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A GEOLOGICAL RECONNAISSANCE IN THE ST. MARIES REGION, IDAHO

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by

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C O N T E N T S

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I N T R O D U C T I O N

PURPOSE AND SCOPE OF THE INVESTIGATION

Reports of the discovery of lead-silver deposits in the upper Marble Creek drainage basin during the winter of 1927-1926 have attracted much attention and brought to the Idaho Bureau of Mines and Geology requests for information, both concerning the significance of these discoveries and the promise held by the district as a whole. Promising developments had also been reported on Roundtop Mountain a few miles northeast of the town of St. Maries, and geologic information was sought on these as well. To gather the desired information the writer was assigned to make a reconnaissance examination of the areas in question, viewing particularly the mines and prospects and such geology as was incidental to the traverses from property to property. As only seven days were at the disposal of the writer, from June 29, 1928 to July 5, 1928, little time was afforded for geologic mapping or untangling some of the complex geologic problems. Consequently, this report is without a geologic map and the interested reader must resort to the maps of such publications that are already available. Some of the broader features of the geology were determined during the reconnaissance and especial attention was given to those combinations of factors that are considered most favorable for mineral deposition. Although the report is primarily economic, the general geology was given adequate treatment so that the prospector and others who are interested can obtain a comprehensive knowledge of the area which may aid them in understanding their problems and aid them in their search for new deposits.

ACKNOWLEDGEMENTS

The work was greatly facilitated through the courtesy of Mr. Huntington Taylor, manager of the Rutledge Timber Company, who placed at the disposal of the party, Mr. B. W. Ashenfelter to serve as guide in the Marble Creek district. To Mr. Ashenfelter goes much credit for the success of the reconnaissance because of his intimate acquaintanceship of the area. The writer gratefully acknowledges this assistance. Directions to the prospects in the Roundtop district were given by Mr. J. M. Warren of St. Maries. The writer was assisted in the field by Mr. Otto Brown, a student in the School of Mines at the University of Idaho.

PREVIOUS GEOLOGIC WORK

The greater part of the Marble Creek basin has been covered in geologic surveys, including that part visited by the writer and a geologic map is already available. In these earlier studies the stratigraphy and some of the structural features were unraveled and are shown on the maps, but little mention is made of mineralization. The Roundtop district, however, has not received previous geologic study except in a most general reconnaissance by Calkins, who grouped the rocks as undifferentiated Belt sediments.

The following is a list of the more important publications that have a bearing on the geology of the area under investigation. This list includes

several publications that pertain to other parts of the St. Joe region not covered in the reconnaissance by the writer:

1. Calkins, F. C., A geological reconnaissance in Northern Idaho and Northwestern Montana. U. S. Geol. Survey Bulletin 384, 1909. Shows the area north of the St. Joe River, as undifferentiated Belt Series, capped in places along the river valley by Miocene basalt.

2. Calkins, F. C., and Jones E. L. Jr., Geology of the St. Joe-Clearwater region, Idaho. U. S. Geol. Survey, Bulletin 530, pp. 75-86, 1912. Describes the geology of the region lying south of the St. Joe River and east of Avery. The west border of the area is within 12 miles of the region examined by the writer.

3. Collier, A. J., Ore Deposits in the St. Joe River Basin, Idaho. U. S. Geol. Survey Bulletin 285, pp. 129-139, 1905. The region was described by Collier, who made a reconnaissance over the known prospects at that time. His reconnaissance covered a part of the Marble Creek district.

4. Kirkham, V. R. D., Ground Water for municipal supply at St. Maries, Idaho. Pamphlet No. 17, Idaho Bureau of Mines and Geology, 1926. Describes the geology immediately tributary to the town of St. Maries, but does not cover the area included in the present report.

5. Pardee, J. T., Geology and Mineralization of the Upper St. Joe River Basin, Idaho. U. S. Geol. Survey Bulletin 470, pp. 39-61, 1910. Describes the geology of a large part of the St. Joe River basin not covered by Calkins and Jones in Bull. 530, including the region north of the river and east of range line 2 E to the Montana line, and also the lower course of Marble Creek as well as some of its tributaries near the headwaters. Part of the area lies within that visited by the writer.

6. Umpleby, J. B., and Jones, E. L. Jr., Geology and ore deposits of Shoshone County, Idaho. U. S. Geol. Survey Bull. 732, 1923. The whole of the Marble Creek area is shown on the geologic map of Shoshone County as well as the upper tributaries of the St. Maries River. The geology of the greater part of the region visited by the writer in the Marble Creek district is on the map.

G E O G R A P H Y

LOCATION AND ACCESSIBILITY

The area covered in the reconnaissance can be grouped as two localities, one on the north of the St. Joe River which will be referred to as the Roundtop district from the highest emminence in the area, and the second south of the St. Joe in the upper Marble Creek basin which will be referred to as the Marble Creek district. These are separated by more than 15 miles in air line, and by about 50 miles by road. Several prospects were visited which were outside of these areas.

The Roundtop district is in the west part of T. 47 N., R 1 W., and in the west part of T. 46 N., R. 1 W. north of the St. Joe River. This district is wholly within Benewah County, of which the town of St. Maries is the county seat. The south part of the district is about 6 miles northeast of St. Maries and is reached by a good highway which follows the St. Joe River from St. Mar-

ies. However, most of the area is difficultly accessible, and the prospects are reached by trails which extend north from the highway along streams that drain into the St. Joe River. Two of the properties are best reached by trail from the Coeur d'Alene River by following Evans Creek to its head.

The Marble Creek district is within Shoshone County. The area covered in the reconnaissance lies in part in T. 43 and 44 N., R. 2 and 3 E. also in T. 43 N., R. 4 E., all measured from the Boise Meridian. Clarkia is the nearest town, being a little over a mile south of the southwest corner of T. 43 N., R. 2 E. A logging road from Clarkia leads to the center of the district on Marble Creek. This road is very steep in places, has long grades, and is not generally fitted for automobile traffic except during the summer period when the road is dry. The town of Clarkia is on the Elk River branch of the Chicago, Milwaukee, and Puget Sound Railway. Most of the area included in this district has been logged over as well as burned over and all parts may be reached without great difficulty by saddle or foot.

TOPOGRAPHY

Both areas lie within the Coeur d'Alene Mountains, a broad greatly dissected plateau standing at an elevation of about 6,000 feet in its higher parts with the deeper valleys along the west where the major streams leave the district carved to elevations of about 2,150 feet. The mountains are mainly structureless and the directions of streams are little influenced by the strike of the sedimentary rock. However, the major stream, the St. Joe River, which flows in a westerly direction and drains the greater part of the region follows more or less closely a westerly trending fault of considerable magnitude at least in its lower course from the town of St. Joe to St. Maries. The St. Maries River rises in the southern part of the area and flows in a general northwesterly direction to the town of St. Maries where it enters the St. Joe River. Tributaries to both streams are numerous for the region is in an early mature stage of dissection and lies on the west side of the Rocky Mountains. Marble Creek is another noteable tributary of the St. Joe River entering from the south.

The ridges of the area are even-crested and gently sloping, and the sides are generally steep, but not so steep as to prohibit a heavy growth of timber. Steep slopes characterize the surface of at least two-thirds of the area. The remainder, of level or gently sloping ground, is found mainly on ridge summits or high rock-cut terraces, or flats in the lower valleys of the St. Joe and the St. Maries Rivers. The region has a very interesting physiographic development as well as a very complex one. Evidences of at least three former base-levels or peneplains are well preserved in the Marble Creek district and in the upper St. Maries River region. The earliest comprises flats at approximately 6,000 feet elevation now forming the summits of the high ridges. These probably correspond to an extensive peneplain described in the Clearwater Mountains and Salmon River Mountains of Idaho by Umpleby* and others. Beneath this at an elevation of from about 4800 feet to 5000 feet is a second less extensive base-level that is well preserved near the headwaters of all the major streams and has greater surface distribution than the earlier peneplain. These rock-cut terraces are beautifully preserved in the higher parts of the Marble Creek district and remnants as much as 3 to 5 miles across remain, deeply trenched by the present streams. A third base-level has been cut beneath the second peneplain, this now at an elevation of 3500 to 3800 feet.

