

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

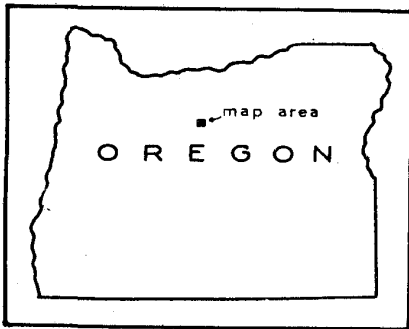
2033 First Street
Baker

239 S.E. "H" Street
Grants Pass

HORSE HEAVEN MINE
JEFFERSON COUNTY, OREGON

By
J. Eldon Gilbert*

The Horse Heaven Mine, located in sec. 12, T. 10 S., R. 18 E., Jefferson County, about 35 miles east of Madras, ranks as one of Oregon's principal mercury producers. During its two periods of activity, from 1934 through 1944 and from April 1955 to the present time, the mine has produced slightly more than 16,600 flasks of quicksilver.



Geology

The Horse Heaven ore bodies are associated with a biotite rhyolite plug, and its subsidiary dikes and protrusions, which has intruded volcanic rocks and derived sediments of Clarno (Eocene) and post-Clarno age. Three general types of ore bodies were formed: (1) Breccia zones formed during the emplacement of the intrusive were later

filled with cinnabar to form relatively large and high-grade ore shoots. The size and grade of the shoots were in part dependent upon the intensity and amount of brecciation. (2) Locally cinnabar was dropped from solution beneath clay cappings developed along minor faults bordering the intrusive. Small but very high-grade ore bodies were formed. (3) Relatively low-grade ore bodies were formed in the rhyolite tuffs overlying the intrusive.

