

near the junction of the Poughkeepsie and Silver Blossom-Port Hope veins. It is reported to have supplied a number of fine argentiferous sulfbismuthite specimens.

Exploration and Prospecting

The principal veins explored in this area have been the Old Lout, Maid of the Mist, the Forrest, the Alabama-Victory, and the Poughkeepsie. Prospecting along the Alabama and Victory-Silver Monarch veins has so far revealed rather narrow ore bodies. Although locally a good base-metal content has been shown, on the whole the widths and continuity are not encouraging enough to warrant expanded operations or exploration in the near future.

The Poughkeepsie lode because of its width and persistence warrants additional exploration. In the future this exploration may be undertaken from three centers: (1) at the Poughkeepsie mine, (2) on the west side of the gulch along the Poughkeepsie extension towards its intersection with the Gibraltar-Silver Star vein, and (3) along the east extension of the vein north of Canadian Lake where the Port Hope and White Crow claims cross each other. This last point is a wide zone of silicified rock and vein matter which is controlled, in part at least, by the intersection of the Poughkeepsie vein with a northerly vein extending from the Brazillian mine on the north nearly to Lake Como on the south.

On the west side of the gulch the silicified area south of the Free Gold prospect and the veins of the Free Gold property itself are deserving of some additional exploration as is the Grand View vein with its enargite mineralization.

Considering its accessibility and backs of proved mill-grade ore, the Old Lout tunnel vein offers the best opportunity for large output from this area. It is the lowest long tunnel entry for veins of the Mineral Point area, although from the point of view of accessibility it has no advantage over the Frisco tunnel.

UPPER POUGHKEEPSIE GULCH (LAKE COMO) AREA

General

Included in this area are the many mines and prospects of the head of Poughkeepsie Gulch and in the upper Ross Basin at the head of Cement Creek. It is a high region of many cirque basins rimmed with such hornlike peaks as Hurricane Peak and those around triangulation station Duco of Brown Mountain. Great talus piles, rock streams, and rock slides occupy the cirque basins, but in the bottom part of the gulch good exposures have resulted from the last glacial scour. The rocks of the gulch are largely latite flows, flow breccias, and tuffs of the Burns latite. The high ridges rimming the gulch are made up of flows, breccias, and water-laid tuffs of the pyroxene andesite unit. Around Lake Como a most spectacular system of split, braided, and crossed conjugate veins form almost a maze. Abrupt turns, sharp terminations, and "horse tail" features are all displayed with remarkable conspicuousness. The veins are most abundant in the Burns latite and become fewer and less distinct in the pyroxene andesite. Great gaps in the continuity of outcrop of the veins in the cirque basins commonly render the correlation of the veins on opposite sides uncertain. In general, three principal sets may be defined: (1) a persistent set of larger veins of northeasterly strike and southeasterly dip characterized by abrupt easterly turns on which vein widening occurs, (2) a westerly to west-northwesterly set of smaller cross veins which are generally shorter and interrupted by the northeasterly set, and (3) a minor more poorly defined north-northeasterly set. The area is the most inaccessible of the region, but the size and number of the veins and the tenor of some of the ore shoots have encouraged much prospecting. Most of the claims of the area are owned by Ernest Miller of Denver, Colorado.

Sixteen-to-One Mine

The Sixteen-to-One mine is located at an altitude of 11,250 feet near the junction of Poughkeepsie Creek and the tributary creek that heads in Alaska Basin. The caved tunnel portal is about 100 feet southwest of this junction. The tunnel which was probably not more than one or two hundred feet long bears S. 3° W. at its portal. The mine is on the same vein as the Saxon. The dump consists mostly of highly altered rock, the fragments of which contain narrow stringers of quartz or dense pyrite seams. Little or no base-metal sulfides are present.

Amador Mine

The main or upper workings of the Amador mine are located at an altitude of about 11,485 feet. The portal is at the base of a small cliff on the face of which the white Amador vein is clearly exposed. There are two other entries to the vein, one through a shaft located on the flat above the cliff and the other a lower tunnel at an altitude of 11,374 feet about 200 feet northeast of the upper workings. The upper workings consist of a drift 340 feet in length which is connected through a raise to the shaft (see fig. 21). About 135 feet from the portal a curving crosscut branches to the south. This is known as the Lilla level. This crosscut follows minor breaks and veins for about 400 feet and then curves abruptly east for about 50 feet where the Saxon vein, the apparent objective, was encountered. The Saxon vein was drifted on for about 80 feet to the southwest. The lower Amador tunnel, which is caved at the portal, trends southwest along the Saxon vein for about 150 feet to the intersection with the Amador vein, which it thence follows for some 235 feet. A small mill run by water power from the cliffs was operated at the upper workings during the early nineties.

