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DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES
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THE
ORE.-BIN

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In the future, issues of the "Ore.-Bin" will contain notices of the release of our bulletins. In case you do not receive your copy of the bulletin within a few days after the stated date of mailing, please advise us at once or the Department will feel it no longer needs to take the responsibility for miscarried or mislaid bulletins.

OREGON SILICA DEPOSIT BEING OPENED

MAY BE BASIS OF NEW INDUSTRY

A silica deposit having, according to preliminary estimates, a tonnage of something like ten or fifteen million tons, is being opened up and developed by the Bristol Silica Company about two miles from Gold Hill, Oregon. The deposit is quartz and is stated to have a thickness of 150-175 feet and a length of many hundreds of feet. A composite sample of this, taken from the surface of this deposit by a well-known engineer who reported on the deposit, was furnished the Department. The result shows the material to contain 98.7% SiO_2, with the impurities being very low.

At the present time Mr. Fayette Bristol, proprietor of the property, is manufacturing chicken grit of superior quality and is also shipping ground silica to some of the smelter people. So far as we know, there is in Oregon no other producer of insoluble poultry grit and it is our opinion that this is indeed a very high grade product.

The Department is particularly interested in this deposit of silica for the reason that the State has no known deposits of glass sands. The reason for this is plain, namely, because much of the State is covered by basic igneous rocks which do not produce this type of sand. The only difficulty with the Bristol deposit is that, being quartz, it is more difficult and costly to grind than is ordinary glass sand. In addition to furnishing a possible source for metallurgical silica, which the Department believes will be in demand for Bonneville industries, there is the added bare possibility that the material might furnish the basis for a glass brick industry. It is realized that in this connection the fuel situation is critical. However, with the presence of partially developed coal deposits in Oregon and the possibility that some method of using the electric furnace for glass manufacturing may be developed, there seems to be a very reasonable chance that this deposit may have interesting possibilities as an Oregon mineral resource within the next few years.

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STUDY OF SALT DEPOSITS

The State Department of Geology and Mineral Industries proposes to carry out an economic study of the possibilities of utilizing the salt deposits in the Lake and Harney county areas, in connection with a chemical industry or by-product plant near Bonneville. The principal products which would be produced by such a plant are chlorine, sodium silicate, and sodium sulphate, and certain others of lesser importance. For this study, the Department has asked in its budget for an additional sum of $1,000 to employ an outside metallurgical engineer for a period of two months. Field work would be carried out by the Department and laboratory work would be done in part with the facilities of the Department and in cooperation with the Department of Chemistry under Dr. George W. Gleeson of Oregon State College. The college has been interested in these deposits for some time, and the Department is pleased to receive the benefit of the excellent personnel and facilities which the College offers.

At the present time, considerable chlorine used in the Portland and lower Columbia area is obtained from salt manufactured from sea-water near San Francisco and shipped to a reduction plant near Seattle, and the chlorine itself shipped again to Portland. If the sewage disposal plant proposed for the city of Portland should be of the type requiring substantial amounts of chlorine, this would furnish a substantial outlet for chlorine which might be produced at the Bonneville chemical plant from salt deposits existing in this state. The study proposed by the Department includes the problem of transportation, cost of manufacture, and the market situation of all of the various by-products.

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MINING ASSISTS LUMBERING

OREGON QUICKSILVER MAY BE USED AS FUNGICIDE.

The mining industry, through its production of quicksilver, or mercury, is assisting the lumber industry to produce bright air-dried lumber. Lumber which a few months after cutting becomes sap-stained or which develops the well-known "blue stain", is difficult to sell. This stain, it has been determined recently, is caused by a fungus growth that flourishes on the sap fluid. In recent years the Graselli Chemicals Department of E. I. du Pont de Nemours & Company has developed a fungicide which in its new form is called "lignasan". This contains ethyl mercury phosphate, which has a toxic effect on the sap fungi. It is expected that enlarged use of this quicksilver bearing compound in the lumber industry to combat the fungus, may be helpful in increasing the demand for quicksilver in this state.

