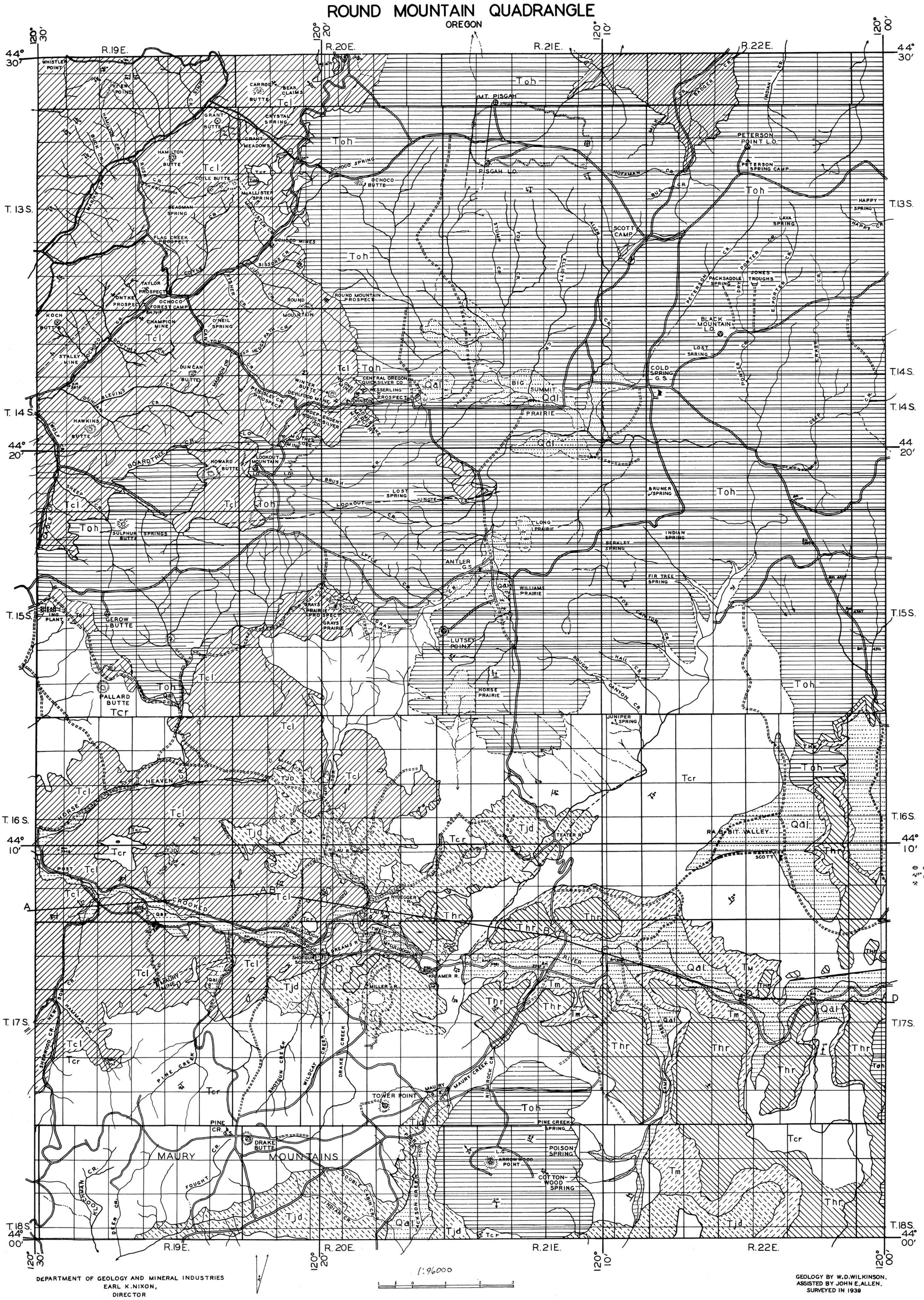
GEOLOGIC MAP
OF THE
ROUND MOUNTAIN QUADRANGLE
OREGON



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DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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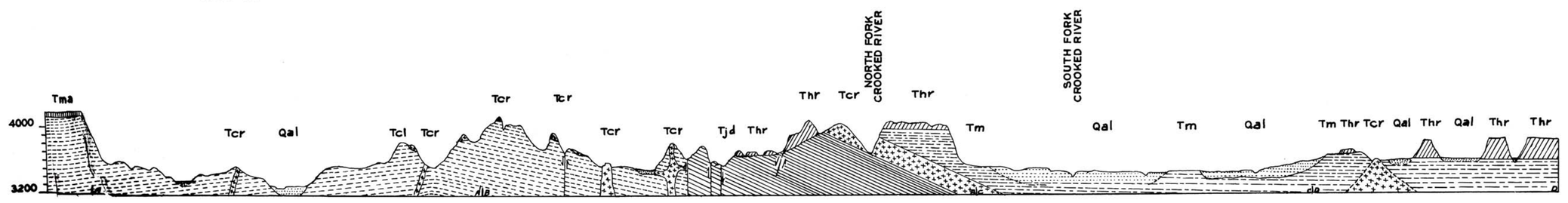
GEOLOGY BY W. D. WILKINSON.
ASSISTED BY JOHN E. ALLEN.
SURVEYED IN 1939



GENERALIZED SECTION ALONG LINE A, B, C, D

VERTICAL SCALE 1:12000
HORIZONTAL SCALE 1:96000

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by W. D. Wilkinson

INTRODUCTION.

The Round Mountain quadrangle is located in central Oregon about twenty miles east of the city of Prineville, Crook County, and includes the area between latitude 44° and 44°30', and longitude 120° and 120°30'. The northern part of this region is accessible via the Ochoco Highway and numerous Forest Service roads; the southern half of the area is accessible via the Crooked River Highway.