The Amador vein strikes about N. 85° W. at the portal. It is nearly vertical and about six feet wide. The vein consists mostly of dense white quartz with only a sprinkling of

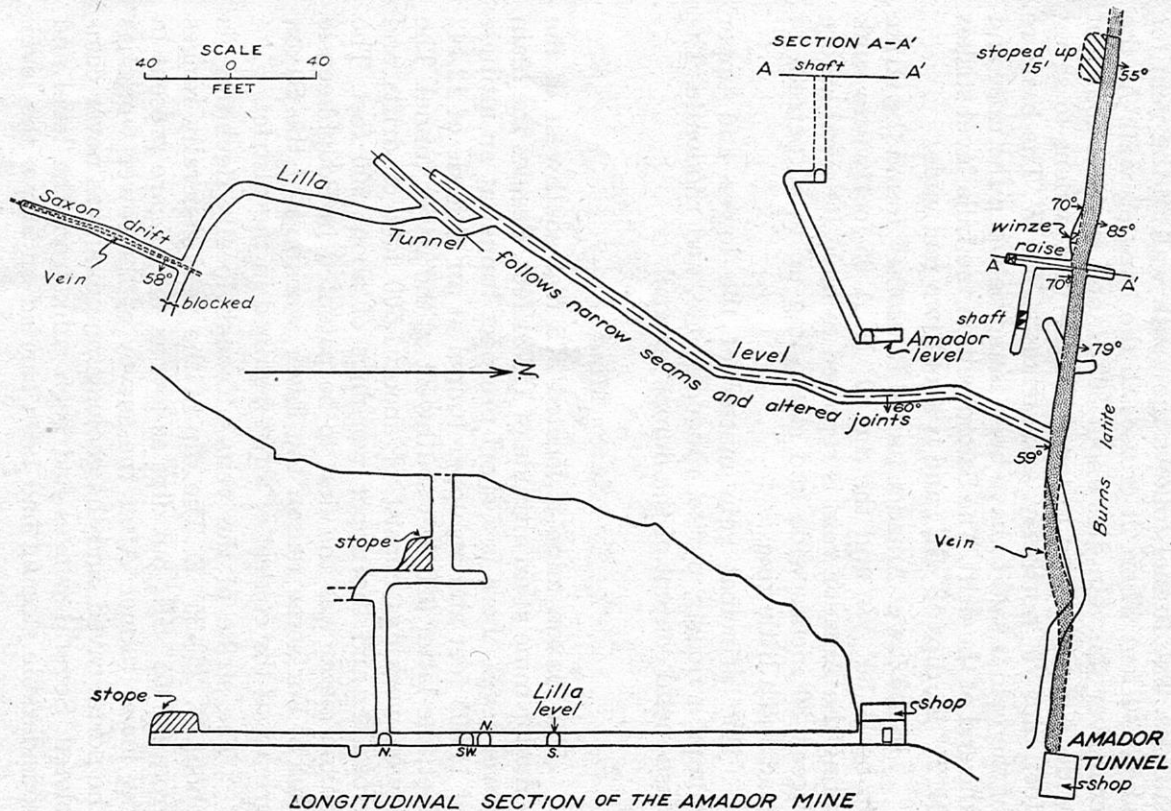


Figure 21. Plan and sections of the Amador mine.

sulfides. The tunnel follows the south wall of the vein for about 40 feet where it crosses to the hanging wall. At the crossover the vein dips about 80° N. and is about four feet wide. Near the raise to the shaft the vein widens to seven feet, dips 70° northerly, and strikes N. 82° W. The best ore of the vein is said to have been found between the raise and the end of the drift. The Saxon vein in the Lilla level strikes N. 21° E., dips 58° SE., and is about two feet wide.

In the lower Amador tunnel Ransome⁷² found the strike to be N. 80° W., and the dip 60° N. A 65-foot winze sunk along the Amador vein is reported to have followed an ore streak 30 inches wide and containing up to 50 percent of lead and a little zinc.

The principal vein matter of the lower and upper dumps is quartz, pyrite, rhodochrosite, and rhodonite. The base-metal content of the dumps is small.

Saxon Mine

The Saxon mine is located 575 feet southwest of the Amador mine at an altitude of 11,731 feet. Besides the main lower level, there is a short prospect tunnel at an altitude of 11,905 feet and an upper tunnel at an altitude of 12,142 feet, the latter 920 feet southwest of the lower tunnel. The lower workings consist of about 1,500 feet of drifts and crosscuts and the upper workings of about 500 feet. The Saxon claim was the first to be patented in Poughkeepsie Gulch. For some reason the lower workings of the Saxon are about the coldest of any examined in the district.

