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EDWARD WISSER
MINING GEOLOGIST
533 CALL BUILDING
SAN FRANCISCO
TELEPHONE GArfield 4676

January 9th, 1942.

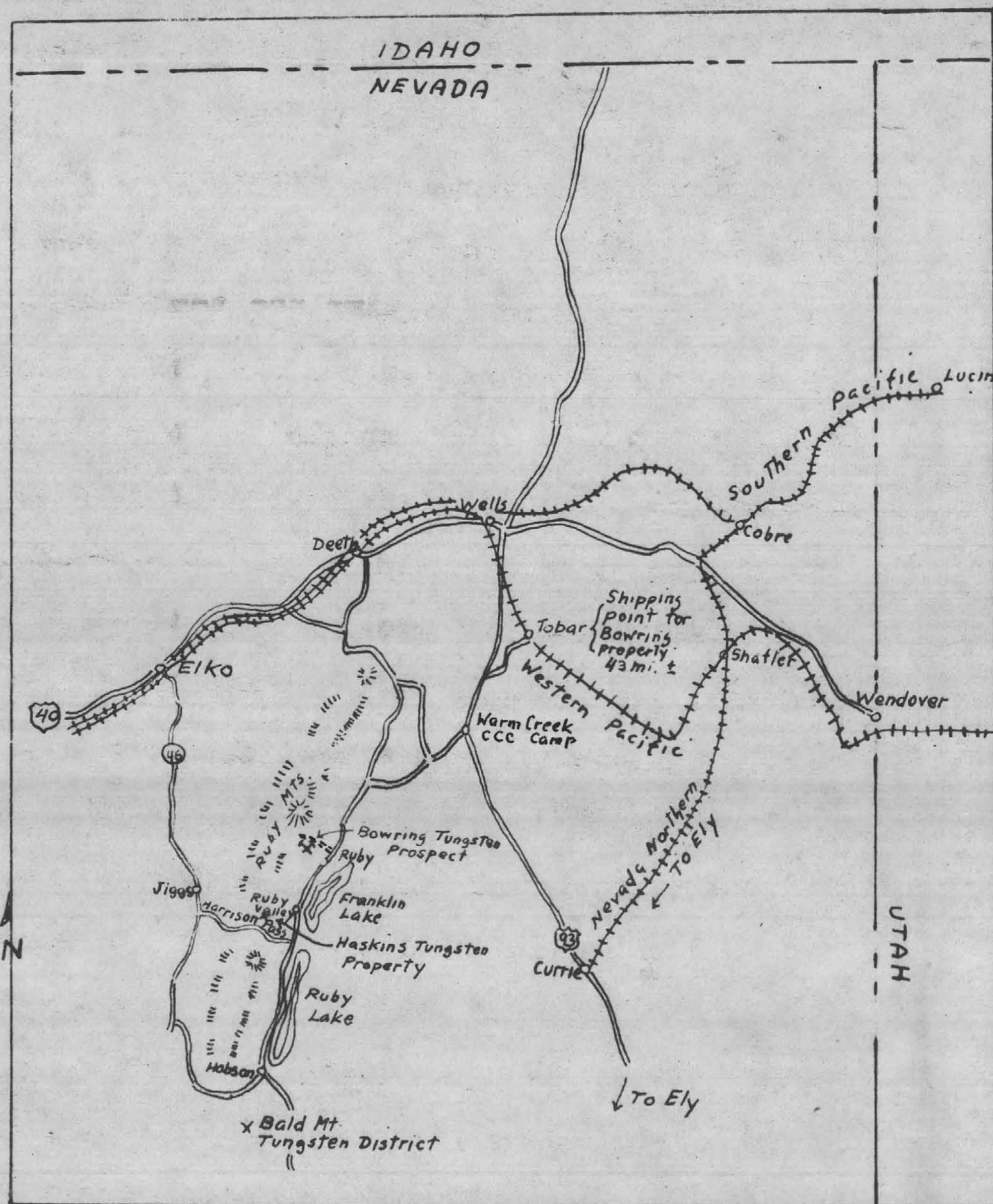
Mr. John A. McDonald,
912 Russ Building,
San Francisco, Calif.

Dear Sir:

Pursuant to your request, I have made a preliminary examination of the Bowring tungsten prospect, in the Ruby Mountains, Elko County, Nevada, and submit herewith a report on this examination.

Yours truly,

Edward Wisser



PORTION OF N.E. NEVADA

SHOWING BOWRING TUNGSTEN PROSPECT, ROADS, RAILROADS ETC.

0 10 20 30 40 mi.

PRELIMINARY REPORT ON THE BOWRING TUNGSTEN PROSPECT,

RUBY MOUNTAINS, ELKO CO.,NEVADA.

INTRODUCTION.

