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DEPARTMENT OF THE INTERIOR
Geological Survey
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[Mineral deposits of Alaska, short prelim. repts.]

QUICKSILVER DEPOSITS IN THE CINNABAR CREEK AREA, GEORGETOWN AND AKIAK DISTRICTS, SOUTHWESTERN ALASKA.

By

Wallace M. Cady

INTRODUCTION

The Cinnabar Creek area includes the tract on the divide between the Aniak and Holitna Rivers, both north-flowing tributaries of the Kuskokwim River (see figs. 1 and 2), in the southern parts of the Georgetown and Akiak districts, southwestern Alaska, about 85 miles S. 25° W. of Georgetown. The area (see fig. 3) is chiefly one of steep, rock-crested hills and the average relief is about 700 feet. Some of the uplands are gently rolling but are studded here and there with sharp outcrops. The hills are covered largely by moss but the lower reaches of the valleys within the area are forested with spruce. Small alders and willows, and locally rather large cottonwoods, predominate in the gulches near timberline, which is about 1,000 feet above sea level.

The broad Aniak River valley lies in the western part of the area. To the north and northeast the hilly country of the area expands into a range of hills and mountains which extends to and beyond the Kuskokwim River. To the southeast and south is the Gemuk River which empties eastward into the Chukawon (Swift) River and then into the Holitna River. South of the Cinnabar Creek area the Gemuk River drains mountainous country that forms the divide between the Kuskokwim and Nushagak Rivers near the head of the Aniak River and the Tikchik Lakes.

The deposits are generally reached by boat by traveling about 200 miles up the Holitna River from Sleitmut at the mouth of the Holitna. The water route up the Holitna, Chukawon and Gemuk Rivers is preferable to the route up the Aniak River because, with the exception of the Gemuk, the waters of the Holitna route are confined largely to one deep channel whereas the Aniak is said to be a braided stream broken into several channels crossing numerous shallow gravel bars. The Holitna River may be followed with little difficulty from Sleitmut 140 miles by water to Kashegelok, a native village ½ mile below the mouth of the Chukawon River. A few miles above its mouth the Chukawon River splits into several channels but farther upstream, where the country is more hilly, it follows a single channel. Approximately 40 miles by water above its mouth the Chukawon River is formed by the confluence of Chikululnuk (Cycle) Creek and the Gemuk River, both navigable by

power boats during high-water stages. Beaver Creek, navigable by poling boats, enters the Gemuk River from the west about 15 miles above its mouth. Cinnabar Creek enters Beaver Creek about 3 miles by water from the Gemuk River.

An experienced boatman, preferably one familiar with the route, is essential for travel beyond Kashegelok. Under normal conditions two men with a 30-foot poling boat carrying 1 ton and equipped with a 22 h. p. motor can make the trip from Sleitmut to the Cinnabar Creek area in about 1 week, 3 to 4 days being required to reach Kashegelok, 1 day on the Chukawon River, 1 day on the Gemuk River, and 1 to 2 days on Beaver Creek. The return trip takes about the same time.

The best land route for dog teams or tractors, but open only to winter and early spring travel, is said to be from the end of the road along Bear Creek, a tributary of Tuluksak River. The Tuluksak enters the Kuskokwim River a short distance from Bethel, an ocean port, and is the route from Bethel to the road leading to the gold placers on Bear Creek. From Bear Creek the winter route to the Cinnabar Creek area leads easterly across the Aniak River and then turns southerly through the hills along the east side of the Aniak River valley, a total distance of not more than 60 miles. This trail is cleared and can be covered in 2 or 3 days with dog team or tractor.

A lake said to be large enough for use by pontoon-equipped planes, lies about 10 miles south of the Cinnabar Creek area. No natural landing ground for wheel or ski-equipped planes is known in the area or near enough to it to be useful.

History od Development and Production.

