6/46

Bombsight Claim — NAME | OLD NAMES | Opalized Calcite — PRINCIPAL ORE | MINOR MINERALS

T	R	S
23 S	43 E	NE1/4 21

Malheur .... COUNTY

.... AREA

3500 .... ELEVATION

.... ROAD OR HIGHWAY

.... DISTANCE TO SHIPPING POINT

PUBLISHED REFERENCES

MISCELLANEOUS RECORDS

PRESENT LEGAL OWNER (S) ... R.D. Lytle ... Address ... Vale, Oregon ...

Chas W Swan ... " " ...

....

....

OPERATOR ....

Name of claims	Area	Pat.	Unpat.

Name of claims	Area	Pat.	Unpat.

EQUIPMENT ON PROPERTY

MI-21

State Department of Geology and Mineral Industries

702 Woodlark Building
Portland, Oregon

BOMBSIGHT CLAIM (Optical Calcite) Malheur County

Owners: R. D. Lytle and Charles W. Swan of Vale, Oregon

Location: Two miles south, and a half mile west of the point where the Watson Road crosses Dry Creek, on the north side of the second right hand canyon near summit in the NE¼ sec. 21, T. 23 S., R. 43 E. The property is 41 miles south of Vale, 46 miles southwest of Nyssa, of which 35 miles is over unpaved roads.

Area: One lode mining claim.

History: This general area had a small boom about 15 years ago. It did not amount to much and there is no record of production. Wagner[1] visited this general area and made a reconnaissance of the various calcite occurrences on April 9, 1943. After a brief study, he recommended that exploration at depth be attempted since there was an apparent improvement in crystal grade with increase in depth. Lowry[2] subsequently visited these calcite localities in May 1943 and did some shallow digging at several points on the veins. His trenching, which extended to a depth of 2 or 3 feet below the surface, seemingly bore out Wagner's contention in that there was an apparent improvement in crystal grade immediately below the surface. Following publication of Lowry's report in August 1943, about half a dozen claims were hurriedly located on open ground in this area, but other than this no exploration or development work has been attempted. Due to the fact that the war effort is critically short of optical grade calcite and owners of the various claims were apparently unwilling or unable to operate their holdings, the Department decided to take the initiative and determine whether or not any material of optical grade was available, particularly at depth. A crew of 5 men set up camp on February 15 and spent a

1 Wagner, N. S. "Iceland Spar Claims," G.M.I., April 9, 1943
2 Lowry, W. D., "Calcite Occurrences near the Owyhee Reservoir, Malheur County," June 1943.

month on the ground conducting surface reconnaissance and underground exploration. Following a careful scrutiny of the numerous outcrops of calcite in the area south of Dry Creek, it was decided to explore farther the best looking occurrences on ground which offered the greatest opportunity for digging both a shaft and drift. The claim selected was the "Bombsight" claim, held by the Messrs. Lytle and Swan of Vale, Oregon. This property lies at least 500 feet above the floor of Dry Creek Valley and is reached by a rough road constructed by the Department 1-3/4 miles long from the end of the road leading to the Iceland Spar claims, No. 1 and No. 2. Another factor in selecting the Bombsight claim was that it was the only claim suitable from a geologic standpoint on which the Department was able to obtain permission to carry out its program. Several of the other claims in this area were either under lease or option, so that ready permission to enter on the ground was not obtainable.

Topography, Climate, etc.: Elevation of the property is about 3500 feet. Elevations in the district as a whole range from 2500 to 3500 feet. The area is composed, for the most part, of flat-topped mesas covered with basaltic flows which are cut up by steep-walled canyons, 500 or more feet deep. Crossing the area are numbrous creek beds which are dry except for periods during cloudbursts, when they may rise considerably. Rainfall in the area probably is not in excess of 15 inches annually and is largely confined to the winter months. A considerable portion of the winter precipitation occurs as snowfall at the higher elevations.