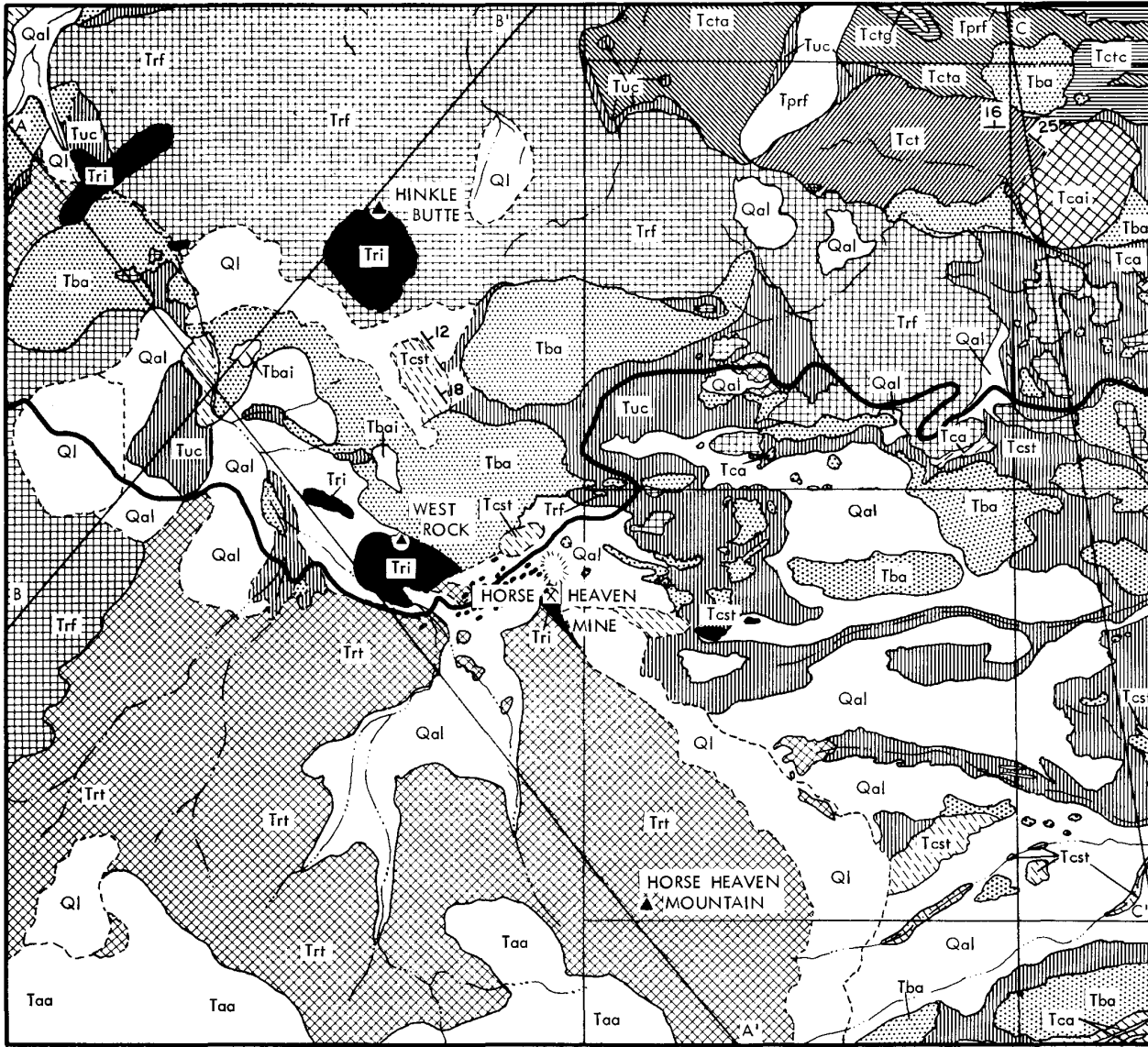
History

The initial evidence that a body of quicksilver ore lay along the northern base of Horse Heaven Mountain was found in the pan of Art Champion who was prospecting for cinnabar on Cherry Creek in April 1933. His interest in the "prospect" was sold to Ray R. Whiting, Ray R. Whiting, Jr., and Harry Hoy. The latter two discovered the first ore in place when one of them accidentally kicked loose a piece of rock with cinnabar attached to it. Subsequent underground work the same year revealed a high-grade ore shoot.

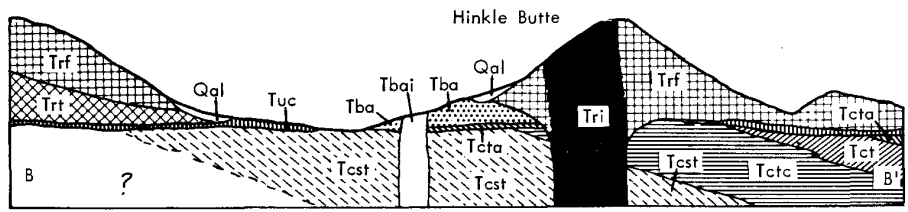
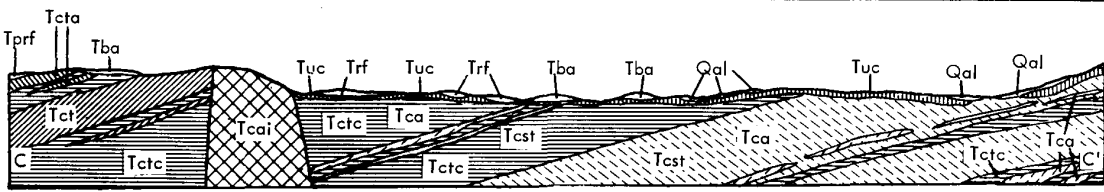
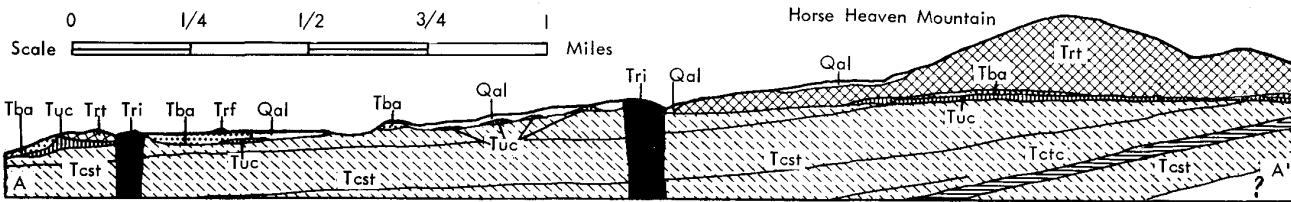
A small Herreshoff furnace was purchased and installed, and production began in September 1934. The mine ran under the supervision of Ray Whiting, Sr., for about 2 years during which time it produced approximately 2,200 flasks of mercury. In 1936 the property was sold to the Sun Oil Company which still owns and operates the property. Operation of the mine was continued with little interruption for the next 8 years, increasing the total production to 15,097 flasks of quicksilver. In November 1944, the Herreshoff furnace, the power plant, and other structures were destroyed by fire.