Russell Schaefer and Harvey Winchell located the Lucky Day lode in Canary Gulch and the Redskin lode in Alder Gulch in the summer of 1941. They sampled the Lucky Day lode. They located placer claims on Cinnabar Creek, Cinnabar Run, and Cinnabar Gulch at the same time and dug several test pits. Herschel Landru discovered and located the Broken Shovel lode in Broken Shovel Gulch in September 1941. In October 1941 Kenneth Deleray, engineer for the Bristol Bay Mining Company, made further tests of the placer claims on Cinnabar Run. During the spring of 1942 Schaefer selected 1,000 pounds of high-grade ore that had been mined at the Lucky Day lode and brought it to Sleitmut for treatment, obtaining 8 flasks of quicksilver. Later that season he returned to the Lucky Day lode and obtained 1,32[illegible] pounds of selected ore which yielded 7 flasks. In the winter and spring of 1943 the New York-Alaska Corporation operating gold dredges on Bear Creek, tested the cinnabar-bearing gravels on Cinnabar Run and in Cinnabar Gulch. In the early summer of 1943 Schaefer took 1,200 pounds of ore from the Lucky Day lode.

Field work and acknowledgments

In July 1943, Wallace M. Cady and Charles A. Hickcox of the Geological Survey spent 4 weeks mapping the geological features of the Cinnabar Creek area and making a preliminary examination of the quicksilver deposits. A total of about 1 week was spent in a rapid reconnaissance of outlying parts of the area and the remainder of the time was devoted to examinations in the immediate vicinity of the prospects.

