USBM IC 8252

TITLE

Mercury

Pdf. Part 2 of 2

TABLE 20. - California mercury properties

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
CLEAR LAKE DISTRICT							
Baker mine.....	Lake.....	Sec 16, T 12 N, R 6 W.	About 80.....	100-foot incline and drifts, 700-foot adit.	Low grade in zones of crushed opalized shale.	Mrs. Carl Peterson.	12, 49
Baxter prospect....	do.....	Sec 32, T 13 N, R 8 W.	2 to 3.....	200-foot adit, trenches.	Fractures in altered rhyolite.	W.C. Baxter....	49
Lucitta property (Konokti).	do.....	Secs 20, 21, T 13 N, R 8 W.	Small.....	1,500 feet of tunnels and drifts.	Coatings and in altered tuff.	J.L. Jago.....	29, 49
Shamrock prospect..	do.....	Sec 23, T 13 N, R 6 W.	Occurrence....	200-foot adit.....	In gouge along serpentine sandstone contact.	Unknown.....	12, 29
Sulphur Bank mine..	do.....	Sec 6, T 13 N, R 7 W.	127 to 137....	Large open pits.....	Veinlets in andesite, shale, and sandstone.	Bradley Mining Co.	1, 12, 49
Utopia property....	do.....	Sec 25, T 15 N, R 9 W.	Occurrence....	350-foot adit, drifts, 60-foot incline.	In narrow vein of crushed sandstone.	Unknown.....	12, 49
White Elephant group (King of All)	do.....	Secs 29, 32, T 12 N, R 7 W.	....do.....	200 feet of underground workings.	Mineralized zone in silicified serpentine.	Arthur Copsey, and Ed Rush.	12, 29, 49
WILBUR SPRINGS DISTRICT							
Abbott mine.....	Lake.....	Secs 30, 31, 32, T 14 N, R 5 W.	Over 50,000...	Extensive underground workings.	Fracture filling in altered breccia zones.	Abbott Mines, Inc.	1, 12, 49, 65
Central and Empire group.	Colusa.....	Secs 28, 29, T 14 N, R 5 W.	About 100.....	Several hundred feet of underground workings.	Narrow seams in silicified and brecciated serpentine.	J.W. Cuthbert estate.	12, 41, 49
Elgin mine.....	do.....	Sec 13, T 14 N, R 5 W.	Over 35.....	500 feet of underground workings, trenches.	Silicified zone of serpentine and shale.	W.S. Norman	12, 41, 49
Judy.....	do.....	Sec 6, T 14 N, R 5 W.	Occurrence....	Unknown.....	Unknown.....	Unknown.....	-
Manzanita mine.....	do.....	Sec 29, T 14 N, R 5 W.	Over 2,500....	Shaft, underground workings.	With gold in silicifield zone along fault in shale and sandstone.	Mrs. A.A. Gibson	12, 41, 49
Rathburn group.....	do.....	Sec 6, T 14 N, R 5 W.	About 200.....	130-foot shaft, adit, surface works.	With siliceous vein-material in serpentine.	Walter Petray..	49

TABLE 20. - California mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
			WILBUR SPRINGS DISTRICT--Continued				
Wide-Awake mine (Buckeye).	Colusa.....	Sec 29, T 14 N, R 5 W.	About 1,800...	470-foot vertical shaft, levels, surface pits.	Pockety distribution in silicified breccia on shale-serpentine contact.	Mrs. A.A. Gibson.	12, 41, 49
Wilbur Hill prospect.	do.....	Sec 28, T 14 N, R 5 W.	Some.....	Unknown.....	Narrow fractures in sandstone and shale.	Unknown.....	12, 49
			KNOXVILLE DISTRICT				
Harrison mine.....	Yolo.....	Secs 26, 35, T 12 N, R 5 W.	Over 350.....	Shaft, four adits, several hundred feet of drifts.	In silicified rock along fault zone between serpentine and sandstone or shale.	V.W. Harrison and others.	5, 12, 29, 48, 49
Knoxville mine.....	Napa.....	Secs 6, 7, T 11 N, R 4 W.	Over 121,000..	600-foot incline, 15,000 feet of workings.	Cinnabar and metacinnabarite in silicified fault zone.	G.E. and L.J. Gamble.	5, 12, 16, 29, 49
Manhattan mine.....	do.....	Sec 6, T 11 N, R 4 W; Sec 1, T 11 N, R 5 W; Sec 36, T 12 N, R 5 W.	Over 16,000...	Extensive surface and underground workings.	Small irregular veins in basalt and along silicified fault zone.	R.B. Knox	5, 12, 16 29, 49
Northern Light prospect.	do.....	Sec 10, T 11 N, R 5 W.	Occurrence....	Unknown.....	Weakly mineralized silica-carbonate zone.	Unknown.....	12
Red Elephant mine..	Lake.....	Sec 3, T 11 N, R 5 W.	405.....	Shafts, adit, drifts.	With native mercury in narrow veins along shear zone in silicified serpentine.	Z. Gradine.....	5, 12, 49
Reed mine.....	Yolo.....	Sec 25, T 12 N, R 5 W.	27,489.....	Extensive underground workings.	In silicified serpentine along fault zone.	Bradley Mining Co.	5, 12, 48, 49
Soda Springs prospect.	do.....	Sec 36, T 12 N, R 5 W.	Small.....	Surface pits.....	Small veins in silica-carbonate rock.	V.W. Harrison and others.	5
			EAST MAYACMAS DISTRICT				
Aetna mine.....	Napa.....	Secs 2, 3, T 9 N, R 6 W.	About 66,000..	Open pit and extensive underground workings.	In fractures in silica-carbonate rock along faults in serpentine and sandstone.	Basin Montana Tunnel Co.	12, 16, 49, 50, 68