* Manager, Cordero Mining Company.

GEOLOGIC MAP AND SECTIONS OF THE HORSE HEAVEN DISTRICT, JEFFERSON COUNTY, OREGON



Scale 0 1/4 1/2 3/4 1 Miles



Geology by A. C. Waters,
R. R. Compton, R. E. Brown,
and Howel Williams, 1942
Source U. S. G. S.
Bulletin 969 plate 21
Traced by M.P. Christianson
March 1958

EXPLANATION

BEDDED ROCKS INTRUSIVE ROCKS

- Qal Alluvium
- QI Landslides and creeping soil

ANGULAR UNCONFORMITY

- Taa Augite andesite flows

DISCONFORMITY

- Tri Rhyolite plugs and dikes
- Trt Rhyolite tuff and tuff breccia
- Trf Biotite rhyolite flows
- Tprf Porphyritic rhyolite flow

DISCONFORMITY

- Tbai Basaltic andesite plugs
- Tba Basaltic andesite flows
- Tuc Clays - ancient soil above Clarno formation

ANGULAR UNCONFORMITY

- Tcai Andesite plugs and dikes
- Tct Tuffs and breccias with interbedded andesite flows, Tcta, and tuffaceous clays, Tctc
- Tctc Tuffaceous clays with interbedded gravel beds, Tctg, and stratified tuffs, Tcst
- Tcst Stratified tuffs, breccias, and conglomerates with interbedded tuffaceous clays, Tctc, and andesite flows, Tca
- Tca Andesite flows with interbedded tuffaceous clays, Tctc