The writer visited the property on January 2nd and 3rd, 1942. It lay under one to four feet of snow (see photos), snow was falling much of the time,the temperature was around zero,and a strong wind blew across the ridges. The cuts, small shafts etc. were full of snow, and exposures generally limited to prominent outcrops,many of which were surrounded by impenetrable snow drifts. No adequate picture could be gained under such conditions. I was able to see enough to recommend further investigation; but the tentative ideas outlined below are liable to radical change when the snow clears off and a real look can be had at the country.

LOCATION. ACCESSIBILITY. CLAIMS. OWNERSHIP.

Refer to map of N.E. Nevada facing this page. The property lies within Battle Creek canyon. Battle Creek,said to carry water the year round,heads under the high crest of the Ruby Range and flows east to disappear under the wash of Ruby Valley, a closed desert basin. Elevations near the property vary from 6000' in the Ruby Valley near the mouth of Battle Creek canyon, to 8000' just above the Bowring claims. The climate is therefore somewhat severe, with more or less snow on the ground from December to May. However, the snow pack tends to reach a certain moderate thickness and maintain it; I am told the property has now as much snow upon it as it should ever get.

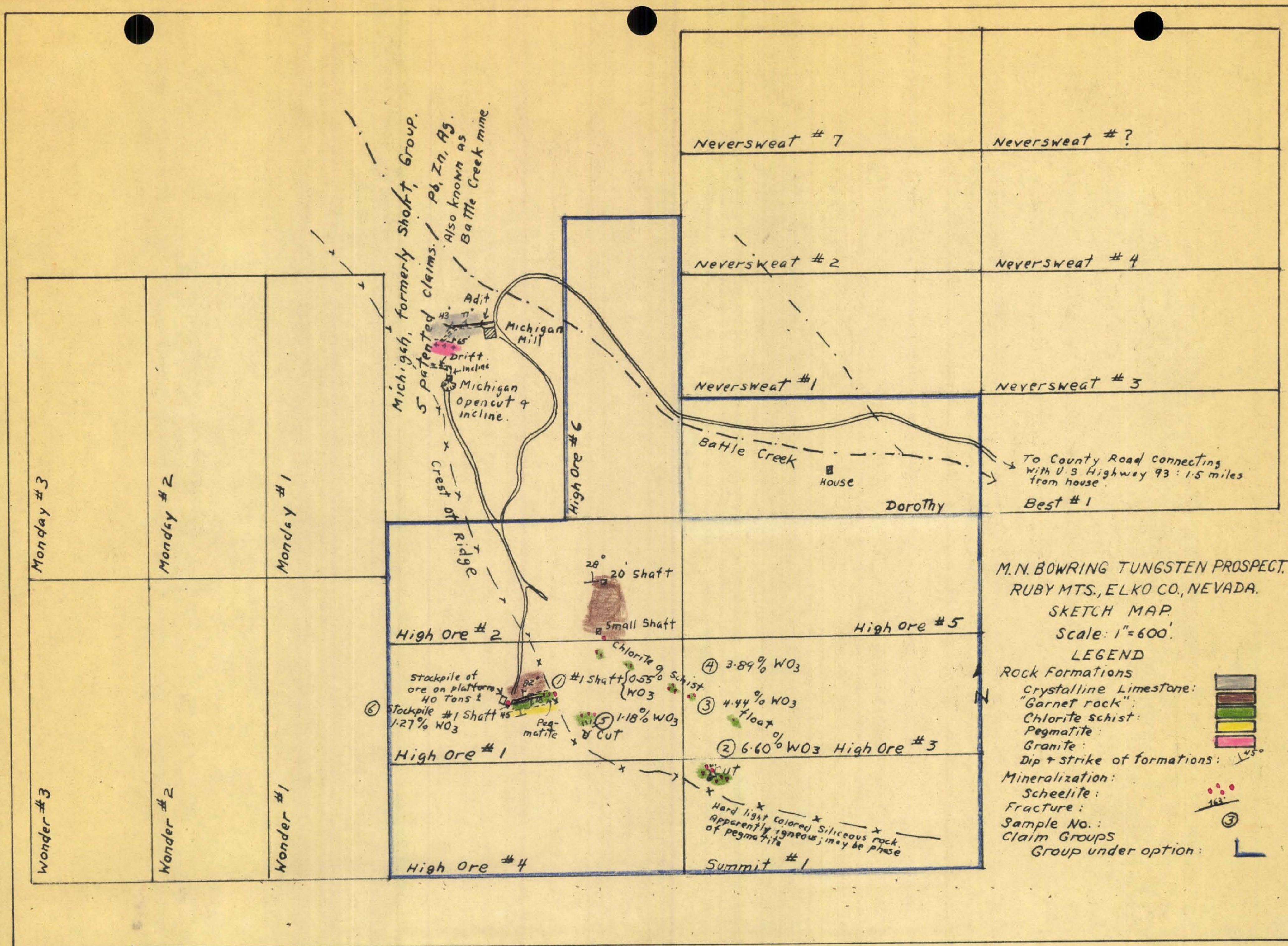
The property is reached from Wells,on U.S.Highway 40 and on the Southern and Western Pacific Railroads, by driving south on

