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DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES
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SUMPTER QUADRANGLE GEOLOGY RELEASED

A four-color geologic map of the Sumpter Quadrangle, the mining region twenty miles west of Baker, Oregon, which has been in the past and still is one of the foremost gold producing areas in Oregon, has just been issued by the Oregon State Department of Geology and Mineral Industries.

The field work, upon which this publication is based, was done by members of the U.S. Geological Survey in 1908-1909 and 1914-1915, but the map remained unpublished until joint funds were supplied last year by the Oregon Department. The map is on a scale of about 3/4-inch to the mile, and depicts the various geologic formations in an area of some 600 square miles of one of the most prolific gold mining regions in the state. Fifteen different types of formation are outlined, and the thirty-three most important mines in the area are located.

On the reverse side of the map is printed a description of the geologic formations and deposits of economic value. Besides the gold lodes and placers, deposits of chromite, quicksilver, limestone, iron ore, diatomite, volcanic ash, building stone and road metal are mentioned.

The map is for sale for 40 cents at the State Assay Laboratories in Baker and Grants Pass, as well as the head office of the State Department of Geology and Mineral Industries in Portland.

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FEDERAL SURVEY REPORTS SUBSTANTIAL NICKEL ORE RESERVES IN OREGON

The U. S. Geological Survey has issued the following report of a survey made in 1940:

As a part of the investigation of domestic deposits of strategic minerals by the Geological Survey, United States Department of the Interior, two of the Survey's geologists, W. T. Pecora and S. W. Hobbs, have examined a nickel deposit about 5 miles northwest of Riddle, Douglas County, Oregon. The town is 230 miles south of Portland by highway and is on the Southern Pacific Railroad. There is a dirt road between the town and the nickel deposit.

The nickel deposit is a rather irregular blanket on the western, southern, and southeastern slopes of Nickel Mountain. It was formed as a result of the concentration by weathering agencies of the small quantities of nickel originally present in the silicate minerals that compose the peridotite underlying the mountain. The peridotite is a dark igneous rock made up largely of the minerals

olivine and pyroxene: it is commonly altered to serpentine along its contacts with the sandstones and greenstones into which it was intruded. The concentrations of nickel, however, appear to be limited to the ores underlain by the peridotite and not to overlie the serpentized masses.

The nickel-bearing blanket is best developed on terraces and gentle slopes above an altitude of 2000 feet, where its thickness reaches a maximum of 60 to 70 feet. Within the blanket, nickel is present chiefly in the mineral garnierite, a hydrous silicate of nickel and magnesium. The garnierite varies in nickel content, the darker varieties having the larger amounts. Three layers or zones may be distinguished in the blanket; a thin upper brick-red soil layer at the surface, which is relatively low in nickel; a thick intermediate layer, richer in nickel and composed of limonite cut by a network of quartz and garnierite veinlets; and a bottom layer in which thin veinlets of quartz and garnierite occur in unaltered peridotite. The network of veinlets in the second and third layers is thought to have formed along the blocky jointing in the unaltered peridotite.

Messrs. Pecora and Hobbs believe that the concentration of the nickel originally present in the peridotite, which is in the order of 0.2 percent, into the higher-grade garnierite-bearing material of the blanket deposit was the result of two successive long-continued climatic cycles. During the earlier cycle the minerals of the peridotite were decomposed, forming an aggregate of hydrous iron oxides and nickel-poor garnierite. The more recent temperate and humid cycle resulted in the solution of the nickel-poor garnierite and its redeposition in veinlets as quartz and nickel-rich garnierite.

No comprehensive sampling program of the entire deposit has been undertaken; such sampling as has been done indicates that the great bulk of the deposit contains from 1 to 2 percent of nickel, and a much smaller part contains from 2 to 3 percent of nickel. Should emergency conditions result in a substantially higher price for nickel or stimulate the development of a practicable method of treatment for low-grade nickel silicate ores, the deposits on Nickel Mountain would provide a reserve of some 6,000,000 tons of material with an average nickel content of 1 to 2 percent and in addition possibly 250,000 to 300,000 tons that contain 2 to 3 percent of nickel, of which 80,000 tons in the vicinity of the Discovery workings can be regarded as proved ore.