*Umpleby, J. B., Geology and ore deposits of Lemhi County, Idaho: U. S. Geol. Survey Bull. 528, 1913.

This peneplain has the greatest areal distribution of all and is well preserved over much of the Marble Creek area. Stretches of this base-level, as much as 8 miles across may be found along the Marble Creek drainage. The base-level has been deeply trenched by the present streams which now flow in steep youthful valleys dissecting it into a stage of early maturity. The road from Clarkia to Marble Creek follows the narrow ridges of this peneplain.

Younger than the peneplains described above is a constructional plain built by the flows of Columbia (Miocene) basalt which extended far back into the valleys that were carved into the third base-level. This forms extensive plateau-like areas at elevations from about 2500 to 2700 feet which extend up the St. Joe Valley and up the St. Maries Valley beyond the town of Clarkia. The two rivers and their larger tributaries have cut deeply in the former lava plain and have dissected it considerably, though large terraces, some of them several miles across, yet remain and flank the present stream valleys. In many places the streams have cut through the basalt and have exposed the older rocks.

Part of the basalt plain remains in the Marble Creek district on the St. Maries River drainage side, but apparently none occurs in the main part of the district, due to the fact that much of it is represented by the three early peneplains and stood too high at the time of the outpouring of the lava to be buried. Part of the Roundtop district, however, along the St. Joe River has a capping of the basalt, but Roundtop Peak, itself, rises to an elevation of about 4400 feet. On the flanks of this the mineral prospects are located either above the basalt surface or in the valleys where the streams have cut through the basalt into the older rocks.

VEGETATION

Except the highest summits and ridges, all the area is or recently was clothed with a dense forest and denser underbrush. Lumbering is the chief industry of this part of Shoshone and Benewah counties and, except for farms and ranches on some of the cut-over lands on the basalt plateau and along the flats of the St. Joe and St. Maries valleys, in their lower parts constitutes the chief source of income in the district. Logging operations have continued for many years and areas of virgin timber are becoming depleted. White pine is the most valuable timber in the district. Much cedar remains, however, in the Marble Creek district where it is left uncut, because the poles cannot be floated down Marble Creek without being destroyed in the rough waters.

A large part of the area on Marble Creek is scarred with burns and is in various stages of reforestation, some of the timber being destroyed in 1910 and again in 1923. Much of the remaining stands have been logged off as well, consequently the area is relatively easy to prospect. Nevertheless, bedrock is exposed mainly along the stream bottoms for a deep cover of soil serves to mask the rocks on the slopes and on most of the lower ridges. Roundtop has been logged and only a dense growth of brush covers the surface. In many places the brush is nearly impenetrable. Bedrock, however, is exposed abundantly in most places and the region is easy to prospect.

G E O L O G Y

GENERAL FEATURES

The greater part of the area is underlain by rocks of sedimentary origin which are considered to be the equivalent of the pre-Cambrian or Algonkian

formations in the Coeur d'Alene district. These show some differences from the rocks described in the type localities, but the differences are not too great to prevent correlation, though some uncertainty is introduced with respect to the St. Regis formation and to lesser extent with the Burke and Revett. Intruded into the Algonkian sediments is a series of sill and dike injections of probable quartz dioritic and diabasic composition which may be pre-Cambrian in age. These dark colored igneous bodies are most numerous near the base of the Algonkian sediments, but several occur in higher parts of the series. These rocks and sediments have in turn been invaded by stocks of granodiorite and monzonite, stocks and dikes of granodiorite (?) and monzonite (?) porphory, and by pegmatite dikes and quartz veins. These intrusions are believed to be late Mesozoic in age. Sediments of younger age, probably of early Tertiary age, occur as high bench gravels and cap the ridges which form the base-level at 3500 feet. Mention has already been made of the basalt of Miocene age which drowned the lower courses of the St. Joe River and St. Maries River valleys. Recent alluvium occupies the present valley flats along the St. Joe River and along the St. Maries River.

SEDIMENTARY ROCKS

Algonkian System

The Algonkian or Belt rocks of the district comprise calcareous shales, quartzites, slate, and strata of intermediate composition. Those in the northern part of the district are similar to the equivalent members in the Coeur d'Alene district, but in the southern part near bodies of granitic rock they have been greatly metamorphosed and changed to mica schists and hornfels of various composition. The series is many thousand feet thick, and at many horizons in it ripple marks clearly indicating deposition in shallow water, are well preserved. However, in the metamorphosed areas these features have been entirely destroyed. The subdivisions used in the Coeur d' Alene district will be used in this report.

Prichard Formation: The Prichard formation is the oldest member of the Belt series and attains a thickness of at least 8000 feet with the base not exposed. It forms the main country rock in the Roundtop district and the greater part of the bedrock of the Marble Creek district. The formation in each place is surprisingly dissimilar because of the metamorphism in the Marble Creek area. Otherwise little difference in the condition of sedimentation of the two localities can be seen. In the Roundtop area the formation consists of blue and gray shale or slate with subordinate interbedded quartzite. Some of the members may be more properly classed as argillites and argillaceous quartzites. Evidently the lower part of the formation is exposed at this place, for a mile or two to the east a massive white quartzite member about 200 feet thick crops out along the summit of the ridges, and this probably corresponds to the middle quartzite member in the *Pine Creek district. In the Marble Creek district the shales and impure quartzites have been altered to mica schists and gneiss through contact metamorphism. Here the series may be divided into three members, a lower composed of micaceous schists and gneiss, much of it garnetiferous, alternating with thin beds of quartzite. This member comprises the greater part of T. 43 and 44 N., R. 3 E. and covers nearly half of T. 43 N., R. 4 E. It also covers the east part of

*Jones, E. L., Jr., Reconnaissance of the Pine Creek district, Idaho: U. S. Geol. Survey Bull. 710, pp. 1-36, 1919.

the townships in R. 2 E. Dark dioritic intrusives are particularly numerous in this thick member. Overlying the lower member is about 1000 feet of white quartzite that constitutes the middle of the section. This member is well exposed on Marble Mountain. The quartzite is in turn overlain by the upper series of grayish and brownish mica schists.

Burke-Revett Formations: The Burke and Revett formations are difficult to differentiate in the St. Joe district. These outcrop outside of the districts visited by the writer. They have been described as white, rather flaggy, slightly sericitic quartzites, grading into grayish and brownish quartzites and schists. The supposed equivalent of the Revett quartzite is more micaceous and thinner bedded here than in the type locality, and therefore less distinct from the beds which are believed to represent the Burke formation. The Burke appears to be about 1000 feet thick and the Revett about 1500 feet. The two members are conformable with each other, and the Burke with the underlying Prichard. The formations outcrop in T. 44 N., R. 4 E., and possibly about a mile east of the town of Santa.

