

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

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

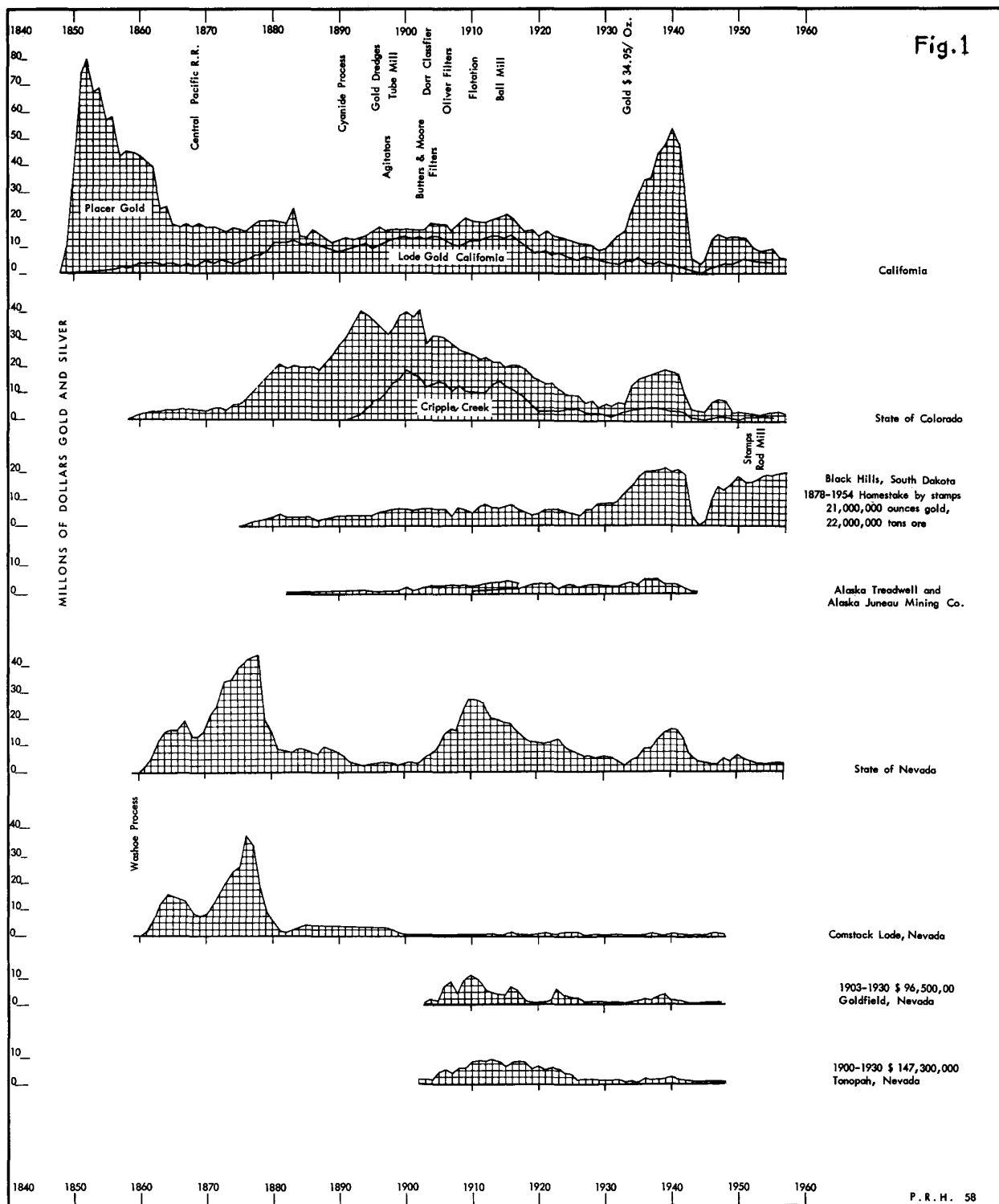
California ranks first in the United States in the total amount of gold produced. The plot for California (Figure 1, p. 32) shows graphically the relative amounts of gold which came from both placer and vein or quartz mining. Up to 1865, vein mining accounted for very little of the gold, as the discovery 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.