U.S. 93, a surfaced highway, to a point a mile or so south of the Warm Creek C.C.C. camp, thence southwest by unsurfaced county road to the mouth of Battle Creek, from which a private road leads to the property. There are practically no grades to the mouth of Battle Creek. The road from there to the property, along the north slope of Battle Creek canyon, follows a uniform grade to the Michigan mill (see Sketch Map facing page 3), climbing perhaps 1000' in 1.5 miles (12.5% average grade). This road was closed to cars at the time of my visit, on account of snow; but it could easily be kept open throughout the winter. The county road connecting this road with U.S.93 is a mail route and is supposedly kept open all winter.

The property under option consists of 8 contiguous mining claims recently located by Mr. M.N.Bowring of Ely, Nevada. The group is shown outlined in blue on the Sketch Map. The remaining claims shown on the map have, I understand, also been located by Mr. Bowring and some associates, and could presumably be aquired. The Michigan group of 5 patented claims do not run north-south or east-west as do the recent unpatented claims; they impinge to an unknown extent on the later claims, and being patented, have priority.

GENERAL GEOLOGY.

The Ruby Range consists mainly of Paleozoic beds of limestone, quartzite and dolomite, intruded, and generally metamorphosed, by highly irregular bodies of pegmatite and granite. The metamorphism is shown by crystallization of limestone, and by the extensive development of the so-called contact metamorphic silicates, such as diopside, garnet, vesuvianite etc. During or preceding this complex intrusion and metamorphism, the beds were folded into a number of



M.N. BOWRING TUNGSTEN PROSPECT.
RUBY MTS., ELKO CO., NEVADA.
SKETCH MAP.
Scale: 1" = 600'.
LEGEND
Rock Formations
Crystalline Limestone:
"Garnet rock":
Chlorite schist:
Pegmatite:
Granite:
Dip + strike of formations:
Mineralization:
Scheelite:
Fracture:
Sample No.:
Claim Groups
Group under option:
Michigan, formerly Shaft Group.
5 patented claims. Pb, Zn, Ag.
Also known as Battle Creek mine
Adit
Michigan Mill
Drift
Incline
Michigan Opencut & incline.
Crest of Ridge
Battle Creek
House
To County Road connecting with U.S. Highway 93: 1.5 miles from house.
Neversweat #7
Neversweat #?
Neversweat #2
Neversweat #4
Neversweat #1
Neversweat #3
High Ore #6
Dorothy
Best #1
Monday #3
Monday #2
Monday #1
Wonder #3
Wonder #2
Wonder #1
20' Shaft
Small Shaft
High Ore #2
High Ore #5
Chlorite schist
Stockpile of ore on platform 40 Tons ±
① #1 Shaft 0.55% WO3
④ 3.89% WO3
③ 4.44% WO3 float
⑥ Stockpile 1.27% WO3
#1 Shaft
Pegmatite
⑤ 1.18% WO3 & Cut
② 6.60% WO3
High Ore #3
High Ore #1
Cut
Hard light colored siliceous rock. Apparently igneous; may be phase of pegmatite
High Ore #4
Summit #1

anticlines and synclines. This deformation and intrusion presumably took place toward the close of the Jurassic, or at about the same time as similar but large-scale deformation and intrusion occurred in the Sierra Nevada region. A long time afterward, during the middle and late Tertiary, the range as a whole was uplifted along two great north-south faults that bound it on the east and west, to form what is known as a basin-range.

Mineralization in the Ruby Range.- Regions of deformation and intrusion by granitic rocks are apt to be regions of ore deposits. The Ruby Range is no exception, but so far, no important mine has been discovered within it. The Michigan, Short or Battle Creek mine, shown on the map facing this page, produced a little lead-zinc silver ore from a lens of contact-metamorphic silicates along a contact between granite and white crystalline limestone. (Granite and limestone shown on map; geology is from adit, not surface). A similar deposit was mined at the Friday mine, just north of Battle Creek gulch near its outlet. (James M. Hill: Notes on Mining Districts in Eastern Nevada. U.S. Geological Survey Bulletin 648 (1916), 59-62).

The Bowring find is not the first discovery of scheelite in the Ruby Range. Hill, in the paper cited, describes the Haskins scheelite property (location shown on map facing p.2) and Frank L. Hess and Esper S. Larsen (Contact-Metamorphic Tungsten Deposits of the United States, U.S.G.S. Bulletin 725, 1922, 304-307) describe scheelite deposits near Harrison Pass and in the Bald Mountain district at the south end of the range.