St. Regis Formation: The St. Regis formation is the most difficult of all the formations to identify because it shows considerable lithologic variation from the Coeur d'Alene district. It is with difficulty separable from the underlying Revett quartzite, and the overlying Wallace formation, because characteristic purplish bands of the Coeur d'Alene district are here lacking and the formation is composed of thin-bedded quartzitic sandstone and shale which grade imperceptibly into the underlying Revett. The upper part of the St. Regis is composed of pale greenish, indistinctly banded shale with thin-interbedded layers of sandstone and merges gradually with the overlying Wallace formation. The formation was not clearly identified in the area visited by the writer and was generally considered a part of the Wallace. The formation is reported to be about 1000 feet thick.

Wallace Formation: The Wallace formation is next to the Prichard in areal distribution and crops out over much of T. 43 and 44 N., R. 2 E., in the Marble Creek district, in much of the area northwest of Marble Creek to the town of St. Maries, and along the St. Joe River from St. Maries to several miles east of St. Joe City. It is the thickest formation above the Prichard and is probably in excess of 6000 feet. This formation too shows notable variations due to igneous metamorphism. As a whole, however, it is made up of thin-bedded calcareous rocks. Along the St. Joe River the series shows least metamorphism and is composed of greenish shales and sandstones, in part calcareous, and is much like the St. Regis in general appearance except for a few limy members. Higher in the formation the calcareous sandstones and calcareous shales are more abundant and inclose irregularly spaced beds of impure limestone. The higher members are composed of bluish limy shales which grade upward into greenish-banded to greenish shale. The formation usually weathers buff, and the lime leaches from the rocks producing irregular cellular surfaces. These features readily serve to identify this formation in the field. In the Marble Creek district, however, the formation has been considerably metamorphosed and the shales have been altered to pale-greenish and brownish hornfels. These hornfels are generally studded with white grains of scapolite about the size of buckshot and this feature may be used to identify the formation in the field in the metamorphosed areas. In those places the sandstones have been converted to quartzites, some of the limestone to marble, and some of the shales to micaceous schists.

Striped Peak Formation: No members of the Striped Peak formation were seen by the writer. The formation crops out rather extensively in the upper

St. Joe basin where it is described as a series of light-gray to greenish flaggy sandstones, graywackes, and quartzite. It lacks the reddish and purplish banding of the Coeur d'Alene district.

Tertiary System

The Tertiary system is confined to the high bench gravels that lie on the base level at 3500 feet. These are mainly erosional remnants of a former widespread blanket deposit that now cap the ridges. Because these deposits occur at considerably higher elevations than the surface of the Columbia basalt of Middle Miocene age and because most of the gravels were removed by erosion during the uplift of the base level which preceded the carving of the valleys into which the basalts extended, the formation is probably of Early Tertiary age. The deposit is composed of rather poorly consolidated gravels and boulders of the Belt Terrane and of the granitic rocks. Many of the ridges at 3500 feet in the Marble Creek district contain a capping of these deposits.

A small patch of Latah formation near the town of St. Maries composed of fine silts, clays, and carbonaceous matter occurring between the basalt flows and containing fossils of Middle Miocene age has been described by Kirkham. These were formed as a result of imponding by the flows of lavas in the valleys.

Quaternary System

The Quaternary System is represented by the recent deposits which occur in the bottoms of the present stream valleys, and also by the hill wash. The St. Joe and St. Maries rivers in their lower courses have well-developed flood-plains and the deposits are mainly fine silts modified by gravels brought in by the tributaries.

IGNEOUS ROCKS

Algonkian (?) Intrusives

Dark colored intrusives in both sill and dike form are numerous in the Prichard though by no means confined to this member. Several very persistent sills of diabase have been described by Pardee farther east that have been intruded into the middle and upper part of the Wallace formation. Several sills and dikes (?) of from a dozen feet to several hundred feet thick were noted by the writer along Marble Creek. These appear to be similar, megascopically to a series of sills in the Cabinet Range of Bonner County that have been studied in considerable detail by the writer* and which have the composition of quartz-rich diorites. The sills have been metamorphosed along with the Belt sediments by the late Mesozoic intrusives and are thus obviously older than Mesozoic but younger than the Belt sedimentation. They may be late Proterozoic in age, though possibly they may be even early Paleozoic. The mineralization of the region does not appear to be related to this period of igneous activity, but to the younger intrusions of the Late Mesozoic.

The sills farther east have been described by Pardee as greenish black, fine grained to coarsely granitoid diabases, with feldspar laths embedded in

*Anderson, A. L., Geology and ore deposits of the Clark Fork district: Idaho Bureau of Mines and Geology, Bull 13 (in press).

a dark-greenish crystalline ground mass of ferromagnesian minerals. The microscope shows them to be rather siliceous types, free from olivine, and composed essentially of labradorite, augite, ilmenite, and interstitial micropegmatite. Some contain considerable interstitial quartz and alkali feldspar. In the Marble Creek district metamorphism has produced in some a decided gneissic texture and most of the augite has been altered to hornblende. In many places large garnet crystals have been developed as well. A sill or dike about 350 feet thick outcrops on the south side of Roundtop. This has a medium grain, with abundant crystals of hornblende or augite in a light mass of feldspar and quartz and is dark greenish gray in color. An especially thick basic intrusive outcrops in T. 43 N., R. 4 E., which Pardee describes as an altered schistose amphibolite. A large body of anorthosite occurs in contact with this sill. Its exact relation to the dark basic sill is not definitely stated, but microscopic sections show that it has been thoroughly crushed and sheared. It has suffered about the same amount of dynamic metamorphism as the amphibolite. This rock is white in color and consists essentially of soda-lime feldspar with the average composition of labradorite. Some phases contain minor amounts of hornblende and other dark minerals.

Late Mesozoic Intrusives

The intrusions of the Late Mesozoic are very important from an economic standpoint because of their relationship to the mineralization of the area, for they are usually considered the source of the ore deposits of much of central and northern Idaho. These may be listed as granodiorite and monzonite stocks and batholiths, granodiorite (?) and quartz monzonite (?) porphyries which generally form a border fringe of dikes and apophyses about the bodies of granodiorite, and as pegmatite dikes and stringers. At least one of these occur in the districts examined by the writer. All are probably outliers of the extensive central Idaho batholith of late Mesozoic age. Several small lamprophyric dikes were noted in the Roundtop district, one in association with a vein.

Monzonite and Granodiorite: Bodies of granodiorite outcrop in T. 43 N., R. 4 E., in the Marble Creek district. A large oval-shaped stock projects into the northeast corner of the township from the east and has been described as a rock of medium granular texture, consisting essentially of plagioclase (andesine and oligoclase), subordinate orthoclase, quartz, and biotite, locally with a little hornblende. Another stock enters the southeast corner of the township from the south and invades the body of anorthosite. It has more nearly the composition of a quartz monzonite. It is about these bodies of igneous rock that the metamorphism of the sediments and pre-Cambrian (?) basic sills is so strongly pronounced. Another body of monzonite and granodiorite outcrops north of the St. Joe River at the mouth of Marble Creek. This was not seen by the writer.

Porphyry Dikes and Stocks: Porphyry dikes and apophyses of probable granodioritic and quartz monzonitic composition are numerous on the lower south flank of Roundtop Mountain, being easily seen from the highway along the St. Joe River between Street Creek and Warren Creek. These dikes are well exposed for over a mile up Warren Creek, forming bodies several dozens of feet across and traceable for several hundreds of yards along the strike. The rocks are stirkingly porphyritic and have phenocrysts of feldspar (probably plagioclase) embedded in a fine-grained, grayish base in which minute crystals of hornblende, biotite, quartz, and additional feldspar may be recognized. Some dikes also have large rounded phenocrysts of quartz. These dikes and apophyses may indicate the presence of an underlying granodiorite

batholith, but the noteable lack of metamorphism of the sediments suggests that such a body would be at considerable depth. The mineralization on Roundtop is probably genetically related to these porphyry intrusions.