Aetna Extension mine.	do.....	Sec 34, T 10 N, R 6 W.	Occurrence....	Two long adits.....	Disseminations along fractures in sandstone and shale.	Lawrence Lindblom.	12, 16, 68
Anderson Springs mine.	Lake.....	Sec 25, T 11 N, R 8 W.	Small.....	Adits, shallow shaft, trenches.	Along fractures in altered sandstone.	Dale Strickler.	12, 49
Bacon Consolidated mine.	do.....	Secs 11, 12, T 10 N, R 8 W.	About 300.....	Undergound.....	In silica-carbonate rock.	Unknown.....	12, 49, 68
Big Chief mine.....	do.....	Secs 25, 35, T 11 N, R 8 W.	325.....	Several thousand feet of underground workings, trenches.	In altered sandstone and chert.	H.H. Barrows...	1, 49, 68
Big Injun mine.....	do.....	Sec 35, T 11 N, R 8 W.	About 250.....	Four adits.....	In brecciated sandstone and shale along silica-carbonate zone.	Mrs. Alice Fisher Armstrong.	1, 12, 49, 68
Bullion mine.....	do.....	Sec 23, T 10 N, R 7 W.	Several thousand, included with Mirabel.	400-foot shaft, 3,000 feet of underground workings.	In silica-carbonate rock along serpentine-sandstone contact.	Mirabel Quicksilver Co.	1, 12, 68
Calistoga Hot Springs.	Napa.....	Secs 32, 33, T 10 N, R 6 W.	Occurrence....	Unknown.....	In soil at hot springs.	Unknown.....	12, 49
Chicago mine.....	Lake.....	Sec 1, T 10 N, R 8 W.	Under 150.....	150-foot vertical shaft, 1,500 feet of underground workings.	With native mercury in narrow vein in silica-carbonate rock.	W. M. Land.....	1, 12, 49, 68
Corona mine.....	Napa.....	Secs 32, 33, T 10 N, R 6 W.	About 5,000...	About 10,000 feet of underground workings.	In silica-carbonate rock along thrust fault between serpentine and sandstone.	Vallejo Quicksilver and others.	12, 16, 49, 68
Granada mine.....	do.....	Secs 27, 34, 35, T 10 N, R 6 W.	Small.....	Several hundred feet of underground workings.	Along fault in altered graywacke.	H.M. Simmons...	49, 68
Great Western mine.	Lake.....	Secs 16, 21, 22, T 10 W, R 7 W.	Over 100,000..	700-foot vertical shaft with extensive underground workings.	Veinlets in brecciated chert along contact of serpentine with sandstone and shale.	Bradley Mining Co.	1, 12, 47, 49, 68
Hardister property (McGuire Peak, Rich Hill).	do.....	Sec 19, T 10 N, R 6 W.	Small.....	Open cuts, shallow shaft.	In altered sandstone.	Scott Kline....	1, 12, 68
Hays prospect.....	do.....	Sec 18, T 10 N, R 7 W.	do.....	Underground.....	In silica-carbonate rock along serpentine-sandstone contact.	Unknown.....	12