GEOLOGY AT BOWRING PROSPECT.

Sediments, mainly limestones, strike east-west and dip north, at flat to steep angles. Large and small masses of pegmatite intrude these beds, together with even larger masses of a siliceous rock not typical pegmatite,but probably allied to that rock type. (Some of this may be quartzite). Fine-grained biotite granite occurs in scattered areas: as a small tongue in the pegmatite mass at No.1 shaft; as tongues in crystalline limestone,and probably as a larger mass,in the Michigan adit and in the footwall of the Michigan incline; at the Friday mine.

The sediments have been extensively altered by emanations connected with the pegmatite and granite intrusions.Some of the limestone has been recrystallized,with development of minor contact-metamorphic silicates (Michigan adit); other beds of limestone,probably less pure, have been changed to aggregates of dark silicates,x which include grossular garnet, diopside, vesuvianite,clinozoisite, zoisite and epidote. These are the typical accompaniments of contact-metamorphic tungsten deposits. (Bishop district, California; Mill City, Nevada). What looks like a well-defined belt of chlorite schist outcrops along the north slope of the main ridge south of Battle Creek,in the High Ore No.1, High Ore No.3 and Summit No.1 claims. (See Sketch Map facing page 3). A belt of "garnet rock" (limestone altered completely to the dark contact-metamorphic silicates mentioned) lies on the north side of the chlorite schist;on the south side, the rock is in places pegmatite (No.1 shaft),in places the siliceous, supposedly allied rock mentioned. In places the rock within the belt of chlorite schist is not schistose,but looks like hornfels (shale baked and altered by igneous action). This hornfels(?) contains large garnets.

<u>Mineralization.</u>- The Michigan lead-zinc-silver mine has been briefly described. In addition to these metals,the region shows considerable scheelite (calcium tungstate,$CaWO_4$). The "garnet rock" and pegmatite appear to be nearly barren of this mineral,the granite

and crystalline limestone entirely so. The scheelite occurs typically, and almost exclusively, in the chlorite schist, as grains and small masses, and as veinlets cutting across the schistosity. Six samples were taken by Mr. Robert Hall, during his initial visit to the property last December. They are shown on the map facing page 3, and described in the following list:

Sample List.

No.	Location.	Description.	%WO3.
1.	No.1 Shaft.	W side of shaft, vertical cut from collar 7' down. Chlorite schist with epidôte & sericite. Scheelite as aggregates of grains in the chlorite schist. Garnet rock pieces are barren. Sparse small grains of galena, sphalerite and pyrite in the chlorite schist.	0.55
2.	7' trench, bottom of cut in Summit No.1claim.	Chlorite schist with flat-lying lenses of pegmatite. Most of scheelite in veinlets. Tungsten lamp suggests assay too high.	6.60
3.	Outcrop near W end, High Ore No. 3 claim.	Chlorite schist with considerable scheelite as grains and masses.	4.40
4.	Outcrop, down slope from No.3.	Chlorite schist. Grains, small masses, short irregular veinlets of scheelite.	3.89
5.	Cut, High Ore No. 1 claim.	Nearly black, dense, altered rock, probably hornfels, containing garnets. Sparse but relatively large blebs of scheelite.	1.18
6.	Stockpile, No.1 shaft.	Mostly chlorite schist, with large hematite cubes, probably after pyrite. A few pieces suggest a porphyritic igneous rock. Blebs and grains of scheelite in the chlorite schist.	1.27

These samples make the property of interest. Work with the tungsten lamp roughly checks the assays, except for No.1, the assay of which looks a bit high. Note that the 3 lowest assays have the least chlorite schist. On the basis of present data, the schist is the key to the situation. If the chlorite schist is merely some fringe phenomenon around the irregular masses of pegmatite, the Bowring prospect probably has little value, because the scheelite will be too sporadically distributed to make ore. If, however, and this looks more likely, the chlorite schist is derived from hornfels, which in turn was derived from a formation of impure shale, then the property looks of interest, for the following reasons:

First, the supposed hornfels is, nearly everywhere exposed, altered to chlorite schist, and the schist, as far as could be seen in the snow, nearly everywhere carries scheelite. A belt over 1000' long of such scheelite-bearing schist is suggested. To the west, in the High Ore No.1 claim, this supposed belt seems to be pinching out between garnet rock on the north and pegmatite on the south (at No.1 shaft); but to the east, in the Su mmit No.1 claim, the belt may be 50' wide, and there may be two parallel belts here, judging by the float. Second, beside the suggestions of continuity seen on the surface, the fact that this schist appears derived from a sedimentary formation (shale) offers promise of continuity along the strike and in depth. Third, the Ruby Range has only recently, in a geologic sense, been uplifted. Erosion has had relatively little opportunity to cut into it. The exposed masses of pegmatite and fine-grained granite suggest larger masses of granite below (such as are typically associated with contact-metamorphic tungsten deposits), with a corresponding increase, with depth, in the intensity of contact-metamorphism, and, quite possibly, of scheelite as well.