Pegmatites: Pegmatitic dikes and sheets are particularly numerous and conspicuous in T. 43 and 44 N., R. 3 E., especially near the mouths of Cornwall Creek and Homestead Creek. Most of these are coarse-grained pegmatites with large crystals of feldspar, quartz, and mica. Some of the dikes contain plates of biotite up to 4 inches in diameter. The dikes and sheets range from a few inches to several feet in thickness, but most of them are from one to two feet. In many places the pegamtitic material occurs between the bedding planes of the sedimentary rock and produces a rock very similar to granite gneiss. The most interesting feature is the great variation in the amount of quartz in the dikes and gradations were noted from coarse grained pegmatites with quartz subordinate to the feldspar into those consisting essentially of quartz, and it is probable that several quartz veins free from feldspar in the area are of this origin.

Miocene Basalt

The basalts of Miocene age are all younger than the mineralization of the area and are hence unworthy of prospecting. On the other hand they probably conceal mineralized areas in the older rocks which they cap. In the Roundtop district this former blanket-like series of lavas has been cut through by Street Creek and Warren Creek and the older rocks brought to view. It is for this reason that the porphyry dikes are exposed and probably some of the mineralized veins on Street Creek. The basalt is a heavy, dark rock, varying greatly in texture and characteristics in the various flows. It shows well-developed fracturing and jointing, and at some places is vesicular and porous.

METAMORPHISM

The metamorphism of the sediments and Algonkian (?) intrusives in the Marble Creek district has been sufficiently discussed in the preceding sections, except in some of the broader relations. The intensity decreases northward and to the northwest and increases decidedly on approach to the bodies of granodiorite on the south. The metamorphism is due in part to the nearness of the great Idaho batholith and in part to dynamic stresses acting under a heavy load of sediments. The metamorphism has apparently been most intense in those areas that contain numerous pegmatites and it is more than likely that the metamorphism has been largely due to the addition of material from the igneous magma. The widespread and abundant occurrence of scapolite in the calcareous rocks of the Wallace formation indicates that chlorine has been added from the metamorphosing magma. That all the metamorphism is not due to the magma is indicated by the sheared anorthosites and basic dikes and sills and indicates that pressure as well as heat and volatile components have played a part.

Of more than general interest is the lack of appreciable mineralization in the areas of highly metamorphosed sediments. Quartz veins and other evidences of mineralization are few and these areas are not generally favorable for prospecting, especially for lead and silver minerals. Some gold and copper-bearing veins have been found in such areas but none of them have so far proved of economic significance.

STRUCTURE

The structure of the region is complex and involves folding and faulting on a grand scale. These features could be noted only in a most general way during the reconnaissance. The features due to faulting are most important, for it is in the fault zones that much of the mineralization has been centered.

Folding

The folding of the region is complicated and no attempt was made to decipher the record. The beds are generally steeply tilted either to the northeast or southwest. In general the St. Joe River tends to follow the axis of a west-northwest syncline. This structure has been modified, however, by faulting which has greatly increased the areal extent of Wallace rocks. The synclinal fold is broad and gentle, but variations of strike and dip are numerous and probably indicate a series of minor folds, and the whole structure is that of a synclinorium. This syncline is probably commensurated with an anticline that occurs south of Lookout Mountain in T. 43 N., R. 4 E. It also, is complicated, as the Marble Creek section shows, by minor folds. Many of the smaller folds are overturned and all have an eastward pitch.

Faulting

Faults of great magnitude were noted in the area as well as numerous smaller ones, all of which tend to complicate the structure. The major faults trend in west-northwest lines, but a few of large magnitude trend nearly north. These, however, may be cut off by the west-northwest faults, though the relation is not clear. Of the northerly trending faults, one in T. 43 and 44 N., R. 2 E., is the most striking, for the beds of the Wallace formation have been brought against the lower member of the Prichard involving a displacement which must be measured in several thousands of feet. The fault is followed for two miles by the headwaters of Bussell Creek. Whether the fault is normal or thrust was not determined, but it may possibly be normal with the downthrow on the west. Apparently another nearly parallel fault which is followed by the west fork of Merry Creek, a tributary of the St. Maries River, brings the Prichard to the surface again on the west. Its displacement, too, must be several thousand feet. This fault may also be found two and one half miles east of Clarkia where it is crossed by the St. Maries River. Other faults of similar nature will probably be found on closer search.

The most interesting and probably the most important of these major earth fractures, however, trends west-northwest and follows the general course of the St. Joe River from the town of St. Maries eastward. This fault was traced for more than 12 miles by the line of depressions or saddles across the ridges which slope to the river from the north. Near St. Maries the fault is apparently concealed by the gravels of the river, but beginning near the mouth of Warren Creek the fault lies from a half mile to two miles north of the river and is behind a low line of hills which lie in front of the high mountainous ridges on the north. The mountains on the north have a bold, steep, regular front and outline the trace of the fault very distinctly. The fault was traced several miles beyond St. Joe City but was not followed to its end. It may be a continuation of the great fault of west-northwest trend that follows the general course of St. Joe River near the mouths of Marble and Mica Creeks which has been described by Pardee. The mapped ends of these faults are in nearly perfect alignment and if projected would probably join. Between St. Maries and St. Joe city the fault appears to be normal with downthrow on the south which has brought the Wallace formation on the south against

the Prichard formation on the north. Near St. Joe City the Wallace formation may come into view on the north as well. Pardee describes the fault near Marble and Mica Creeks as having its downthrow on the north and great enough to bring the Wallace formation into close proximity to the lower part of the Prichard. This great fault may be similar in its magnitude and origin to the famous Osburn fault of the Coeur d'Alene district. It parallels the Osburn fault and like the Osburn may have a great horizontal displacement, measurable in terms of 10 or 12 miles. With such an hypothesis the dense white quartzite member of the Middle Prichard which outcrops a mile or two east of Street Creek may be made to match with the same member near the mouth of Mica Creek. The proof rests with detailed work. The direction of movement, however, would be opposite to that along the Osburn. The mineralization on Roundtop may be in part localized by this major earth fracture.

SUMMARY OF GEOLOGIC HISTORY

The geologic record begins with the deposition of a great thickness of sediments in a vast shallow sea probably throughout the whole of Algonkian time. At the close of the sedimentation, either in late Algonkian or perhaps in early Paleozoic time, the sediments were invaded by basic igneous magmas which forced their way along the bedding planes as sills or across them as dikes. The record is then missing or incomplete until the late Mesozoic when the Rocky Mountains were formed. The rocks in the area were then subjected to compressive forces, and were folded, faulted, and at the closing stages of the mountain building invaded by stocks and batholiths of granodiorite, and dikes and apophyses of porphyry, which cooled far beneath the surface. During the decline of the igneous activity pegmatites, quartz veins, and aqueous solutions which carried minerals were given off and filled fractures in the sedimentary rock.

The region was then subjected to erosion which has continued to the present day. By early Eocene time the mountains were reduced to a base-level or plain of low relief, and the underlying granitic rocks brought to view in many places. The land was again elevated, probably without folding, and erosion was again inaugurated and a second peneplain carved about 1000 feet below the earlier. Only remnants of the first peneplain now remain. The land was then elevated a third time and a new cycle inaugurated. A peneplain less extensive than the second was cut about 1500 feet lower and was floored by gravels deposited by the sluggishly moving streams which carved the broad valleys which now constitute the ridge summits at elevations of 3500 feet. Probably renewed elevation caused the streams to entrench in their old valleys and in Middle Miocene time their lower courses were flooded by flows of basalt which did not, however, fill them so as to overflow upon the terraces which constitute the third base level. Since then the land has undergone erosion, quickened, perhaps, at least twice by slight reelevation, and the basalt plain has been entrenched several hundred feet by the present streams. The region herein described escaped glaciation in the Pleistocene.