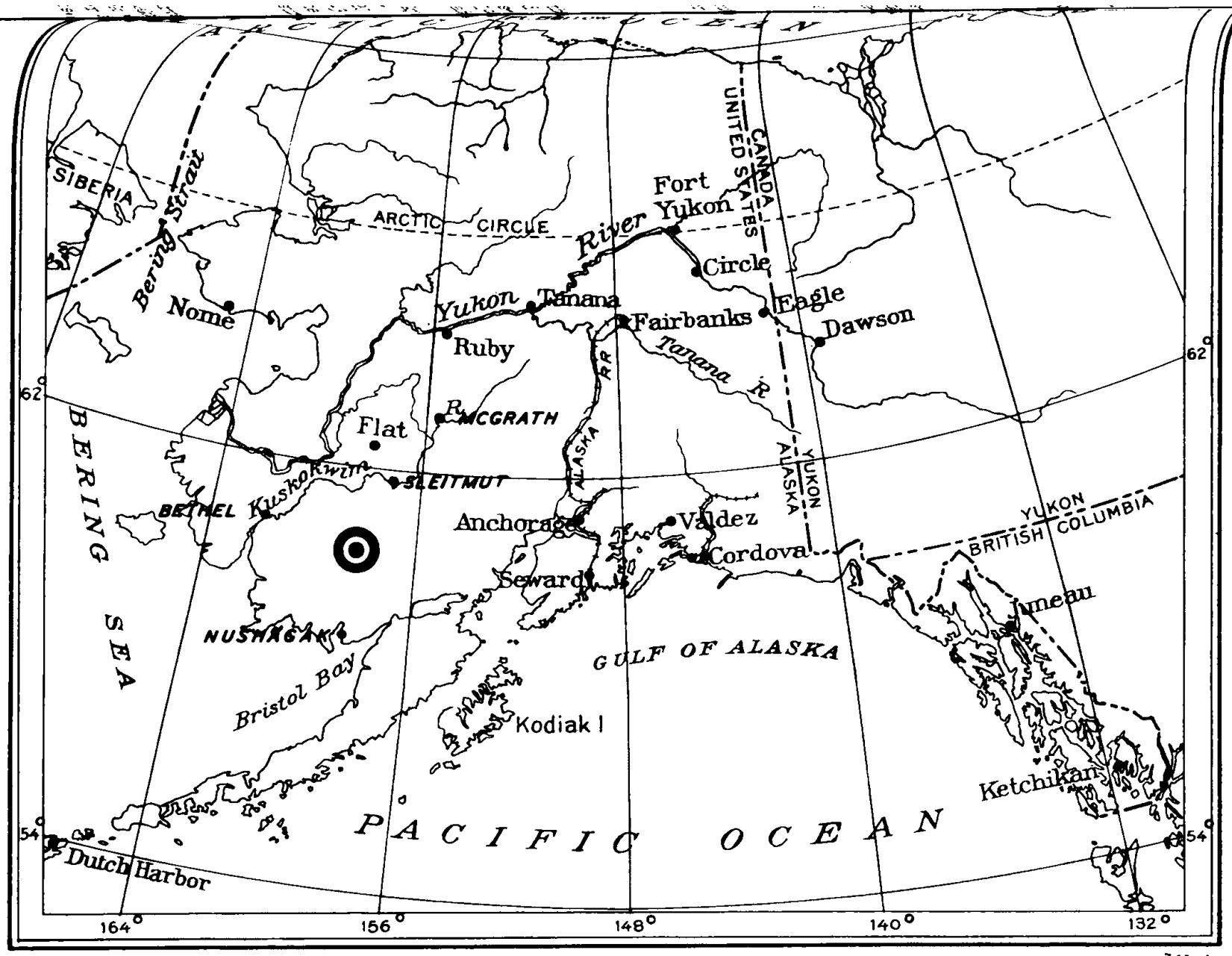

FIG. 1 INDEX MAP OF ALASKA SHOWING LOCATION OF CINNABAR CREEK AREA

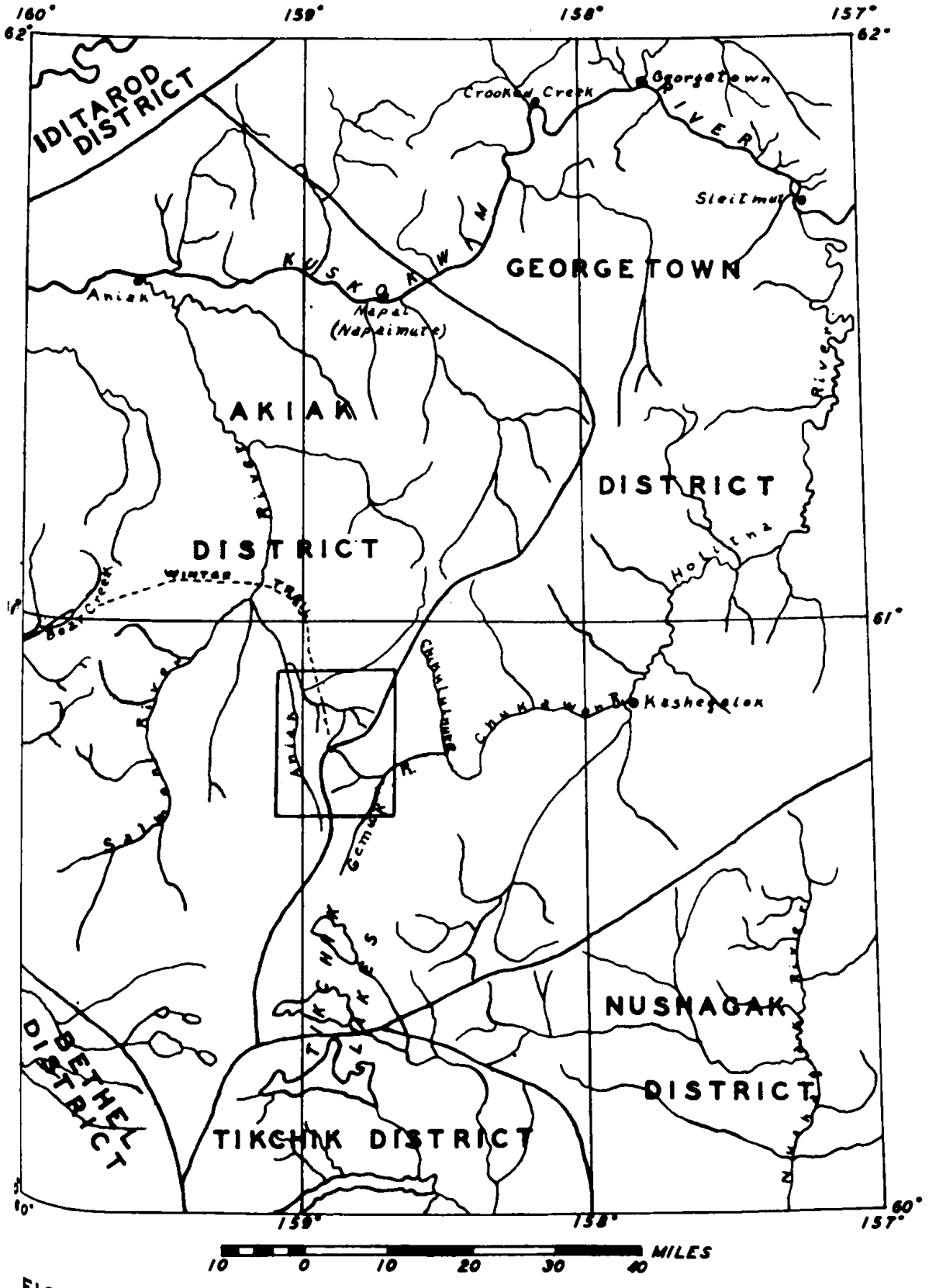

FIG. 2 SKETCH MAP OF CENTRAL KUSKOKWIM REGION SHOWING APPROACHES TO CINNABAR CREEK AREA

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EXPLANATION

QUATERNARY

QAL — ALLUVIUM

TERTIARY ?

TBF — OLIVINE BASALT FLOW

TBS 1 2 — BASALTIC SILLS
1 UNALTERED
2 ALTERED

CRETACEOUS ?