The area is of interest both from the mining and geologic viewpoints. There are many cinnabar prospects along the western margin of the quadrangle, and some of them have been on a productive basis for some time. From the geologic standpoint, this quadrangle presents a complete stratigraphic section of the Tertiary formation for this part of Oregon.

With the economic and geologic problems in mind, the State Department of Geology and Mineral Industries, cooperating with the Department of Geology of Oregon State College, prepared this geologic map of the Round Mountain Quadrangle during the summer of 1939.

A party of seven men, under the direction of Dr. W. D. Wilkinson, of Oregon State College, spent six weeks in the field. Since no topographic map was available for the area, the plane table was used except in the most heavily forested regions. The Forest Service triangulation points were used as a basic control, thus tying all points into the General Land Office Survey. For most of the work the Forest Service map was enlarged to one inch to the mile, but in key areas the scale was frequently enlarged to as much as one thousand feet to the inch.

Wherever possible, the contacts between formations were traversed either by plane table and stadia, or aneroid, brunton and chain. In heavily wooded areas paced section line traverses were made at intervals of one-half mile.

Acknowledgements.

The cooperation of Mr. Frank B. Folsom, Forest Supervisor, Ochoco National Forest; Lt. James M. Roberts, Camp Mill Creek CCC; and of the numerous persons whose assistance made the work possible, is appreciated.

The personnel was as follows: Earl K. Nixon, director, Department of Geology and Mineral Industries; W. D. Wilkinson, geologist in charge; John E. Allen and Wayne Lowell, geologists, State Department of Geology and Mineral Industries; Ford Young and Wallace Lowry, junior geologists; and Murl Hutchinson, Eldon Gilbert, and Herbert Harper, student geologists.

Literature.

Early published records of explorations in this area are found in the letters of Thomas Condon (1). These letters refer to the discovery of Cretaceous fossils along Beaver Creek, a tributary of the Crooked River.

Russell's (4) extensive reconnaissance reports deal more particularly with other parts of central Oregon. Calkins (2) reported on the petrography of the John Day Basin, and Merriam (3) made a contribution to the geology of the same region in 1902.

In 1927 Chaney (6) described the flora of Gray ranch locality, but confined his description of the geology to a generalized statement dealing with the Crooked River Basin. Hodge (14) has mapped a large area in north-central Oregon which touches the eastern boundary of the Round Mountain quadrangle.

The writer has cooperated in mapping the Dayville quadrangle which is contiguous to the eastern boundary of the Round Mountain quadrangle.

Since the discovery of cinnabar, several short articles dealing with various prospects or mines have appeared (17),

TOPOGRAPHY.

In general, the entire area within the Round Mountain quadrangle is rugged, dominated by two serrated east-west ridges, the Ochoco and Maury Mountains. Minor ridges with gentle slopes strike north and south from these major topographic features. The mountainous masses rise from flat lava surface lands which predominate in the south and southeastern portion of the quadrangle.

The Maury Mountains, located in the southwestern part of the quadrangle south of the Crooked River, are about 22 miles long and average 10 miles in width. They rise abruptly from the flat-lying late Tertiary lava sheets which surround them on the east, south, and west sides. On the north side, they drop away to the Crooked River as a series of north-south parallel ridges. These ridges rise rapidly from an elevation of about 3,300 feet at the Crooked River to the crest of the Maury Mountains which averages nearly 4,500 feet. Their crest extends westward from Arrowood Point to the boundary of the area where the mountains give way to a gently sloping lava surface.

"Ochoco Mountains" is a general term applied to the mountainous area immediately north of the Crooked River. The most prominent peaks of this area are Lookout Mountain, 6,791 feet, and Mount Pisgah, 6,798 feet. Unlike the Maury Mountains, the Ochoco Mountains are not confined to this quadrangle but extend east and west across the northern border for over 60 miles and vary from 20 to 30 miles in width.

The region north and west of Lookout Mountain is rugged, but the area east of Lookout Mountain and south of Mount Pisgah is characterized by broad, flat, gently-dipping surfaces with only an occasional deep river canyon. An explanation of the difference between the topography of the east and west portions of the area is found in the formations represented. Along the western boundary, the Clarno formation predominates, while in the eastern half, the surface is covered by younger lavas which have not been folded, faulted and eroded to the same extent as the older Clarno formation.

STRATIGRAPHY

Cretaceous Conglomerate.

The oldest rocks within the Round Mountain quadrangle occupy a small triangular area on the northern boundary in Sec.26, 27, 33, T.12 S., R.20 E. The total area within the Round Mountain quadrangle does not exceed one square mile, lying at the headwaters of the west branch of Bridge Creek and O'Kelly Creek, but Cretaceous sediments have been mapped in the Mitchell area to the north by Buwalda (11) and studied by Packard (12).

The Cretaceous conglomerates stand in precipitous cliffs, composed of pebbles averaging one to two inches in diameter, in a matrix of small fragments and grits. The poorly defined bedding shows the structure to be monoclinal, dipping 20° to the west. The exposure is flanked on the east and west by the Clarno formation which is anticlinal, dipping 30° SE and 35° NW, the conglomerate being exposed along the dissected apex of the Clarno fold.

There is some probability that the area just north of Mount Pisgah is underlain by Cretaceous sediments which have proved incompetent. This region of several square miles is characterized by hummocks and local depressions, indicating a wide slump area. The Clarno basalts and andesites predominate throughout the slump area. At all other localities these rocks are competent, and for this reason it seems probable that for some distance south of the actual conglomerate, outcrops of Cretaceous shale may underlie the Clarno basalts and andesites.