Contact, accurately located

Margin of landslide

Mine dump

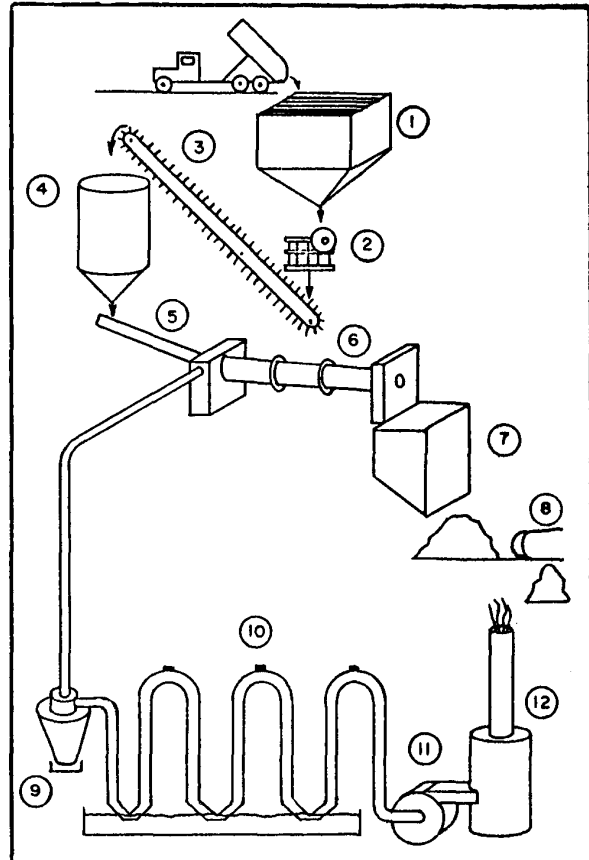
Contact, inferred or projected

Strike and dip of beds

Mine

Principal peaks

HORSE HEAVEN MINE FLOW SHEET



1. Coarse ore bin, 75-ton
2. Crusher 8" x 16"
3. Bucket elevator
4. Fine ore bin, 50-ton
5. Feeder
6. Rotary furnace 30" x 30'
7. Calcine soaking pit
8. Calcine scraper
9. Sirocco dust collector, 8"
10. Condensers - 44 pipes 8" x 16'
11. Stack fan
12. Redwood stack

At the time of the fire, known ore reserves were limited to pillars containing vital access ways and thin layers of ore left to help support the upper edges of some of the stopes. In view of rising costs and the decreasing value of quicksilver which followed the Government purchase of large stocks of foreign mercury in 1944, no immediate plans were made to rebuild the mill. However, mine development was continued on a very limited and intermittent scale for the next 10 years.

During 1954 the price of mercury climbed to more than \$300 per flask. This price seemed to reflect a new market for the metal, and future needs looked promising. Consequently the company decided to install a small plant to recover the limited amount of ore left in the mine when it closed. A small rotary furnace was installed together with ore bins, crusher, and conveyors, and was put in operation in April 1955.

From 1955 through 1957 the mill operated more or less continuously. Some difficulties were experienced in reclaiming the smaller, less accessible ore pockets. A great deal of exploration work was attempted in 1955 but practically all of the results were negative; exploration and development work was stopped and the crew concentrated on mining and milling.

For about 18 months, during 1955 and 1956, a large portion of the ore came from an open pit but this eventually became too low grade to operate. The ratio of stripping to ore became excessive. The furnace, which was originally designed for 15 tons, was forced to mill 25 tons per day, and later 30 tons per day. Even with the ore coming from underground, each man-shift mined and milled 2.6 tons during 1957 and, as the price of mercury dropped and the grade of ore dropped, this was upped to a present rate of 3 tons per man-shift.

During the years 1956-1957 a total of 18,829 tons of ore containing slightly more than 6 pounds of mercury per ton was furnaced.

Present operations

Extraction of ore is done by various mining methods, from simple drifting to square set stoping.

The entire crew at the property, including mine, mill, surface, office and supervision, is 11 men. Many of the men, especially the mill crew, have been with the mine continuously from the beginning of the present operation. They work harmoniously together and, as employees of any small mine, they realize the necessity of augmenting each other's efforts and working for the good of the operation.

The success of this small mine is due essentially to three men. Frank E. Lewis, general superintendent, has been in charge of the operation for 20 years and it is his knowledge of the old work and the conditions of parts of the old mine which has made it possible to recover, economically, rock which was once left as waste. Mr. Lewis also keeps up the essential engineering and office work. Clarence McClain, general foreman, is in charge of all labor, both underground and in the plant. He has had considerable experience in many types of mines and in handling many classes of people. This experience has been valuable to Horse Heaven. Verne Haas, assistant manager of Cordero Mining Company, has been in the planning end from the beginning of the present operation. He put the various parts of second-hand equipment together to form an efficient, integrated mill. Many of the units are his own design and construction. He also assisted in planning work underground and organizing the entire operation. Many times he has had the role of trouble shooter and has helped solve problems of malfunctioning machinery and low-grade ore.

