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STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
Head Office: 702 Woodlark Building, Portland 5, Oregon

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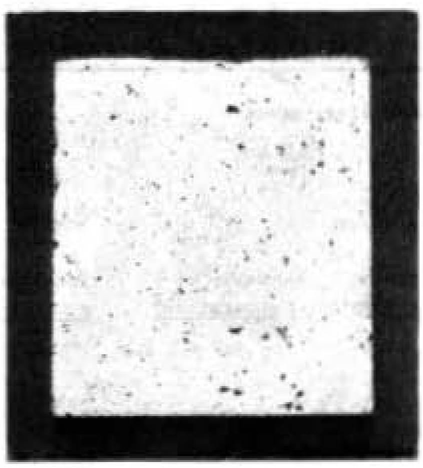
NEW BUILDING STONE DISCOVERY



Photograph of sawed specimen of Crooked River tuff showing uniform texture (natural size).

Introduction

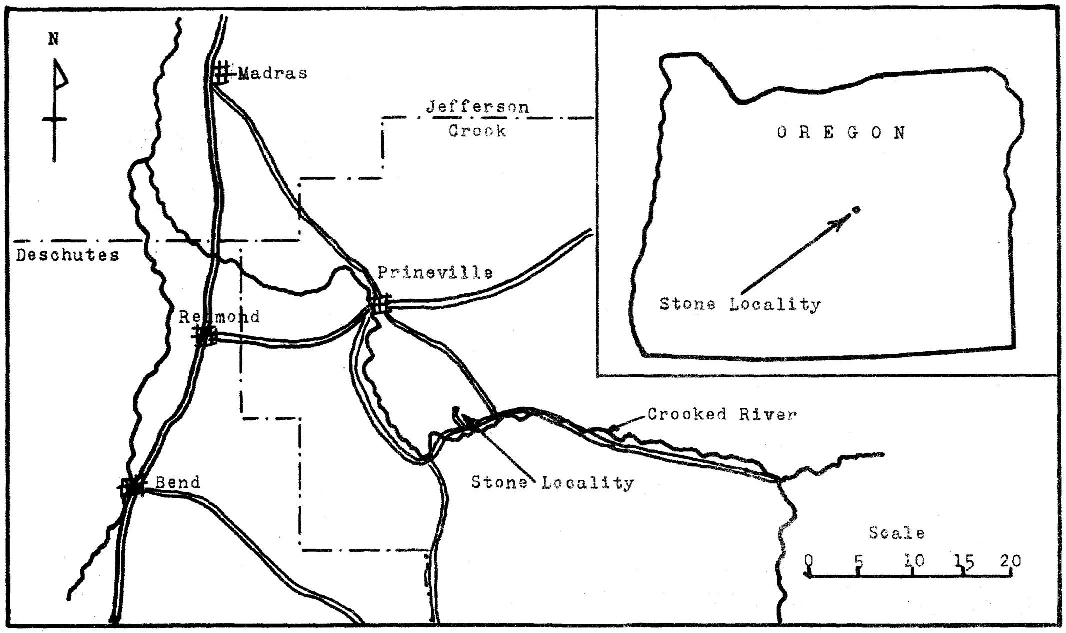
The discovery of a bed of pinkish-white rhyolite tuff near Crooked River in western Crook County may make available a new building material with some unique characteristics. The description of the stone is based only on the outcrop, as no exploration work has so far been done. The deposit, as shown on the accompanying index map (page 28), is located in sec. 21, T. 16 S., R. 17 E., and is reached by taking the graveled Combs Flat road southeast from Prineville for a distance of 17 miles to the junction at Crooked River, thence downstream on the Crooked River road for approximately 5 miles to the Bailey School at the mouth of Owl Creek. The rhyolite tuff bed lies a short distance to the northeast of the Carey Ranch which is about 1 mile up Owl Creek from the school house. The rock crops out along a fairly steep hillside for a distance of half a mile or more in a series of beds which dip steeply into the hill.

