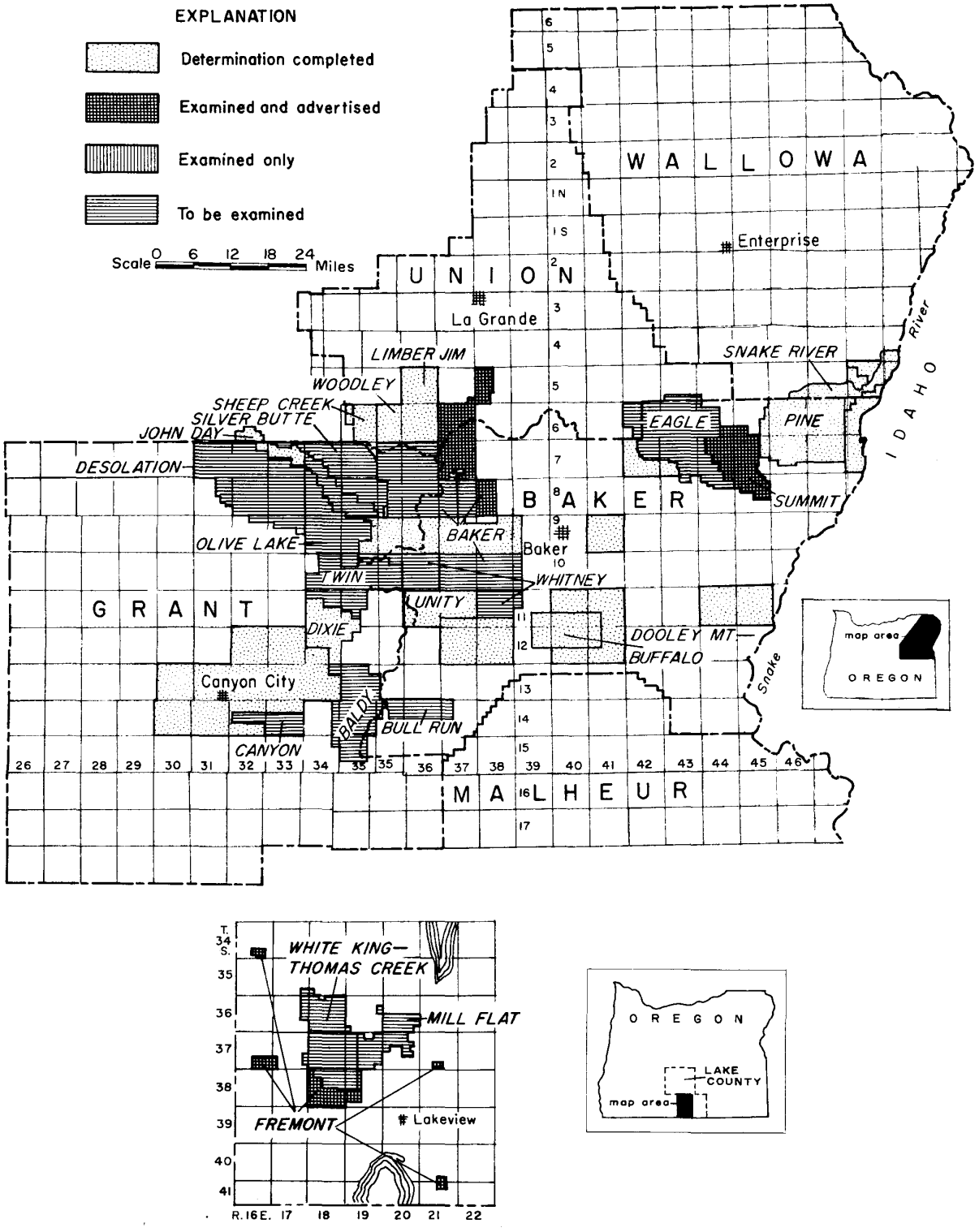
States	Contests Referred to Hearings Examiner: Cases	Contests Referred to Hearings Examiner: Mining Claims	Hearings Pending (Cases)	Cases Closed, No Hearing	Hearings on Merits (Cases)	Decisions: As of 6/30/59 (Cases)	Decisions: For Government	Decisions: For Claimant
California	10	29	1	6	4	4	3	1
Idaho	16	117	7	7	1	1	1	
Oregon	12	59	7	2	3	3	3	
Washington	8	38	3	3	3	3	3	