Lignasan is dissolved in water in the ratio on one pound to 50 gallons of water for small lumber, and ;¼ to 1½ pounds to 50 gallons of water for heavy timbers. Sprayed on the lumber, the coating of chemicals protects the wood and prevents the entrance of sap-stain-producing fungi through the surface of the wood during the early part of the air-seasoning period. It is understood that lumber manufacturers using mechanical dipping apparatus can treat a thousand feet of lumber for about 10 or 15 cents.

Additional information about this interesting chemical may be obtained from Dr. E. E. Hubert, of the Western Pine Association, and Mr. V. R. Diamond, the du Pont representative, both of Portland.

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METEORITES

Simple Test

Meteorites are a constant source of wonder to most people. They flash across the sky in their brief period of existence, and sometimes penetrate to the earth's surface. They have considerable scientific as well as commercial value, and the discoverer of one of them is usually well rewarded.

Specimens are constantly being received, labelled as meteorites. This Department is always glad to be of service, and desires a record of such finds. But the general public may save themselves many false hopes and disappointments if they had some simple means of testing the suspected meteorite.

There are two general types of meteorites; those composed of iron and nickel and known as iron meteorites, and those composed of various elements and known as stony meteorites. Both kinds usually have at least small amounts of nickel and a nickel-test may eliminate a large number of objects commonly mistaken for meteorites. This test is not conclusive in an area that has nickel-bearing rocks.

The test requires four chemicals:

Dilute nitric acid
Ammonium hydroxide (ammonia)
Alcohol
Dimethyl-glyoxine

A small sample of the material to be tested is ground to a fine powder and dissolved in nitric acid. Then add ammonium hydroxide until the solution is distinctly alkaline. A test for alkalinity is accomplished by using litmus paper, preferably red, and the color will change to blue when sufficient ammonium hydroxide has been added. If a reddish brown mass forms at this point, it is an indication of the presence of iron.

Allow the reddish-brown mass to settle, and then carefully pour off the clear liquid. The clear liquid can also be filtered from the solid material.

While the liquid is clearing, or filtering, the dimethyl-glyoxine solution may be prepared. Dissolve this chemical in about an ounce of alcohol until the alcohol will hold no more. This is a saturated solution. Add a few drops of this solution to the clear liquid and a scarlet-red precipitate indicates the presence of nickel.

Dimethyl-glyoxine can be obtained from any chemical supply house at a cost of about 75¢ per ounce. This is a dry chemical. The alcohol may be purchased most anywhere.

The presence of nickel in the specimen indicates that it has a possibility of being a meteorite, and you can then contact some agency who can assist you further. If it has no nickel, you may feel reasonably sure that your rock is no "wanderer from heaven", and it probably will not pay the next instalment on the new car.

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MINERAL PRODUCTION

Referring to the production of gold in the United States, preliminary estimated figures for which have just been released by the United States Bureau of Mines, it is interesting to note that the increase in production in 1938 over 1937 is relatively small, about 5%. During 1937, 4,834,062 fine ounces of gold were produced, and 5,106,109 (estimated) in 1938.

It is significant that certain states had a considerably less production in 1938 than in 1937. Utah, for example, is down about 34% in the one year. The largest change is the state of Washington, which is up about 100%, from 36,000 ounces in 1937 to 73,000 ounces in 1938. This amazing increase is due principally to one mine, the Chelan, property of Howe Sound.

Oregon is next among the states in the production of gold with an increase of nearly 50%.. This is due in considerable part to the fine showing of the Cornucopia mine in Baker county, but also due to the doubling of the number of dredges operating in this state.

Idaho with an increase of about 25% in its gold production, is next among the states which show an increase.

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NEWS NOTES

George P. Sopp, of the Colorado School of Mines, has accepted the job of geologist at the Al Sarena mines (more often called the Buzzard mine) and located north of Medford.

William and Hugo von der Hellen are operating the Lance property on the right fork of Foots creek, near Rogue River, Oregon. This is a dry land mechanical operation, in which trucks and power shovel are used in connection with a washing plant. This equipment was last used by Mr. von der Hellen on Althouse creek in southern Josephine county.

The Greenback Consolidated Co., which has been carrying on development work on the Jim Blaine and Yellow Horn claims, adjacent to the old Greenback mine on Grave creek in southwestern Oregon, are making plans to build a mill and place the property in regular production.

The Morris Mine Co., Mr. G. G. Smith, president, Stanfield, Oregon, is preparing to finance and carry on exploration work at the Morris property in the Greenhorns.