CONCLUSIONS. RECOMMENDATIONS.

Scheelite is exposed widely on the Bowring property, and notably in what appears to be one or more bands of chlorite schist, apparently derived from shale intercalated within the limestone making up the bulk of the sediments exposed in the area. Nothing can be said, on the basis of the few samples taken, regarding the grade and tonnage of what ore there is in sight; but the property clearly merits more detailed examination, in spite of the fact that earlier exploration for tungsten in the Ruby Range elsewhere than in Battle Creek proved disappointing.

The chlorite schist band, on the north slope of the main ridge south of Battle Creek, seems to dip gently north, more or less with the slope. The slope of the ridge is relatively gentle (see photos); this particular band of chlorite schist, then, could apparently be well explored by bulldozer. Such a method of exploration would not only clear off the snow and give a look at the showing; it would clear off the float and talus underlying the snow as well. Judging from the pieces of scheelite-bearing float seen in the snow, such an operation might produce considerable ore to begin with, and at the same time tell whether the scheelite-bearing formation is really rather flat-lying, as now appears, or whether it has some other structure. At the No.1 shaft the ore lies between two well-defined steep slips, and it may be that such fractures furnish the chief ore control rather than the flat-lying, supposed formation of metamorphosed shale. It is of the utmost importance to know this.

Whether after bulldozing operations have cleared off the snow and talus, or after the snow has melted, this property should be given thorough study and sampling. In my opinion, it has decided possibilities as a producer of tungsten.

San Francisco, Calif.
January 9th, 1942.

Edward Wisser.
Mining Geologist.

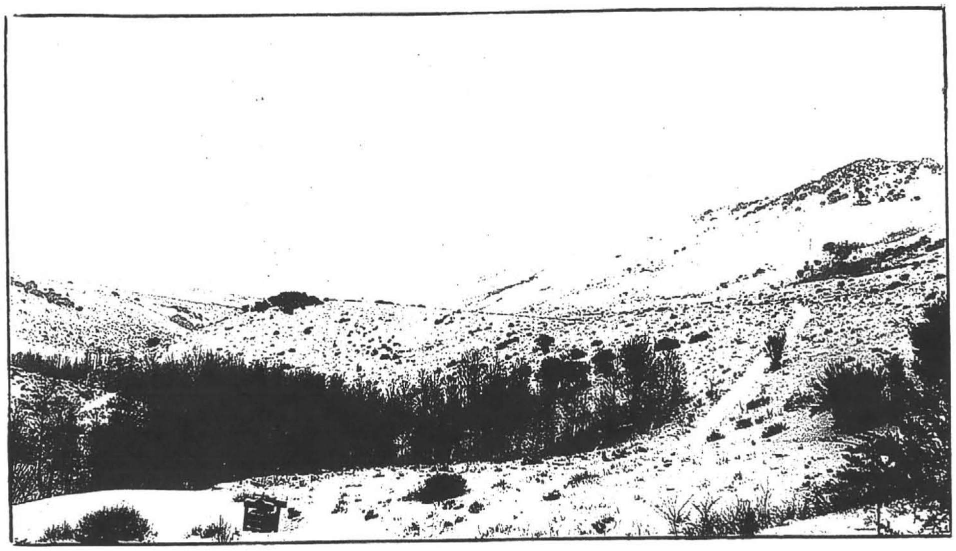


Photo 1. Looking east down Battle Creek Canyon from vicinity of Michigan mill. Ridge in right background is that bearing the scheelite showings. Flat, lower ridge in center, belt of "garnet rock."

