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MT. HOOD'S VANISHING GLACIERS

by
Ralph S. Mason[1]

Oldtimers who are fond of telling people that "the winters aren't as severe as they used to be . . ." may very well be telling the truth if present glacial activity on Mt. Hood and other continental peaks is taken into consideration.

A small group of Mazamas, led by Kenneth Phillips and accompanied by the writer, spent three days in the latter part of August, this year, on the slopes of Mt. Hood establishing control points by which changes in the mountain's ten ever-shrinking glaciers can be checked by aerial photographs taken each year in the future.

The Mazamas[2], cooperating with other groups engaged in a nationwide study of mountain glaciation, have been measuring Mt. Hood's glaciers for many years. These measurements were made by establishing reference points near the lower end, or snout, of several of the glaciers, and then making careful checks each year. Reference points consist of crosses painted on solidly placed moraine boulders. In addition to checking the relative position of the various snouts, some cross-section surveys of Eliot Glacier were made.

A glacier's terminal velocity, or better, movement (since a rate of speed that is confined to a few feet or inches per year can hardly be said to have velocity) is measured by means of a wire which passes through a device, consisting of a train of gears, which multiplies the movement of the wire many times. One end of the wire is attached to a pin driven into the terminal ice, while a lead weight is attached to the other end which supplies sufficient tension to ensure accurate measurement. A dial with calibrated divisions indicates the linear motion of the ice at the terminus.

The recently completed project will make unnecessary most of the arduous leg work which has been entailed in the annual measurements. Large bright-yellow crosses which will be visible from the air were painted by the group this year and should show up plainly in aerial photographs. Distance and bearing between the pairs of crosses were determined carefully, and these pairs of points will thus serve as a convenient means for measuring the amount of glacial advance or recession. Photographs will be taken late in October, just before the first snow falls and at a time when most of the previous winter's snow has melted away to expose the glacial ice.

The Mazama party found that all of Mt. Hood's glaciers had receded considerably during the past year - continuing a trend of many years' duration. The recession reflects a period of warmer weather and less rainfall which has characterized the climate of North America for the past several decades. A "healthy" glacier is one which receives sufficient new snow each year so that its upper surface remains convex in cross-section. A "dying" or receding glacier is concave or trough-shaped in cross-section. The surface of Eliot Glacier on the north side of Mt. Hood has rapidly become more concave; surveys made three years apart by the Mazamas reveal that the glacier surface in the center sunk 50 feet during that time. The snouts of all the glaciers have receded a great deal, as evidenced by terminal and lateral