These conglomerates were traced into the Mitchell area to known Cretaceous as mapped and described by Packard and Buwalda (10-12).

Clarno Formation

The name "Clarno" was applied by Merriam (6) in 1902 to a series of rocks of volcanic origin which are exposed at Clarno's Ferry, Wheeler County, Oregon.

Rocks correlated with the Clarno formation are exposed over the western portion of the Round Mountain quadrangle. These exposures are continuous in T.12, 13, 14 S., R.19 E. Near the southern boundary of T.14 S. they are interrupted by younger lavas, but reappear in the Crooked River valley as far as Kramer's ranch, where they dip under the younger formations. There is a very limited exposure in sec. 31, 32, T.14 S., R.21 E., and a second exposure along Badger Creek in T.12 S., R.22 E., which is an extension of a larger mass lying to the north. In total area there are about 200 square miles of Clarno formation within the boundary of the Round Mountain quadrangle.

Merriam (5) described the general characteristics of the Clarno, and Calkins (2) has described andesites, basalts, and rhyolites which occur as flows with associated tuffs and agglomerates.

In this area the andesites occur near the base of the Clarno section and lie unconformably upon the Cretaceous conglomerate which is exposed along the northern edge of the area. These andesites are closely fractured and jointed; along the fractures is a characteristic red stain, produced by alteration of the iron-bearing minerals. The weathered surfaces are greenish, drab gray, or nearly black, almost basaltic in appearance.

In hand specimens elongate crystals of striated plagioclase feldspars can be observed, and close examination shows minute crystals of augite and greenish prismatic hypersthene. These dark colored minerals are so common that in some cases they give the fresh surface of the rock a green cast. The texture is very fine and the minerals listed can only be observed with the aid of a hand lens.

The Clarno basalts are black and flinty in appearance, and show conchoidal fracture surfaces. Relatively large striated plagioclase feldspar crystals may be seen distributed through a glassy groundmass. Occasionally they appear without phenocrysts, and are difficult to distinguish from Columbia River basalts.

At the top of the Clarno section there are rhyolite flows of variable thicknesses. These rhyolites are usually fine-grained, with only occasional recognizable crystals of quartz and feldspars. The color of the outcrops ranges from shades of red to white, the former predominating. The massive exposures of these rocks show spherulitic and flow structures, often with chalcedony deposits along fracture planes. The surface of the rhyolite is irregular and usually is covered only by a limited soil mantle.

Clarno tuffs associated with these lava rocks vary in color from buff to pale green, and are composed of shards of glass, fragments of feldspars, and other minerals. Frequently the tuffs have been silicified to such an extent that they may be confused with rhyolite lavas.

In places the Clarno tuffs contain fossil leaves which have been collected and studied by Chaney (9). The stratigraphic position, underlying all other formations, supplemented by the evidence of the fossil leaves, indicates Eocene age of the Clarno formation.

The John Day formation, as shown on this map, occurs mainly in the central portion of the region north of the Maury Mountains, west of the North Fork of Crooked River. It also occurs in a limited area along Parish and Bear Creeks on the south side of the Maury Mountains. The total area covered does not exceed 50 square miles.

John Day tuffs are relatively soft and porous, and when the overlying protecting lavas are stripped away, they are readily eroded, forming subdued, well rounded, red, green, and cream colored hills. The John Day formation is the most colorful of all the Tertiary formations of this area, because of ferric and ferrous iron compounds which produce the green and red coloration.

The bulk of the formation is composed of devitrified glass fibers, pumice shards, occasional fragments of feldspar, pyroxene and amphibole crystals. These tuffs are harsh to the touch due to the angular character of the material composing them. They are kaolinized, and upon moistening they may be pressed into a clay paste.

Beds designated as John Day in this area cannot be traced across the Ochoco Mountains to the type section. The correlation in the field is based on stratigraphic position and the typical lithology. This was supported by comparison of the fossil leaves of the Niedegger ranch with the Gray's ranch flora described by Chaney (9). Additional evidence was obtained from vertebrate fossils found on Lost Creek and on Tom Vane Creek. This evidence indicated that the John Day formation as mapped can be correlated with the type John Day section of the John Day formation and is therefore Oligocene in age.

Columbia River Basalts.

The term "Columbia River basalts" has been applied by various writers to the extensive Miocene basalt flows which are exposed over wide areas in north-central Oregon.

These basalts are widely distributed throughout the entire area of the Round Mountain quadrangle. At one time, the Columbia River basalts were more extensive than at present, as indicated by the isolated areas distributed over the central and western portions of the map.

The Columbia River basalt formation is made up of a series of flows, each ranging in thickness from 20 to 80 feet. These flows tend to show two structures; first, well developed five-sided columns; second, irregular blocks with curved interlocking surfaces. The blocks may vary in size up to several feet but usually are not over a foot in the greatest diameter. Associated with these massive flows are comparatively thin white ash beds, and occasionally red scoria or ropey lava. Alterations of iron-bearing minerals along the fractures often tend to color the face of the cliffs brown or red.

Fresh unaltered specimens of these lavas are uniformly black in color and usually have a flinty or glassy luster. In general, they [illegible] and have a distinct conchoidal fracture.

These rocks are recognized in the field by their stratigraphic position, uniform dark color, flinty conchoidal fracture, mineral composition, and typical columnar or irregular jointed structures.

Mascall Formation.

The name "Mascall" was applied by Merriam (3) to those upper Miocene cream colored tuff beds lying over Columbia River lavas at the Mascall ranch, seven miles west of Dayville, Grant County, Oregon.