Communication is maintained with the other company-owned operations and with the company management in Palo Alto, California, by means of a radio which operates on a special frequency authorized by the Federal Communications Commission.

During the past 3 years the operating profit less amortization and depreciation costs has been about 10 percent of the gross sales. This leaves the property with a breakeven operation at best. Had the operation been forced to carry its fair share of the Company

1958

overhead, or had it been necessary for it to pay a royalty to a land owner, the operation would not have been even near an overall breakeven point.

The future of the mine is not bright. During the past year the price of mercury has declined from \$250 per flask to \$220-225. Mercury can be sold to General Services Administration during the rest of 1958 at a price of \$225 delivered San Francisco but difficulties in obtaining tags and flasks which are acceptable to GSA reduced this to an equivalent of \$220 per flask. The future beyond 1958 is very uncertain.

Selected Bibliography

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Thirty years of mercury in Oregon: Ore.-Bin, v. 19, no. 3, p. 19-24, March 1957.

Oregon Dept. Geology and Mineral Industries, 1955

Prospecting for quicksilver in Oregon: Ore.-Bin, v. 17, no. 3, p. 15-20, March 1955.

Schuette, C. N., 1938

Quicksilver in Oregon: Oregon Dept. Geology and Mineral Industries Bull. 4, 1938.

Waters, A. C., and others, 1951

Quicksilver deposits of the Horse Heaven mining district, Oregon: U.S. Geol. Survey Bull. 969-E, 1951.

GEOLOGY AND GEOGRAPHY SPLIT AT UNIVERSITY OF OREGON

The Department of Geography and Geology at the University of Oregon has been divided into two departments. Dr. Samuel Dicken, who has been head of the Department for the past ten years, will head the Department of Geography. Dr. Lloyd Staples, who has been a member of the teaching staff of the Department for many years will head the Department of Geology. The separation of the two departments was made to accommodate more efficiently the 800 students now enrolled in Geography and Geology. There are seven graduate students in Geography and twenty-five in geology.

In addition to Dr. Dicken, the Geography Department will be staffed by Dr. Forrest Pitts and Dr. Gene Martin, both of whom are assistant professors, and by an associate professor who will join the staff shortly. The Geology Department will be staffed by Dr. Ewart M. Baldwin, Dr. Ernest Lund, and Dr. Walter Youngquist, all associate professors, and James Stovall an assistant professor who will divide his time between the two departments.

Geology was first taught at the University in 1876 when Dr. Thomas Condon began lecturing there. A geology student's organization named in honor of Dr. Condon has been in existence for 40 years on the campus.

NEW DRILLING PERMIT

Permit no. 31 was issued by the Department to Mr. V. V. Ernston of 745 West 30th St., Albany, Oregon, on March 4, 1958. The oil test hole will be drilled on the Schermacher property which is located in the SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, T. 9 S., R. 2 W., Marion County. Elevation is 355 feet above sea level.

FERROCHROME PLANT STUDY TO BE MADE

A study on the feasibility of a western plant to make ferrochrome from domestic ores was authorized March 4 in a cooperative arrangement between two organizations within the Executive Department of the State of Oregon. The two organizations cooperating on the study are the Department of Geology and Mineral Industries and the Department of Planning and Development. Purpose of the study is to determine if local processing of domestic ores could sustain mining of chrome in Oregon.

Metallurgical-grade chromite in the United States is found only in Oregon, California, Washington, and Alaska. Domestic mining has been restricted to periods of international stress when chrome shipments from overseas were cut off and incentive prices paid by the Government. At the present time Oregon's chrome mining is for the Government stockpile of strategic materials. The chrome program was established during the Korean crisis. The amount of domestic chrome allocated for stockpile purchase is expected to be obtained within the next few months and as a result chrome mining will cease unless a market can be established.