Development Work: Development work done by the Department consisted of sinking a shaft and driving a drift on two of the three veins cropping out on the claim. An open cut approximately 6 feet wide by 18 feet long, which exposed both sides of the nearly vertical vein 18 inches wide at the surface was converted into a shaft when a depth of 6 feet was reached. As the shaft deepened, work was confined to the footwall side, leaving the vein in place. The shaft was bottomed at 20 feet and had been decreased in cross-section to about 3 feet wide and 6 feet long. At a point on another vein which outcropped about 150 feet south of the shaft and 40 feet below it, a drift was driven along the hanging wall for a distance of 15 feet from the face of an open cut 8 feet deep. Several other small open cuts were also dug at various points in the general vicinity, but none of them extended more than 3 feet below the surface. Approximately 55 tons of calcite was exposed in all the places worked.

Geology: The geological relationships of this area have been described by Lowry*.

Briefly, the area consists of flat-lying beds of sedimentary material probably of lake origin which are in part capped by basaltic flows. Veins and veinlets of calcite having a nearly vertical dip cut through the lake beds in numerous places, and have a northwest trend, extending in some places for as much as half a mile before either pinching out or disappearing under overburden. A few minor veins had a north strike. Widths of the veins are from a few inches to as much as 20 or more feet although normally about 1 to 2 feet.

The lake bed material weathers to a soft fine soil on exposure but changes rapidly to a tough, resistant mass at depth and is firmly cemented by inclusions and veinlets of calcite next to the vein. There are also occasional cobbles, pebbles, and some fossil material such as tree limbs, fish bones, and snails.

The calcite in the veins explored was of a remarkable degree of purity for the most part. The calcite tended to be a solid mass with but few inclusions of foreign material although certain areas along the vein were only cemented masses of lake bed material which apparently had sloughed into the fault. Generally the vein made a sharp contact with the lake beds but, as noted above, there was some impregnation of the bedrock. At the point selected for sinking the shaft,

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*Lowry, W. D., Op. Cit.

a solution channel was found in the center of the vein. This channel, ranging in diameter from a tiny aperture to an opening of 16 or 18 inches, was open for the most part, and extended from the surface down to at least the bottom of the shaft, and apparently continued on to a somewhat greater depth. Fracturing was common in the upper portions of the vein where frost action prevailed, but disappeared with depth. There seemed to be no systematic disposition of the water-clear portions in the vein. Often perfectly clear material was found adjacent to opaque material of no value whatsoever with no gradation apparent. In other places the calcite slowly changed from very impure material to that which was perfectly clear. In general the central portions of the vein tended to be purer than that along the walls. This was evidently caused by the covering up of the walls of exposed lake bed material with layers of calcite, thus permitting later solutions to travel upwards through calcite-coated channels which imparted little or no extraneous material to the crystallizing fluid. One of the objectives of this investigation was to determine if possible whether or not there was an improvement in the calcite with depth. As far as it was possible to determine in the field, there was no such improvement. Perfectly clear material was found at the surface of the vein where it had been subjected to weathering for a considerable time, although this material was of much too small a size to be of optical use. At depth perfectly clear material was also obtained which had a somewhat greater size but it likewise was still too small. All of the pieces larger than one-half inch on a side found in any of the veins explored contained physical imperfections such as twinning and fracturing, but this does not mean to say that suitable material in marketable sizes cannot be found. Inasmuch as the calcite veins must necessarily extend to considerable depths, any difference in grade of the vein material, barring purely surface effects, between two points separated by only 20 feet vertically would probably be negligible. In other words, a shaft sunk to a depth as great as 100 feet would very likely fail to show any marked change in the vein.

After the completion of the project it was learned that the bulk of optical grade calcite currently being produced in the United States and Mexico is obtained from vugs occurring in calcite veins rather than from the solid portions of the vein itself. Although this is undoubtedly true, it is felt that in the Malheur County deposits there is a distinct possibility of finding good grade material in the solid portions of the vein as well as in vugs.