TABLE 20. - California mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
			EAST MAYACMAS DISTRICT--Continued				
Helen mine	Lake	Sec 1, T 10 N, R 8 W.	Over 7,000	Extensive underground workings.	Veinlets and disseminations in silica-carbonate rock along fault zone.	H.W. Gould Co.	1, 12, 49, 68
Hughes-Bradbury	do	Sec 15, T 10 N, R 7 W.	Small, included with Mirabel.	Unknown	Unknown	Unknown	-
Ivanhoe mine	Napa	Sec 34, T 10 N, R 6 W.	Over 100	Two adits	Small ore bodies in breccia zones of sandstone and shale.	H.M. Simmons	16, 49, 68
James Creek placers	do	Secs 34, 35, T 10 N, R 6 W.	Over 400	Sluice boxes	Placer below Oat Hill mine and dump.	do	12, 49, 68
Jewess property	Lake	Sec 1, T 10 N, R 8 W.	About 60	Two short adits, open cuts.	In silica-carbonate rock.	Unknown	1, 12, 68
Joyce prospect	do	Sec 14, T 10 N, R 7 W.	Several	Two shallow shafts	Along fault in sandstone.	Stevens Mining Co.	1, 68
Juanita	do	Sec 17, T 10 N, R 7 W.	Occurrence	Unknown	Unknown	Unknown	-
Kellett prospect	Napa	Sec 7, T 8 N, R 6 W.	A few	350-foot adit open cut.	As paint along joints in opalized tuff.	S.W. Kellett	68
Maypole	Lake	Sec--, T 10 N, R 7 W.	Occurrence	Unknown	Unknown	Unknown	12, 49
Middleton	do	Sec 7, T 10 N, R 7 W.	do	Three adits	In silica-carbonate alteration of serpentine.	do	12, 49
Midway property	do	Sec 17, T 10 N, R 7 W.	Small	Short adits, open cuts.	Small fissures in sandstone and shale.	E.J. Wilkinson.	1, 68
Mirabel mine (Bradford, Great Eastern).	do	Sec 23, T 10 N, R 7 W.	Over 41,000	Two shafts, extensive underground workings.	With native mercury and metacinnabarite in tabular ore bodies in fractured silica-carbonate rock along serpentine-sandstone contact.	Mirabel Quicksilver Co.	1, 12, 49, 50, 68
Oat Hill mine	Napa	Sec 33, T 10 N, R 5 W.	165,000	20 miles of underground workings.	Along faults in sandstone.	Norman B. Livermore and Sons.	12, 16, 37, 47, 49, 68
Oat Hill Extension mine.	do	Sec 27, T 10 N, R 6 W.	Over 1,000	Several hundred feet of underground workings.	Along fault in sandstone.	Zack Anderson	16, 49, 68