The strike of the vein, although locally deviating, is about N. 25° - 35° E. The dip of the vein generally ranges from 60° - 65° SE., but dips as low as 45° SE. are present in the lower tunnel. After the survey of the lower workings the portal caved, and the geologic mapping was never completed. Several winzes had been sunk from the level and considerable stoping had been carried on above the level.

⁷²Op. cit., p. 194.

One of these winzes is reported to be 70 feet deep and to show a lead-zinc shoot from three to four feet wide.

The vein is bounded in most places by well-defined and strongly gouged walls. The width ranges from a few inches to as much as 15 feet. On the dump are several tons of good lead-zinc ore. Galena and sphalerite are in both coarse- and fine-grained intergrowths. Chunks of ore on the dump show bands as much as 18 inches wide composed of quartz containing galena and sphalerite. Pale rhodochrosite is commonly intergrown with quartz and associated directly with sphalerite and galena. Pyrite is mostly disseminated in the walls; the pyrite in the vein is largely restricted to small crystals lining quartz vugs. Marcasite and chalcopyrite are present in minor quantities. Chunks containing wall-rock fragments cemented and veined by quartz are common on the dump. In 1875 the Saxon mine was reported to have supplied ore from a 22-inch gray-copper ore shoot which contained from 600 to 1,383 ounces of silver to the ton. The output of the mine is supposed to have been worth about \$30,000 up to 1899. No output has been recorded since 1900.

Alaska Mine

The Alaska mine is located at an altitude of 12,405 feet at the entrance to Alaska Basin and about 3,500 feet northwest of Lake Como. The mine workings are not accessible. Parts of the stope are open to the surface for about 50 feet along the vein, and are partly filled with ice or snow. An old shaft has been sunk in the hanging wall about 30 feet southeast of the open stope. There are other shafts and cuts to the west on a parallel lode. Although the evidence is not entirely clear, it appears that the lode may have been entered also through a tunnel about 300 feet east.

The Alaska lode strikes about N. 75° E. and dips 75°-80° SE. It is irregular in detail as revealed in the stopes and toward their northeast end, where the vein splits and mining has followed both branches. The vein matter contains much pyrite and in certain bands is intergrown with rhodo-

chrosite and rhodonite. As is true wherever these gangue materials are abundant, much of the dump material is coated with the black oxides of manganese. Coarsely speckled resin-brown sphalerite and galena are imbedded in quartz, as are numerous highly altered rock fragments. Sericite and kaolin are common as gangue constituents. A very small quantity of the alaskaite ($(\text{Pb}, \text{Ag})_2 \text{S} \cdot \text{Bi}_2\text{S}_3$) ore is left on the dump. Associated with this ore is a gangue of quartz, pyrite, and kaolin which contrives to give the weathered material a sort of moth-eaten appearance. More or less tetrahedrite and chalcopyrite may be associated with the alaskaite ore, and the richer ore was reported to contain more barite. Ransome⁷³ described the richest ore as occurring in bunches of several sizes in the altered country rock adjacent to the coarse white quartz. Although the general run of vein matter composed of quartz and base-metal sulfides was generally low-grade, pieces of the alaskaite ore contained as much as 3,000 ounces of silver to the ton.

Most of the output, valued at around \$90,000, came from a rather small pocket in the ore shoot. In 1875 gray-copper ore was shipped from an ore shoot that was three to seven inches wide and contained 612 ounces of silver to the ton. The principal activity was in the seventies and eighties, and it is doubtful whether any ore has been produced since Ransome's examination in 1900. Alaskaite was first discovered and named for this mine by Koenig in 1881.⁷⁴

Picket Mine

The Picket mine is located at an altitude of 12,012 feet at the head of a swampy flat about 1,000 feet north of Lake Como. There are three tunnel levels on the Picket vein: a lower tunnel with more than 400 feet of drifts and stopes connecting to the level above, a middle one at an altitude of 12,090 feet with 120 feet of drift and some stopes, and an upper short prospect tunnel at an altitude of 12,230 feet.

⁷³Op. cit., p. 195.

⁷⁴Koenig, G. A., On alaskaite, a new member from the series of bismuth sulphosalts: Proc. Am. Philos. Soc., vol. 19, pp. 472-477, 1881.