Outcrops of this formation are limited to the southeast quarter of the quadrangle, covering only a few square miles, and here it is composed of interfingering lenses of tuffaceous sandstones, conglomerates, and volcanic ash.

The formation is light cream in color and in this respect resembles the upper John Day formation. It reaches a maximum thickness in Sec.3, T.17 S., R.21 E. The lower one-third of the section is predominately tuffaceous sandstone, which contains irregular quartz grains, glass and pumice shards. It is a fine grained, massive, cream colored sandstone. Overlying this is a few feet of volcanic ash, light blue in color, and composed essentially of glass fibers, bubble fragments, and pumice shards.

Above the thin ash bed is a pebbly, buff colored sandstone, composed of quartz grains, obsidian, chert, and quartzite pebbles. The total thickness of this sandstone, including a massive bed of fine grained tuff, is two hundred feet. The remainder of the section is cream colored tuff, similar to the material found near the base of the section.

It has not been possible to trace the Mascall (?) formation of this area across the Ochoco Mountains to the type section, but the Mascall (?) of this area is similar lithologically, stratigraphically, and has a similar fauna, so it is tentatively correlated with the Mascall of the John Day basin.

Rattlesnake Formation.

The name "Rattlesnake" was first used by Merriam (5) to designate an isolated series of beds which truncate the Mascall formation in the vicinity of the Mascall ranch near Dayville, Oregon. At the type section the formation is made up of a series of partly consolidated gravels lying over a thin pumiceous rhyolitic flow.

The Rattlesnake (?) formation outcrops extensively throughout the southeastern quarter of the Round Mountain quadrangle, and covers about 50 square miles.

The gravel beds which are described by Merriam (8) as occurring at the type section do not appear in the area mapped, although material referred to by Merriam as a glassy, pumiceous rhyolitic flow is well represented. Some detailed work already done indicates that this material is a highly consolidated rhyolitic tuff rather than a flow.

Near the top the flow is red to pink in color, changing abruptly into a gray glassy mass near the base. It varies in thickness from 14 to 50 feet, usually standing in sheer cliffs. It is characterized by the great quantity of pumice distributed throughout a glassy matrix. These pumice fragments vary in size from a fraction of an inch to a foot or more in length. The only mineral that can be easily recognized is orthoclase which occurs as clear, glassy, well formed crystals.

The Rattlesnake (?) of the Round Mountain quadrangle is lithologically the same as that described by Merriam (8), and, consequently, is considered to be Pliocene in age.

Ochoco Lavas

The name "Ochoco Lavas" has been used tentatively by the writer to designate a series of relatively late flows which lie disconformably above the Rattlesnake (?) formation. They were first observed in the Dayville quadrangle along the flank of Wolf Mountain, and occur throughout the eastern and northeastern part of the Round Mountain area.

The Ochoco lavas are gray olivine basalts in which the groundmass is composed of elongate crystals of plagioclase with intervening areas of glass. The dark minerals are predominately augite, with scattered areas of yellowish green olivine. The texture is usually fine-grained equigranular, except near the upper part of the sections where they become vesicular and are frequently characterized by tabular phenocrysts of plagioclase which show some zonal growth.

Platy cleavage is a common feature of the outcrop, accompanied by an indistinct columnar structure. Along the south side of Lookout Mountain columnar structures are pronounced, but elsewhere in the area the platy cleavage is typical.

This formation is composed of several flows which have poured out of different small vents. A typical example is Arrowood Point. Here the flows dip away from the vent in all directions, gradually thinning out to one flow about 15 feet in thickness which abuts unconformably against the Columbia River basalts and John Day formation. Another recognizable vent occurs in Sec.36, T.15 S., R.22 E. The lavas have poured out over Columbia River basalts, Mascall and Rattlesnake (?) formations. The structure is determined by the consequent slope, over which these lavas poured, and is not due to the deformation, except for an occasional small sloping fault.

This formation overlies all other rocks in the area mapped, except the valley fill; therefore from its position above the Rattlesnake (?) formation, it is evident that the age is upper Pliocene or later.

Table I gives, in summary form, the stratigraphic sequence, origin, and general characteristics of the formations which occur within the Round Mountain quadrangle.

TABLE I.

STRATIGRAPHIC SEQUENCE.

	Age	Formation	Origin	Characteristics
Quaternary	Recent		Fluviatile	Valley alluvium
	Pleistocene			
	Pliocene (Toh)	Ochoco Lavas Disconformity	Volcanic	Andesites and basalts
	(Thr)	Rattlesnake (?) Disconformity	Volcanic	Pumiceous rhyolitic flow
	Miocene (Tm)	Mascall (?) Nonconformity	Volcanic-lacustrine, fluviatile	Yellow and white tuffs, ash tuffaceous sandstones and conglomerates
Tertiary	(Tcr)	Columbia River lavas Nonconformity	Fissure flows	Black, flinty, fine-grained basalts
	Oligocene (Tjd)	John Day Nonconformity	Detrital	Red, green to cream tuffs with thin rhyolite flow near top of series.
	Eocene (Tcl)	Clarno Nonconformity	Volcanic and lacustrine fluviatile	Andesite, basalt, rhyolite, dikes, flows, tuffaceous sediments, mineralized locally
Cretaceous	(K)	Middle Cretaceous	Marine	Conglomerate

STRUCTURAL GEOLOGY.

The oldest formation exposed in the Round Mountain quadrangle is a Cretaceous conglomerate which is probably of marine origin. Farther north in the Mitchell quadrangle Packard (12) has described Cretaceous fossils collected from this series. These conglomerates had been folded and subjected to erosion before deposition of the Clarno. In this area they stand as a monoclinal fold, dipping 20° west and striking north-south.