Ks — INTERBEDDED GRAYWACKE AND SHALE SUCCESSION

TRIASSIC

RS 1 2 — INTERBEDDED ARGILLITE, CHERT GRAYWACKE, LIMESTONE, AND LAVA.
1 FOSSILIFEROUS LIMESTONE ZONE
2 LAVA FLOWS

1 2 — FOLD AXES
1 ANTICLINE
2 SYNCLINE

FORMATION BOUNDARY ------

PROSPECT ×

1 0 1 2 3 4 5 MILES

GEOLOGY AND DRAINAGE BY
W. M. CADY AND C. A. HICKCOX JULY 1943

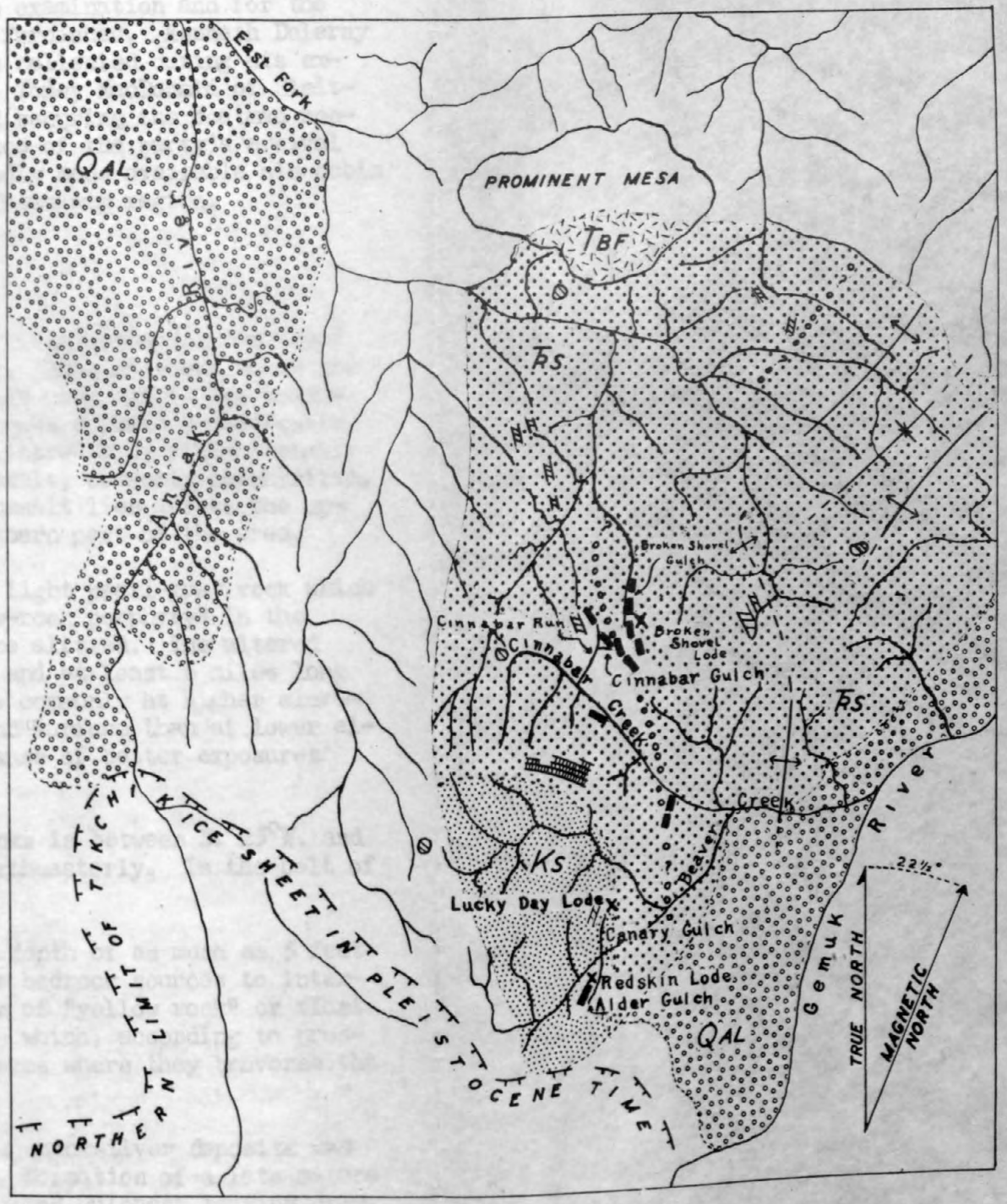

FIG. 3 GEOLOGIC SKETCH MAP OF THE CINNABAR CREEK AREA, SOUTHWESTERN ALASKA.

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The Geological Survey field party is indebted to Russell Schaefer of Sleitmut for his hospitality, cooperation, and assistance in the examination and for the numerous sketch maps and analytical data he has kindly furnished. Kenneth Deleray of San Francisco has made available analyses of samples collected during his exploratory work for the Bristol Bay Mining Co. in 1941. Toney MacDonald of Sleitmut contributed his services in planning the outfit and securing the boatman necessary for the trip to the Cinnabar Creek area in advance of the party's arrival in the field. Mr. Oswald Willis, also of Sleitmut, kindly made available his cabin as the base for the party's activities in the central Kuskokwim region.

GENERAL GEOLOGY

The bedrocks of the Cinnabar Creek area include a succession of interbedded graywackes, shales, argillities, and lavas (see fig. 3). Most of these rocks are of Triassic age, but sediments of probably Cretaceous age crop out in the southwestern part of the area. Some zones in the Triassic rocks contain considerable chert with minor limestone. The sedimentary rocks are intruded by sills probably of Tertiary age. Most of the sills and flows are of basalt, commonly porphyritic. A flow of rather coarse-grained, porphyritic, olivine basalt lies across the upturned and eroded edges of the bedded rocks in the northern part of the area.