A Seattle group has been driving a tunnel to intersect a quicksilver deposit on the Westerling prospect in the Ochoco mountains east of Prineville. This is an old property located about a mile from the Blue Ridge mine. Considerable production is reported in the past, and the present work is designed to cut the lode at some distance below the old workings.

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ELECTROSTATIC SEPARATION OF MINERALS

NEWER DEVELOPMENTS IN MINERAL SEPARATION

Advances in metallurgy are making well known deposits usable - deposits which were too low grade, too complex, or were handicapped by any one of several difficulties. Electrostatic separation, a new or reasonably recent advance in the metallurgical field, is beginning to find rather a wide use in the separation of minerals, both metallic and non-metallic. It is believed that some details of this method will be of interest to readers of this pamphlet. Below is a brief outline of what electrostatic separation is. It is to be noted that electrostatic is quite different from magnetic separation, which is a very old process.

Electrostatic separation of minerals is based on the theory that objects can store charges of electricity, either positive or negative, if not grounded so as to complete a circuit. Like charges repel, while unlike charges attract, each other.

These charges, and their attractive forces, should not be confused with magnetic attraction. In order that a magnetic field, and therefore magnetic attraction, may exist, the material of which the magnet is made must be magnetic and there must be two magnetic poles of opposite sign reasonably close to each other. The object being attracted need not be magnetized but it must be a conduction of magnetic lines of force, and is considered magnetic.

An electrostatic charge may be developed on any object not grounded. Glass, which is extremely non-magnetic, will store quantities of static electricity. Objects may accumulate a static charge while passing rapidly through air; thus an automobile or truck may develop a static charge while in motion, and become a miniature thunder cloud. Oil and gasoline trucks carry a dragging chain which grounds any static charge developed on the truck, and thus prevent a disastrous spark from developing. It is not necessary that another "pole" be present, but the object being affected must have a static charge.

It seems apparent, then, that if crushed particles of rock or ore are passed by an electrostatic charge that they will be repelled or attracted according to the charge developed on the particles. There have been many attempts to make use of this principle but a critical feature was the inability to develop a sufficiently high electrostatic charge on the pole piece.

This handicap has been surmounted, and experimentation along these lines has proceeded with some success. Crushed particles of rock and ore are dropped over a "material-conveying electrode" in such a manner that if no charge were on the electrode, the particles would fall in a vertical line. An electrostatic charge is now placed on a "charged electrode" which is a short distance from the "material conveying electrode" and the latter is grounded. As the crushed particles passed between the two "electrodes" they are deviated from their path of vertical fall, some to the right and some to the left. The amount of deviation depends on the strength of the charge on the "charged electrode" and the electrostatic conductivity of the particle.

Certain minerals always are repelled from the "material-conveying electrode" regardless of the positive or negative charge on the "charged electrode." These minerals are classed as non-reversible. Others are always repelled from a positive electrode, and are classed as reversible-positive while a third group is always repelled from a negative electrode, and is classed as reversible-negative. This phenomenon of reversibility is entirely new and offers possibilities for electrostatic separation heretofore unknown.

Experiments were performed with some 90 minerals. The feed was sized between 16 and 150 mesh as representative of the usual size of crushed feed in commercial mills. It was heated to 175 ° F., and dried immediately before placing in the hopper for observation in the electrostatic field. This procedure was followed to assure uniformity in surface moisture. Each mineral, in turn, was fed through the feed-hopper into an electrostatic field. A low static voltage was applied to the "charged electrode" and the voltage gradually increased until all the particles in the stream were deflected away from the line of gravity fall. The voltage necessary to deflect each stream of minerals was then recorded as its "electrostatic conductivity". Each mineral was investigated several times under varying atmospheric conditions to check the results.

It was then necessary to pass all of the minerals that had been observed in the first investigation through the separator, to test them for what has been termed "reversibility". The majority of them behaved in the same manner regardless of the positive or negative charge on the "charged electrode". These were listed as non-reversible. Those which had their direction of deviation from line-of-gravity fall changed were classed as reversible-positive.