MARKETING CHROME ORE

The only commercial ore of chromium is the mineral chromite. There are three classes of chrome ore, namely, metallurgical, chemical and refractory, and specifications vary for each class.

Metallurgical chrome ore is used in making the various ferro-chrome alloys; the critical specifications are a high chromic oxide content and a ratio of chromium to iron that is not less than 3 to 1. Specifications are less strict under emergency conditions of national defense needs.

Chemical chrome ore is used in the manufacture of chromates and bichromates used in tanning and dyeing, for pigments, and in production of other chemicals as well as chromium plate. In chemical chrome ore a high chromium content is the desirable factor.

Refractory chrome ore is used to make chrome brick or, together with a small amount of bonding substance, to make a refractory cement. These refractories are used in furnace linings mainly in the basic open hearth process for making steel. Lower chromium content can be used; a low silica content is desirable.

Metallurgical chromite is much the most important class economically since ferro-chrome is essential in national defense, and in normal times practically all of the metallurgical grade chromite used in this country is imported.

Chromite is considered to be a chemical combination of iron and chromium oxides and is usually written as $\text{FeO} \cdot \text{Cr}_2\text{O}_3$ or $\text{Fe Cr}_2\text{O}_4$, but, as it occurs in nature, other oxides, ferric oxide (Fe_2O_3) and alumina (Al_2O_3) may in part take the place of chromic oxide (Cr_2O_3); ferrous oxide (FeO) may be replaced partially by magnesia (MgO). Thus, besides ferrous oxide and chromic oxide, natural chromite usually contains alumina and magnesia.

Theoretically, pure chromite would contain approximately 68% chromic oxide (46.5% chromium), 32% ferrous oxide (25% iron), which gives a chrome-iron ratio of 1.86 to 1. The chrome-iron ratio of natural chromite almost never approximates the theoretical ratio. The desirable metallurgical grade chromite is one which contains three times as much chromium as iron, and at the same time contains a minimum of 48% chromic oxide (32.8% chromium).

The first step in the utilization of metallurgical chromite is to make ferro-chrome - an alloy of iron and chromium - by smelting the chromite. Ferro-chrome is used to supply the chromium in the various ferro-chromium alloys, mainly the so-called stainless steels. Ferro-chrome should contain a minimum of 65% chromium. This would mean that the chrome-iron ratio in the ferro-chrome would be approximately 1.86 to 1. Since in the smelting process chromium has a tendency to slag more easily than the iron, it is necessary to start with a chromite which has a much higher chrome-iron ratio than this and it has been found that a 3 to 1 ratio is necessary in order to obtain a ferro-chrome having a minimum of 65% chromium.

Chromite is sold on the long ton basis, that is, per ton of 2240 pounds. Present market quotations are \$42-\$45 per long ton for chromite assaying 48%-50% Cr_2O_3 delivered at Atlantic Coast points. Market quotations are given delivered in the East since until recently all ferro-chrome plants were located there. Now two plants are located in the Northwest and chromite produced in Oregon may be sold at the railhead. Prices for such ore will be quoted producers by the following companies:

Rustless Mining Corporation, 505 Farmers & Merchants Bldg., Sacramento, Cal.
U. S. Vanadium Corporation, 114 Sansome St., San Francisco, Cal.
Ohio Ferroalloys Corporation, Tacoma, Washington.