Description of the stone

The accompanying photograph shows a sawed section of a piece of the stone in which the dense, uniform texture is indicated. There is a pale-pinkish matrix in which numerous creamy-white patches occur. In addition, there are some tiny black rock fragments which add interest to the appearance of the stone. It can be sawed readily and little if any raveling or pitting has been observed. Architects who have seen the stone have been very enthusiastic over its possibilities, since it would provide them with a new material which would be easy to prepare and would be an Oregon stone.

The tuff possesses a low apparent porosity and a remarkably high crushing strength. The specific gravity is much less than most common building stones.

The following table summarizes the physical properties of the Crooked River stone and compares them with three other Oregon stones which have been used in the erection of buildings in the State. Physical properties of some of the "standard" building stones used in construction are also included for comparison. Professor S. H. Graf of the Mechanical Engineering Department of Oregon State College cooperated in making tests of the stone on samples prepared by the State Department of Geology and Mineral Industries.



Index Map Showing Location of Crooked River Stone

Physical Properties of Some
Oregon Lightweight Building Stones

Description	Crushing strength (lbs./sq.in.)	Apparent porosity[1]	Water of absorption[2]	Specific gravity
Crooked River tuff	13,859	17.1 %	9.4 %	1.82
Volcanic tuff from quarry at Pleasant Valley Baker County, Oregon	2,916	33.9	22.3	1.53
Rhyolite tuff from Willowdale quarry Jefferson County, Oregon	----	31.6	21.9	1.66
Mt. Angel tuff from quarry on Little Abiqua Creek Marion County, Oregon	----	36.0	26.6	1.35

[1] Apparent porosity is obtained by dividing the weight of absorbed water (in grams) by the volume (in cubic centimeters) of the stone.

[2] Water of absorption is obtained by dividing the weight of water absorbed by the weight of the dry stone.

Average Values for Some Common Building Stones

	Crushing strength	Apparent porosity	Specific gravity
Granites	15,000	0.5% (max.)	2.65
Sandstones	10,000	2-15%	2.65
Limestones	10,000	0.5-5.0%	2.73
Marbles	12,000	0.5% (max.)	2.78

From the above table it is evident that the Crooked River stone possesses some remarkable and favorable characteristics for use as a building material.

Chemical analysis

The Crooked River stone was analyzed in the Department's chemical laboratory with the following results:*

Silica (SiO_2)	67.15 %
Iron as ferric oxide (Fe_2O_3)	1.36
Alumina (Al_2O_3)	13.30
Lime (CaO)	3.88
Magnesia (MgO)	0.62
Potash (K_2O)	1.63
Soda (Na_2O)	3.03
Ignition loss	9.67

Petrographic description

This rock is a coarse vitric tuff. It is composed of pumice in a matrix of glass shards and dust; mineral grains make up no more than 5 percent of the total. Pumice makes up around 65 to 70 percent of the rock, glass shards and dust 25 to 30 percent, and obsidian occurs in occasional black fragments.

The size of the pumice ranges from ¼ mm to 8 mm in diameter; most particles are subangular but the edges are generally smooth. It has an index of refraction less than 1.50 and greater than 1.49, indicating a rhyolitic composition. Although few vesicles remain, occasional devitrified particles show remnants of bubble walls.

The matrix has an index of refraction of circa 1.50, also indicating a rhyolitic composition. Most of the matrix is without character, but typical shard structure is frequently observed. The size range is all below ¼ mm.

Both the pumice and the matrix show signs of devitrification. Each is weakly birefringent and has occasional poorly developed spherulites. The weakly birefringent material was too small to be resolved under the microscope but is apparently quartz and feldspar. In the pumice the weakly birefringent areas sometimes appear to follow the sides of collapsed vesicles. Magnetite is common in the pumice and the shard matrix is tinted pink by disseminated hematite in dust-size particles. The hematite dust tends to increase around the edges of the pumice, thus accentuating the outline of these particles; however, the pumice particles are comparatively free of hematite.