Otto-Bullion mine..	Lake.....	Sec 22, T 10 N, R 7 W.	Small, included with Great Western.	165-foot shaft, two small levels.	In silica-carbonate rock along sandstone serpentine contact.	Otto family....	1, 68
Palisade (silver mine).	Napa.....	Sec 24, T 9 N, R 7 W.	Occurrence....	Silver mine.....	Quartz vein with argentite and stibnite.	Unknown.....	12, 49
Philadelphia.....	do.....	Sec 26, T 10 N, R 6 W.	do.....	Adit.....	Float.....	do.....	12, 49, 68
Plymouth mine.....	Lake.....	Sec 24, T 10 N, R 7 W.	Small, included with Mirabel.	2,500 feet of underground workings.	In tabular body of silica-carbonate rock.	Mirabel Quicksilver Co.	1, 68
Pope Creek placers.	Napa.....	Sec 6, T 9 N, R 5 W.	Small.....	Surface stream gravels.	Placer, very low grade.	Wm. F. Sayers..	16
Research mine.....	Lake.....	Sec 1, T 10 N, R 8 W.	do.....	1,000 feet of underground workings.	Disseminated in silica-carbonate rock.	Otto Koopman...	1, 68
Scott Ranch property.	Napa.....	Sec 10, T 9 N, R 6 W.	Occurrence....	Unknown.....	Unknown.....	Chas. P. Scott.	-
Summit.....	do.....	Sec 19, T 7 N, R 5 W.	Some.....	Adit.....	In fault at serpentine-sandstone contact.	Unknown.....	12, 29, 49
Thorne mine.....	Lake.....	Sec 36, T 11 N, R 8 W.	About 500.....	Short adits, open cuts.	Disseminations in sandstone.	H.H. Barrows...	1, 12, 49, 68
Toyon mine.....	Napa.....	Sec 34, T 10 N, R 6 W.	About 100.....	Two adits, incline, drifts.	Along sheared zone in mudstone and graywacke.	George R. Anderson.	16, 49, 68
Twin Peaks mine....	do.....	Sec 4, T 9 N, R 6 W.	Over 200.....	4,200 feet of underground workings.	In silica-carbonate rock along contact of serpentine with sandstone and shale.	Louis D. Fay...	12, 16
Valley mine (Lidell).	do.....	Sec 34, T 10 N, R 6 W.	Small.....	100-foot shaft, 700 feet of underground workings, trenches.	In silica-carbonate rock.	George S. Hiebel.	68
Wall Street mine...	Lake.....	Sec 1, T 10 N, R 8 W.	Over 350.....	Several thousand feet of underground workings.	With native mercury in lenses in fault zone in silica-carbonatized serpentine.	Fred Dunkin....	1, 12, 49, 68
Whitney prospect...	Napa.....	Sec 21, T 10 N, R 5 W.	Slight.....	Two shallow shafts, drifts.	Along serpentine-shale contact.	G.B. Whitney...	12, 46, 68
Williamson lease...	do.....	Sec 6, T 9 N, R 5 W.	Small.....	Unknown.....	In alluvial material.	R.D. Williamson	-
			WEST MAYACMAS DISTRICT				
Anne Belcher prospect (Lucky Stone).	Sonoma.....	Sec 4, T 10 N, R 8 W.	Occurrence....	400-foot adit.....	In silicified serpentine.	Ralph Grant....	34
Black Bear mine....	do.....	Sec 22, T 11 N, R 9 W.	Over 50.....	Shallow shaft, adits, drifts.	In silica-carbonate rock along serpentine-sandstone contact.	Buckman Laboratories.	7, 34

TABLE 20. - California mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
WEST MAYACMAS DISTRICT--Continued							
Black Oak mine.....	Sonoma.....	Sec 2, T 11 N, R 9 W.	Small.....	Three adits.....	In fractured chert along fault zones.	Ralph E. Thompson.	-
Boston group.....	do.....	Sec 9, T 10 N, R 8 W.	Occurrence....	Two adits, underground workings.	In opalite along a fault.	Unknown.....	12, 29, 49
Buckeye mine.....	do.....	Secs 3, 4, T 11 N, R 9 W.	40.....	Adits, drifts, stopes	As paint on fractures in chert zone with some native mercury.	Charles Cavhnaro.	7, 12, 34, 49
Cinnabar King group	do.....	Secs 10, 11, T 10 N, R 8 W.	Small.....	55-foot shaft, 600 feet of adits.	Disseminations in silica-carbonate rock.	H.B. Rosenburg	7, 12, 34, 49
Cloverdale mine....	do.....	Sec 4, T 11 N, R 9 W.	Over 17,500...	10,000 feet of underground workings, glory holes, open cuts.	With native mercury in fracture filling in broken chert.	Edward Prattic, and others.	7, 12, 34, 49, 50
Contact mine.....	do.....	Sec 5, T 10 N, R 8 W.	965.....	Shaft, levels, two adits.	With native mercury in silica-carbonate rock along serpentine-sandstone contact.	Harvey Blair...	7, 34, 49
Crystal mine.....	do.....	Sec 5, T 10 N, R 8 W.	Small.....	2,000 feet of underground workings.	In lenses of silica-carbonate rock along serpentine-sandstone contact.	P.G. Cox.....	7, 12, 34
Culver-Baer mine...	do.....	Sec 23, T 11 N, R 9 W.	Over 12,000...	About 10,000 feet of underground workings, open pit.	In silica-carbonate rock associated with faults.	Buckman Laboratories.	7, 12, 34
Denver and Hope prospects.	do.....	Sec 4, T 10 N, R 8 W.	Small.....	80-foot shaft, 1,000 foot adit.	Disseminations in silica-carbonate rock.	Ralph Grant....	7, 34
Dewey mine.....	do.....	Sec 14, T 11 N, R 9 W.	Over 150.....	Adit and open pits...	Lenses along fault zones in silica-carbonate rock serpentine, sandstone, and shale.	Geysers Developing Co.	7, 34
Double Star.....	do.....	Sec 10, T 10 N, R 8 W.	Occurrence....	Shaft, two adits.....	In fissure along serpentine-sandstone contact.	Unknown.....	12, 29, 49