Purchases of chromite for stockpiling purposes are made for the Federal Government by two agencies, namely, the Procurement Division of the Treasury and the Metals Reserve Co., organized under the Reconstruction Finance Corporation. Price to be paid and points of delivery are subject to negotiation. Procurement Division specifications are as follows: chromic oxide (Cr_2O_3) content (minimum) 48%; iron (Fe) (maximum) $1/3$ of the chromium content;

sulphur (S) (maximum) 0.5%; phosphorus (P) (maximum) 0.2%. Specifications also provide that all ore shall pass a six-inch screen, and that not more than 10% shall pass a 1/2-inch screen. Specifications for purchases by the Metals Reserve Co. have been liberalized and the minimum on Cr_2O_3 for metallurgical lump ore has been lowered to 45%. Purchases of both refractory and chemical grades of chromite have been made by the Metals Reserve Co.

The demand for chromite is such that grades at least as low as 40% Cr_2O_3 may be marketed. It should be realized however that the low price commanded by the lower grades warrants a profitable operation only where large scale production and low transportation costs may be had. Careful sampling should be done so that ore shipped will not fall below the grade guaranteed by the producer. Hand sorting is usually necessary.

If large enough deposits of low grade ore occur (in which chromite particles are disseminated throughout the country rock) they may sometimes be treated economically by gravity concentration (tabling, jigging, etc.), so that the concentrates may be marketed. Only very large deposits in which several tens of thousands of tons of ore are well developed, justify the installation of such a mill.

Usually 15-25% chromic oxide content for these low grade ores is the minimum that could be economically handled.

The following notes on Monazite and Sea Water are from the U. S. Bureau of Mines Mineral Trade Notes, July 19th, 1941:

MONAZITE

General: - Imports of monazite, the commercial source of the rare-earth metals cerium, lanthanum, didymium, and thorium, achieved an all-time record of 2,967 short tons in 1940, compared to the previous peak of 2,914 short tons in 1917. During the first 4 months of 1941 imports totaled 1,247 short tons. The record imports for 1940 do not indicate current consumption, because a substantial tonnage was stockpiled by some of the large consumers for use on orders already received. A few years ago monazite seemed about to be dropped from the field of useful minerals when world output dropped to less than 100 tons in 1925 from a peak production of 7,392 tons in 1909. The sharp decline in world production resulted from the decreased use of incandescent gas mantles, in which considerable quantities of thorium nitrate and smaller quantities of cerium nitrate had been consumed.

The oxides and fluorides of the rare-earth elements contained in monazite are used in the cored carbons of searchlights, motion-picture machines, and therapy lamps to increase the lighting intensity and are therefore important in both peace and war. It is estimated that about 50 percent of the total domestic consumption of monazite goes into carbons and about 25 percent into the manufacture of pyrophoric alloys (misch metal), many of which are exported to the Dutch East Indies and to other countries having humid climates, where the use of matches is less satisfactory. The remaining 25 percent is consumed in various products, including cerium oxide for coloring glass (cerium gives a yellow color) and in glasses for ophthalmic and scientific lenses, where absorption of ultra-

violet light is desired. Cerium acetate is used for mildew-proofing. Lanthanum compounds are used by a large optical concern in scientific lenses. Thorium is used in tungsten filaments to increase luminosity and reduce brittleness, and in radio tubes to emit electrons, which cause the tubes to function. Monazite is still employed to manufacture the nitrates of thorium and cerium, which are exported directly and consumed in the manufacture of incandescent mantles, domestic producers of which continue to do a good export business with the Far East.

Appreciable quantities of mesothorium, a radio-active element that is preferred to radium for painting airplane dials, is recovered as a byproduct in processing monazite to obtain the various rare-earth constituents. Mesothorium is currently worth about \$24,000 per gram.

Monazite is imported chiefly from British India, where the mineral is recovered as a byproduct in processing beach sands for ilmenite. Brazil supplied but 7 percent of the total imports in 1940, but would become a more important producer if the present price of \$60 a ton was increased. Monazite was mined in the United States from 1890 to 1910 and again in the war years, 1915-17, but domestic deposits are submarginal at less than \$300 a ton, and even at that price it is doubted if they could supply war-time requirements. (Leo J. O'Neill, Bureau of Mines).