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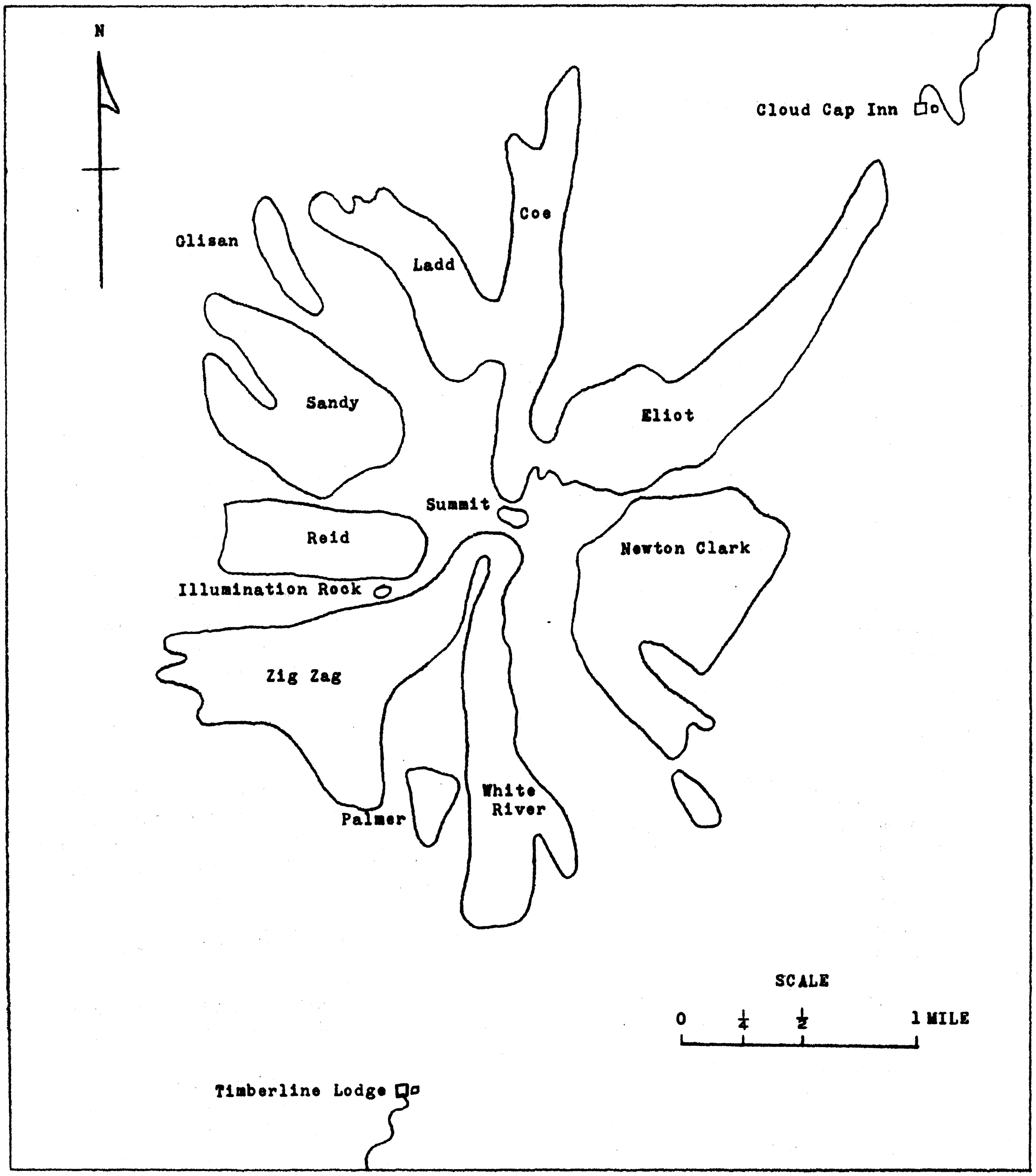
[2]Much of the factual material on glacial movement was obtained from Mazama, official publication of the Mazamas.

PLAN MAP OF THE GLACIERS OF MT. HOOD



moraines which are located far down the valleys from the glaciers. A lateral moraine is a ridge of rocks formed along the sides of a glacier. The rocks are obtained from the valley walls of the glacier and are carried along toward the terminus where they eventually form part of the terminal moraine. A receding glacier leaves both a terminal moraine, which is generally crescent-shaped, and lateral moraines, which are narrow winding ridges of unsorted rocks and debris. Glacial markings on rocks 500 feet above the present surface of Reid Glacier indicate the amount of shrinkage of one of Mt. Hood's now shrivelled glaciers.

The importance of glacial surveys such as those being carried out by the Mazamas becomes clear in the light of these findings. Such research will not influence the rate of recession of the ice nor the climate. However, it does indicate what has happened in the past, what is happening now, and what can happen in the future. Armed with the knowledge of what is happening, man may be better able to cope with the changes that the glaciers forecast.

Glaciers are of four main types: continental, plateau, piedmont, and mountain. During the ice age much of the northern part of this continent was covered by a vast, thick sheet of ice similar to that which covers much of Greenland to a maximum thickness of 8500 feet. Plateau glaciers are smaller than the continental, but are otherwise similar. Piedmont glaciers, such as the Malaspina Glacier at the foot of Mt. St. Elias, Alaska, cover hundreds of square miles but are more or less confined to valleys down which they move to the sea where they form icebergs. A mountain glacier is literally a "river of ice" which has its source high on the slopes of perpetually snow-covered mountains. Its channel is not unlike that of an orthodox river, the principal difference being in the shape of their cross-sections. A glacier "flows" in a manner strikingly like that of a river, passing around large obstacles in its path and re-forming beyond. A glacier moves most rapidly in midstream and even has eddies or countercurrents which "flow" in the opposite direction to the course of the glacier. The termini of most mountain glaciers, however, have little similarity to that of a river. Here the delicate balance between the rate of advance of the ice and the rate of melting and evaporation produces a nearly static condition. A mountain glacier, then, is a body of ice continually in motion but which never seems to get anywhere.