STATUS OF DETERMINATIONS UNDER PL 167
(Act of July 23, 1955, Public Law 167)
(As of June 30, 1959)

States	Preliminary Examination (Acres)	No. of Claims Found	Areas Under Publication (Acres)	Verified Statements Filed: No.	Verified Statements Filed: Claims	Determination Completed (Acres)	Surface Rights Retained by Claimants: Claims	Surface Rights Retained by Claimants: Acres
California	104,314	445	103,356	152	332	97,496	48	765
Idaho	1,573,171	1,004	1,573,171	171	1,417	1,573,171	288	5,760
Oregon	470,663	1,645	407,619	86	273	391,026	56	1,120
Washington	--	--	--	--	--	--	--	--


LAND DETERMINATION AREAS CURRENTLY BEING EXAMINED BY U.S. FOREST SERVICE AND U.S. BUREAU OF LAND MANAGEMENT
WHEELER
GREEN MTN.
ROUND
Prineville
MARKS
CROOK
map area
OREGON
LITTLE N. FK. SANTIAM
DETROIT
LINN
CASCADIA
QUARTZVILLE
BLUE
BLUE RIVER
BEND
Bend
DESCHUTES
LANE
OCEAN
PACIFIC
BOHEMIA
DOUGLAS
KLAMATH
GROUND
TOLO
STEAMBOAT
CHEMULT
Coos Bay
COOS
Roseburg
Crater Lake
Nat. Pk
COW CREEK
UNION
PANHANDLE
EDEN
FULLER
ELK
MCLOUGHLIN
FOSTER
AGNESS
TAYLOR
JACKSON
WILDHORSE
GALICE
Grants Pass
Gold Beach
SILVER
JOSEPHINE
Medford
CURRY
ILLINOIS
PISTOL
Ashland
TAGGART
APPLEGATE
CHETCO
SMITH
ROUGH
BOLAN
CALIFORNIA
EXPLANATION
Determination completed
Examined and advertised
Examined only
To be examined
Scale 0 6 12 18 24 Miles

LAND DETERMINATION AREAS CURRENTLY BEING EXAMINED BY
U.S. FOREST SERVICE AND U.S. BUREAU OF LAND MANAGEMENT



RESUME OF U.S. BUREAU OF LAND MANAGEMENT PUBLIC LAW 167 WORK *

AREAS EXAMINED AND ADVERTISED

Douglas County
October 28, 1959

T. 29 S., R. 2 W.
T. 31 S., R. 4 W.
T. 32 S., R. 4 W.
T. 32 S., R. 5 W.
T. 32 S., R. 7 W.
T. 33 S., R. 7 W.

Jackson County
December 10, 1958

T. 33 S., R. 2 W.
T. 37 S., R. 2 W.
T. 40 S., R. 2 W.
T. 33 S., R. 3 W.
T. 39 S., R. 3 W.
T. 33 S., R. 4 W.
T. 34 S., R. 4 W.
T. 38 S., R. 4 W.

Josephine County
June 11, 1958

T. 39 S., R. 7 W.

Josephine County
April 1, 1959

T. 33 S., R. 5 W.
T. 35 S., R. 5 W.
T. 35 S., R. 6 W.
T. 38 S., R. 6 W.
T. 33 S., R. 7 W.
T. 35 S., R. 7 W.
T. 40 S., R. 7 W.
T. 33 S., R. 8 W.
T. 34 S., R. 8 W.
T. 35 S., R. 8 W.
T. 34 S., R. 9 W.