Both the Department of Geology and Mineral Industries and the Department of Planning and Development recognize that loss of this basic industry would be detrimental to the State's economy and hope that some plan can be worked out that will prevent the loss. The ferrochrome plant feasibility study is only one of several plans under consideration by the State departments and West Coast chrome miners.

The U.S. Department of Interior proposed a plan for subsidization of domestic chrome mining when the National Long-Range Minerals Program was presented to Congress last summer. The Secretary of Interior in presenting the plan, which is considered unrealistic and not workable by the chrome miners, stated "The basically short world supply coupled with the strategic nature of (chrome) as well as the heavy dependence of the United States on distant overseas sources of supply, underscore the desirability of making every effort to develop and maintain some production from domestic sources." It has been announced that the Department of Interior is preparing another Long-Range Minerals Program for presentation to the Senate Committee on Interior and Insular Affairs.

If it appears that a ferrochrome plant would benefit Oregon chrome mining, the plan will be presented to the Senate Committee.

Ivan Bloch and Associates, Industrial and Economic Consultants, Portland, Oregon, have been retained to make the study.

OREGON MANGANESE SURVEY PUBLISHED

"Manganese Deposits of Southwestern Oregon" has been published by the U.S. Bureau of Mines as Report of Investigations 5369. Author is Richard N. Appling. The report describes 39 manganese deposits in southwestern Oregon (Curry, Coos, Douglas, Josephine, and Jackson counties), and one in northern California. The deposits are irregular and small and the ores generally average less than 20 percent manganese and contain from 25 to 50 percent silica. Limited development of some of the ore has been attempted, but total output over the years probably has not exceeded a few hundred tons. Although this type of ore is not generally acceptable for ordinary processing, the Bureau of Mines has demonstrated at its Northwest Electrodevelopment Laboratory at Albany, Oregon, that high-silica, low-grade manganiferous materials from this part of the State can be smelted in an electric furnace to make silico-manganese or an acceptable pig iron for use in the Northwest.

The publication may be obtained free of charge from the Publications Distribution Section, Bureau of Mines, 4800 Forbes Street, Pittsburg 13, Pennsylvania. It should be identified by title and number.

SPOKANE TO PLAY HOST TO AIME NORTHWEST REGIONAL CONFERENCE

More than 40 technical papers will be presented at the 1958 AIME Pacific Northwest Regional Conference in Spokane on April 17, 18, and 19. The conference which was first organized in 1948 by the Oregon Section of AIME has grown steadily during the 11 yearly meetings. The large number of papers to be presented at Spokane has necessitated holding sessions in the Davenport Hotel, the Chamber of Commerce Building, and the Spokane Club. Thursday and Friday will be devoted to the presentation of papers at the following sessions: a General Session at which "Cooperation of Industry, Government and Universities to Produce More and Better Engineers and Scientists" will be the theme; a Uranium Geology Session with papers describing deposits in Alaska, Washington, and Utah; a Mineral Beneficiation Session devoted to metallurgical problems of phosphate, chromite, manganese, and uranium; a Mining Session with subjects for papers ranging from road surfacing to shaft sinking and operations of a silver mine; a Geochemical Prospecting Session with two papers on copper prospecting and recent developments in geochemical prospecting; a session on Physical Metallurgy with five papers treating on testing various metals; a General Geology Session at which Washington's new geologic map will be discussed and the geological mapping program of the Southern Pacific described; an Extractive Metallurgy Session with three papers on uranium metallurgy; a Coeur D'Alene Geology Session with four papers on mines in the area; and an Industrial Minerals Session with papers on heavy clay, fluorspar, lime, and a discussion of industrial minerals in the Northwest.

Other events Thursday and Friday will be two luncheons and a banquet. On Saturday there will be two field trips, one to the Dawn Mining Company Mill and the Midnight Mine, and the other to the new Gladding McBean Company Brick Plant. Dr. A. E. Weissenborn is general chairman for the Conference.