Hypersthene andesites of the Clarno formation lie unconformably over the Cretaceous conglomerates. At the southern contact of these formations, the andesites strike N.40° E. and dip 35° west. Along the eastern contact they strike N. 40° E. and dip 30° east, forming a small anticline with the conglomerates exposed near the axis of the fold.

In T.13 S. and the N½, T.14 S., R.19 E., there are excellent exposures of the Clarno formation which have been faulted and folded extensively. The major structure is a syncline with the axis striking northeast and approximately paralleling, but lying a mile east of Mark Creek road. The dips average about 40° on both limbs, the strike varying from N.10° E. to N.40° E. In Sec.33, T.12 S., R.19 E., just north of Viewpoint, there is a minor anticline with the axis striking north and south, which seems to be a flexure on the northwest limb of the major fold.

Further folding of the Clarno formation was observed in T.16, 19 S., R.19 E. The dips are low, averaging on both limbs of the anticline about 4°, forming a gentle anticline which disappears north and south under the Columbia River basalts. The axis of this fold strikes south just west of the Maury mine, and the dip on the east limb increases to 7°.

Faulting.

In the northwest quarter of the Round Mountain quadrangle there are two fault zones which strike N.60° E. and are continuous for several miles. The fault zones do not have a continuous exposure on the surface, but have been exposed in the workings of the mines developed along the strike of the two zones.

On the major fault at the Staley Mine over five feet of gouge separated the hanging wall from the foot wall. This is a normal fault, dipping 55° SE and striking N.50°-55° E. A later fault dipping to the northwest cuts the gouge zone and has produced an offset of about 15 feet.

The second fault zone is located along the northwest face of Lookout Mountain, trending N.60° E. as far as Johnson Creek. West of the Mother Lode Mine there was some evidence that two small faults striking northwest intersected the main fault zone.

A third fault zone occurs south of Post at the Maury Mountain Mine. The major fault strikes slightly northeast and is continuous for some distance northeast and southwest. At the mine there is a series of small parallel faults cutting this major fault and striking about N.25° W.

STRUCTURE OF THE JOHN DAY FORMATION.

The John Day formation was deposited in basins in the Clarno. One such basin is well outlined in the vicinity of Nieddiger's ranch, where excellent fossil plant remains were collected. These occurred in a very fine-grained silicified tuff at a uniform elevation and abutting against the Clarno formation. The fineness of the sediments and preservation of the plant remains indicate still water conditions during late upper John Day in this basin. Over these John Day sediments there is a single flow of rhyolite about 14 feet in thickness.

Post-John Day folding has tilted this formation in such a manner that the fold axis coincides with the major fold axis, as described for the Clarno formation.

In addition to folding, there were two small faults near Gray's ranch which were confined to the John Day formation. These were normal faults, striking due north with an offset of about 100 feet. The fault face was indistinguishable and no gouge could be noted, although an offset in the bedding across a small valley was readily determined.

STRUCTURE OF THE COLUMBIA RIVER BASALTS.

The Columbia River basalt formation lies unconformably over the John Day formation. The only good exposure of this relationship occurs at the junction of the North Fork of Crooked River and Crooked River, in sec.7, T.17 S., R.21 E. The Columbia River basalts have a minimum dip of 4° to the southeast and the John Day formation dips 10° to the northeast. Thus, the Columbia River basalts form the last member in the east limb of the Post anticline. This anticline drops away eastward into a gentle syncline, with the axis striking northeast through Rabbit valley.

In the southwest corner of the area, along the South Fork of Crooked River, the Columbia River basalts dip 7° to the north, while on the north side of Beaver Creek they dip 2° NW. This variation is caused by a normal fault having an offset of about 200 feet, and striking east-west parallel to Beaver Creek. This faulting occurred before the Mascall (?) sediments had collected, since they are undisturbed.

On the north side of Mount Pisgah a major fault occurs which extends eastward across the Round Mountain and Dayville quadrangles. This has been called the Ochoco fault. The fault escarpment is very pronounced, reaching its maximum height in Spanish Peak about 25 miles east of Mount Pisgah. At various points the fault has been mineralized, although no lode mines of importance have been developed.

STRUCTURE OF THE MASCALL FORMATION.

The folding and faulting of the Columbia River basalts formed structural basins in which the Mascall (?) sediments of the Round Mountain quadrangle collected. These sediments lie horizontal and abut unconformably against the older Columbia River basalts.

In this area they have been undisturbed, differing in this respect from the type locality where they lie conformably upon the Columbia River basalts, and have suffered some deformation which was probably due to movement along the Ochoco fault.

STRUCTURE OF THE RATTLESNAKE FORMATION.

This rhyolitic tuff (?) covered vast areas of central Oregon to a uniform depth. Erosional remnants are found resting unconformably [illegible] formations except the Mascall, in which case the so slump faulting has resulted, producing local slump areas.

STRUCTURE OF THE OCHOCO LAVAS.

These lavas poured out of a number of different local vents, probably at different times during the Pliocene. They have an initial dip which was determined by the slope of the surface over which they were extruded.

They have not been deformed except for two step faults on the west side of Mount Pisgah. Here there are two parallel faults striking almost north-south with a displacement of several hundred feet. These faults are probably associated with a large slump area which is west of Mount Pisgah.

At all other points where these lavas have been observed in this quadrangle, as well as the Dayville quadrangle, they are undeformed, although they do have initial structure.

SUMMARY.

The general structure of this region is characterized by one major anticline and two synclines with the axes parallel and striking north-east. Associated with this folding are a series of mineralized fault zones with a general northeast strike. It may be noted that the structural trend is northeast, whereas the topographic trend is east-west, which may be accounted for when the Ochoco fault is considered. This fault has, in general, an east-west trend and a profound north facing escarpment with a gentle south-facing dip slope.