Mountain glaciers depend on an abundance of snowfall on the upper slopes of a mountain for their continued existence. Winter snows slowly become compacted by repeated thawing and freezing, and by the weight of later snows. This compacted snow, called névé, has a granular texture quite unlike the feathery flakes which originally fell on the snow field. Further compaction and burying of the névé gradually changes it into glacial ice. This ice, which forms the bulk of a glacier, moves slowly downward over the rocky slopes which it relentlessly wears away to form a U-shaped valley. A mountain glacier will ultimately destroy a mountain and itself by the removal of blocks of rock both large and small from the walls of the cirque at the head of the glacier. The eating away of the cirque wall eventually consumes the mountain top, causing a reduction in the annual snowfall to a point where the glacier can no longer exist.

A snow covered mountain may be considered to be a gigantic reservoir of water with a very sensitive thermostatic outlet valve. During winter months, when rainfall is abundant over the land, this valve remains closed. The flow of water from the snow fields and glaciers dwindles to a mere trickle. The high elevation, coupled with large heat losses through radiation because of relatively clearer skies, tends to keep most of the snow above the timber line frozen during the winter months. In the summer, however, warmer temperatures open the mountain's thermostatic valve and as the surrounding countryside dries out, water pours down to enter the irrigation laterals, power dams, and myriad other channels man has devised for his well-being. Nature is ever saving of her resources. Should a period of cool weather occur during the summer and the need for water become less, then the mountain obligingly gives the valve a twist to cut down the flow for a time. There is also a fine degree of control over the amount of water a mountain provides owing to the fluctuations in temperature between night and day. These variations are generally small but nonetheless measurable.

Today, the receding tongues of Reid Glacier have uncovered evidence that at one time in the not too distant past the glaciers suffered a shrinking back as profound as that now going on. Several years ago a buried forest was discovered on the ridge dividing Reid and Zigzag glaciers at an elevation of 6200 feet. The trees, now pressed flat and buried by glacial debris, measure from 1 to 3 feet in diameter. The nearest living trees of comparable size now grow far down in the valleys. Evidently the glaciers on Mt. Hood at one time receded until their snouts were far up on the mountain or had even vanished entirely for a time. This shrinkage may have coincided with a period of renewed vulcanism. During this time conditions permitted the growth of the now buried forest, which must have stood at an elevation considerably higher than that where it now lies. Eventually conditions changed. Increased rainfall caused packs to grow in size and the glaciers once again advanced down the mountain, overwhelming the trees, carrying and burying them at a point some distance below where they grew. Dr. E. T. Hodge[3] states that Zigzag Glacier may have continued its advance on past the site covered by the forest as far as Salmon Post Office in the Salmon River canyon, a distance of 12 miles. From that farthest point of advance, Zigzag Glacier, along with all the other glaciers on the mountain, has again receded, not yet as far as it once did but given time and a continuation of present climatic conditions, all the glaciers on Mt. Hood may well become a thing of the past in the not too distant future.

Let us suppose that the glaciers on Mt. Hood <u>should</u> become extinct. What would be the effect on the mountain itself, on vegetation, stream flow, and human life in the area? The mountain would perhaps fare reasonably well, bereft of its snowy coat. A glacier is at best a poor guest on any mountain. It continually plucks and carries away large quantities of rock which comprise the very structure of the mountain itself. Having rid itself of its destructive guest, Mt. Hood would suffer the lesser ravages of spring torrents which, implemented with abundant abrasive material in the form of rocks and sand, would carve V-shaped gullies and canyons in the bottoms of the former U-shaped glacial troughs. Most of the snow fields would also vanish - save for a few months in winter and spring.

From an aesthetic standpoint, Mt. Hood would no longer be the object of beauty it now is. Instead of being a mecca for thousands of mountain sports enthusiasts and lovers of snow-covered mountains, Mt. Hood would deteriorate into a mere pile of stone and ash swept by dust clouds, an attraction to only a few of the hardier "rock hounds". The spectacular glacial displays of huge, fractured blocks of ice and snow which form the bergschrund and seracs present on nearly all of Hood's glaciers would be replaced by jumbled piles of stone which formerly constituted the working tools and burden of the glaciers.