Some of the sills are hydrothermally altered to a light pearl-gray rock which weathers yellow-brown and resembles the typical "yellow-rock porphyry" in the Sleitmut area. Some of the graywacke also appears to be altered. The altered rocks form a northward-trending belt about a mile wide and at least 6 miles long (fig. 3). Altered sill rock appears to be present more commonly at higher elevations immediately beneath remnants of the rolling upland surface than at lower elevations in the gulches, although this may be only because of better exposures near the hilltops.

The general strike in the belt of altered sill rocks is between N. 25°W. and N. although the regional strike of the sediments is northeasterly. In the belt of altered rocks the dip in general is steeply west.

Frost-broken rock fragments mantle the hills to a depth of as much as 5 feet but the fragments are not far enough removed from their bedrock sources to interfere seriously with the tracing of geologic contacts or of "yellow rock" or float ore. In the valley lowlands are deep alluvial deposits which, according to prospectors, contain cinnabar concentrations near those places where they traverse the belt of altered sills.

The topography of the hills in the vicinity of the quicksilver deposits was developed during at least two cycles of erosion; first, formation of a late mature surface and second, incisions to form youthful steep-walled gulches, leaving only remnants of the earlier surface in the rolling upland areas.

ORE DEPOSITS

General statement

The quicksilver deposits of the Cinnabar Creek area include both lodes and placers. The lodes, which are exposed at only a few places, are made up of cinnabar-filled fractures and breccia zones in stratified rocks particularly above the hanging walls of altered sills. The longest openings are bedding-plane joints whereas other shorter ones are fractures which cross the stratification. The breccia zones are parallel to the stratification and appear to have been formed by movement between strata of different competency, or between sills and less competent strata.

Because the lodes are confined to the belt of altered rocks (p. 3) and are closely associated with the "yellow rock" formed by the alteration of basalt sills, the ore mineralization is believed to have been accomplished, as is known to be the case at the deposits at Sleitmut, by hydrothermal fluids genetically related to those which caused the rock alteration.

The lodes seem to contain higher grade ore at or near the heads of the gulches just below the rolling upland where, as has already been stated (p. 3) altered sill rock appears more abundant. This ore contains fewer wall-rock fragments than does the lower grade ore more common at lower altitudes. An undetermined amount of the upper parts of the lodes has been removed by erosion.

The hydrothermal ore and gangue minerals include cinnabar, small amounts of stibnite, a very little native quicksilver, and vein quartz. Some quartz was deposited on breccia fragments and along the fractures before the introduction of the ore minerals. Many of the mineralized fractures parallel to the stratification contain dense, fine-grained, high-grade ore whereas the ore in the cross fractures and breccia zones is usually of lower grade, more coarsely crystalline and contains much more quartz. At one locality cinnabar fills minute cracks in altered olivine phenocrysts in a partially altered basaltic sill.

The known placer deposits in the area are in Cinnabar Gulch and in the valley of Cinnabar Run and Cinnabar Creek. They consist of high-grade ore nuggets in alluvial material. The pay streak, which heads in Cinnabar Gulch is regarded as probably typical of others in creek valleys not yet tested. Near the head of the pay streak the nuggets, averaging about the size of a walnut, are angular, but a claim length downstream where Cinnabar Gulch enters the valley of Cinnabar Run they are rather well-rounded. Thus it is inferred that the bedrock source of the cinnabar was not far from the head of the pay streak. Remnants of a bench 40 feet above the bottom of Cinnabar Run, south of the confluence of Cinnabar Gulch and Cinnabar Run, appear to have held parts of a pay streak from which several large, well-rounded cinnabar nuggets have slumped to the rim of the present flood plain. Because the lode sources of these pay streaks have not yet been found, although the head of Cinnabar Gulch has been prospected, prospectors have inferred that the lodes may have been eroded away. Similar inferences have been made regarding the lode sources of placer cinnabar deposits in other parts of southwestern Alaska. More thorough testing of such inferences is needed before they are generally accepted.