O R E D E P O S I T S

GENERAL STATEMENT

Persons who were directly interested in the ore deposits, especially those on Roundtop, were absent at the time the writer was in the district and consequently little could be learned of the past development or the past history. Because some of the workings appeared very old and some of them in a state of disrepair the mineral lodes have evidently been known and prospected for a number of years. About one thousand feet of tunnels were found on one property

and none of the work was recent. It is likely that most of the properties were dormant the past few years until the summer of 1927 when interest in them was revived and active prospecting began again. At present three properties are being explored with two men employed on each. Numerous location notices dated in 1927 testify to the renewed interest. Apparently no ore has been marketed from the district. Several of the dumps contain considerable ore that would furnish good mill feed, but it is doubtful whether the ore could be hand sorted and shipped direct, especially as much of it is complex as an intimate mixture of several sulphides including both lead and zinc. The future of the district depends on the discovery of ore shoots of such size as would justify the erection of mills. The district is worthy of thorough prospecting.

No prospecting has been done in the Marble Creek district for a number of years, mainly because the land is held by timber companies who retain the mineral rights. If discoveries are made they are kept concealed until such time that the timber companies relinquish their claims and the land reverts back to the State. Discoveries of ore have been reported in the district during 1927, but the location of these could not be ascertained nor the discovery verified in the field.

CHARACTER OF DEPOSITS

The deposits in the Roundtop district are mainly metasomatic fissure veins, though somewhat different from the type in the Coeur d'Alene district. These appear more as very persistent crush zones or fault breccias where the displacement has been slight but sufficient to brecciate the rock over a considerable width and provide channels for the migration of mineralizing solutions which cemented the fractures in part by depositing quartz, calcite, and sulphides and also by enlarging them by replacement of the fragments. Replacement of the country rock along and in the crushed zones has been the dominant process in most of the veins. Few of them show gouge seams or walls, but the mineralization shades gradually into the country rock. True fissure veins in this district were found on the Silver Star property near the head of Warren Creek where the wall rock is a quartz diorite and the vein filling has exceptionally distinct boundaries. The deposits examined near the Marble Creek district are fissure fillings.

The veins that were studied may be classed either as lead-zinc veins or as gold veins. Those in the Roundtop district are of the lead-zinc type and those near the Marble Creek district are probably best classed as the gold-bearing type. Several veins carry copper, but none in sufficient quantity to warrant a third grouping.

MINERALOGY OF VEINS

The primary sulphide minerals of the Roundtop district are pyrrhotite, arsenopyrite, pyrite, sphalerite, galena, chalcopyrite, and tetrahedrite (?). The quantity of each varies, but in most the pyrrhotite and arsenopyrite are the chief minerals. The most valuable ore is a fine-grained aggregate of sphalerite and galena in which there are commonly fragments of unreplaced wall rock and variable amounts of the other sulphides. Galena occasionally occurs in relatively clean seams or bands a fraction of an inch to several inches wide. These usually persist but a few inches. The ratio of galena to sphalerite ranges considerably and one is rarely free of the other. Chalcopyrite is usually present in small amounts in all the veins. Tetrahedrite was doubtfully identified in a specimen from the Monarch group. Pyrite is

generally subordinate to both the arsenpyrite and pyrrhotite, but all occur in nearly every deposit. The gangue minerals with which the sulphides are associated are quartz and calcite. In all except the Big Five group the quartz is the chief gangue, either free or as silicified inclusions of the wall. In the Big Five vein the calcite occurs in seams several inches thick which are cut by veinlets of quartz as well as by veinlets of the sulphides. Wall inclusions in these veins show alteration with the development of minor amounts of chlorite. In many places the sulphides occur in ramifying veinlets where they enlarge the fractured rock by replacement. Primary sulphides in the veins near the Marble Creek district are difficult to find either because the quartz veins are generally free of sulphides or because only the oxidized zone has been explored. Pyrite and a little galena have been recognized in some of the gossans.

The list of secondary minerals include cerussite, anglesite, malachite, massicot (?), pyromorphite, and limonite. These minerals result from the oxidation of the primary sulphides. They have little economic value mainly because the oxidized and enriched zone is extremely shallow in the deposits examined. Cerussite, the carbonate of lead, occurs in some abundance near the surface in the Big Five vein. Wherever the galena in any of the deposits shows stages of alteration minor amounts of anglesite, the sulphate of lead, may be found. Pyromorphite, the phosphate-bearing mineral, was recognized in the oxidized zone of some of the veins as an alteration product of the galena. Minor amounts of greenish malachite also occur in most of the upper workings as an alteration product of the chalcopyrite. Undoubtedly, chalcocite is present as well. The croppings are usually stained with brownish and reddish oxides of iron which are the residues left from the oxidation of the iron-bearing sulphides.

The primary sulphides are clearly the product of but one period of mineralization. In many of the deposits the sulphides are so very intimately associated that no other interpretation is possible. Generally the minerals are of medium to coarse grain, but locally they may be so finely associated that even extremely fine grinding would not serve to separate the various sulphides. The minerals, though the product of one period of mineralization, show a farily definite sequence of crystallization beginning with quartz, then followed in order, not without some overlapping, however, by pyrite, arsenopyrite, pyrrhotite, sphalerite, galena, chalcopyrite, and tetrahedrite (?). This sequence is about the same as that noted by the writer in the Clark Fork district.

THE DEPOSITS

In the Roundtop district the veins or lodes, except the Silver Star, are in the argillaceous quartzites and shales of the Lower Prichard formation. These deposits lie from two to five miles north of the great west-northwest fault which follows closely the St. Joe River and which the writer has described as possibly similar to the Osburn fault of the Coeur d'Alene district. The Prichard formation has been greatly distrubed north of this fault, both by folding and faulting, particularly the latter and it is in these greatly disturbed areas that the mineralization has occurred, not, however, in the major fractures but in those of small magnitude that are probably complementary to the major movement. The bedding of the Prichard alternates rapidly from a steep southerly dip to a steep northerly, and strikes generally westerly or a little north of west. Most of the changes are probably due to faulting. The Silver Star veins are in a dark-grayish sill or dike that is

about 350 feet across which has been intruded into the Prichard probably in pre-Cambrian time. The rock is probably a quartz diorite, which is much older than the mineralization and hence has no genetic relation to the veins.

Most of the veins trend in the northwest and northeast quadrants, ranging from N 45° W. to N. 75° W. and from N. 33° E. to N. 73° E. The dips could not everywhere be determined but generally range close to vertical.

The veins are remarkably persistent when their character is fully recognized and may be traced for hundreds of yards and some of them for several thousands of feet by the boldness of the ledges which they form because of their more resistant nature to erosion. The country rock has been thoroughly silicified along the crush or shatter zones and these stand above the more easily weathered and eroded impure quartzites and shales. Along these zones the bedding of the sedimentary rock has been destroyed usually over widths of from 10 to 30 feet and in some places even greater distances. The surface of the croppings usually gives little indication of the presence of mineral except a little reddish or brownish iron staining that has resulted from the oxidation of the sulphides. This staining is scarcely more pronounced that the usual weathering of the Prichard formation except that reddish tints are added probably because of the oxidation of the iron in the presence of galena. Except for the differences mentioned above, the veins may easily be mistaken for beds of country rock, for they are nothing more than silicified zones in the Prichard where the quartz and sulphides have been deposited mainly by replacement. The outcrops generally show little porosity as the result of leaching of the sulphides by the groundwaters, a surprising factor, for beneath some croppings show little sign of mineralization the sulphides are present in considerable quantity. The factors that control the localization of ore shoots within these veins could not be determined from the limited amount of development done. It is likely that these large silicified zones are generally poor in sulphides over much of their length and that the ore shoots occur irregularly within them. Some of the ore shoots must be several hundred feet long. None of them have been explored at depth. The veins are relatively numerous on the flanks of Roundtop and apparently only a few of them have been prospected. The few veins that may be classed as fissure fillings also have prominent outcrops, usually wide bands of massive white vein quartz containing much pore space where the sulphides have been leached away and with such places heavily crusted with iron oxides.