SEA WATER

Utilization in the United States: - When one considers that more than 70 percent of the earth's surface is covered by sea water it is not surprising that so many people are interested in knowing what is in the sea water itself, not considering the fish, crustaceans, coral, and other animal and vegetable growths that subsist on it.

The Bureau of Mines is often asked how much salt is contained in sea water. For a long time salt has been recovered from sea water by solar evaporation on the Pacific coast, subsequently other compounds, and in recent years magnesite in this same area. Much interest has been evinced in the utilization of sea water on the Atlantic coast to produce bromine, and the sea water in the Gulf of Mexico has recently become the source of a large output of magnesium metal.

Innumerable analyses of ocean salts and ocean water have been made that show some slight differences in different localities, but Dittmar's average seems to be accepted generally as being typical. His analysis, which gives only the main constituents and omits numerous other elements present only in minute traces, is quoted by F. W. Clarke (The Data of Geochemistry, Geological Survey, United States Department of the Interior, Bull. 770, 1924) as follows:

<u>Composition of oceanic salts</u>	
NaCl	77.76
MgCl ₂	10.88
MgSO ₄	4.74
CaSO ₄	3.60
K ₂ SO ₄	2.46
MgBr ₂22
CaCO ₂34
	<u>100.00</u>

<u>Composition of ocean</u>	
O	85.79
H	10.67
Cl	2.07
Na	1.14
Mg14
Ca05
K04
S09
Br008
C002
	<u>100.00</u>

From the foregoing tables it can be seen that of 100 percent sea water and constituents, hydrogen and oxygen make up 96.46 percent, leaving 3.54 of all other minerals. There are less than 10 principal constituents (and many minor elements, more than 40 of which are known) in sea water. Sodium chloride alone comprises about 2.75 percent of raw sea water and almost 78 percent of the total solids. The ratio of oceanic salts to one another is fairly constant, but the total content of salts in ocean water (i.e. the degree of dilution) varies slightly in different parts of the earth and also at different depths from the surface of the water.

Since the salts are ionized in the sea-water solution they may be separated and then recombined in many ways to form a wide range of chemicals. The following analysis is arranged by ions.

	Basis	
	Dry solids 1/	Sea water 2/
Cl (Chloride)	55.292	1.958
Br (Bromine)	0.188	0.007
SO ₄ (Sulfate)	7.692	0.272
CO ₃ (Carbonate)	0.207	0.007
Na ⁺ (Sodium)	30.593	1.083
K ⁺ (Potassium)	1.106	0.039
Ca ⁺⁺ (Calcium)	1.197	0.042
Mg ⁺⁺ (Magnesium)	3.725	0.132
H ₂ O (Water)	-	96.46
Total	100.00	100.00

1/ Dittmar's average (from U.S.G.S. Bull. 770)

2/ Basis: Sea water contains 3.54 percent salts.

NEWS NOTES

Robert G. Bassett, who was assayer and sampler at the Cornucopia Mine for a number of years, has been appointed to fill the position of analyst at the Grants Pass State Assay Laboratory. He succeeds Albert A. Lewis, who resigned to become engineer with the Denver Equipment Company.

The Murphy-Murray Dredging Company has moved the bucketline dredge formerly on Foots Creek to Pleasant Creek. The dredge will mine ground known as the Williams Placer on the channel of Ditch Creek. George Murphy of Portland is president of the company and Hal Young of Rogue River is superintendent.

The Jackson Mining Company is operating a dryland dredge east of the town of Jacksonville. The washing plant is mounted on caterpillar track and has four Anley bowls in addition to sluice boxes. A Lima 1½-yard dragline with a 75-foot boom is used to dig the ground and move the washing plant. E. B. Skeels of Auburn, California, is in charge of the operation.

The Hayfork Exploration Company's dredge which has been operating on Forest Creek has been moved to the Applegate River. Low water in Forest Creek made it

necessary to suspend operations and temporarily to take up new ground. C. C. Stearns is in charge of the operations.