Subsequently, the machine was set as a separator, using mixtures of minerals, and certain ores. It was found that a difference of 3000 volts usually assured fair separation with close sizing while a difference of 5000 volts usually assured good separation even on unsized materials. If the minerals to be separated belonged to different groups, that is non-reversible, reversible-positive, reversible-negative, separation could be effected with little or no difference in voltage. For example, anthracite coal requires a voltage of 3588 (non-reversible) and bituminous coal requires 4056 volts (reversible-positive). The voltage differences of 468 volts is too small for ordinary separation, but excellent separation was possible by giving the "charged electrode" a positive charge. Bituminous coal was deflected to the left and anthracite coal was deflected to the right.

It should be remembered that these experiments were made with one "pass" through the electrostatic field. Some arrangement as is used in magnetic separators, of passing the material through successive fields may effect separation of minerals that have less than 3000 volts difference.

As long as the surface of the minerals was dry, practically no difference was found in the action of the minerals in the electrostatic field or in the voltage required to deflect the stream. Internal moisture seems to have no effect as long as the surface is dry.

Sunlight, or darkness, had no effect on operating conditions as long as the surface of the minerals was dry and the voltage constant.

The depth of the stream of minerals fed into the electrostatic field had no observable effect on the action of the stream in the field.

These conclusions are important as they offset many objections that have been presented for the inability of electrostatic separators to function as commercial machines.

Experimental data, then, indicates that electrostatic separation of minerals is feasible if there is a 3000 volt difference for sized material in the same group (non-reversible, or reversible-positive, or reversible-negative) and a 5000 volt difference for unsized material in the same group. If the minerals are in different groups, little or no voltage difference is necessary. The action of the minerals in the electrostatic field is not affected by sunlight, humidity, internal moisture, or depth of particles in the stream, if the surface of the minerals is dry. (It is also necessary that the feed into magnetic separators be dry).

TABLE OF COMPARISON OF MECHANICAL PROPERTIES OF MINERALS FOR MINERAL SEPARATIONS.

	Electrostatic Conductivity 1/	Magnetic Attractive Force 2/	Specific Gravity for Sink-and-Float 3/
Almandite	12,480 Non		3.5-4.2
Aluminous Oxide	13,572 RP		
Amphibole Hornblende	7,020 RN		3.2
Anglesite			6.1-6.4
Anhydrite	7,800 RP		2.9
Anthracite	3,588		1.3-1.7
Antimony	7,800		
Apatite	11,700 RP	0.21	3.15-3.27
Aragonite	14,800 RP		2.9
Argentite		0.27	7.3
Arsenic	6,552		
Arsenopyrite		0.15	6.0
Asbestos			2.2-3.3
Azurite			3.7-3.9
Barite	5,772		4.3-4.7
Bauxite	8,580 RN		
Bentonite	3,588		
Beryl			2.68-2.76
Biotite	4,836	3.2	2.90
Bismuth	4,680		
Bituminous coal	4,056 RP		1.1-1.5
Bituminous coal (coking)	6,240 RP		
Bornite	4,680	0.22	4.9-5.4
Braunite			4.7-4.9
Calamine	9,048	0.51	3.3-3.5
Calcite	10,920 RP	0.03	2.71

	Electrostatic Conductivity 1/	Magnetic Attractive Force 2/	Specific Gravity for Sink-and-Float 3/
Cassiterite			6.8-7.
Celestite		0.10	3.9
Cerargyrite		0.28	5.5
Cerussite		0.30	6.5-6.6
Chalcocite	6,552	0.09	5.5-5.8
Chalcopyrite	4,680	0.14	4.1-4.3
Chromite	5,616		4.3-4.6
Chrysocola			2.0-2.2
Chrysolite (olivine)	9,204 RP		3.3
Cinnabar		0.10	8.0-8.2
Corundum	13,728	0.83	3.9-4.1
Covellite			4.6
Cryolite	5,460 RP	0.05	3.0
Cuprite		0.08	5.7-6.1
Diamond, black			2.75-3.42
Diamond, gem			3.5-3.56
Dolomite	8,268 RP	0.22	2.83-3.0
Enargite		0.05	4.4
Enstatite	7,800 RN		3.3
Ferberite			7.5
Fluorite	5,148	0.11	3.0-3.2
Franklinite	8,112	35.38	5.0-5.2
Galena	6,864	0.04	7.3-7.6
Garnet	6,864	0.40	3.5-4.3
Garnierite			2.3-2.8
Gold			15.6-19.3
Graphite, flake	2,800		2.1
Graphite, plumbago	3,588		
Gypsum	7,644 RP	0.12	2.31-2.33
Halite	4,056		2.1
Hematite	6,240	1.32	4.9-5.3
Hubnerite			6.7-7.3
Ilmenite	7,020	24.70	4.3-5.5
Iron		100.00	7.3-7.8
Iron, in basalt	7,800		
Kaolinite	6,708 RN		2.6
Kyanite	9,204		3.5-3.7
Labradorite	4,992		2.71
Lepidolite	4,992		2.84
Limonite	8,580	0.84	3.6-4.0
Magnesite	8,580 RP	0.15	3.0-3.3
Magnetite (sand)	7,800	40.18	4.96-5.18
Malachite			3.8-3.9
Manganite	5,616	0.52	4.3
Marcasite	5,460		4.9
Microcline	7,488		2.5
Millerite			5.3-5.9
Molybdenite	7,020	0.23	4.7-4.8
Monazite Sand	6,552		4.7-5.3