Esperanza mine.....	do.....	Sec 10, T 11 N, R 9 W.	200.....	Adits and drifts.....	With native mercury in silica-carbonate rock along a serpentine-sandstone contact.	James G. Cortelyou.	7, 12, 34, 49
Eureka mine.....	do.....	Sec 32, T 11 N, R 8 W.	18.....	Several hundred feet of underground workings.	With native mercury in silica-carbonate rock along serpentine-sandstone contact.	James G. Cortelyou and others.	7, 12, 34, 49
Frazier prospect...	do.....	Unknown.....	2.....	Unknown.....	Unknown.....	K. and V.C. Harrison.	-
Great Northern.....	do.....	Sec 2, T 10 N, R 8 W.	Occurrence....	do.....	do.....	Unknown.....	12, 29, 49
Hurley location....	do.....	Sec 4, T 10 N, R 8 W.	do.....	Two short adits, stripping.	In lenses of silica-carbonate rock along serpentine-sandstone contact.	Earl McKinley..	12, 34
Jumbo prospect.....	do.....	Sec 10, T 10 N, R 8 W.	Small.....	Short adits, pits....	In scattered lenses of silica-carbonate rock along serpentine-sandstone contact.	James G. Cortelyou.	7, 12, 34
Kissack or Amazon mine.	do.....	Sec 4, T 11 N, R 9 W.	do.....	Short adits, open cuts.	In fractured chert layers.	L.K. Kissack...	7, 12, 34, 49
Last Chance and Young Denver properties.	do.....	Sec 5, T 10 N, R 8 W.	do.....	Adits, drifts, and trenches.	Along a shear zone in silica-carbonate rock at a serpentine-sandstone contact.	Banner Zeek....	7, 34
Livermore.....	do.....	Sec 10, T 11 N, R 10 W.	do.....	Underground.....	Unknown.....	Unknown.....	-
Lookout.....	do.....	Sec 32, T 11 N, R 8 W.	Occurrence....	Unknown.....	do.....	do.....	12, 29, 49
Lost Ledge and Mercuryville Divide mines.	do.....	Sec 23, T 11 N, R 9 W.	Small.....	Small open cuts.....	In silica-carbonate rock.	Forest G. Mitchell.	-
Mary Hurley prospect.	do.....	Secs 4, 5, T 10 N, R 8 W.	Occurrence....	Two short adits, stripping.	Erratically distributed in silica-carbonate lens along serpentine-sandstone contact.	Earl McKinley..	12, 34
Mercury Bank.....	do.....	Sec 10, T 11 N, R 10 W.	Small.....	Unknown.....	Unknown.....	Unknown.....	-
Mericoma mine.....	do.....	Secs 30, 31, T 10 N, R 8 W.	do.....	Short adits, drifts..	In lenses of silica-carbonate rock along serpentine-sandstone fault contact.	G.D. Topliff...	12, 34

TABLE 20. - California mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
WEST MAYACMAS DISTRICT--Continued							
Napa prospect	Sonoma	Sec 11, T 10 N, R 8 W.	Occurrence	Unknown	Unknown	Unknown	12, 29, 49
Occidental	do	Sec 10, T 10 N, R 8 W.	Small	do	do	do	12, 29, 49
Old Chapman	do	Sec 25, T 10 N, R 8 W.	Occurrence	Underground	do	do	12, 29, 49
Pacific group	do	Sec 6, T 10 N, R 8 W.	do	Three adits	In vein at serpentine-sandstone contact.	do	12, 29, 49
Rattlesnake mine	do	Sec 31, T 11 N, R 8 W.	Over 100	Two adits	Native mercury disseminated in sandstone and fault gouge.	Frank R. Kiessig.	7, 12, 34, 49
Socrates mine	do	Secs 32, 33, T 11 N, R 8 W.	About 5,000	6,000 feet of underground workings.	With native mercury in silica-carbonate rock along serpentine-sandstone contact.	Frances Vought.	7, 12, 34, 49
Sonoma group	do	Sec 5, T 10 N, R 8 W.	Over 100	Adits and 1,000 feet of drifts.	With native mercury in silica-carbonate rock along serpentine-sandstone contact.	Peter Pakula	7, 12, 34, 49
Truitt #1 property.	do	Sec 15, T 11 N, R 9 W.	Small	Unknown	Unknown	Cloverdale Extension Quicksilver Co.	-
Yellowjacket mine	do	Sec 9, T 9 N, R 7 W.	do	Two shafts, five adits, several hundred feet of underground workings.	In lenses of silica-carbonate rock.	G.P. Dyer	7, 34
GUERNEVILLE DISTRICT							
Altamont copper group.	Sonoma	Sec 17, T 7 N, R 10 W.	Occurrence	Unknown	Unknown	Florence M. Button.	12, 34
Sonoma Quicksilver or Great Eastern and Mount Jackson mines.	do	Secs 16, 17, T 8 N, R 10 W.	Over 100,000	Two shafts of 975 and 500 feet, 14,500 feet of drift.	Mineralized pipes and tabular bodies.	Sonoma Quicksilver Mines, Inc.	12, 34, 44, 49
Walker prospect	do	Sec 8, T 8 N, R 10 W.	Occurrence	650 feet of underground workings.	Unknown	Meeker estate	12, 29, 34
Wall Springs	do	Sec 30, T 8 N, R 9 W.	do	70-foot shaft	do	Unknown	12, 29, 34