The Northern California Dredging Company started operations on the upper end of Jump-off Joe Creek near the county line. A 1500-yard Bodinson washing plant, a 1½ Lima Diesel dragline with a one-yard bucket, and a TD40 Diesel cat comprise the equipment. J. C. Boyle and J. E. Ely are the operators. Digging started about August 11th.

The Southern Oregon Mining Company's dredge on Forest Creek near Ruch has temporarily discontinued operations due to low water. J. D. Bowdish of Medford is in charge.

The Mountain King Cinnabar Mine on Evans Creek has started development, and it is planned to instal a 40-ton Gould furnace. J. W. Deemy is in charge.

The Silica Brick Company of Chemult has its plant in operation for the manufacture of brick made of pumice. This lightweight brick has many advantages in the building industry.

The Oregon Belle Mine is located on the headwaters of Forest Creek near Jacksonville, Oregon. Operations started originally in 1890, and there is a reported production of \$250,000. Mr. Conrad is mining in the tunnel and is doing considerable work along the Roberts Vein.

The California Mine in the Galice District has temporarily suspended operation. This mine is well known for its 7200-foot Wheeler tunnel.

CHROMITE DEVELOPMENTS

Mr. F. I. Bristol of Grants Pass has been moving chromite from the Snowy Ridge Chrome Mine, through which the Oregon-California state line passes, south west of Ashland. The chromite is being trucked via the Applegate Highway to Grants Pass where it is being stocked by one of the buyers.

Both Rustless Mining Corporation and the U.S. Vanadium Corporation are stockpiling chromite at Grants Pass. U.S. Vanadium has also established a stockpile at Crescent City. One company has stated that it now will accept chromite of 40 percent grade at a price of 40 cents/unit; there is an increase of 1 cent/unit per percent increase in grade f.o.b. stockpile. This is equivalent to \$16 for 40 percent, \$20.25 for 45 percent, and \$25 for 50 percent ore.

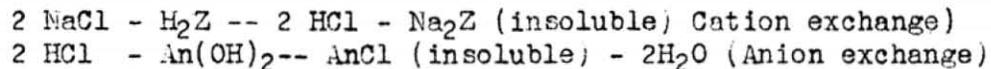
SALT WATER MADE FRESH WITHOUT DISTILLATION

An equivalent of "distilled water" can be made with patented substances known as cation and anion exchangers.

Cation Exchangers are made by heating carbonaceous materials such as coal, peat, and lignite with concentrated sulphuric acid. The most satisfactory

anion exchanger is made by the use of metaphenylene diamine with formaldehyde.

A simplified explanation of the reactions involved may be summed up as follows: Any salt in solution is composed of a cation and an anion; the cation is the negative radical or the non-metallic constituent of the salt and the anion is the positive or metallic constituent. A cation exchanger replaces the negative radical of the soluble salt forming an insoluble compound and an acid. The resulting acid then reacts with the anion exchanger which makes another insoluble compound and water. The following example, in which "Z" represents the cation exchanger and "An" the anion exchanger, illustrates the reactions:



In this way, salt is removed from solution and the water becomes fresh. The insoluble salts settle or are filtered out.

- Abstracted from U.S. Bureau of Mines' Report of Investigation 3571.

OF POSSIBLE INTEREST

At the Friant Dam at the Central Valleys Project, California, equipment was installed to recover gold in the gravel to be excavated and used in the concrete structure. In one year's operation \$100,000 was recovered. The equipment cost \$18,500.

An authority states that by means of the spectrograph it is possible to measure the increase in the lead content of the blood of a person who has slept for one night in a newly painted room. In fact, the spectrograph can measure as little as one atom of lead to a million molecules of blood.

According to the U.S. Bureau of Mines, domestic sales of costume jewelry increased substantially in 1940, amounting to nearly \$34,000,000 in value. Retail sales of all jewelry amounted to \$416,000,000. Domestic production of gem stones in 1940 was estimated at from \$340,000 to \$750,000; the first figure is a rough estimate of the amount used in jewelry and the second is an estimate of the total including that produced by collectors.