Mining: The fragile nature of optical calcite requires that any mining operation must be carried on without the use of explosives near the vein, any sharp blows or heavy strains applied to the vein, or any other operations which might cause internal fracturing in the rhombs. For these reasons, slow hand methods are indicated, although one operator in Montana writes that the use of air-driven paving breakers and chippers is permissible and effective. Where possible a bulldozer might help in removing overburden, although the nature of this particular ground is such that this might not be efficient. Once the calcite has been exposed the next problem is to locate areas along the vein where vugs or cavities occur. These spots are likely to produce better material than the solid portions where fracturing and twinning are common. It should be pointed out that vugs differ from solution channels, in that crystals lining the walls of the latter are likely to have suffered from re-solution from surface waters, while those forming the walls of vugs are less likely to be deformed. Solution channels were fairly common in the veins examined but no true vugs were found, and although this does not preclude their existence, it does indicate that they might be few and far between. The removal of material from the walls of a vug should be a fairly simple operation, although if the vein adjacent to the vug is solid and has a thickness of 1 or more feet, it presents a serious obstacle to the removal of unflawed material. The use of holes filled with quicklime to which water is added has been suggested as a means of prying out chunks from the vein. This method would appear to be slow and would be confined to down-holes. The use of a quarry saw might prove effective, although no instances of its use are known. The Montana operation is currently using 17 percent powder and the use of a 4 percent black powder is contemplated as an experiment. While sinking the shaft, the first five feet was put down entirely with picks and moils. This was exceedingly tedious and it was decided to use light charges of powder, usually a half stick of 7/8 inch, 40 percent gelatin, to speed the work. Great care was exercised in placing the shots so as not to damage the vein. Due to the nature of the ground and the smallness of the charge, most of the holes bootlegged, or broke little ground. A considerable amount of the vein was removed from the shaft and much of this material was subsequently broken up into chunks not larger than 10 pounds. Reducing these chunks was time consuming and often resulted in irregular breakage due to twinning. Techniques used in this process consisted for the most part of attempting to cleave along apparent cleavage faces with either a stout knife blade and hammer or a wide-bladed wood chisel. Considerable stress and shock was necessarily transmitted to the blocks and the need for some better means of reduction was indicated. All cleavage rhombs obtained from these blocks tended to be of the order of an inch or slightly larger on an edge and even these small pieces contained numerous visible cleavages, clouds, or showed evidences of incipient fracturing. As the work progressed careful observation was made of the vein material and, as far as could be determined, it was difficult, if not impossible, to differentiate between portions of the vein containing good and bad material without actually breaking the calcite up into small pieces first. Cloudy or badly fractured material closely resembled the clearer portions while still in place.

<u>Economics</u>: The economics of mining and producing calcite of optical quality is quite different from that pertaining to normal mining operations. Since the likelihood of finding optical grade material is largely confined to the areas adjacent to vugs and other voids, it follows that the vugs must be located first and this is a hit and miss proposition since they apparently have no relationship to faults, solution channels or other geologic factors. In this respect the mining of calcite resembles that of hunting for gold pockets. Since no optical grade material has yet been found in the deposits in Malheur County, no estimation of the amount of suitable material that might be obtained per ton of vein material mined is possible. The optical calcite properties located in California and Mexico have reportedly yielded from 1 to 13 percent suitable material. Taking one-half of the lowest figure as a hypothetical yield for the Malheur deposits and assuming that the material obtained brought an average price of $7.00 per pound, a return of $70.00 a ton is indicated. However, for every ton of such material mined there may be several hundreds of dollars expended in hunting for it and preparing to mine it. It must be emphasized that the above figures are for purposes of illustration only. Some vugs have produced as high as 900 pounds of salable material.

From the above it will be seen that it would be idle to try and estimate the tonnage of calcite that could be mined per man day, and hence any estimate of mining costs is impossible.

Such a venture is decidedly a gamble since it would be impossible to predict recoveries in advance and the nature and extent of the mining operation would be largely dependent on the showings from day to day.

Any mining operation which would extract material of optical grade only would be faced with a good many serious obstacles. In the first place optical grade calcite cannot stand any jarring or strain during mining. The nature of the lake beds is such that they cannot be worked efficiently by hand methods alone. Some types of power equipment such as air-driven paving breakers or moils might prove satisfactory. The veins, too, are tough and resistant and where more than a foot thick present a difficult problem in breaking them up into small pieces. A few natural cleavage or fracture joints were found near the surface of the vein but with depth the vein is uniformly solid and nothing short of a stone quarry saw would seem to be suitable for cutting it up.