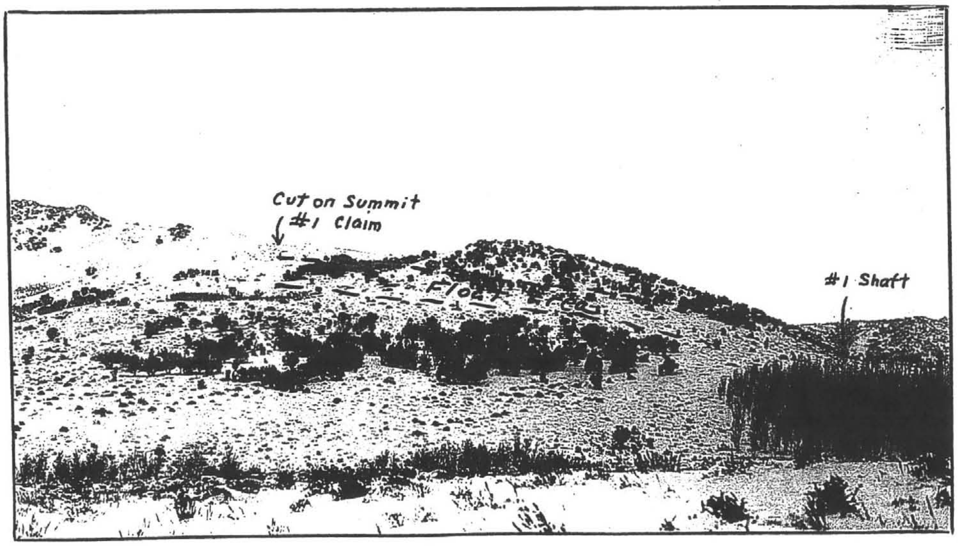
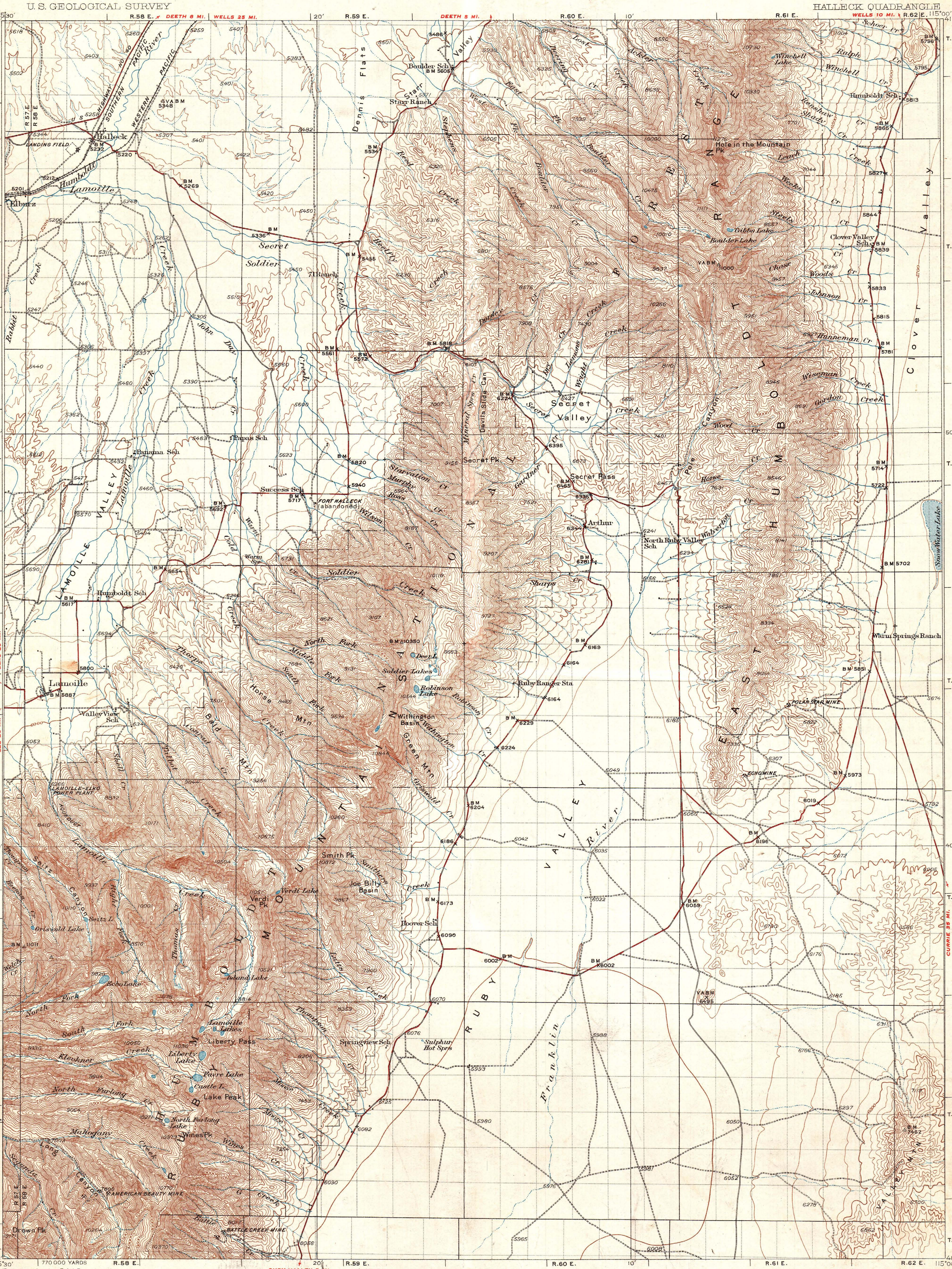


Photo 2. Looking south at scheelite ridge. Main scheelite float area marked by treeless band between trees on crest and band of trees in middle background, extending from No. 1 shaft past cut on Summit No. 1 claim.