The vein along the lower tunnel is very irregular; it strikes N. 35°-55° E., and dips between 75° SE. and steeply northwest. The first 350 feet of the tunnel is on a generally narrow vein 4 to 12 inches wide, except for a short distance about 120 feet from the portal where the vein widens in a crushed and brecciated zone to about four feet (see fig. 22). The far end of the tunnel from which stopes lead to the middle level was inaccessible and the principal ore shoot is probably along this stretch. The vein matter on the lower dump consists principally of quartz, pyrite, and barite. Very little base-metal sulfide is on the dump. A few samples contain calcite gangue.

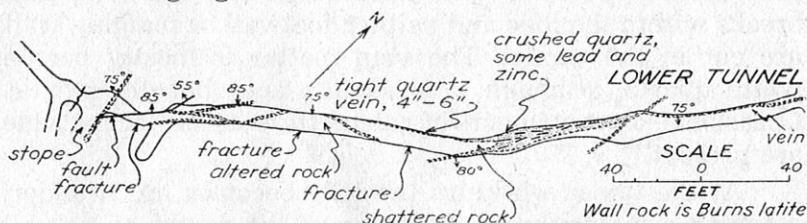


Figure 22. Plan of the lower tunnel level of the Picket mine.

At the middle tunnel the vein strikes N. 54° E. and dips 67° SE. Some chalcopyrite-galena ore with coarse tabular barite was stacked on the dump. About 50 feet from the portal a large stope 75 feet long and five to ten feet wide marks the position of the ore shoot which was mined from the lower level.

No output from the mine is on record.

Seven-Thirty Mine

The Seven-Thirty mine is located on the small knoll north of Lake Como at an altitude of 12,320 feet. The claim extends 1,500 feet west from its east end line which is about 60 feet west of the outlet of the lake. It includes, besides a 350-foot tunnel at the above altitude, many pits, open cuts, and short tunnels, most of which are situated on the higher knoll some two or three hundred feet west of U. S. M. M. No. 2 P. G.

The lode is a widened east turn in a persistent north-easterly vein zone which extends from the head of Grey Copper Gulch on the south as far north as the San Juan Chief mine at Mineral Point. The length of the easterly course of the lode about coincides with the length of the 1,500 foot claim. The country rock along most of the length of the lode is a platy, flow-banded facies of the Burns latite. Along the west half of the lode the south side or foot-wall of the vein is occupied by an irregular white rhyolite dike 10-25 feet wide.

At the lower tunnel the lode is 20 feet wide, strikes N. 75° W., and dips 53° N. The tunnel follows weak zones and breaks within the lode and neither footwall or hanging wall are cut in the tunnel. The vein matter is mostly barren white quartz, although it is some places heavily pyritic. Occasional short stringers of galena three to six inches wide are present.

At the upper workings the lode becomes much wider, reaching a maximum of 75 feet near the center of a swell nearly 500 feet long. The strike is roughly east and the dip about 80° N. This northerly dip is opposite to the usual southerly dips of eastward turns on the other veins of the area. Most of the wide part of the vein, however, consists of barren ribs of quartz. Here the lode has been mined in a series of en echelon trenches or cuts parallel to the strike and along ore-bearing streaks between the dense white quartz ribs. Near the saddle west of U. S. M. M. No. 2 P. G. is a 30-foot trench about ten feet from the north or hanging wall. About 50 feet farther west and 20 feet from the hanging wall is another trench of similar length, and 20 feet west of this is a third similar trench almost at the footwall. These trenches are 4 to 20 feet deep. The ore shoots that were mined are strongly pyritic and almost every one of them contains a band of rhodonite and rhodochrosite as much as twelve inches wide. The base-metal content appears to have been low. Near the west end of the east trench at the hanging wall a tunnel has been driven into the lode, and from a

rather shallow room or level both overhand and underhand stopes have been developed under the northern two trenches. On the dump from this tunnel considerable granular sphalerite and galena are present and, as in most veins of this area, barite is a common gangue mineral.

Red Rogers Mine

The Red Rogers mine is located at an altitude of 12,530 feet on the trail that extends west from Lake Como into Ross Basin. It is only a few yards south of the Seven-Thirty lode. The workings consist of a shaft at the above altitude and a drift at an altitude of about 12,480 feet and 140 feet northeast of the shaft. The vein strikes about N. 45° E. and dips 85° NW. The ores of the Red Rogers are reported to have contained both bismuth and antimony. Probably both were present in sulfosalts of lead. The tunnel is caved, but the dump indicates that the vein consisted of heavily pyritic quartz with some barite but little or no base-metal sulfide. The ore around the shaft is similar. To the northeast the vein joins the Seven-Thirty lode, and to the southwest it is continuous with the Comodore vein.