Plant life adjacent to the mountain would be adversely affected. The first botanic disaster to occur would most likely be the disappearance of the "red snow plant" or <u>Sphaerella nivalis</u>, a reddish algae which may be seen on snow fields as pinkish patches. These, when stepped on, turn a climber's footprints a bright red. Vegetation on the slopes of the mountain would tend to dry up since the myriad alpine rivulets and streams would cease to flow. Draughts of air, cooled by passage over snow and ice fields, which formerly tempered the summer weather, would give way to dry hot gusts of wind. Forests would dry out rapidly in the spring and low humidity would permit forest fires to level the wooded slopes. Stream flow from the many glacial streams would decrease to a trickle except during the spring months when uncompacted drifts of the previous winter's snow would melt rapidly, creating torrential conditions during which glacial silt and boulders would be deposited over fertile valley floors. Public utilities using water originating on the slopes of Mt. Hood might find that a glacierless mountain not only would fail to

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[3] Hodge, E.T., Stadter Buried Forest: <u>Mazama</u>, Vol. XIII, no. 12, pp. 82-86, Dec. 1931.

provide a sufficient flow of water during summer months, but that the fine silt carried down in the spring would be injurious to turbine blades by virtue of its abrasive quality. Dust storms would probably plague areas surrounding the mountain since it is composed of large quantities of volcanic ash and cinders which would be left exposed by the disappearance of the snow and ice.

The phenomenon of glacial movement has never been completely understood. The original European theory, that movement was accomplished by means of cracking and re-forming of the ice, has been discarded in favor of the theory of melting caused by pressure (which can be demonstrated) followed by re-freezing. This theory leaves some aspects of glacial flow still unexplained, and the final word is yet to be said on this matter.

How fast does a glacier move? That question is perhaps the one most frequently asked by persons viewing a glacier for the first time. To the uninitiated a glacier appears to be absolutely motionless and incapable of any movement. The presence of numerous crevasses and seracs, which are huge cracks and blocks of glacial ice caused by the ice moving over an uneven portion of its rocky valley, indicates even to the novice, however, that a glacier does move. Anyone who has been on a glacier when the ice suddenly cracked loudly due to strains set up by the slow movement of the ice, can never doubt that a glacier is in motion.

In order to determine just how fast some of Mt. Hood's glaciers do move, the research committee of the Mazamas has made numerous studies during the past 20 years. Eliot Glacier, because of its proximity to a road and because it has the longest ice stream of any glacier on the mountain, has been the most carefully measured. Movement measurements taken at various times reveal that a glacier (1) moves fastest in warm weather, particularly during and after a warm rain, (2) moves most slowly in the winter, and (3) moves more slowly at night than in the daytime. Average advance of the snout over a 6-year period was about 30 feet per year. Reduced to daily movements, this would be approximately one inch per day. Maximum rate of movement recorded amounted to 80 feet per year. Counteracting this forward motion is the removal of the surface ice by melting and evaporation. A receding glacier suffers removal of its terminal ice by these means at an average annual rate which is greater than its advance.

Measurements of the rate of flow of the ice at a point about a mile above the snout showed that the maximum rate of flow was in midstream and amounted to nearly 175 feet per year, or about 6 inches per day. The rate of flow was least near the edges of the glacier where the ice section was thinnest and friction of the rocky walls greatest. As would be expected, the ice moved progressively slower as it approached the snout.

Anyone who, upon peering down into a large glacial crevasse, has wondered what the bottom of a glacier is like, can satisfy his curiosity at Reid Glacier. Reid Glacier on the west side of Mt. Hood now is but a tiny ribbon of snow and ice in the bottom of a large valley gouged out in years past when the glacier was fed by a more abundant supply of snow from the catchment basin reaching almost to the summit of the mountain. At many places the nearly vertical walls of this glacial valley have been polished smooth; in others deep grooves have been cut. The floor is strewn with boulders which have fallen from the walls or have been left behind by the retreating ice. From the headwall, which abuts against Illumination Rock, the last vestiges of the once mighty glacier may be seen poised on the edge of an abrupt ice fall. Every so often, huge blocks of ice tumble down to the valley floor with a deafening roar, then all is still on the dying glacier.

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PLATINUM METALS

Ceiling prices of platinum metals were removed by the Office of Price Administration on April 29, 1946. Thereafter there was much hesitancy and confusion in quoting prices on the refined metals. Effective August 5, quotation on platinum was advanced to $80-$83 an ounce; ruthenium was raised to $70; osmium was normally quoted at $100 an ounce on August 15. On June 27 the quotation on iridium was advanced from $95-$100 to $125, which was $40 less than the OPA fixed price. Quotations on palladium and rhodium remained at $24 and $125 respectively. (Extracted from U.S. Bureau of Mines release on platinum metals September 18, 1946.)