Fig.1



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 personnel 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

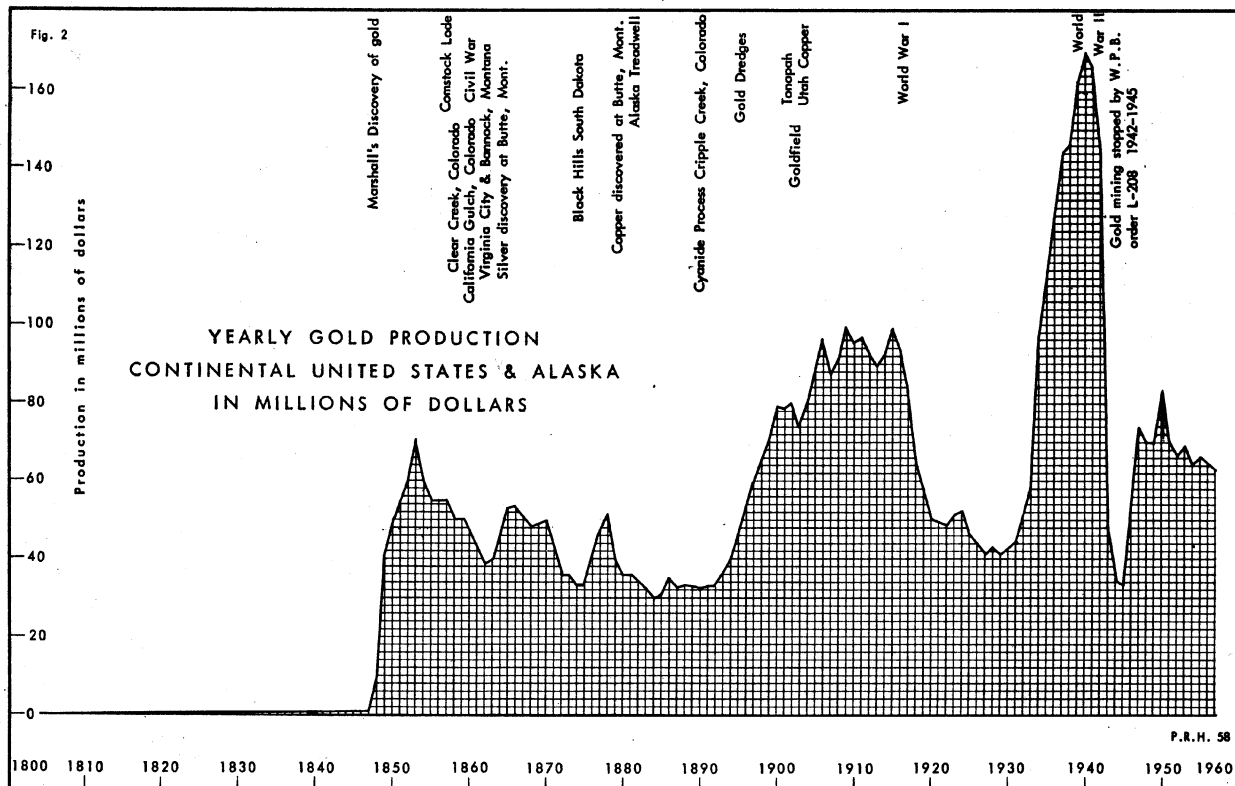
Colorado (Figure 1) has a number of gold and gold-silver mines and districts, as well as notable silver production from the lead-silver district at Leadville. Early gold production came from Gilpin County and Idaho Springs, some of it from placers and some from weathered overburden near the outcrops 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 Leadville 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.