Mineral grains are dominantly quartz with minor feldspar and accessory sphene, augite, and magnetite. The quartz occurs in rounded to angular grains and varies in color from water clear to smoky black. The darker quartz grains have many inclusions which apparently are mainly rutile. The feldspar is orthoclase. It occurs in subhedral to anhedral phenocrysts which have an index of refraction greater than 1.52 and less than 1.53, is optically negative, and has a large axial angle; all gradations of alteration from clear to completely

*Analysis by L. L. Hoagland, Chemist.

masked are present. No reaction rims were noted on either the quartz or feldspar but some feldspars were shattered. Platy intergrowths of quartz and orthoclase are frequent; these grains are usually dark colored, subangular, and the feldspar commonly shows alteration. Grain size of these minerals and their intergrowths varies from 0.1 mm to 1.5 mm. Although most magnetite is probably secondary, euhedral phenocrysts were seen. The euhedral forms are thought to be primary.

Secondary mineral products are kaolin, chlorite, iron oxides, and leucoxene (?).

The dark grains of the rock are quartz, quartz-orthoclase intergrowths, obsidian, magnetite, chlorite, and devitrified pumice.

It is possible that this rock is a welded tuff. The collapsed vesicles in the pumice, the lack of form of much of the matrix, the denseness of the whole rock, and the absence of foreign material would indicate this.

Summary

The Crooked River stone possesses not only the physical characteristics which would make it suitable for a building material but it possesses the equally important factor of having an interesting and attractive appearance. The stone can be shaped easily, and although no freezing and thawing tests have been conducted, its low absorption indicates that it will weather well. Volcanic tuffs have been used in both eastern and western Oregon as building stone for many years without any apparent deterioration, even though their water absorption is relatively high. In sufficient exploration work has been done on the deposit to determine whether or not the material can be obtained in pieces of economic size or whether the sub-surface stone will possess the same physical characteristics as at the outcrop. The answers to these questions can only be determined by opening up the deposit sufficiently at several places and carrying our additional testing work.

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EASTERN OREGON MINING NOTES

Mr. Bert Hayes, John Day, will resume exploration work in the near future at the Standard mine on Dixie Creek in Grant County. Hayes plans to sink a 50-foot shaft to explore the vein below the old workings. Samples of ore taken from an old pillar gave high results in cobalt and gold.

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The Buffalo Dredging Company, which operated a bucketline dredge near Mt. Vernon in the John Day Valley during 1949, is sampling dredge ground on the Middle Fork of the John Day River in Grant County.

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The Golden Century Industries, an Idaho corporation in which Mr. George Fenton is one of the principals, has leased and is testing part of the Baker Ranch at the mouth of Conner Creek, a tributary of the Snake River in Baker County, Oregon. This company is also testing placer ground in the McNamee Gulch area in the Greenhorn Mountains, Baker County.

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William Rick has leased the Macy mine, Baker County, Oregon. He has rehabilitated the camp and some of the underground workings. In addition, he has sunk a 45-foot winze. Some of the development ore has been milled in a small Gibson mill.

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The mine road from the Snake River road up Conner to the old Conner Creek mine in Baker County has been extended about 2 miles so that the southwest edge of the Marble Mountain limestone area is now accessible by road.

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DEPARTMENT EXHIBITS AT INDUSTRIES EXPOSITION

An exhibit emphasizing the mine-to-mill-to-consumer path that minerals must follow before they can be utilized was prepared by the Department of Geology and Mineral Industries for the Greater Portland Industrial Exposition held at Portland University May 2 to 7. Included in the display was a series of rocks ranging from unweathered basalt through various stages of laterization to a ferruginous bauxite, thence to alumina and metallic aluminum and finally to finished extrusions. Another group of minerals and products traced the course that cinnabar, the principal ore of mercury, goes through to become a useful product in such things as the recently perfected mercury dry cell and various chemicals containing mercury. Perlite, a newcomer to the industrial minerals field, was represented by the crude quarry run material, the "popped" granules, and the finished products such as wallboard and insulation fill. Lightweight aggregates were represented also by pumice and expanded shale, both of which are being produced in Oregon for lightweight insulating building materials. Building stones were represented by several blocks of rhyolite tuff from Willowdale, where a quarry of a reddish-brown rhyolite tuff occurs, and a cream-colored tuff from the Carey Ranch area near Crooked River southeast of Prineville. The various steps leading up to the manufacture of calcium carbide were shown in a display consisting of black marble from the Enterprise quarry, the same rock after being burned, and the final product which is formed by the fusion of burned lime and coke in an electric furnace. Also included in the exhibit were displays of silica, granite, high-alumina clay, diatomite, and some bricks made from local silts. A display of semi-precious gems and other objects fashioned from various gem stones was loaned to the Department by a Portland gem cutting establishment whose products are sold all over the United States. Probably the most interesting feature of the Departmental booth was the demonstration by Charles Jacobs, ceramist, who divides his time between the Oregon Ceramic Studio and the Department. Mr. Jacobs conducted his demonstration each evening during the week and on Saturday and Sunday afternoons, when he showed the techniques of "throwing" clay pots and jars on a potter's wheel.