Bonanza Mine

The Bonanza mine is located along the northeast side of Lake Como on what is one of the largest lodes of the districts. The lower workings is a tunnel some 250 feet long. The portal is practically at the lake level or 12,215 feet. This tunnel connects with a shaft on the lode about 250 feet northeast and at an altitude of 12,277 feet. The bottom of the shaft is reported by Ernest Miller⁷⁵ to be at least 100 feet below the level of the lake or something over 162 feet deep. In addition, a 15- or 20-foot shaft was at one time sunk near the portal of the tunnel, but this is now largely filled.

The Bonanza lode is a widened eastward turn in a persistent vein of general northeasterly course. The vein extends from the head of Cement Creek on the southwest,

⁷⁵Written communication.

through several widened eastward turns and multiple zones in upper Ross Basin and the Lake Como region, into two prominent branches—(1) the southeastward dipping Vermillion-Red Cloud-Ben Butler vein zone and (2) the northwestward dipping Burrows-Sewell vein. In the vicinity of the workings the lode strikes nearly east and dips steep to vertical to the south. Farther east along the lode the strike swings to N. 70° E. with a southerly dip of 75°-80°, but toward the east end of the claim the strike turns east again. The lode is 75-150 feet wide along the claim. It is multiple, consisting of several more or less closely spaced dense quartz ribs in and between which may be ore shoots. The horses of country rock between some of the ribs are cut by networks of smaller veins and veinlets.

It appears that much of the material from the deep shaft was removed through the tunnel. The small dump at the shaft contains much barite, quartz, and pyrite, but few or no lead-zinc minerals in contrast to the lower dump.

Much lead-zinc ore is strewn on the tunnel dump, and it is suspected that much more material was dumped into the deep water immediately at the shore. If so, silver and gold contents of the material were probably low. The lead-zinc ore is remarkably banded; chunks on the dump as much as a foot across may contain as many as a half a dozen bands of dense sphalerite and galena with quartz. Much barite and pyrite and lesser quantities of rhodochrosite and rhodonite are also present mostly in separate bands but still in close association. Tetrahedrite and chalcopyrite are minor constituents, the former, according to Ransome,⁷⁶ is in close association with barite.

The shallow shaft near the lake was sunk on a narrow but rich silver ore streak at the footwall. The tunnel to the deep shaft follows a zig-zag course in the lode south of the footwall and a small stope along the tunnel was opened in a body dipping 80°-85° N.

⁷⁶Op. cit., p. 196.

Most of the work at the Bonanza mine was done by four brothers named Geldon during 1878-1879. In 1943 Ernest Miller was reopening the tunnel.

Rollo Mine

The Rollo mine is located about 1,000 feet east of Lake Como at an altitude of 12,424 feet. Its workings consist of 120 feet of crosscut tunnel and about 300 feet of drift to a raise that is connected with a short surface tunnel at an altitude of 12,503 feet. Most of the drift follows a highly sheared and gouged zone which strikes N. 7°-20° W. and dips 48°-66° E. Near the end of the drift, and in the vicinity of the raise and ore shoot, the vein widens to five or six feet and, in addition to quartz and gouged walls, contains sulfide bands up to six inches wide. Sphalerite forms a few nearly pure veinlets in the altered wall rocks and the base-metal sulfides along with pyrite are also disseminated in the altered walls. Coarse calcite, scattered manganese minerals, and some fluorite occur in the vein. White coxcomb quartz veins interlace the veins containing base-metal sulfides.

The vein is one of the many intricate "horsetail" splits from the Bonanza-Belcher lode to the north.

Belcher Mine

The Belcher mine is located on the west side of the ridge between Poughkeepsie and California gulches about 2,000 feet east of Lake Como, at an altitude of 12,599 feet. It is near the trail from Mineral Point to Lake Como. The workings are entered by a drift tunnel, the caved portal of which is at the northeast corner of an ancient building which may be seen from many points in the Lake Como area. The drift enters the lode about six feet from the north wall. Judging from the size of the dump, several hundred feet of drifts and stopes must lie beneath the ridge that the lode crosses; however, very little more than 100 feet of backs exist above this level.

The lode consists of a multiple set of quartz ribs, and

its aggregate width is about 75 feet. The average strike is about east and the dip is 65° - 75° N. The gentler dips occur on the east side of the ridge. Base-metal sulfides are common; sphalerite is the major and chalcopyrite the minor constituent. The quartz gangue contains, in addition to dense lenses and disseminated pyrite, a pink mottling and streakedness due to intergrown rhodochrosite and rhodonite. Veinlets of late quartz cutting the quartz gangue of the base-metal ore are common. The lode is an easterly branch from the northeasterly Bonanza and Silver Chord vein zone.