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

NEVADA
(ELKO COUNTY)
HALLECK QUADRANGLE



Topography by R.W. Burchard
Control by U.S. Geological Survey and U.S. Coast and Geodetic Survey
Surveyed in 1930-1931

APPROXIMATE MEAN DECLINATION, 1931

Scale 1/125000

1 ½ 0 1 2 3 4 5 Miles

1 ½ 0 1 2 3 4 5 Kilometers

Contour interval 100 feet
Datum is mean sea level

Polyconic projection. 1927 North American datum
5000 yard grid based upon U.S. zone system, F

HARD IMPERVIOUSLY SURFACED ROADS
OTHER MAIN TRAVELED ROADS
1935

HALLECK, NEV.
Edition of 1935

THE TOPOGRAPHIC MAPS OF THE UNITED STATES

The United States Geological Survey is making a standard topographic atlas of the United States. This work has been in progress since 1882, and its results consist of published maps of more than 42 per cent of the country, exclusive of outlying possessions.

This topographic atlas is published in the form of maps on sheets measuring about $16\frac{1}{2}$ by 20 inches. Under the general plan adopted the country is divided into quadrangles bounded by parallels of latitude and meridians of longitude. These quadrangles are mapped on different scales, the scale selected for each map being that which is best adapted to general use in the development of the country, and consequently, though the standard maps are of nearly uniform size, they represent areas of different sizes. On the lower margin of each map are printed graphic scales showing distances in feet, meters, and miles. In addition, the scale of the map is shown by a fraction expressing a fixed ratio between linear measurements on the map and corresponding distances on the ground. For example, the scale $\frac{1}{62,500}$ means that 1 unit on the map (such as 1 inch, 1 foot, or 1 meter) represents 62,500 similar units on the earth's surface.

Although some areas are surveyed and some maps are compiled and published on special scales for special purposes, the standard topographic surveys for the United States proper and the resulting maps have for many years been divided into three types, differentiated as follows:

1. Surveys of areas in which there are problems of great public importance—relating, for example, to mineral development, irrigation, or reclamation of swamp areas—are made with sufficient accuracy to be used in the publication of maps on a scale of $\frac{1}{31,680}$ (1 inch = one-half mile), with a contour interval of 1, 5, or 10 feet.

2. Surveys of areas in which there are problems of average public importance, such as most of the basin of the Mississippi and its tributaries, are made with sufficient accuracy to be used in the publication of maps on a scale of $\frac{1}{62,500}$ (1 inch = nearly 1 mile), with a contour interval of 10 to 25 feet.

3. Surveys of areas in which the problems are of minor public importance, such as much of the mountain or desert region of Arizona or New Mexico, are made with sufficient accuracy to be used in the publication of maps on a scale of $\frac{1}{125,000}$ (1 inch = nearly 2 miles), with a contour interval of 25 to 100 feet.

A topographic survey of Alaska has been in progress since 1898, and nearly 43 per cent of its area has now been mapped. About 10 per cent of the Territory has been covered by reconnaissance maps on a scale of $\frac{1}{625,000}$, or about 10 miles to an inch. Most of the remaining area surveyed in Alaska has been mapped on a scale of $\frac{1}{250,000}$, but about 4,000 square miles has been mapped on a scale of $\frac{1}{62,500}$ or larger.

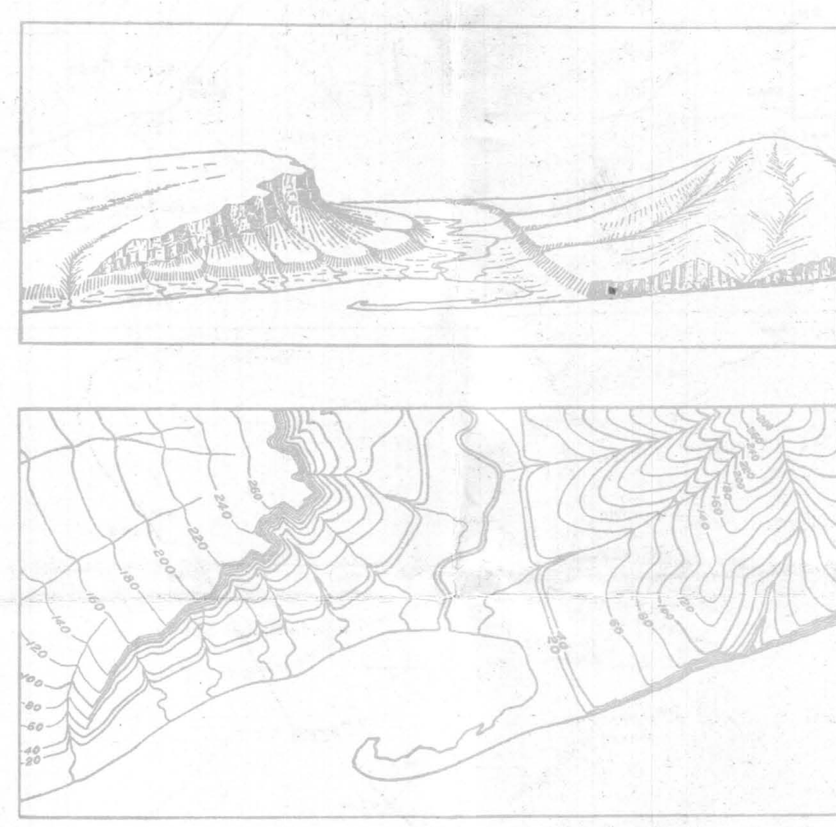
The Hawaiian Islands, with the exception of the small islands at the western end of the group, have been surveyed, and the resulting maps are published on a scale of $\frac{1}{62,500}$.