As most of these deposits lie high on the flanks of Roundtop where the slopes are steep or on the steep sides of the creek valleys, oxidation of the ores and enrichment has not kept pace with erosion and the primary sulphides occur very near the surface, in most places within a few dozen feet or less. Oxidized ores thus have little value.

The writer was unable to procure results of chemical analyses on the ores or find anyone who was aware of such results. Consequently, the value of the ore remains unknown. Galena may be present in some shoots to constitute ore, but in most of them pyrrhotite and arsenopyrite form the chief ore mineral. Pyrite is very abundant in some portions of the lode but whether it is accompanied by gold is also unknown. Further exploratory work and careful sampling is necessary, both of which are justified from the present showings.

The deposits near the Marble Creek district will be considered in the discussion of the mines. Some of the veins have extensive iron cappings or

gossans indicating that sulphides must be present at some depth. What these sulphides are could not be determined in all veins, for in some the development had not proceeded below the oxidized zone. Several of the veins are entirely barren and a few contain only an occasional crystal of pyrite.

GENESIS OF THE DEPOSITS

The mineralogy of the ores on Roundtop is so similar to the minerals and their relations in some of the ores in the Pine Creek district of the Coeur-d'Alene region that the origin of the two are unquestionably similar. Inasmuch as the Coeur d'Alene ores are believed to be genetically related to the intrusions of monzonite that are exposed in the district, it is logical to assume that the deposits on Roundtop are also related genetically to magmatic activity of the same age and of similar kind. The nearest body of monzonite so far as known lies about 17 miles east of the district. However, within the district itself, on the lower flanks of Roundtop and exposed in the valley of Warren Creek are a number of granodiorite (?) or monzonite (?) porphyry dikes and stocks that are probably off-shoots of a deeply buried batholith. The mineralization of the Roundtop district is probably genetically related to these intrusions of porphyry of Late Mesozoic age, the time at which most of the mineralization of the northern half of Idaho is thought to have occurred. The mineralization in the Marble Creek vicinity is probably related to the intrusives that are exposed in T. 43 and 44N., R. 4E. and which probably underly the region at but slight depth judging from the abundance of pegmatites and the great metamorphism of the country rock.

The minerals were probably deposited from magmatic waters that were given off during the declining stages of igneous activity. That the temperatures of deposition were high is shown by the abundance of pyrrhotite in the ores of the Roundtop veins. Pyrrhotite is generally believed to be produced only at high temperatures and at great depths in ore deposits. These veins may be properly classed as hypothermal. Whether the mineralization will persist in depth in the Roundtop district can be determined only by prospecting. Should the temperatures have been much higher at somewhat greater depth than now shown they may have been too high for sulphide deposition and the ore shoots might possibly then fade out with increasing depth. It is likely, however, that some of the veins will persist for several hundreds of feet and some perhaps, for several thousand. The veins in the Marble Creek district are also hypothermal, some of them clearly related to pegmatites. They are therefore similar to those of the Roundtop district and the conclusions just stated are probably applicable to the Marble Creek district.

CONCLUSIONS AND SUGGESTIONS

The Roundtop district is worthy of systematic exploration. The veins are numerous and persistent and, though not mineralized with sulphides their full length, possibly contain some shoots of commercial value, particularly those veins that lie in the northernmost part of the area. The outcrops of the veins should be carefully examined, especially those that contain iron staining of reddish color and if pore space is shown, caused by leaching of the minerals, the spot should be examined for a possible ore shoot by sinking or driving beneath the surface into the unoxidized zone. Not sufficient work has been done to prove the size of ore shoots either in length or depth, but a mineralized shoot has been followed along the vein on the Butte property for over 200 feet without passing through it. This does not guarantee that the shoot is of commercial grade for through most of it pyrrhotite seems to be the most abundant mineral and galena is only shown intermittently. As the oxidized zone

on most of the veins is probably shallow the exploratory work should go beneath into the primary sulphides. Exploratory tunnels should follow the veins from the start. This is possible as most of the veins outcrop near the creek bottoms where they are exposed in cross section and may be traced high on the steep valley sides, and do not require crosscutting. Exploration beneath the iron capping holds for the veins in other places as well as for those in the Roundtop district. Prospecting in the Marble Creek area will probably be delayed. The region bears scant evidences of mineralization and is apparently lacking in the structural features that usually control mineralization. It also shows a generally too intense metamorphism to be considered most favorable for ore deposits, especially lead and zinc. It is also possible that erosion may have planed away all but the roots of the lodes that may have been developed in the area. Theoretically conditions are somewhat better for the development of bodies of copper or gold as these are believed to have a greater range in thermal distribution. Any veins that are worthy of prospecting in the area should be assayed for gold. In general those deposits that contain lead and zinc minerals are usually somewhat deficient in gold but carry silver. On the other hand, those deposits that are free of lead and zinc and contain pyrite or chalcopyrite should be assayed for gold. Several gold nuggets were shown the writer that were reported to have been taken from the gravels of tributaries of the St. Maries River. This would indicate that gold-bearing veins may be found in the district. The ore shoots may prove small, erratic, and irregularly distributed in the veins, for some gold-bearing veins have been reported worked but none of them so far have proven profitable.

The most promising field for prospecting seen by the writer in the present reconnaissance lies north of the St. Joe River between the town of St. Maries and Fitzgerald Creek and probably extends beyond. In this area is found the combination of factors believed to be most favorable to ore deposition, namely, extensive zones of faulting and igneous intrusion without noteable metamorphism. That such deposits occur is shown by the mineralization in the Roundtop region and in a lead-zinc prospect on Fitzgerald Creek. Both areas lie north of the great west-northwest fault which follows the St. Joe River and the veins are probably in minor fractures that are related to the major crustal disturbance. Mineralization along the large faults should not be expected, for the great quantities of gouge developed during the movement usually impedes the migration of mineralizing solutions and the solutions seek escape through the minor breaks and fractures as in the Roundtop district.

MINES AND PROSPECTS

Because the writer had no one to guide him to most of the prospects in the Roundtop district and as he could find no one who knew the exact location of the properties by section and township the locations given herein are only approximate, but as accurate as could be judged from a Forest Service map that showed no topography. Also because the men who are most concerned in the development of the mines and prospects were away at the time the properties were examined, little could be learned of the personnel, the number of claims, and the organization of the companies.

The properties on Roundtop are all along streams which drain Roundtop Mountain, a hill rising to an elevation of about 4400 feet and appearing much as its name suggests. Two properties lie at the head of Evans Creek, a stream that heads on the north side of Roundtop and flows northwestward into the Coeur d'Alene River. One property lies near the head of Warren Creek, a stream that drains the south slope of Roundtop and flows south into the St. Joe River. The remainder except a prospect nearly on the summit of Roundtop lies

along Street Creek and its tributaries. This stream heads on the east side of Roundtop and flows into the St. Joe River paralleling Warren Creek which lies from a mile to a mile and a half on the west. The valleys of all these streams have very steep sides and bedrock exposures are numerous. The streams on their lower courses carry good flows of water the year around. They have cut through the capping of basalt which lies on the flanks of the lower south slope of Roundtop. Trails follow each of the streams. The one on Street Creek is in need of repair in order to approach the Big Five claims.