The Portland Chamber of Commerce and the Raw Materials Survey assisted the Department in the preparation of the exhibit at the Exposition. Without the assistance of these organizations the exhibit would not have been possible as the Department has no funds budgeted for such a purpose.

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OREGON MINING ASSOCIATION DRAFTS RESOLUTIONS

The Oregon Mining Association held its annual meeting in Portland on April 21. A series of resolutions dealing with the principal problems confronting the mining industry in Oregon were drawn up and passed including the following:

1. Advocating tariffs for protection of domestic minerals.
2. Urging a change in the policies presently followed by the Munitions Board so that domestic mining would be given a chance to supply materials to the national stockpile.
3. Urging a revision of taxes on the mining industry as recommended by the National Minerals Advisory Council so that the mining industry may survive.
4. Opposing the Bureau of Land Management's proposed legislation for changing the mining laws.
5. Urging compensation for damage and loss to mine owners occasioned by Federal regulation L-208, which arbitrarily shut down gold mines during World War II.
6. Opposing the proposed legislation for a Columbia Valley Administration.
7. Advocating the building up of a strong school of mineral engineering at Oregon State College.

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MONTAN WAX

According to Industrial and Engineering Chemistry, April 1949, the American Lignite Products Company is operating a plant to produce montan wax at Ione, California. This product is extracted from lignite by means of petroleum solvents.

Montan wax formerly was imported from Germany in large quantities but now the California source makes the United States independent of all foreign sources. This wax is used in making polishes, candles, phonograph records, paper sizing, compositions, paints, electrical insulating compositions, adhesives, and various other uses.

The U.S. Bureau of Mines began investigations about 1946 on various United States lignite and subbituminous coal deposits to determine the amount of montan wax extractable. The solvents used were those reported to have been employed by the Germans on their brown coals - namely, either benzene or a mixture of benzene and alcohol.

Results were as follows: Of coal samples tested from Arkansas, California, Colorado, Montana, North Dakota, Oregon, Texas, Washington, and Wyoming, highest yields of extract were from the Arkansas and California samples. Coals from other sources did not yield enough extract to make them practical as commercial sources of montan wax. Higher yields were obtained when using 80 percent benzene-20 percent ethyl alcohol mixture as a solvent than with benzene alone. Slightly higher yields were obtained from samples air dried than dried at 105° C.

Results of petrographic studies on the composition of some of these lignites showed that lignites giving high yields in extractable wax were attrital (composed of minute plant refuse), whereas low-yield lignites were composed mainly of woody tissue.

Yields of extract from air-dried coals, calculated to dry, ash-free coal basis, percent:

	Benzene	80 percent benzene 20 percent ethyl alcohol
Lignitic coals		
Arkansas	8.8 - 10.8	13.6 - 16.6
California . . .	8.2 - 9.9	15.1 - 15.3
Montana	-	2.6
North Dakota . .	1.5 - 2.2	2.9 - 4.5
Texas	2.1 - 2.3	5.6 - 5.7
Washington . . .	2.7	4.4 - 5.7
Subbituminous coals		
Colorado	-	2.6
Montana	-	2.0
Oregon	-	3.0
Wyoming	-	2.9 - 5.4

References: U.S. Bureau of Mines Information Circulars 7518, 7446, and 7417.
Chemical Engineering, September 1949, p. 270.

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DEPARTMENT RECEIVES MINERAL COLLECTION

The Baker Chamber of Commerce has presented the Department with a fine collection of mineral specimens contained in a glass cabinet. These specimens belonged to the old John Arthur collection a part of which had been previously purchased by the Department which now has the complete Arthur collection on display at the Department's Baker office located at 2033 First Street.

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