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MINING AND MAIL

by

Lewis A. McArthur

In nearly a century of Oregon postal history, the influence of miners, geologists, and metallurgists has been sufficient to produce almost eighty post office names. Many of these names will be of interest to readers of The Ore.-Bin, and a list of them by counties is given below.

There are a number of intrusions in the list and possibly some omissions. The writer strained a point when he listed Rock Creek, Soap Creek, and Arock. These names have no particular mineral significance, but it is probably better to have them in the record than to leave them out. The fact that Jasper was named for Jasper Hills, a prominent Lane County resident, does not detract from the general interest of the name. Oretown in Tillamook County is a synthetic name with Oregon as a base, so readers need not go there with pick and pan.

Post office names only are included in this list.

Baker County: Chloride, Copperfield, Gem, Gypsum, Lime, Rock Creek.
Benton County: Soap Creek.

Clackamas County: Stone, Sandy.
Columbia County: Pebble.
Coos County: Coaledo, Gravel Ford.
Crook County: Silver Wells.
Curry County: Gold Beach, Sandstone.

Deschutes County: Crater, Lava.
Douglas County: Diamond Lake, Nugget, Ruby, Sulphur Springs.

Gilliam County: Alkali, Gumbo, Lone Rock, Oasis, Rock Creek, Rockville.
Grant County: Court Rock, Galena, Granite.

Harney County: Diamond.
Hood River County: Shell Rock.

Jackson County: Agate, Asbestos, Copper, Gold Hill, Gold River, Prospect, Rock Point, Soda Springs.
Jefferson County: Opal City, Warm Springs.
Josephine County: Golden, Granite Hill, Placer, Slate Creek.

Klamath County: Crystal.

Lake County: Hot Springs, Quartz Mountain, Silver Lake.
Lane County: Jasper, Mineral, Natron, Salt Springs.
Lincoln County: Agate Beach.
Linn County: Diamond, Diamond Hill, Lower Soda, Rock Creek, Soda Springs, Soda Stone, Sodaville.

Malheur County: Arock, Ironside, Rockville, Stone.
Marion County: Argenti, Pyrite, Silver Creek, Silverton.
Morrow County: Salineville.
Multnomah County: Sandy.

Polk County: Black Rock, Salt Creek.

Tillamook County: Oretown.

Union County: Hot Lake, Medical Springs.

Wallowa County: Copper.
Wheeler County: Barite.

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IMPORTANCE OF NEW MINES

(From Pay Dirt, publication devoted to the interests of the Arizona Small Mine Operators Association, September 23, 1946.)

Miners in the United States are gratified, even though not satisfied, to see that some countries appreciate the importance of bringing in new mines. It is reported that the Canadian government plans to continue its policy of encouraging new mines by tax exemptions and that, in the budget that is forthcoming shortly, some special provisions for the benefit of the industry again will be included.

Before the war, new mines were given a three-year exemption from income tax. In the war years, strategic mineral mines were required to pay income tax, but were relieved of the excess profits tax. For 1946 the excess profits exemption was extended to include gold mines.

If, as confidently predicted, the excess profits tax is eliminated in the budget, the government will have to look in another direction to maintain the tax advantage for this vital industry.

This line of Ottawa thinking leads to the conclusion that there will be special reductions in the income tax for the industry, particularly for mines coming into production. Another distinct possibility is that the request of the industry for larger depreciation and depletion allowances will be granted.

Canada seems to understand that mining is the one industry that brings in a new, indestructible and permanent wealth. The only new wealth created in any country is that which comes from agriculture, forests, fisheries, stock raising, and mining. While a few of the products of agriculture and the forests have some degree of life, most of them are quickly consumed. It is the products of the mines which add permanent wealth to the country. Thus there are additional reasons why new wealth from new mines should be encouraged by every means possible. Something is created which stays in circulation indefinitely.