Silver Chord Mine

The Silver Chord mine is located in the saddle about 2,500 feet south of Tuttle Mountain. It is on the Mineral Point-Lake Como trail but, like the Belcher mine, is reached more easily from the end of the road up California Gulch to the Mountain Queen mine. The workings consist of two shafts, several pits and trenches on the saddle, and a lower tunnel at an altitude of 12,676 feet which crosscuts toward the Silver Chord lode. The Silver Chord lode is something of a vein knot in that the widely split veins of the Oberto-Starlight from the southeast, the Burrows and Vermillion veins from the northeast, and a northwesterly cross vein (Silver Link) all join along the saddle on the Silver Chord claim. The result is a lode 50 to 75 feet wide made up of intersecting veins and interconnecting stringers. The lode at the main shaft dips vertically to steeply westward. Neither the shafts nor the tunnel could be entered; in the main shaft on the saddle water stood only 15 feet below the collar. Much mineral matter and base-metal ore is piled or strewn on the surface at the many small pits and cuts. Galena is the major ore mineral followed by sphalerite and chalcopyrite. Quartz, pyrite, and barite comprise the other principal constituents. Large chunks on the dumps indicate base-metal ore shoots several feet in width.

Other Mines

Numerous prospects besides the mines already described occur in the Upper Poughkeepsie or Lake Como area; in fact, they are so numerous that it is only practicable to mention a few here briefly. Many little developed and little noticed deposits contain ore shoots of worth and occurrence greater than these specifically mentioned or previously described.

Along the cliffs south of the Poughkeepsie mine is the Brooklyn prospect located on a northeasterly vein. It is reported to have supplied in the early days three sacks of bismuthiferous ores which contained as much as 2,300 ounces in silver and 32 ounces in gold to the ton.⁷⁷ The workings are over 300 feet in length.

The Evening Star claim lies northwest of the Picket mine along an easterly vein which dips 75° S. The prospects along this vein are known as Anderson's workings and comprise several pits and short tunnels between the lake at the west end and the grassy meadow at the east end. Several of the prospects have good showings of lead-zinc ore, and the small pit by the lake exposes veins several inches wide that consist dominantly of galena.

The Acapulca mine is located at an altitude of 12,180 feet, about 700 feet east of the Alaska mine. It is a short tunnel on an easterly vein that branches from the northeast fissures of the Alaska vein zone. Ransome⁷⁸ records the mining of bismuthiferous ore in small bunches from the Acapulca vein in 1900.

About 75 feet north of the mouth of Lake Como a shaft inclined about 75° to the north has been sunk about 70 feet. This shaft is located near the east end of the Seven-Thirty lode and about 50 feet west of where it turns abruptly northeastward into the Champain vein. The shaft at this point is near the footwall. At the top of the shaft and appearing to extend to the bottom is an ore shoot three to four

⁷⁷Miller, Ernest, written communication.

⁷⁸Op. cit., p. 195.

feet wide, lying about two and a half feet from the footwall of the lode. This ore shoot consists of lead-zinc ore nearly if not quite of shipping grade. The ore is irregularly banded with numerous stringers of galena and sphalerite which are more or less associated with barite. This is one of the best base-metal showings in the Lake Como area. The lode here is east of the Seven-Thirty claim and on the Champain and Mobile claims. The Mobile which has a lower patent number than the Champain extends eastward for 1,500 feet from the Seven-Thirty claim, and was staked on the belief that the Seven-Thirty continued eastward to join the Bonanza-Esquimaux lode. Areal mapping, however, does not reveal such a connection.

To the west and southwest of Lake Como and in the Cement Creek divide is the upper Ross Basin. Three lodes cross the part of the basin shown on plate 1. The Anchor, a branch from the Seven-Thirty lode, is only very little prospected. The Comodore lode is a union of the Red Rogers vein with the Discount vein, which in turn is a branch extending from the Bonanza lode across Lake Como. The Comodore lode is a wide part of the vein; it attains a maximum width of about 50 feet and is nearly 500 feet long. It has been prospected in bold outcrop at two points where base-metal ores are common. About 400 feet south of the Comodore the Cashier lode has a similar wide segment which is also nearly 50 feet wide and about 500 feet long. It is located at an eastward turn of the vein. Prospecting here has developed ore similar in most respects to that of the Comodore. To the northeast the vein narrows to a few feet, but on the Canandaigua claim it widens and splits in very spectacular exposures on the steep slope southwest of Lake Como. This widening is also at an eastward turn of the vein. In crossing the lake to join the Bonanza lode the vein turns northeast again and is probably narrower in the intervening stretch beneath the lake.