Butte Mining Company

The vein of the Butte Mining Company lies high at the head of Evans Creek about a mile to the northeast of the summit of Roundtop. Its location is probably in Sec. 20 T. 47 N., R. 1 W. and must be very near the Kootenai County line. A road which follows Evans Creek from the Coeur d'Alene River extends to within two miles of the property and the remaining distance is covered by a good trail. The property consists of 6 unpatented claims.

The vein is of the replacement type along a crushed zone and forms a prominent outcrop at the surface, somewhat more reddish than the Prichard quartzites which it cuts, but with little else to indicate the amount of mineralization shown in the tunnel on the property. The vein strikes about N. 30° W. and the dip is nearly vertical. The vein is persistant and may be traced up to the divide on the south and probably continues farther. Its northwesterly continuation was not followed, but extends several hundred yards beyond the present opening. The quartzites which the vein cuts strike nearly due west and dip south about 40°. The shearing or brecciation of the quartzite extends over a zone in places 20 to 30 feet wide. The bedding is destroyed, but the displacement has been small. The Prichard formation is more arenaceous or siliceous here than in most parts of the district.

The vein has been followed by a tunnel for about 210 feet. The dump is composed wholly of vein material, mainly silicified rock with variable amounts of sulphides particularly pyrrhotite and arsenopyrite. The list of minerals identified in this vein comprise arsenopyrite, pyrrhotite, pyrite, quartz, galena and sphalerite. In some parts of the vein the galena is locally abundant, some of it coarse-grained. The entire tunnel is on the mineralized shoot. Sulphides occur in the face and consequently the length as yet remains undetermined. The width of the vein or ore body also remains unknown. In some places the tunnel is 8 feet wide and both sides show sulphides. It is possible that the vein is as much as 12 feet wide in places or even more. The position of the galena along the mineralized shoot was undetermined. The specimens collected on the property show only subordinate amounts of sphalerite. Although the mineralization has been mainly in pyrrhotite and arsenopyrite, sufficient galena is present in the ore to warrant systematic exploration of the ore shoot.

Rainbow Mining Company

The claims of the Rainbow Mining Company adjoin the Butte mine on the northwest and are on the continuation of the Butte vein. The tunnel which has been driven on the vein is less than 200 yards from the portal of the Butte tunnel. The tunnel trends N. 35 °E. and cuts the vein at an angle. For most of its 120 feet the tunnel is in country rock or in leached parts of the vein, but in the face encounters sulphides similar to those in the Butte tunnel. A specimen examined microscopically is an intimate mixture largely of pyrrhotite and arsenopyrite with a few scattered grains of galena and sphalerite. Condi-

tions of mineralization are similar to those in the Butte and it is possible that both are on the same ore shoot. If this is true, the ore shoot must be several hundred yards long. The surface indications are the same as on the Butte claims and the mineralized shoot is equally as worthy of systematic exploration.

Big Five Mining Company

The Big Five Group of 6 unpatented claims is near the head of Street Creek, perhaps about 4 miles from its mouth in Sec. 29, T. 47 N., R. 1 W. The property has apparently not been worked for a number of years and the log cabins have fallen down. The trail from below is so overgrown with brush that it cannot be easily followed. This property is located on a vein similar to that at the Butte mine. The mineralized crushed zone may be readily traced from the creek bottom northward to the top of the divide by the rather prominent outcrop, iron stained in places. The vein forms a narrow ridge that is nearly free of brush and timber. It has a strike of about N. 50° W. and its dip is apparently nearly vertical. The silicification is shown along most of the outcrop and extends from a few feet to over a dozen feet wide. Several small cuts have been made high on the hill, but little mineralization is disclosed. A tunnel has been driven along the vein near the creek bottom. The portal was caved and the workings are therefore inaccessible. Judging from the size of the dump the tunnel must be 300 or 400 feet long. A considerable pile of ore lies on one side of the dump. This is composed mainly of oxidized material, containing iron oxides, but also with cerussite and a little pyromorphite. With it are scattered grains of sulphides including arsenopyrite, pyrrhotite, pyrite, and galena. The chief gangue mineral is calcite, but with it is considerable quartz. The ore clearly shows replacement of quartzites along the fractures. Both the quartz and sulphides also occur in veinlets in the calcite. Fragments from a lamprophyric rock encountered in the tunnel are strewn on the dump.

A second tunnel about 100 feet west of the first has been driven on what is probably a different vein, though of like character. The tunnel is about 350 feet long and follows the vein which strikes N. 55° W. and dips 70 S. W. This tunnel has a small stope about half way in. The vein consists of brecciated quartzite, cemented and replaced by quartz and calcite seams accompanied by a little pyrrhotite, chalcopyrite and probably the other sulphides. Considerable malachite is shown on the dump. The brecciation of the quartzite extends over a considerable width, in places for several dozen feet. This vein appears to be less highly mineralized than the other.

Hired Girl

The Hired Girl group is also on Street Creek about three quarters of a mile south of the Big Five and probably in the same section. The trail has been cut out to this property from the St. Joe River. The vein is of the usual replacement type along a brecciated or crushed zone and presents a prominent outcrop because of the silicification of the country rock and its resistance to erosion. The outcrop has the customary slightly reddish color. The fracturing of the quartzite is pronounced in this vein. The nature of the mineralization is similar to that in the preceding properties, but includes mainly pyrite with only subordinate amounts of pyrrhotite, arsenopyrite and chalcopyrite. The vein whose strike is N. 75° W. has been followed for 170 feet by tunnel with portal at the creek. Galena was not observed on either the dump or in the tunnel.

Monarch

The Monarch claims lie in Sec. 32, T. 47 N. R. 1 W. about one-half mile south of the Hired Girl or about two and one-half miles from the highway which follows the St. Joe River. This property has the most extensive workings in the district. The surface features are much like those of the other properties, a distinct ledge, rather easily traceable and with considerable porosity or vugginess, more so than on the outcrops of any of the other veins examined. The reddish staining is also pronounced. The vein generally shows the early crushing which formed channels for the migration of the mineralizing solutions. However, in some places along the vein occur three to four feet of solid quartz, which merges with the other type along the strike. The vein tends to follow a more defined fissure than the others and the movement produced some gouge which is shown in the underground workings. The mineralization is complex and much of the ore seen on the dump is a very intimate mixture of pyrrhotite, arsenopyrite, pyrite, chalcopyrite, galena, sphalerite, and possibly a few grains of tetrahedrite (?). The proportion of each sulphide varies considerably, though pyrrhotite usually predominates and in some specimens excludes all other sulphides. Galena occurs in appreciable amounts locally. The vein has been explored by a tunnel about 900 feet long and by about 130 feet of crosscuts. A shaft now filled with water was sunk on the vein about half way in. A small stope also extends up the vein an unknown distance. Near the portal the vein strikes about N. 40° W. and dips 70° N. E. but at the face the strike is N. 45° W. and the dip 80° S. W. The quartzites strike N. 10° W. and dips 23° N. E. The shoot encountered is apparently small, but is well mineralized. Several other ledges were noted in the vicinity.

The Monarch Claims as well as the Hired Girl now probably belong to the Roundtop Mining Company who control 12 unpatented claims in this vicinity.