From the trend of the fold axes it seems probable that the compression causing the folds was from the southeast and northwest.

ECONOMIC GEOLOGY (15-17).

Cinnabar is the most important economic mineral of this area. The mineralization occurs only in the Clarno formation, and is associated with intrusions.

With one exception all of the properties which have produced commercial ore have been mercury mines. This exception is the Ophir Mayflower which is a gold and silver property, and was not accessible due to caving and water. This property is described in U.S.G.S.Bulletin No.846-A and will be omitted from this report.

Of the cinnabar properties within the quadrangle, seven have a record of production, and eleven others showed cinnabar in place or by panning. In addition, there are innumerable prospect holes scattered throughout the area, some of which will show colors and others are simply discovery pits placed on or near claims where cinnabar has been found.

Cinnabar in the Round Mountain quadrangle is restricted to the Clarno formation, as stated above. One or two properties are mapped as lying near the contact within the much later Ochoco lavas, but these lavas are very thin at their edge, and the ore lies in the underlying Clarno.

Within the quadrangle, most of the cinnabar properties lie within two wide but more or less distinct zones, along which faulting, mineralization, and alteration of Clarno rocks have occurred to a marked degree. These zones tend to parallel topographic lows (Ochoco and Johnson Creeks) which may have resulted, at least in part, from erosion along altered and less resistant rocks.

At the Maury Mountain Mine, however, (and on Bear Creek, west of the quadrangle) quicksilver mineralization is associated with silicification of the rocks and the zones may stand out as more resistant ridges.

One of the major zones of mineralization extends from the base of Lookout Mountain N.60°E. to Johnson Creek. In this zone there are a series of faults trending N.62°E., N.10°E., and N.45°E. Movement along these faults has produced a sheer zone along which the mineral deposition has taken place. As is frequently the case in such a fault zone, mineralization is concentrated at fault intersections. Within this zone there is a great deal of gouge which contains veinlets of cinnabar about the thickness of a knife blade. These veinlets are discontinuous, occurring along fractures and joints within the gouge. Examples of this type of occurrence are to be found at the Mother Lode Mine.

The zone extends roughly from the Mother Lode Mine at the base of Lookout Mountain about N.60°E. to the Central Quicksilver Company on Johnson Creek, and includes the following properties: Independent Quicksilver Company, Devilsfood Mines, Homestake Mercury Mine, Inc., Number One Mine, and the Westerling prospect.

A second similar belt of mineralization extends N.50°E. from the Johnson Brothers' property, which is about two miles west of the quadrangle, in Sec. 23, T.14 S., R.18 E., to the Taylor ranch property, and probably continues on to the northern edge of the quadrangle to include the Bear claims and Beaver Guard Station prospect. Although cinnabar was not traced over this entire distance, it is known to occur at various points along this course.

Besides the properties mentioned, this belt includes the Byram and Oscar Mine, the Staley and Barney Mine, Ontko's prospect, the Little Hay Creek prospect, and probably the old Champion Mine. These properties are located in either the main zone or on cross faults, extending out from the major fault zone.

This leaves only four properties not included in the above two zones: the Round Mountain prospect; the Peaslee Creek prospect; the Gray Prairie prospect; and the Maury Mountain mine. The first three may be associated in some way with the zones of mineralization described. However, the Maury Mountain Mine is quite definitely isolated by distance from these two zones.

Most of the properties examined are characterized by faults which usually have a rather wide gouge zone. The principal mineralization has developed in these gouge areas, and seems to be associated with basaltic or andesitic intrusions.

In every case, the mineralization has occurred in the Clarno formation.

Johnson Creek Properties

Mother Lode Mine (15-17)

This mine, which has been known as the American Almaden, Quicksilver Consolidated Mining Company, and Crams, Inc., is located about 32 miles from Prineville on the road to Lookout Mountain. It lies in Sec.20, 29, T.14 S., R.20 E., and is just below the north face of Lookout Mountain. At the time of the visit, work in progress, under A. J. Champion, included retimbering some of the old workings, exposing surface showings with a bulldozer, tunnel work, and reconditioning the rotary furnace and condensing system. In January, 1940, production was at the rate of two flasks a day.

The property has several hundred feet of old workings, much of which was inaccessible, due to caving. There is about 100 feet of new tunnel work, as well as many open cuts. The main tunnels have been driven into basalts and andesites of the Clarno formation. Along faults and fractures in these rocks, ore occurs in veinlets varying in thickness from knife blade to two or more inches. In some cases definite post-mineral movement was observed. Stopes have been developed from the lower tunnel following these small localized orebodies. Total production has been about 200 flasks.

In the lower tunnel a dense fine-grained black basalt was found which had invaded the more coarsely crystalline Clarno basalts and andesites. In one place small stringers of cinnabar and quartz were observed, penetrating this rock for a short distance.

In this region the Clarno is capped by a series of younger andesitic flows. At present none of the workings has extended high enough to reach the bottom of the series of andesites. Whether these flows form a cap for this deposit is problematical, and could only be determined by development. However, no evidence was found in the quadrangle to indicate that mineralization was later than these overlying andesites.

While high grade ore veins four inches wide have been exposed in the new workings, the tenor of the ore in the old workings is low grade.

Independent Quicksilver Company (15-17).

This property is located about one-half mile north of the Mother Lode Mine on the Lookout Mountain road in sec.20, T.14 S., R.20 E., along the north face of Lookout Mountain.

Development work on the property consists of several tunnels and numerous open cuts. All but one of the tunnels were caved, and that one showed unaltered andesites and basalt. The tunnel was crossed by several minor faults, one of which was said to pan cinnabar.