Between the Cashier and Canandaigua is the Short Stop claim. On the west end of Canandaigua, 20 feet from

the end line of the Short Stop claim, a prospect was opened in 1943 to a depth of 11 feet and disclosed an ore shoot which was 26-33 inches wide. Samples taken by Ernest Miller contained 1.10 ounces of gold and 20 ounces of silver to the ton; 22.5 percent of lead and 23 percent of zinc.

Exploration and Prospecting

Upper Poughkeepsie Gulch has been extensively prospected, and more than 150 prospects and mines are marked within an area of about one and one-half square miles (see pl.1). Others not plotted on plate 1 raise the total to nearly 200. All the ground is above 11,200 feet and over half of the prospects are above 12,000 feet. These figures merely speak for the attraction which the deposits have offered even under the adverse climatic and physical conditions that prevail. Many rich ore shoots have been found. On the whole they have been small, but they range from a few tens of feet to a few hundred feet in length. The very wide lodges are composed mostly of barren or low-grade vein matter.

The general pattern of the Lake Como veins and observed offsets on them indicate that faulting along the northeasterly fissures has moved the southeast sides down and southwestward with respect to the northwest sides. Although this conclusion is somewhat general, it may serve as a starting point in planning exploration. One of the initial results of this kind of displacement would be to make the steeper parts as well as the eastward turns of the fissures more favorable for the presence of ore. This relationship, however, should not be too readily accepted; local indications of factors controlling the positions of ore shoots should be closely studied during the progress of exploration.

The northeasterly master fissure veins are the best deposits and their most favorable parts may be determined by turns, steepenings, and by their intersections with other veins. The following are the major vein zones of northeasterly course, named in order from northwest to southeast.

- (1) Silver Monarch and Hagedy vein.

- (2) Poughkeepsie and Digger Indian vein. (2)
- (3) Tyrol, Saxon, and Sixteen-to-One vein.
- (4) Alaska and San Antonio vein.
- (5) Acapulca, Star of the West, and Brooklyn vein. (1)
- (6) Hesperian, Bannock Burne, and Silver Blossom vein. (1)
- (7) Black Spar, Picket, Chicago, and Denver vein.
- (8) Comodore, Red Rogers, Champain, Peekskill, and Gipsy King vein. (4, 5, 6, 7)
- (9) Cashier, Canandaigua, Bonanza, Oberto, and Silver Chord vein. (8, 9)

These groupings of names suggest the probable connections between the major lodes, which may be regarded as continuous vein zones, many of them including several parallel and branching veins. The figures in parentheses after the names refer to veins in the Mineral Point district that are essentially continuations of those in the upper Poughkeepsie Gulch area (see pages 441-442).

The principal vein zones of easterly and east-southeasterly trend, named from north to south, are listed below.

- (1) Gibraltar, Silver Star, Amador, and O. K. vein.
- (2) Treasury, California, Sussa, and the Silver Link vein.
- (3) Fire King and Rough & Ready vein.
- (4) Evening Star vein.
- (5) Seven-Thirty, Esquimaux, and Belcher vein.
- (6) Serrano and Indian Chief vein.

These are more interrupted than the veins of northeasterly trend.

Plans to mine veins of both groups from lower levels have long been considered. The projected tunnels have many approaches with the shortest naturally the most inaccessible. One approach is by crosscut tunnels beginning in Poughkeepsie Gulch. A crosscut beginning near the Picket mine would cut the Lake Como veins at a distance from 700 to 2,000 feet and a depth from 200 to 400 feet. One

of the ideas that has lured proponents of such a tunnel has been that the draining of the lake would reveal rich float or rich veins; but geologic conditions, as shown on page 414 are such that the veins under the lake are undoubtedly poorer than in the adjoining sections. From the point of view of accessibility the proposed Picket crosscut tunnel offers little advantage over nearer and more direct approaches to these veins.

Still longer crosscuts from lower in the gulch have been contemplated; for example, near the Sussa or Star of the West claims, that would have an altitude of about 11,700 feet. In the absence of access roads, which would be difficult to build and maintain, this portal also would be difficult to reach. The Lake Como veins would be cut at distances ranging from 2,500 to 4,000 feet with backs of only 500-700 feet. Although many extra veins would be cut, they would be small for the most part. More direct approaches to ore could be made near this site by drifting along such veins as the Star of the West to the Acapulca or even Alaska vein. Similar conclusions would follow for even lower tunnels, for example near the Amador; furthermore, if a large operation is to be considered it should be remembered that the gulch is not very accessible by road much above the Old Lout tunnel owing to talus and steep slopes.