AREAS EXAMINED AND NOT ADVERTISED

Crook County

T. 17 S., R. 19 E.

Curry County

T. 31 S., R. 14 W.

Deschutes County

T. 21 S., R. 10 E.
T. 22 S., R. 10 E.

Jackson County

T. 34 S., R. 2 W.
T. 34 S., R. 3 W.
T. 35 S., R. 3 W.
T. 34 S., R. 4 W.
T. 36 S., R. 4 W.

Josephine County

T. 34 S., R. 9 W.

Klamath County

T. 23 S., R. 9 E.

Wheeler County

T. 7 S., R. 22 E.
T. 8 S., R. 22 E.
T. 11 S., R. 24 E.
T. 11 S., R. 25 E.

* In most instances only part of township has been examined. Exact areas examined can be obtained from U.S. Bureau of Land Management.

DATA* ON PUBLIC LAW 167
(As of June 30, 1959)

4,663,799 acres have received preliminary examination by Bureau of Land Management. This is less than 1 percent of the lands administered by the Department of the Interior.

35,543 mining claims in area examined by Bureau of Land Management.

Bureau of Land Management has published notices of examination covering 4½ million acres.

451 "verified statements" of ownership and occupancy covering 2,369 mining claims (approximately 1 percent of area examined) have been received by the Bureau of Land Management.

Examinations following "verified statements" have resulted in exclusive surface rights to miners on 415 claims (17.6 percent of "verified statements") on Bureau of Land Management land and 197 claims (1.6 percent of "verified statements") on Forest Service land.

Forest Service has completed field examination of 444 areas containing 53,000,000 acres (32 percent of land administered by this agency).

In 337 Forest Service areas, the period for asserting surface rights by the claim holders has expired. These areas contained an estimated 427,000 mining claims.

Less than 3,000 "verified statements" covering 12,471 claims on Forest Service land have been filed by mine owners. This is equal to about one-half of 1 percent of the area advertised.

96 percent of a total of 39,000,000 acres is under complete Forest Service management.

Out of 1,585 completed "verified statement" cases on Forest Service land, 1,377 cases were withdrawn by claim holders, 197 cases were covered by stipulations of validity, and 11 cases went to hearing. All hearing cases were held invalid.

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* Furnished by U. S. Department of the Interior and U. S. Department of Agriculture.

THE MINER AND THE TROLL

A royalty of $2\frac{1}{2}$ cents per ton on all mineral products transported over roads constructed across public lands almost became a reality in recent months. That this additional burden on the mining industry was not imposed, and will not be imposed in the future, is due to the spirited and persistent efforts of F. I. Bristol, miner and president of the Oregon Mining Association. Bristol came to the aid of Mabry Ogle of Grants Pass, who was preparing to open the old Jones Marble Quarry near Provolt in Josephine County. Both the quarry and the road leading to it are 50 years old. The Bureau of Land Management served notice on Ogle that a royalty would be charged against every ton of limestone hauled over the road. Bristol became interested in the problem since he realized the tremendous effect it would have on all minerals hauled across public lands throughout the eleven western states. On June 10, Bristol wrote Secretary of the Interior Fred A. Seaton and asked the following questions: (1) Is it the policy of the Bureau of Land Management to collect a royalty from mining claims? (2) Is it the policy of the Bureau of Land Management to collect an indirect royalty by denying access to mining claims if a royalty is not paid? (3) Is it the policy of the Bureau of Land Management to collect a toll on a road that has been open to public use for 50 years? Five months later, in a letter dated November 9, the Secretary of the Interior wrote Bristol as follows:

> "It is the opinion of the Solicitor that the U. S. Mining Laws give to the locators and owners of mining claims as a necessary incident the right of ingress and egress across public lands to their claims for purposes of maintaining the claims and as a means of removing the minerals. He states that because this is a statutory right, use fees may not be charged for roads constructed pursuant to this right. If a miner wishes to use a road built or acquired by the United States or if he applies for and obtains a right-of-way, which would grant him exclusive use, he must pay whatever fees are required. However, no charge may be made for use of a road constructed and used as a necessary incident to the maintenance of a mining location and its development."