SKAGGS SPRINGS DISTRICT							
Skaggs Springs mine	Sonoma.....	Secs 23, 24, T 10 N, R 11 W.	330.....	1,800 feet of underground workings.	Metacinnabarite and some cinnabar finely disseminated in massive sandstone bed.	Leo Curtis.....	26, 34, 49
OAKVILLE DISTRICT							
Bella Oak mine.....	Napa.....	Secs 20, 21, 28, T 7 N, R 5 W.	1,792.....	6,000 feet of underground workings.	Veinlets and disseminations in silica-carbonate rock.	Carolyn Landry and J.J. Cohn	12, 29, 49, 64
La Joya mine.....	do.....	Secs 23, 24, T 7 N, R 6 W.	2,017.....	Six shafts, three adits: 5,000 feet of underground workings.	Veinlets and disseminations in silica-carbonate rock.	James Doherty..	12, 28, 49, 64
Mountain.....	do.....	Sec 2, T 6 N, R 5 W.	Occurrence....	Unknown.....	Unknown.....	M. Johnson.....	12
PETALUMA DISTRICT							
Edwards mine (Bentley Ranch).	Marin.....	Sec 13, T 4 N, R 9 W.	Not available.	Bulldozer cuts, short adits, trenches.	Filling along shear breccia zones.	Ray Schultz and Mr. Bentley.	-
Gambonini property.	do.....	Sec 19, T 4 N, R 8 W.	do.....	Shallow shafts, adit, trenches.	Small pods in fractured sandstone and shale.	Arnold Gambonini.	63, 64
SULFUR SPRINGS (VALLEJO) MOUNTAIN DISTRICT							
Borges prospect....	Solano.....	Sec 15, T 3 N, R 3 W.	Occurrence....	Trenches.....	Disseminated in silica-carbonate rock.	Tony Borges....	-
Brownlie property..	do.....	Sec 10, T 3 N, R 3 W.	Small.....	Short adits, trenches	Small erratic pockets in breccia zone.	John Brownlie estate.	12, 64
Hastings mine.....	do.....	Sec 11, T 3 N, R 3 W.	do.....	1,100-foot adit, open cuts.	Irregular masses in breccia zone.	Hastings estate	12, 49, 64
St. Johns mine.....	do.....	Sec 33, T 4 N, R 3 W.	Over 17,000...	Extensive underground workings over vertical range of 650 feet.	Fissure filling in fault zone.	St. Johns Mines Co.	12, 29, 49, 64
MOUNT DIABLO DISTRICT							
Mt. Diablo mine....	Contra Costa.	Sec 29, T 1 N, R 1 E.	About 11,000..	Over 4,500 feet of underground workings, open pits.	Metacinnabarite and cinnabar fracture filling in silica-carbonate rock.	Mt. Diablo Quicksilver Co.	12, 19, 49, 51
EMERALD LAKE DISTRICT							
Challenge mine (Farm Hill No. 2).	San Mateo..	Sec 36, T 5 S, R 4 W.	Over 2,500....	Several open pits to depth of 75 feet.	Cinnabar, metacinnabarite, and native mercury in vugs and fractures in silica-carbonate float rock.	A.F. Oddstad, Jr.	17
DEL PUERTO AND ORESTIMBA DISTRICTS							
Adobe mine.....	Stanislaus.	Secs 23, 24, T 6 S, R 5 E.	About 50.....	180-foot vertical shaft, incline, drifts.	Erratic distribution along sandstone fissures.	Paul Gerber....	12, 14, 29, 33, 49
Crocker-Winship prospect.	do.....	Sec 31, T 5 S, R 5 E.	Occurrence....	Unknown.....	Unknown.....	Unknown.....	12, 14