This property lies along the N.62°E. zone of faulting, and the program of drilling during 1937 was so arranged as to test the possibility of ore occurrence along this direction and also along possible cross fractures.

Geo. C. Hogg is now superintendent at the property.

Devilsfood Mine (15-17).

This prospect is located on the Johnson Creek road about 31 miles from Prineville in sec.16, T.14 S., R.20 E., and is owned by William Endicott.

The workings consist of a drift about 130 feet long and a crosscut 33 feet long. From the drift a 50 foot raise has been put through to the surface. The drift runs along a fault zone which varies from about 2 to 8 feet in width, strikes S.81°W. and dips 70°-78°S. Colors were found in this drift in several places, and at the top of the raise which has been put up on the vein.

The country rock consists mainly of a coarse conglomerate and a fairly coarse-grained basaltic rock. The fault passes through the conglomerate and basalt, and ore was found in both.

Homestake Mercury Mine, Inc. (15-17)

This property, which has also been known as the Paulsen and Saylor Mine, International Mercury, Inc., and Johnson Creek Mine, is located about one-third mile east of the Devilsfood Mine in Sec.15, T.14 S., R.20 E. Mr. Morris is superintendent of this property.

It is located on a fault trending N.60°E. Workings consist of a shaft and glory hole and several abandoned tunnels. The old workings were inacessible at the time of visit. Development work consists of a crosscut being driven from the south about 80 feet below the shaft bottom to intersect the vein. This tunnel is entirely in a coarse-grained basaltic rock which shows no mineralization and little alteration. Minor faults have been crossed, but as yet no cinnabar has been found.

The formation in which the shaft was sunk is a highly altered Clarno rhyolite. Ore has been reported as occurring both on the hanging and foot walls.

Number One Mine (15-17).

This property is located about one-half mile east of the Homestake Mine in Sec.15, T.14 S., R.20 E. Previous work consists of a shaft and several hundred feet of workings from the bottom of the shaft. The workings were full of water at the time of visit. Production has been about 50 flasks.

New work consists of about 300 feet of tunnel crosscutting to and drifting along a major fault which trends N.60°-65°E., and dips about 70°S. This fault was exposed in previous work, and considerable ore is reported to have been taken from it. Good cinnabar showings were found in several places, particularly where the major fault was intersected by cross fractures trending N.12°E.

Central Oregon Quicksilver Co. (15-17).

This mine, formerly known as the Blue Ridge Mercury Co., Western Resources, Inc., and Oregon Cinnabar, Inc., is located immediately to the east of the Number One Mine. No one was on the property at the time of visit, and since the underground workings were reached by a shaft which contained water, no geologic information was obtainable.

The position of the shaft would seem to indicate, however, that it is on the same fault as the Homestake and Number One Mines. Production has been about 17 flasks.

Westerling Prospect (15-17).

This prospect is located a short distance southeast of the Central Oregon Quicksilver holdings. No underground work has been done, but Mr. Westerling reports that good cinnabar showings were obtained by panning.

Ochoco Creek Properties.

Staley and Barney Mine (15-17)

This mine which has at times during its life been termed Champion Mine, Cinnabar Mines, Inc., Beardsmore Mine, Jimmie Anne Mine, Ochoco Mines Corp., and the Ochoco Quicksilver Mine, is located about one-half mile north of the Ochoco highway, some 20 miles east of Prineville, in Sec.7, T.14 S., R.19 E.

The property is opened by 1100 feet of tunnel, an inclined shaft 125 feet long, a vertical shaft about 80 feet deep, and a stoped area. Besides these connected workings, there are a number of open cuts and two other shafts about 35 feet deep. Past production totals about 218 flasks.

The country rock is Clarno and consists of andesite, rhyolite, tuffs, and agglomerates which have been intruded by a basalt. In most cases where ore was found in the workings, this basaltic intrusion was found in the near vicinity, and was particularly noticeable in a shaft [illegible] are separated by several feet of gouge at various po[illegible] has been st[illegible]ed on both sides of the main inclined [illegible] trates this zone. A raise was driven from one of the lower levels northeast of the incline and struck good ore along the fault. Other faults intersect this main fault, some apparently contemporaneous and others later.

About 100 feet north of the main shaft, cinnabar colors have been found indicating that a mineralized cross fracture intersects the main fault. It is probable that a high concentration might exist at this point, since experience on other properties in this area indicates the highest concentration of ore is most commonly found at such intersections.

The only other important exposure of ore was seen in the main drift where a crosscut entered a fault zone trending N.55°E. The foot wall was definite and the hanging wall indefinite, and a short distance beyond this fault a basaltic intrusion was observed. The intrusion probably continues to the east, since it outcrops again in the main drift where ore was reported as being found along the basalt contact.

The lower level was caved and inaccessible, but good ore was reported as occurring in this level.

Ontko Prospect (15-17).

About 4 miles east of the Staley and Barney mine, near the Ochoco Highway, is the Ontko prospect. This property is on Ontko's ranch, about one-third mile north of the highway in Sec.33, T.13 S., R.19 E. Development work consists of a tunnel about 50 feet long and a large open cut. The prospect embraces the same type of rock as that found at the Staley and Barney Mine. No production has been made, but high grade stringers have been exposed. Insufficient work has been done to determine the structural relationships.

Taylor Ranch Prospect (15-17).

This property is just west of the Ochoco Guard Station, one-third mile north of the Ochoco Highway in Sec.34, T.13 S., R.19 E., and is owned by R. Whiting. The old workings consist of a few open cuts now badly caved. Recent work consists of a 40 foot vertical shaft and about 100 feet of drift and crosscut at the bottom of the shaft.