	Electrostatic Conductivity 1/	Magnetic Attractive Force 2/	Specific Gravity for Sink-and-Float 3/
Muscovite	2,964 RP		2.83
Nephelite	6,240		2.55-2.65
Niccolite	7,800	0.04	7.3-7.8
Oligoclase	6,240 RN		2.65
Orpiment		0.24	3.48
Orthoclase		0.05	2.57
Pentlandite			4.6-5.1
Phosphate Rock			3.15 (varies)
Platinum			14-19
Psilomelane			3.7-4.7
Pyrite	7,800	0.23	4.95-5.17
Pyrolusite	4,680	0.71	4.73-4.86
Pyroxene	6,084 RN		
Pyrrhotite	6,552	6.69	4.5-4.6
Quartz, chert	8,892 RN	0.37	2.65-2.66
smoky	9,672 RN		
flint	10,140 RN		
gold	10,140 RN		
crystal	13,416 RN		
milky	14,820 RN		
rose	14,820 RN		
Rhodochrosite	8,580		3.3-3.76
Rhodolite	16,380 RP		
Rutile	7,332	0.37	5.9-6.2
Rutile, beach sand	8,892		
Rutile, beach sand	7,488		
Scheelite	8,580		2.38-2.75
Senarmonite		0.05	
Serpentine	6,084 RP		
Shale			2.38-2.75
Siderite	7,176	1.82	2.83-3.88
Silver Ore	6,552		
Slate			2.45-2.70
Smaltite	6,396		6.2
Smithsonite	12,480 RN	0.07	4.30-4.45
Sphalerite	8,580 RN	0.23	3.9-4.2
Spodumene			3.1-3.2
Stannite			4.3-4.5
Stibnite	6,864	0.05	4.5
Sulfur	10,920 RN		2.07
Talc	6,552	0.15	2.7-2.8
Tetrahedrite		0.21	4.4-5.1
Topaz	12,480 RP		3.5
Tourmaline	7,176 RN		3.0-3.25
Vanadinite			6.6-7.10
Wad			3.4-4.26
Willemite		0.21	3.9-4.3
Witherite		0.02	4.2-4.3
Wolframite	7,332		7.1-7.5

	Electrostatic Conductivity 1/	Magnetic Attractive Force 2/	Specific Gravity for Sink-and-Float 3/
Wulfenite	11,700		6.7
Zincite		0.10	5.4-5.7
Zircon	11,700 RN	1.01	4.7
Zircon, beach sand	11,076 RP		

1/ Johnson, Herbert Banks, "Selective Electrostatic Separation": Am. Inst. Min. & Met. Engrs., Mining Tech., Tech. Paper no. 877, pp.8-9, Jan. 1938.

2/ Crane, Walter R., "Investigations of Magnetic Fields, with Reference to Ore Concentration": Am. Inst. Min. & Met. Engrs., Trans., vol. 31, p. 405, 1901.

3/ Pamphlet on Sink-and-Float, released by E. I. du Pont.

4/ RP represents reversible-positive.

5/ RN represents reversible-negative.

6/ No symbols after electrostatic conductivity indicates non-reversible.