TABLE 20. - California mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
DEL PUERTO AND ORESTIMBA DISTRICTS--Continued							
International prospect.	Stanislaus.	Sec 3, T 8 S, R 6 E.	Small.....	Unknown.....	Unknown.....	Unknown.....	12, 14, 49
Newhall prospect...	do.....	Sec 32, T 5 S, R 5 E.	Occurrence....	do.....	Cinnabar in sandstone and serpentine.	do.....	12, 14
Orestimba mine.....	do.....	Sec 28, T 7 S, R 6 E.	Small.....	75-foot shaft.....	Shear zone in silicified shale.	H.A. Wilder....	14, 29, 49
Phoenix group.....	do.....	Secs 20, 21, 28, T 6 S, R 5 E.	About 200.....	Three adits, underground workings.	Along fissures near serpentine-sandstone fault contact.	Emma Rose and E.S. McCurdy.	12, 14, 33, 49
Red Acres mine (Orestimba, Winegar).	do.....	Secs 25, 35, 36, T 6 S, R 5 E.	Occurrence....	Shallow shaft, two adits.	Irregular distribution in sandstone breccia.	H.L. Spencer...	12, 14, 33
NEW ALMADEN DISTRICT							
Bernal prospect....	Santa Clara	Sec 24, T 8 S, R 1 E.	Occurrence....	200-foot adit.....	No significant mineralization found.	Pedro A. Bernal	12, 18, 31
Bowie property.....	do.....	Sec--, T 9 S, R 1 E.	do.....	Unknown.....	Unknown.....	Unknown.....	12, 18, 31
Brainard prospect (James Ranch).	do.....	Sec 5, T 9 S, R 1 E.	do.....	Two adits.....	In clay seams along serpentine sandstone contact.	Mrs. M.D. Brainard.	12, 18, 31
Chaboya-Hillsdale mines.	do.....	Secs 33, 34, T 7 S, R 1 E.	Several hundred.	4,000 feet of underground workings.	In lenses of silica-carbonate rock along serpentine-sandstone contact.	Manuel T. Azevedo.	12, 18, 31
Guadalupe mine.....	do.....	Sec 30, T 8 S, R 1 E.	Over 113,000..	Several miles of underground workings, open cuts.	Fracture filling in silica-carbonate rock along fault.	James Rolfe, III	10, 12, 18, 29, 31,
Midway location....	do.....	Unknown.....	Small.....	Unknown.....	Unknown.....	Unknown.....	-
New Almaden mine...	do.....	Secs 27, 28, 29, 33, 34, 35, T 8 S, R 1 E. Secs 1, 2, 3, 4, T 9 S, R 1 E.	Over 1,050,000	Over 100 miles of underground workings, diamond drilling.	In silica-carbonate rock on contact between serpentine and sandstone. Some free mercury and metacinnabarite.	New Almaden Property Holders, Inc.	11, 12, 18, 29, 31, 49
New North Almaden mine (Santa Clara)	do.....	Sec 5, T 8 S, R 2 E.	Small.....	1,400- and 100-foot adits.	Fracture filling in sandstone.	Jacob Miller and Grace Miller.	18, 31, 49
Rianda mine.....	do.....	Sec 22, T 10 S, R 4 E.	do.....	About 1,000 feet of underground workings.	In ledge of silica-carbonate rock near sandstone contact.	Antone A. Rianda.	18