To the east, in California Gulch, crosscut tunnels could be driven at altitudes as low as 12,000 feet which would reach the Lake Como veins in distances ranging from 2,000 to 4,000 feet. The immediate backs would be from 400 to 700 feet. Such a portal would be reached directly by the road from Animas Forks to the Mountain Queen, but this road is generally open for only a few months of the year.

Another entry to the veins of this area is through long low-level tunnels. From the Saratoga mine in Ironton Park the Lake Como veins could be cut at distances ranging from 10,000 to 15,000 feet. At least three major vein breaks would be cut on the west side of Brown Mountain at much shorter

distances.⁷⁹ This tunnel would be at an altitude of 10,050 feet and accessible the year around. It would be comparable in length to the Treasury tunnel entry to the Black Bear vein or the Campbird tunnel.

From the lower Sunnyside tunnel, at an altitude of 10,217 feet, the Lake Como veins could be reached through 20,000-25,000 feet of crosscut tunnel, or 6,000-11,000 feet after completion of a crosscut to the Sunnyside vein.

From Gladstone at an altitude of about 10,600 feet the Lake Como veins could be reached through 13,000-18,000 feet of tunnel. A considerable part of such a projected tunnel could be in the form of drifts.

Finally, the Lake Como veins may be reached by drifting southeast from the Dakota, Red Cloud, or Sewell drifts in the Frisco tunnel. The backs of ore would be less than along any other long tunnel approach, but ore would be opened up progressively.

To summarize, the Lake Como veins (altitude 12,215 feet) could be reached through long low-level tunnels as follows:

Entry	Portal Alt. (feet)	Direction	Distances (feet)	Backs (feet)
(1) Saratoga mine, Ironton Park.....	10,050	S. 54° E.	10-15,000	2,000-2,700
(2) Sunnyside tunnel, Eureka.....	10,217	N. 45° W.	20-25,000	1,800-2,500
(3) Gold King mine, Gladstone.....	10,599	N. 61° E.	13-18,000	1,400-2,100
(4) Frisco tunnel, Calif. Gulch.....	11,430	S. 50° W.	8-13,000	600-1,300

These tunnels would crosscut the several vein zones, but there is no guarantee that ore shoots would be found at such random intersections. Considerable development work would be necessary to establish the continuity and grade of ore shoots in the different veins. In general, the average

⁷⁹Burbank, W. S., Structural control of ore deposition in the Red Mountain, Sneffels, and Telluride district of the San Juan Mountains, Colo., Colorado Sci. Soc. Proc., vol. 14, no. 5, pl. 1, 1941.

grade of ore probably will be comparatively low but with scattered high-grade pockets and some extensive base metal shoots, as is characteristic of mineralization throughout the Silverton quadrangle. The assurance of large reserves in the Poughkeepsie and adjoining areas, however, justifies serious consideration of long low-level development tunnels.

MINERAL POINT AREA

General

The Mineral Point area as herein defined is bounded by Poughkeepsie Gulch on the west, Engineer Mountain on the north, the California Gulch divide on the southeast, and the Canadian Lake basin on the southwest. By comparison with the surrounding areas it is flat, consisting of high and bare glacial moors with many small ponds, lakes, meadows, and swamps. Its altitude ranges from 11,500 to 12,500 feet.

The dominant rock is a dense porphyritic andesite of the Burns latite. East of Mineral Point near Denver Hill it overlies rhyolite-latite flows and breccias of the Eureka rhyolite. To the south of Mineral Point the andesite is overlain by platy latites of the Burns. In the Silverton Folio the andesite of Mineral Point was interpreted as overlying the Burns latite and was considered as part of the younger pyroxene andesite unit; however, south of Mineral Point the contact of the Burns latite, which dips southward at a very low angle over the andesite of Mineral Point, is clearly exposed. The Red Cloud shaft, several hundred feet south of this contact, extends through the andesite into the Eureka rhyolite on the Frisco tunnel level as is shown by the presence of andesite on the tunnel dumps. The andesite pinches out to the south between the Eureka rhyolite and the platy latites of the Burns which directly overlie the rhyolite in California Gulch (see pl. 2, sec. F-F'). White to gray rhyolite is intruded along some of the fissures.

Most of the veins trend northeastward; the easterly cross fissures so common in Upper Poughkeepsie Gulch are