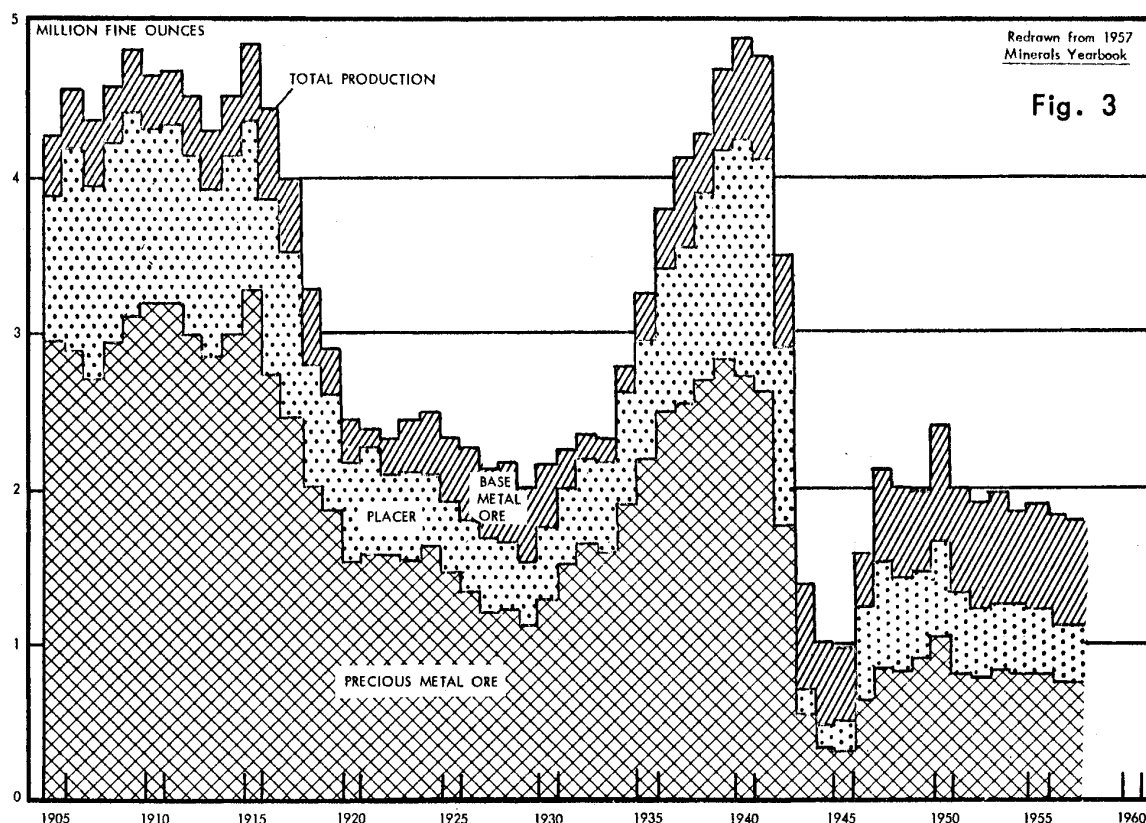
The gold recovery was 72 percent by amalgamation. The sands were cyanided in 1901 and the slime in 1906. As a result, recovery rose to around 94 percent. Although improvements and changes had been made in grinding, stamps were not retired in favor of a rod mill-ball mill grinding flow sheet until 1953.

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	Percent	1940	Percent	1957
		Ounces		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.

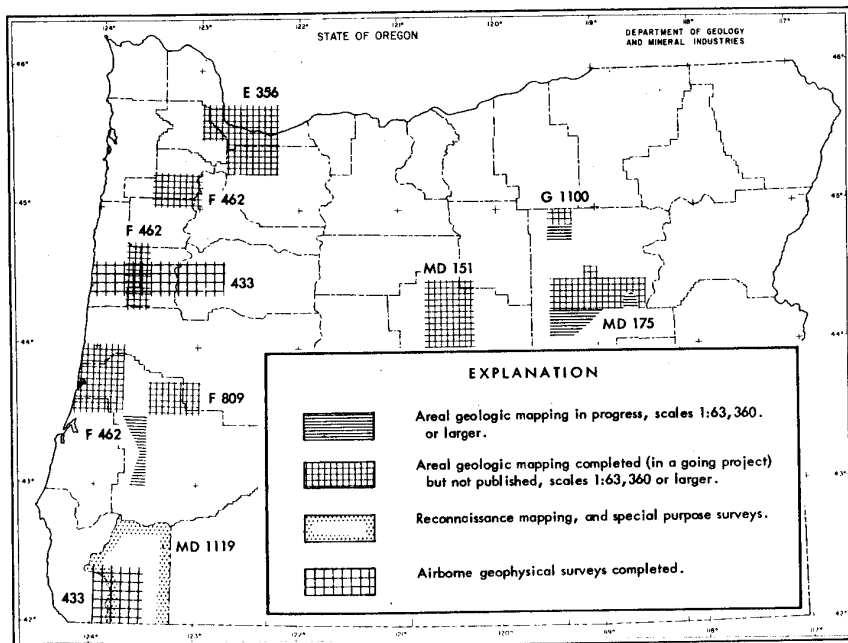
The gold dredge digs a high yardage-per-man shift and can operate profitably under today's conditions, particularly if the investment in the dredge was made prior to World War II. Yardage sufficient for large capacity dredges is difficult to find and the known yardage is being rapidly exhausted.