The present demand is for rhombs at least an inch and a half on an edge and having very minor or no impurities, either visible or invisible to the unaided eye. Basal twinning is not objectionable, but all other twinning is. As mentioned above, all the cleavage rhombs seen either in the vein or actually recovered were much smaller than an inch and a half, and all contained visible defects. Another disadvantage lies in the fact that this material will be needed in quantity for the duration only and might become relatively worthless once the wartime consumption has ceased. These veins occur in a remote area and some difficulty might be experienced in maintaining a suitable camp and crew at the present time. The use of miners familiar with standard mining practices would require re-educating them in the careful handling of this material, since one misplaced blow could conceivably destroy several hundred dollars worth of rhombs.

On the other hand, there are certain advantages which an operation of this type possesses and which might be great enough to offset the disadvantages mentioned above. There would be no transportation expense since the marketable material would be of such small bulk. Also there would be no assay charges or delays in payments since delivery would probably be made to an agent in the nearest town, at which time material would be graded and payment made. Prices range from $5 to $50 a pound depending on the size and purity of the rhombs. However, these prices are for material used for Nichol prisms, while rhombs used for military purposes bring only $6 to $8 a pound.

TABLE 1

VALUES FOR RHOMBS OF VARIOUS SIZES AND PRICE RANGES

Size Of Rhomb	Wt. Lb.	$5.00 Lb.	$6.00 Lb.	$7.00 Lb.	$8.00 Lb.	$9.00 Lb.	$10.00 Lb.
1½"	.33	$ 1.65	$ 1.98	$ 2.31	$ 2.64	$ 2.97	$ 3.30
2"	.78	3.90	4.68	5.46	6.24	7.02	7.80
2½"	1.52	7.60	9.12	10.64	12.16	13.68	15.20
3"	2.64	13.20	15.84	18.48	21.12	23.76	26.40
3½"	4.18	20.90	25.08	29.26	37.62	41.80	45.98
4"	6.24	31.20	37.44	43.68	49.92	56.16	62.40
5"	12.22	61.10	73.32	85.54	97.76	109.98	122.20
6"	21.10	105.50	126.60	147.70	168.80	189.90	211.00

Table No. 2 shows the number of rhombs of various sizes per ton required to return $30.00 per ton of calcite mined. The figure of $30.00 per ton is used since it might possibly approximate actual mining costs, although as stated above it is difficult to estimate accurately costs of mining and preparing the rhombs.

TABLE 2

NUMBER OF CALCITE RHOMBS PER TON REQUIRED
TO RETURN $30 PER TON OF MATERIAL MINED.

Size	Wt. Lb.	$5.00 Lb.	$6.00 Lb.	$7.00 Lb.	$8.00 Lb.
$1\frac{1}{2}$"	.33	18.18	15.15	12.99	11.36
2"	.78	7.69	6.41	5.49	4.81
$2\frac{1}{2}$"	1.52	3.95	3.29	2.82	2.47
3"	2.64	2.27	1.89	1.62	1.42
$3\frac{1}{2}$"	4.18	1.43	1.20	1.02	0.78
4"	6.24	0.96	0.80		

From a study of Table 2, it will be seen that only a very small portion of the material removed needs to be salable. For material worth $5.00 per pound only .3 percent of the calcite mined must be of optical grade, to yield $30.00 per ton, with proportionately smaller amounts for higher grade or larger sized rhombs.

Although the mining operation itself would be slow and tedious there would be little or no expense for timbering since the ground stands well and the aridity of the region would permit year around operation. Since there are any number of outcrops of calcite in this general area it is likely that mining operations would not be carried to a very great depth since it would probably be cheaper to move from point to point on the surface and confine operations to a shallow depth instead. Priorities for materials of all sorts would be the highest available and the full cooperation of the various Government agencies could be expected since optical grade calcite is one of the most critical of the raw materials needed in the war effort today.

Report by: R. S. Mason

Date: May 9, 1944