The features shown on these maps may be arranged in three groups—(1) water, including seas, lakes, rivers, canals, swamps, and other bodies of water; (2) relief, including mountains, hills, valleys, and other features of the land surface; (3) culture (works of man), such as towns, cities, roads, railroads, and boundaries. The symbols used to represent these features are shown and explained below. Variations appear on some earlier maps, and additional features are represented on some special maps.

All the water features are represented in blue, the smaller streams and canals by single blue lines and the larger streams, the lakes, and the sea by blue water lining or blue tint. Intermittent streams—those whose beds are dry for a large part of the year—are shown by lines of blue dots and dashes.

Relief is shown by contour lines in brown, which on some maps are supplemented by shading showing the effect of light thrown from the northwest across the area represented, for the purpose of giving the appearance of relief and thus aiding in the interpretation of the contour lines. A contour line represents an imaginary line on the ground (a contour) every part of which is at the same altitude above sea level. Such a line could be drawn at any altitude, but in practice only the contours at certain regular intervals of altitude are shown. The line of the seacoast itself is a contour, the datum or zero of altitude being mean sea level. The 20-foot contour would be the shore line if the sea should rise 20 feet. Contour lines show the shape of the hills, mountains, and valleys, as well as their altitude. Successive contour lines that are far apart on the map indicate a gentle slope; lines that are close together indicate a steep slope; and lines that run together indicate a cliff.

The manner in which contour lines express altitude, form, and grade is shown in the figure below.



The sketch represents a river valley that lies between two hills. In the foreground is the sea, with a bay that is partly inclosed by a hooked sand bar. On each side of the valley is a terrace into which small streams have cut narrow gullies. The hill on the right has a rounded summit and gently sloping spurs separated by ravines. The spurs are truncated at their lower ends by a sea cliff. The hill at the left terminates abruptly at the valley in a steep scarp, from which it slopes gradually away and forms an inclined table-land that is traversed by a few shallow gullies. On the map each of these features is represented, directly beneath its position in the sketch, by contour lines.

The contour interval, or the vertical distance in feet between one contour and the next, is stated at the bottom of each map. This interval differs according to the topography of the area mapped: in a flat country it may be as small as 1 foot; in a mountainous region it may be as great as 250 feet. Certain contour lines, every fourth or fifth one, are made heavier than the others and are accompanied by figures showing altitude. The heights of many points—such as road corners, summits, surfaces of lakes, and bench marks—are also given on the map in figures, which show altitudes to the nearest foot only. More exact altitudes—those of bench marks—as well as the geodetic coordinates of triangulation stations, are published in bulletins issued by the Geological Survey.

Lettering and the works of man are shown in black. Boundaries, such as those of a State, county, city, land grant, township, or reservation, are shown by continuous or broken lines of different kinds and weights. Good motor or public roads are shown by fine double lines, poor motor or private roads by dashed double lines, trails by dashed single lines.

Each quadrangle is designated by the name of a city, town, or prominent natural feature within it, and on the margins of the map are printed the names of adjoining quadrangles of which maps have been published. Over 3,300 quadrangles in the United States have been surveyed, and maps of them similar to the one on the other side of this sheet have been published.

The topographic map is the base on which the geology and mineral resources of a quadrangle are represented, and the maps showing these features are bound together with a descriptive text to form a folio of the Geologic Atlas of the United States. More than 220 folios have been published.

Index maps of each State and of Alaska and Hawaii showing the areas covered by topographic maps and geologic folios published by the United States Geological Survey may be obtained free. Copies of the standard topographic maps may be obtained for 10 cents each; some special maps are sold at different prices. A discount of 40 per cent is allowed on an order for maps amounting to $5 or more at the retail price. The geologic folios are sold for 25 cents or more each, the price depending on the size of the folio. A circular describing the folios will be sent on request.

Applications for maps or folios should be accompanied by cash, draft, or money order (not postage stamps) and should be addressed to

THE DIRECTOR,
United States Geological Survey,
Washington, D. C.

September, 1928.

STANDARD SYMBOLS