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.

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)
G 1100	Geology of Monument 15-minute quadrangle (Wilcox)
MD 151	Oregon quicksilver (Waters)
MD 175	John Day chromite (Thayer)
MD 1119	Klamath nickel (Hotz)

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.

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.

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.

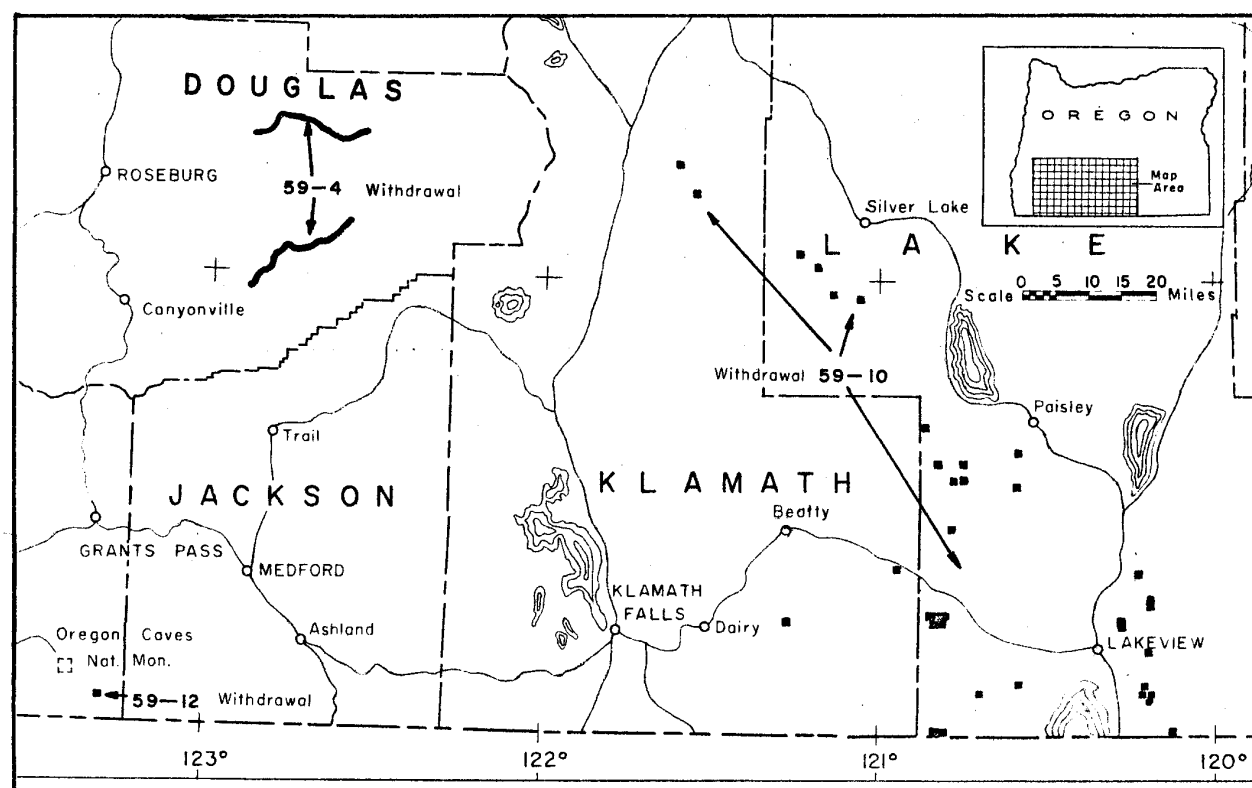
Operations at the reduction plant will continue without change, and the ore haul from the White King will be made by the Lakeview Logging Company as in the past.

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

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.



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.

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-appraisal 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)

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).

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.)

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.