Mountain View Mining Company

The property of the Mountain View Mining Company was unavoidably missed during the reconnaissance because of lack of information of its existence. The property lies on McCarter Creek, a tributary of Street Creek, not far from the Monarch and Hired Girl claims. This property is reported to be on a vein similar to those already described. Specimens of ore examined by the writer suggest brecciated quartzite that has been replaced by quartz and sulphides. The chief mineralization has been in pyrite, possibly some arsenopyrite, and small amounts of galena. Assays have not been made for gold and silver. The development consists of several small cuts on the surface. The property is reported to have been located in 1927.

Silver Star Mining Company

The property of the Silver Star Mining Company consists of 4 unpatented claims located in Sec. 31, T. 47 N., R. 1 W., at the head of Warren Creek on the south slope of Roundtop about three miles from the St. Joe highway. A trail of easy grade follows Warren Creek to the property. The veins differ from the usual type of the district and are distinctly fissure fillings in quartz diorite. Several veins outcrop on the surface a few of them of considerable size. The largest of these strikes N. 73° E. and dips about 40° N. W. It varies from several feet to as many as 16 feet wide and consists mainly of barren quartz, carrying iron stained vugs in places. These mineralized areas apparently form but a small portion of the vein. A second vein strikes N. 70° W. and dips 43° N. E. This has been explored by several

small cuts and shows a few vugs from which the sulphides have been leached. Small stringers are numerous on the property. A tunnel from the creek level has been driven to intersect the larger veins. This is in about 290 feet. It cuts several small veins varying from an inch to twelve inches, all dipping to the north, but lacks many feet of reaching the larger veins which dip away from the portal of the tunnel. All the veins pinch and swell greatly. Unoxidized ore from some cuts that were being made on the veins when the property was visited showed a few scattered grains of galena, sphalerite, and chalcopyrite. A little gold and silver has been reported. In one selected sample the gold was reported to run from $14 to $19 to the ton. So far as the development has shown the sulphide zones are irregular and of small size. Little work has been done beneath the oxidized zone. The writer would like to suggest that the places most worthy of prospecting are beneath those parts of the vein that are honey-combed and crusted with iron oxides and that efforts should be made to enter the sulphide zone which lie beneath these places.

The difference in the type of vein filling here and in the Street Creek and Evans Creek regions is probably accounted for in the difference in the nature of the wall rock. The diorite wall shows no apparent silicification or other evidence of replacement or hydrothermal alteration, but the contact between wall and vein is sharp. The difference then is largely that the whole amount of quartz is confined between the walls of the fissures in the Silver Star veins and that in the others the mineralizing solutions were permitted to spread out through the brecciated zone and causes a silicification of the country rock. Any other difference in the nature of the mineralization may perhaps be explained by the temperatures at which the vein materials were deposited. What will happen when the fissures pass from the igneous body into the quartzite wall is purely speculative.

Green Back Prospect

The Green Back claims lie nearly on the summit of Roundtop in Sec. 30, T. 47 N., R. 1 W. A vein consisting of about 12 feet of quartz showing a little iron staining and striking northwest has been opened in a small cut.

Beaver Creek Mining Company

The property of the Beaver Creek Mining Company lies in Sec. 19., T. 45 N., R. 1 E., at the head of Beaver Creek, a tributary that enters the St. Maries River about 2 miles northwest of Santa. Work ceased about 1926 and the road which serves the property from the town of Santa is in disrepair and the property must be reached on foot. The property was discovered in the early nineties and has had a hectic career. The greatest activity occurred about 1923 when northern Idaho was in the throes of a platinum excitement. Considerable money has been expended in constructing the road to the property, in camp buildings, and in a small mill. The mill was operated but a short time, and because of apparent lack of sufficient values in the ore was dismantled and the property is now idle. Two tunnels were seen on the property. The older tunnel on the vein was caved at the portal and hence an underground study was not afforded. A newer tunnel has been driven, but this about parallels the vein and is about 75 feet from it. The country rock is the Wallace formation which here is studded with round grains of scapolite the size of buckshot. The vein strikes N. 40° E., but the dip could not be determined. The vein is persistent and may be traced for a long distance on the surface. It ranges up to 7 and 8 feet in thickness. The filling is wholly massive white quartz generally without iron staining or other indication of sulphide mineralization. A few vuggy pieces of vein filling were found in the premises

as well as some with a few scattered minute cubes of pyrite.

Gold Center Prospect

The Gold Center Prospect is in Sec. 11, near the boundary of Sec. 12, in T. 42 N., R. 2 E. The prospect lies along Gold Center Creek, a tributary of the St. Maries River, 4 miles east of Clarkia and may be reached by wagon road which follows the stream. The outcrop of the vein has a heavy "iron capping" composed of reddish and brownish iron oxides that has been produced through the oxidation of the primary sulphides under surface weathering. The vein has been explored by several open cuts and a short tunnel, but none of them have passed into the sulphide zone and the primary minerals are unknown, though probably mainly pyrite or pyrrhotite. The appearance of the gossan suggests that possibly small amounts of galena may accompany the other sulphides. The vein is composed mainly of quartz, very porous or spongy in the outcrop and heavily crusted by the iron oxides. The vein may be traced for a hundred feet or more on the surface by the line of open cuts, but the exact length was not determined because of excessive overburden. The strike is about N. 50° W. and the dip about 50° S. W. The full width of the vein was not determined because the walls were concealed by overburden, but the vein must be at least 8 feet wide in places. The country rock is a highly metamorphosed member of the Wallace formation, part of it showing scapolite, and whose strike is about N. 80° E. and whose dip is 23° N. W. The vein lies about a mile east of a north-south fault of great displacement that has brought the Wallace formation in contact with the micaceous schists of the Prichard on the west. The gold and silver values are reported to be low in this vein. Because of the large quantity of gossan in the outcrop, the vein is worthy of further exploration beneath the oxidized zone, for the value can be determined only from the kind and quantity of the primary sulphide minerals.

Titley Prospect

The Titley prospect is about two and one-half miles east of Clarkia in Sec. 10 T. 42 N., R. 2 E., along the St. Maries River. The prospect lies about a half mile west of the north-south fault that is mentioned in the description of the Gold Center Prospect, but is within the schists of the Prichard formation. A quartz vein ranging up to 8 inches wide whose strike is about N. 47° E. and whose dip varies from vertical to 45° N. W. is exposed on the surface for several hundred feet. The vein filling is mainly quartz, stained here and there with small patches of iron oxides. The mica schist wall shows evidence of hydrothermal alteration. Several small cuts have been made on the vein. In one of these a small dike or sill of altered diorite (?) was encountered. A tunnel driven lower on the hill to cut the vein at depth follows a small shear zone in the schist that has been sparsely mineralized with quartz, calcite, chalcopyrite, and an occasional grain of galena.

Other Prospects

Collier* describes some old prospects in T. 43 N., R. 4 E., on a vein carrying pyrite, chalcopyrite, and bornite in white quartz. The vein is

*Collier, A. J. Ore deposits in the St. Joe River Basin, Idaho. U. S. Geol. Survey Bull. 285, pp. 136-138, 1905.

reported to be traceable for 400 or 500 feet in a northeast-southwest direction, and contained between walls of schistose quartzite of the Prichard. The vein is reported to be about 10 feet wide and is developed by several open cuts and a tunnel 36 feet long. An average sample of the ore taken across the ledge is said to have yielded $2.48 in gold, silver, copper, and lead. A picked sample assayed for Collier contained a trace of gold, 0.8 ounce silver, and 2.1% copper. This prospect has been idle for many years. Other indications of copper mineralization have been reported in the district. Collier reports having sampled a small quartz vein along the trail near Slide Rock Peak in T. 44 N., R. 3 E., that is about 1 foot thick and lies between the bedding of the Prichard schists. The assay yielded a trace of gold and no silver.