The letter above reinforces one of the statutory rights granted to miners under the U. S. Mining Laws. In recent years regulations by Federal bureaus have imperiled and even destroyed some of these rights, but thanks to Fay Bristol there will at least be no toll paid to the troll.

Ralph S. Mason, Mining Engineer

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WAH CHANG PLANS FURTHER INTEGRATION

Stephen Yih, general manager of the Wah Chang Corporation, has announced that a new research center will be established in connection with the plant at Albany. This new department will be concerned primarily with the physical metallurgy of the refractive metals, especially problems in fabrication. Basic properties of such metals as zirconium, hafnium, columbium, tantalum, and molybdenum will be studied.

A second electron-beam melting furnace (see Ore.-Bin, Oct. 1959) has been installed and is now in operation to meet increased needs for high-purity columbium and tantalum alloys. Also under construction is a rolling mill to produce rods and sheets of the various refractory metals, and it is expected that pilot production will start in February. Since it is probable that many items produced will be of new types, the research department will be a necessary adjunct to these new facilities.

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DEPARTMENT PROTESTS WITHDRAWALS

The Governing Board of the Department, in its meeting held December 10, submitted a protest to the U. S. Bureau of Land Management on three proposed withdrawals of land by the U. S. Forest Service. The proposed withdrawals are in strips bordering highways along the North and South Umpqua rivers, the Willamette highway, The Dalles-California highway, the Fremont highway, and in the vicinity of Sisters and Bend, Oregon (see September and April 1959 Ore.-Bin). Total acreage involved amounts to 12,350 acres. The Forest Service states that the withdrawals were for the following purposes: to protect and preserve the aesthetic values, for the eventual establishment of camp and picnic grounds, for the development of the natural resources, and to provide for road betterment and public safety. The withdrawals were for the sole purpose of preventing appropriation under the general mining laws; they except the mineral leasing laws and all other types of land appropriation or use.

A summary of the Board's statement on why the applications by the Forest Service should be refused is given below:

(1) Purposes appear to be inadequate and are tenuous. The Board stated in part: "If the elimination of mining were really necessary to 'preserve aesthetic values', etc., then it would seem that all mining should be prohibited. It is difficult, for example, to understand why a gold or cinnabar mine with the appurtenant surface improvements would impair 'aesthetic values' while a coal mine or an oil derrick would not. These considerations seem to brand the proposed withdrawals as being merely further examples in the long series of attempts by the Forest Service to hamper and restrict the appropriation of public lands under the general mining laws."

(2) The proposed withdrawals conflict with the principle of Public Law 167, the Multiple-Use Law. This conflict breaks down the high purposes of multiple-use of land.

(3) There is no need for the withdrawal if it is to affect mining alone. The protest stated: "There seems no reason for singling out mining as the sole activity to be prohibited within the affected areas. Other activities of a commercial nature, including logging and grazing of livestock, would not be affected. Why is a quartz mill more abhorrent to 'aesthetic values' than skid trails, landings and logging debris, or loading pens, feed yards, lambing sheds, shearing pens, or the droppings incident to all livestock operations? The truth is, of course, that all commercial uses of public lands impair their natural 'aesthetic values' to some extent. If the withdrawals were actually necessary, there would be no excuse whatever for selecting mining as the only activity to be prohibited."

(4) Withdrawals for recreation use at the present time are premature and should await the findings of the National Outdoor Recreation Review Commission.

(5) Tying the withdrawals to the existing highways is too indefinite a reference point as highways are transitory in nature. It was noted in the protest that highways along the South and North Umpqua were under construction and quite obviously relocations, due to slides, were already under way. The Board stated they felt that tying the withdrawals to a "strip of land 330 feet on each side of the center line of the existing" highways was too insecure a reference point. To keep up to date on the change of center lines of highways would create a complex and conflicting group of withdrawals that would baffle and confound the most expert miner if he found a mineralized zone adjacent to a withdrawal. The complexities which would arise from these withdrawals would effectively discourage any prospecting or mineral development in the region.

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INDEX TO ORE.-BIN, Vol. 21, 1959