Lucky Day lode

The Lucky Day lode of Russell Schaefer and Harvey Winchell is near the head of Canary Gulch, a tributary of Beaver Creek, about 2½ miles airline southwest of the mouth of Cinnabar Creek (see fig. 3). Development work on and near the lode includes about 12 pits and trenches and 7 adits, no one of which is more than 50 feet long (see fig. 4-A). Most of the openings do not go below the surface of the bedrock. All of the adits were inaccessible when visited by the Geological Survey.

From the openings near the head of the gulch a total of 75 tons of loose mantle rock estimated to average about 1.25 percent of quicksilver have been taken. The quicksilver was extracted from about 3600 pounds of high-grade ore fragments representing practically all of the ore in the loose material. These averaged about 55 percent of quicksilver. Practically all of this ore came from pits and trenches, A, B, B^1, B^2, B^3, and C, and 2,300 pounds of it from pits A and B.

The Lucky Day lode is in the Cretaceous rocks of the southwestern part of the area (see fig. 3) in a succession of predominantly shaly strata about 400 feet thick. Very irregularly distributed basalt sills (not shown on fig. 4-A) as much as 4 feet thick intrude the shaly strata. Some of these sills are altered, whereas others are fresh. In the vicinity of the lode the strata strike approximately north and dip steeply west or are vertical.

The lode, exposed over a vertical extent of about 130 feet, consists of a low-grade metallized zone at least 900 feet long in a N. 20° E. direction from pit K to pit C. This zone, which includes several narrower high-grade zones averaging about 1 inch thick, appears to be 50 feet or more wide but its width cannot be adequately determined from the present exposures. The dip of the lode is westerly.

The lode contains ore minerals, principally cinnabar, in zones along and near the hanging walls of the sills. In the high parts of the lode the cinnabar is principally in bedding-plane fractures, whereas in the lower parts there are more short cross joints and breccia openings. The zones within the lode are wider but leaner where exposed in the lower prospect openings than they are in several of the upper pits where at least one high-grade veinlet is as much as 5 inches thick for a short distance. This vein may average 1 inch thick over a distance of 150 feet. Other high-grade veinlets are present in the lode as is indicated by rich float from pit P, 50 feet east across the creek from the lower workings, and from pit L, unless the veinlets from which the float came have been eroded away.

Because much of the lode is covered by loose material and because it is inadequately exposed by prospect openings, the detailed character of the lode is largely inferred from float, which is thought to have moved only short distances from its source.

The ore at the Lucky Day lode is similar to that at other lodes in the area and is described on pages 7 and 8. 4.

Broken Shovel lode.

The Broken Shovel lode (see fig. 4-B), about 4½ miles north of the Lucky Day lode (see fig. 3), is a little east of Broken Shovel Gulch, in the drainage basin

of the East Fork of the Aniak River. The lode probably lies a little to the east of the Broken Shovel lode claim of Herschel Landru which centers on the gulch. A few shallow prospect pits have been dug in the steep head of the gulch at an altitude of about 1,500 feet and at somewhat higher altitudes on the rolling upland southeast of the head of the gulch.

Triassic argillite with some interbedded graywacke strikes N. 20° W. and dips steeply west in the vicinity of the Broken Shovel lode. At least three sills of altered porphyritic basalt intrude the argillite exposed in the creek bed near the head of the gulch. One of these can be traced southward onto the upland by following the yellow-weathered porphyritic float. At least two other lines of such float lie on the upland surface east of the gulch. A little below the head of the gulch where altered sills are most abundant, the strike of the argillite swings more westerly for several hundred feet.