PUMICE STONE BILL INTRODUCED IN HOUSE

H.R. 11269 "Place Certain Pumice Stone on Free List." This bill has been introduced by Rep. Rogers (Florida), Committee on Ways and Means. It would place pumice stone on free list when imported to be used in the manufacture of concrete building blocks.

(From American Mining Congress Legislative Bulletin No. 13, March 13, 1958).

MILITARY WITHDRAWAL BILL APPROVED

H.R. 5538 - "Military Withdrawal of Public Lands," introduced by Rep. Engle of California, was signed by the President February 28 and becomes Public Law 85-337. The legislation provides that (1) withdrawals of public lands exceeding 5,000 acres for one Defense Department facility may be made only by Act of Congress, and (2) minerals in public lands withdrawn or reserved for military purposes may be disposed of only under the applicable mining and mineral leasing laws, except where the Secretary of Defense determines that such disposal would be inconsistent with the military use of the lands.

Enactment of this meritorious law was strongly urged by the American Mining Congress to curb military withdrawals of large western areas and thus remove them from the purview of the mining laws.

(From American Mining Congress Bulletin Service, No. 5, March 4, 1958.)

CHROME STOCKPILE SHIPMENTS

The Grants Pass chrome stockpile operated by General Services Administration reported that a balance of 11,978 long dry tons of chromite remained to be purchased on March 21. GSA has now combined all of the tonnages formerly earmarked for the Carload, Seattle, and Grants Pass programs into one figure. Information on the amount of tonnage remaining to be purchased is available at the Portland and Grants Pass offices of the Department each Tuesday afternoon, and at the Baker office on Wednesday mornings.

DIRECTORY OF INDUSTRIAL MINERALS PRODUCERS

"A Directory of Pacific Northwest Industrial Minerals Producers" is the title of Information Circular no. 8 issued February 1958 by Raw Materials Survey of Portland, Oregon. The directory, arranged alphabetically by mineral commodity, lists mineral producers in Oregon, Washington, Idaho, Montana, and British Columbia. Price is \$2.00.

WASHINGTON GETS OIL AND GAS MAP

The first map in the Oil and Gas Investigations series to cover a portion of western Washington has been issued as OM 188 by the U.S. Geological Survey. Most of western Oregon is already covered by maps of this series. Map OM 188, with text, is entitled "Geology of the Doty-Minot Peak area, Washington," and authors are Maurice H. Pease, Jr., and Linn Hoover. The area covered by the map lies immediately west of the Centralia-Chehalis district, in parts of Grays Harbor, Lewis, and Pacific counties where Tertiary sedimentary and volcanic rocks range in age from middle Eocene to possibly Pliocene and have a total thickness of about 15,000 feet. The map may be purchased for 75 cents from the Distribution Section, Geological Survey, Denver Federal Center, Denver, Colorado.

INDUSTRIAL SILICA SOURCES PUBLISHED

A January 1958 revision of "Industrial Silica for Pacific Northwest Industries," has been published by Raw Materials Survey. The publication is Resource Report No. 1, originally published in 1946 and revised in 1948. The new edition is intended to answer the increased demand for information on this important industrial mineral. It covers primarily the sources of silica available on a reasonably economic basis to industries in the lower Columbia River area. The report may be purchased for \$3.00 from Raw Materials Survey, 324 S.W. Fifth Avenue, Portland 4, Oregon.

MONTANA SCHOOL OF MINES TO HOLD SYMPOSIUM

Montana School of Mines announces that plans for its Stope-fill Symposium to be held on the campus May 9-10, 1958, are now practically complete. A considerable portion of the symposium will deal with the theoretical and practical aspects of handling slurries in pipe lines. Technical papers and field trips are scheduled. For further information write to Stope-fill Symposium, c/o Montana School of Mines, Butte, Montana.