In MINING AND METALLURGY, July 1941, George C. Branner, State Geologist of Arkansas, makes an estimate of reserves of bauxite ore in Arkansas, Georgia, Alabama, Mississippi, and Tennessee. Practically all known commercial bauxite deposits occur in those states. The grade usually considered as ore contains 55% or more of alumina, and it is estimated that reserves of this grade total 11,000,000 long tons. Lowering the grade to 50% makes an additional 9,000,000 long tons available. The OPM has stated that we should produce 800,000 tons of aluminum annually to fill all military and civilian needs (average annual consumption of aluminum 1936-1938 was 146,000 tons). The higher grade ore would last about $3\frac{1}{2}$ years at a production rate of 800,000 tons of aluminum a year. Including the 50% ore the time would be extended another three years.

WORLD PRODUCTION CRUDE OIL 1940 (x)

	<u>Bbls. a day</u>	<u>Percent of total</u>
United States	3,692,000	63.0
Other Western Hemisphere	866,000	14.8
Russia	593,000	10.1
Near East	335,000	5.7
Netherlands East Indies	166,000	2.8
Rumania	188,000	2.0
Germany, Poland, Albania, Japan, Hungary and France	43,000	0.7
Rest of world	49,000	0.9
	<u>5,862,000</u>	<u>100.0</u>

(x) Table compiled from WORLD PETROLEUM, February 1941. Germany produced also in 1939 probably about 65,000 bbls. a day of synthetic oil and gasoline. It is estimated in TECHNOLOGY REVIEW, June 1941, that Germany's present capacity for synthetic petroleum products may be of the order of 100,000 barrels a day - reduced an unknown amount (but perhaps less than 20 percent) by British bombing attacks.

SAFETY CONFERENCE AT SEATTLE

The Western Safety Conference will hold its seventh annual convention September 22-26, Seattle, Washington. Convention headquarters will be the Olympic Hotel. The object of the Conference is to exchange ideas and standardize on safety methods in industry, home and traffic. The mining group discussion leader is A. H. Zeilinger of the Colorado Fuel and Iron Co. Dr. R. B. Sayers, director of the U. S. Bureau of Mines, will take part. An attractive recreational program is also planned.

AMERICAN MINING CONGRESS CONVENTION

The American Mining Congress will hold its 8th Annual Metal Mining Convention and Exposition in San Francisco September 29th-October 2nd. Headquarters will be at the Fairmount Hotel. A most comprehensive program, including technical papers, discussions, and field trips, has been planned. Particular attention will be given to metals and minerals necessary in national defense as well as to operating methods and problems. Most of the operators of the larger mines of the western states or their representatives will take a leading part. Various manufacturers of mining machinery are to have exhibits.

PRIORITIES

The office of Senator Rufus C. Holman has notified the Department that the Priorities Division of the OPM is preparing to grant preference ratings to manufacturers of mining equipment which should assist mine operators in procuring equipment. A project number may be assigned if the operation is sufficiently substantial and important from the standpoint of national defense. The corporate owner of the mine should address a letter to Mr. Ward Freeman, Director of Priorities Plant Expansion Unit, 462 Indiana Avenue, Washington, D.C., requesting a project number and stating nature of the project, location, and particularly value and importance to national defense. By this means operators may, as we understand it, get a priorities rating for the whole project and will not be required to get such a rating for each piece of equipment desired.

CLEARING HOUSE

Andrew Hawkins, Mill City, Oregon, and W. M. S. Risley, Albany, Oregon, wish to sell or lease their property known as the Vandalia or Savage Mine, located in the Quartzville Mining District, eastern Linn County. There are 8 unpatented claims. Several hundred feet of development work. It is stated that the average width of vein is 14 feet and that the average value is \$15 per ton, mostly in gold, but carrying some lead and zinc. 2-stamp mill and 10-ton Gibson mill. Location $2\frac{1}{2}$ miles by trail from Quartzville highway.

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