The location of the lode is inferred entirely from the distribution of float; thus its length and width are conjectural. Ore fragments have come to the surface in frost boils on the upland east of the upper reaches of the gulch and are mixed with fragments of altered porphyritic basalt in the easternmost of the porphyritic float streaks described above (see fig. 4-B). Cinnabar also is present as scattered float in the creek at the bottom of the gulch, whereas farther northward down the gulch (north of map area, fig. 4-B) stibnite and quartz are progressively more abundant. The float ore in the bottom of the gulch has probably been eroded from the lode, which is believed to be east of the upper reaches of the gulch. As nearly as can be determined from the distribution and character of the fragments the ore minerals fill small cross joints and breccia openings in a zone parallel to the sills and sedimentary strata. Fine particles of cinnabar, filling cracks in altered olivine phenocrysts, are dispersed through partially altered basaltic sills northwest of the lower reaches of the gulch, in a zone which is apparently a continuation of the lode and associated sills already described.

The ore and gangue minerals at the Broken Shovel lode are comparable to those at other lodes in the Cinnabar Creek area and are described on pages 7 and 8.

Cinnabar Gulch

The lode source of the cinnabar on the placer claims of Schaefer and Winchell on Cinnabar Creek, Cinnabar Run and in Cinnabar Gulch has not been discovered, but if the lode has not been completely eroded away, it lies only a short distance upstream from the head of the placer claims in Cinnabar Gulch. The locality is less than a mile south of the Broken Shovel lode, on the opposite side of a remnant of the upland that forms the divide between the Aniak and the Holitna drainages (see figs. 3 and 4-B). At least one altered basaltic sill crosses the head of Cinnabar Gulch parallel to the sills in Broken Shovel Gulch, but only a few fragments of cinnabar are said to have been found upstream from the head of the placer claims and none near the sill; thus it is likely that the head of the placer pay streak more nearly coincides with the location of the lode than does the altered sill above mentioned.

Redskin lode

The Redskin lode of Russell Schaefer and Harvey Winchell is near the head of Alder Gulch, a southern tributary of Beaver Creek opposite Canary Gulch about 1

miles south of the Lucky Day lode (see fig. 3). According to Schaefer only a few openings have been made there, but the lode was exposed and appeared to be comparable with, although probably less extensive than the Lucky Day lode. This claim was not examined by the Geological Survey.

ORE RESERVES

At the present state of development none of the lode ore in the Cinnabar Creek area can be classed as more definite than inferred ore. The ore mined thus far at the Lucky Day lode has been of sufficient grade and volume to warrant extraction of the quicksilver, as Schaefer has demonstrated. The float ore beneath the rolling upland in the pass at the head of Canary Gulch is, according to Schaefer, becoming increasingly difficult to find, and is probably nearly mined out. He is continuing to find new streaks of float ore in the gulch below. Little ore in place has been mined. If the high-grade portion of the lode in the pass extends to a depth of ½ the inferred length of 150 feet without change of grade, and maintains an average thickness of 1 inch, 125 to 150 tons of ore containing about 55 percent of quicksilver can be expected there. It is rather probable that several other high-grade zones, comparable to this one, are to be found in scattered positions within a belt about 50 feet wide (see p. 5-10) along the lode. Analyses now available from the trenches and adits farther south down the gulch and about 100 feet below the elevation of the pass indicate that the ore there is present in several veinlets scattered over the width of the lode. These veinlets may aggregate about 1 inch in thickness over a 5-foot width and contain less than 5 percent of quicksilver. This zone is at least 300 feet long. More systematic exploration and sampling will be necessary to determine with reasonable assurance the ammount of mercury in these deposits.

Geologic conditions indicate the possible existence of other deposits similar to the Lucky Day lode. The altered basaltic sills associated with the ore zones are more widely distributed than the cinnabar deposits thus far discovered. The altered rocks, country rocks, ore and structural conditions are, in their broader aspects, essentially the same in the Cinnabar Creek area as they are at the quicksilver-antimony deposits in the Sleitmut and DeCourcy Mountain areas farther north. The extent of the known mineralized area is about the same as that near Sleitmut and greater than that near DeCourcy Mountain. The higher grade of ore which has been mined thus far is comparable with that mined near DeCourcy Mountain. The lower grade ores found in the area appear on inspection to be comparable to that at the Alice and Bessie claims near Sleitmut.

February, 1944.