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MINERAL LAND TITLE

The following is taken from the News Letter of the Mining Association of Montana, August 1946:

An interesting land title ruling has been made by Montana Attorney General R. V. Bottomly for Musselshell County Attorney J. M. Watts. The county had taken title to a tax-delinquent mining claim, including surface and underground mineral rights, and sold the surface rights only to a purchaser, who claimed he thought the mineral rights went with his purchase, and that the county had no right to divide the property. The Attorney General said that the county had the right to divide the property. The Attorney General said that the county had the right to divide such land any way it wanted to after the advertised sale date. Under state statutes, Bottomly explained, one party - a rancher for instance - could buy surface rights to that type of land, and another could purchase the mineral rights, with the latter having a lawful right to mine or drill under the surface owned by the rancher.

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"EYE BALL" ASSAY?

We in the mining business have often heard of the "eye ball" assay; now we have an authenticated instance. The United Press sent out the following from San Francisco September 21:

Scientifically, the recent Crescent City gold rush slacked off to a faltering walk today.

The __________Company of San Francisco, one of the nation's leading mineralogy firms, took a look at a sample of red volcanic rock sent to the United Press by one of the "prospectors" and reported: "It contains no trace of gold." (Name of assay firm deleted because of their known reliability and high standing for many years. Ed.)

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BEAVER MONEY AND AN OREGON MINT

The early settlers in Oregon got along without a circulating medium for money. They were self-contained, and barter was used where necessary. As the population increased, however, this lack was felt more and more, and, when the gold came pouring in from California, there was great difficulty for the want of a standard, so that it might be used as a more precise medium of exchange. Also holders of the metal suffered loss by abrasion, etc. The Legislature, which convened early in 1849, determined to do something about this confused condition and passed an act to provide coinage. It allowed $16.50 an ounce for gold of "virgin purity and fineness without alloy". The act also provided for the coinage of 5 and 10 pennyweight pieces. However, the mint did not operate because, before any minting was done, General Joseph Lane, who had been appointed territorial governor by President Polk, arrived and the period of provisional government came to an end.

However, the local needs of the community for coins were supplied in part by private enterprise. Coins of 5 and 10 dollar denominations were issued by the Oregon Exchange Company. On the obverse side these coins bore the figure of a beaver above which were the letters K, M, T, A, W, R, C, S and below was O.T. 1849. The letters are said to be the initials of the names of the men who made up the company---Kilbourn, Magruder, Taylor, Abernethy, Wilson, Rector, Campbell, and Smith. On the reverse side of the coins was Oregon Exchange Company---130 grains native gold, 5 D for the 5 dollar pieces, and 10 pwts., 20 grains, 10 D. on the ten dollar pieces. These coins contained 8% more gold than 5 and 10 dollar pieces of U.S. money and quickly disappeared from circulation when the national money became more common in Oregon, obeying the rule (Gresham's) that inferior money always displaces superior money in circulation.

Later on in the early 1860's when miners were bringing in gold dust in large amounts from the camps of Eastern Oregon and Idaho there was much agitation for a branch U.S. mint at The Dalles. It almost became a reality. The matter is related in the Oregon Historical Quarterly, vol. 25 (1924) under "Reminiscences of Colonel Henry Ernst Dosch" by Fred Lockley, as follows:

> "So much gold dust was coming in that the citizens started an agitation for a mint, and in 1865 Congress appropriated $100,000 and a contract was let for the building of the mint. The rock was brought in from Mill Creek, about five miles from The Dalles. After the first story was completed, Congress decided that the mint at San Francisco was sufficient, and sold the site and building for a song."

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PUMICE PRODUCERS OF CENTRAL OREGON

Mr. Ollie Grub is currently shipping pit run pumice from a deposit on the east side of the Deschutes River near Tumalo.

Mr. Dillon Moore of Bend is shipping pumice from a deposit just south of Bend; shipments are made both to local building-block plants and to California points.

Mr. L. A. Williamson of Bend is operating a custom crushing plant to supply pumice for three concrete-block plants in Bend. Pumice is supplied by Dillon Moore.

Oregon Pumice Products Company of Bend, operated by Waldeen Upp and T. G. Becker, is currently manufacturing concrete blocks using pumice as an aggregate. The blocks and brick are produced with a vibrator-block machine, and present plans call for the erection of a steam drying shed in the near future. Production is limited by the supply of cement which is still difficult to obtain.

Mr. H. W. Christy of Chemult has enlarged the facilities at his plant on the Great Northern Railroad 1½ miles north of Chemult. A bulldozer delivers pit run pumice to a 3/8-inch grizzly with oversize passing through rolls. Gondolas are loaded with a scoopmobile. Mr. Christy plans to enlarge his plant further in the near future.

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