The country rock is Clarno tuffs and porphyritic andesite, both highly altered. Mineralization is in a poorly defined fault zone which is intersected by numerous small fractures along which the ore occurs. Cinnabar is associated with calcite, pyrite, and quartz.

In addition to the ore exposed in the workings at the foot of the shaft, good showings were seen in a short drift about 10 feet below the surface. Ore here is finely disseminated, rather than in distinct veinlets. It was reported that good colors could be panned for a distance east and west of the shaft.

Champion Mine (15-17).

This mine is located in Sec.3, T.14 S., R.19 E., about one-half mile south of the Ochoco Highway, 24 miles from Prineville, and is owned by the Johnson Brothers. It is not in operation at present; the workings are badly caved and for the most part inaccessible.

About 700 feet of tunnel connects two shafts, one inclined and one vertical.

The only accessible workings showed a fault zone in Clarno andesite, shales, and agglomerate. No ore was seen in place; however, a small quantity which apparently came from some of the caved areas was seen in a chute.

Little Hay Creek Prospect (15-17).

This property is located near the head of Little Hay Creek, in Sec.22, 27, T.13 S., R.19 E., and is owned by Bert Tolliday. Development work consists of open cuts which give good indications of cinnabar.

The property may be in the Ochoco Creek zone, since the country rock consists of andesites and coarse to fine tuffaceous sediments of the Clarno formation, similar to those found farther south along Ochoco Creek.

Beaver Guard Station Prospect (15-17).

This property is located in Sec.27, 28, T.12 S., R.20 E., south of the Ochoco Highway at a point about one-half mile toward Prineville from the Beaver Guard Station.

Workings consist of several open cuts, a 10 foot shaft, and a tunnel about 35 feet long. The country rock is a highly altered amygdaloidal basalt. Calcite veins were observed accompanied by limonitic stain, but no cinnabar was found in place.

Other Prospects

Peaslee Creek Prospect (15-17)

This property is located on the Lookout Mountain road, about five miles from the Ochoco Ranger Station, on the north bank of Peaslee Creek, in Sec. 18, T.14 S., R.20 E. The only work done consisted of open cuts exposing a fault trending N.80°W., showing marcasite and quartz mineralization. No cinnabar was seen, although it may be panned at various points along the creek. The country rock is Clarno andesite and agglomerate with a later intrusive basalt.

Round Mountain Prospect (15-17).

This prospect is located about 3/4 miles east of Round Mountain, in Sec.33, T.13 S., R.20 E., and is owned by W. J. Westerling. It is reached by a road turning off the Johnson Creek road at the Central Oregon Quicksilver property.

The underground workings consist of a tunnel about 175 feet in length; there are several open cuts and shallow shafts. All the workings are in a highly altered andesite of the Clarno formation. One major fault and several cross fractures were intersected by the tunnel. The main fault trends N.10°E. and dips steeply to the west. No ore was seen in the tunnel, but finely disseminated cinnabar was visible in several of the open cuts and in one of the shafts.

It was reported that assays of from 8 to 24 pounds per ton were obtained from the dumps. Samples taken by the Department of Geology and Mineral Industries assayed from a trace to one pound.

Gray Prairie Prospect (15-17).

This property is located on the southern edge of Gray Prairie in Sec.16, 21, T.15 S., R.20 E. Its owners are Bert Tolliday and R. Whiting. It is reached by a road leading south from the Antler Guard Station.

Exploration work consists of about 50 shallow pits and a vertical shaft 30 feet in depth. The country rock is a fine-grained, light colored Clarno tuff. The ore occurs in small stringers which, in the surface pits, show no definite alignment, and are usually accompanied by marcasite. In one pit a fine-grained basalt was exposed.

A short distance south of the shaft is an area of tuff which has been silicified. No cinnabar was seen in this material. Insufficient work had been done at the time of visit to give much idea as to the value of the deposit.

Maury Mountain Mine (15-17).

This mine, also known as the "Staley and Towner", is located in Sec. 10, T.17 S., R.19 E., about 4 miles southeast of Post in the foothills of the Maury Mountains. It is reached by a road turning off the Crooked River Highway about one-half mile east of Post. It is now owned by F. D. and H. W. Eickemeyer.

The property is opened by about 2500 feet of underground workings in good condition and numerous surface cuts and pits. Country rocks are Clarno,-tuffaceous shales, and conglomerates with some andesites.

Ore occurs in well defined fault zones, but is not continuous. It is found in very high grade bodies varying in size from a few pounds to several thousand pounds. No regularity of occurrence was found in these bodies. They may be on either the hanging or foot wall, or may extend across the width of the fault. The ore is usually accompanied by calcite and a hydrocarbon, known locally as "gelsenite".

Two major fault zones are present. One trending N.25°W. and dipping 50 E., and the other striking N.70°W. and dipping steeply to the south. Both faults are intersected by cross fractures, some are younger and some are older than the major faults.

The ore is all hand picked before retorting, with the result that charges may run as much as 25% mercury.

SUMMARY.

Except for the small amount of Cretaceous sediment, the geologic history of the region is one of volcanism, beginning with the Clarno formation of Eocene and continuing until late Pliocene or early Pleistocene. As a result of this activity a wide variety of extrusive igneous rocks occur distributed throughout the area. Intrusive rocks are not uncommon since the older formations are cut by dikes and plugs of younger rock. There were periods of relative quiescence and then times of violent explosive activity since both flows and pyroclastics (?) of varying thickness occur. This volcanic activity produced stresses and strains which are expressed in the faults and folds found in all of the older formations. In the early Tertiary the intrusions were heavily charged with mineralizing solutions, which collected under favorable conditions; precipitation occurred to form cinnabar deposits.

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