Santa Teresa prospect.	do.....	Sec 24, T 8 S, R 1 E.	Occurrence....	Adits and drifts.....	Mineralized silica-carbonate rock along serpentine-sandstone contact.	Enos Fontis....	12, 18, 31
Silver Creek mine..	do.....	Sec 33, T 7 S, R 2 E.	Few hundred...	Underground workings.	In silica-carbonate rock and in surrounding sedimentary rock.	Lee Slatore....	12, 18, 31, 49
Tilton Ranch prospect.	do.....	Sec 26, T 8 S, R 2 E.	Occurrence....	160-foot adit.....	Fracture zones in serpentine.	Otto Taubert...	18, 31
Wright property....	do.....	Sec 21, T 9 S, R 2 E.	Small.....	Two shallow shafts, short adit.	Mineralized silica-carbonate rock in serpentine.	Mayfair Packing Co.	12, 18, 31
STAYTON DISTRICT							
Comstock mine.....	Santa Clara	Sec 19, T 11 S, R 7 E.	About 500.....	250-foot incline, short drifts.	Mineralized silica-carbonate rock along fault.	T.H. French....	8, 12, 29, 38, 49
Gypsy mine.....	Merced.....	Sec 5, T 12 S, R 7 E.	About 500 (Included with Stayton).	Stope from surface to depth of 100 feet, several drifts, two adits.	Vein fillings and coatings in breccia zone along fault.	R.B. Knox.....	8, 38
Mariposa mine.....	San Benito.	Sec 28, T 11 S, R 7 E.	Small.....	350-foot adit, short drifts.	Disseminated along shear zone in basalt.	T.H. French....	8, 12, 29, 38
Red Metal or Shriver mine.	Merced.....	Sec 31, T 11 S, R 7 E.	do.....	Two adits with combinded length of 1,200 feet.	Stibnite-cinnabar vein in basalt.	R.B. Knox.....	8, 49
Stayton mine.....	do.....	Sec 5, T 12 S, R 7 E.	About 1,500 (Includes Gypsy).	Extensive underground workings.	In parallel fractures along basalt fault zone.	do.....	2, 8, 12, 38, 49
Yellowjacket mine..	do.....	Sec 5, T 12 S, R 7 E.	Occurrence....	600-foot adit, drifts	Veins in altered basalt.	do.....	8, 38
CENTRAL SAN BENITO DISTRICT							
Arrambide mine (Mercy).	Fresno.....	Secs 32, 33, T 13 S, R 10 E.	About 1,700...	2,000 feet of underground workings, open pit.	In fractures in quartz vein, disseminated in wall rock, and in fault breccia zone.	W.M. Biaggi, F. Burrell, L.S. Albertini	12, 42, 49, 67
Bitter Water mine..	San Benito.	Sec 25, T 15 S, R 9 E.	Small.....	Short adits, open cuts.	Along fractures and disseminated in sandstone.	H.V. Underwood.	2, 49, 67
Butts property.....	do.....	Sec 4, T 16 S, R 8 E.	do.....	Short adits, two open cuts.	Cinnabar and metacinnabarite along breccia zone in sandstone.	William Butts..	12, 49, 29
Cannon, Cerro Gordo, Lone Star properties.	do.....	Sec 15, T 15 S, R 8 E.	Occurrence....	250 feet of underground workings.	In silicified belt of serpentine along sandstone contact.	Unknown.....	2, 12, 29, 49, 67

TABLE 20. - California mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
CENTRAL SAN BENITO DISTRICT--Continued							
Cerro Bonito mine..	San Benito.	Sec 31, T 15 S, R 10 E.	About 800.....	2,000 feet of underground workings, open cuts.	In silicified serpentine along sandstone contact.	Mrs. Thomas Flint.	2, 12, 29, 49, 67
Crystal quartz prospect.	Fresno.....	Sec 5, T 14 S, R 10 E.	Small.....	Surface cuts.....	Cinnabar-bearing quartz vein in sandstone.	Louis Sciochetti.	-
Dar prospect.....	San Benito.	Sec 12, T 16 S, R 10 E.	47.....	Open cuts.....	Disseminated along shear zone in sandstone and shale.	Donald and Louis Sciochetti.	-
Don Juan and Don Miguel mines.	do.....	Sec 36, T 18 S, R 11 E. Sec 31, T 18 S, R 12 E.	Small.....	Limited underground workings.	In fractures of interbedded sandstone and shale.	E.J. Breen estate.	12, 29, 49
El Cajon mine.....	do.....	Sec 3, T 16 S, R 10 E.	do.....	Open cuts.....	In breccia zone between sandstone and shale.	Edward A., Everett J., Edward S., and James D. Matthews.	-
El Rey mine.....	do.....	Sec 12, T 15 S, R 9 E.	do.....	Short adits, drifts..	Small disconnected bodies along fault zone.	Manuel Perry...	2, 67
H and G.....	do.....	Sec 31, T 17 S, R 12 E.	do.....	Unknown.....	Unknown.....	Unknown.....	-
Juniper mine.....	do.....	Secs 11, 12, T 16 S, R 10 E.	Substantial...	65-foot shaft, 1,000 feet of underground workings, open pits.	Fault zones in altered sandstone.	Lily Berg.....	-
Lea-Grant group....	do.....	Secs 1, 2, T 16 S, R 10 E.	Over 700.....	Adits, drifts, open pits.	In fault zone in altered sandstone.	Goodall estate.	2, 67
Lone Oak mine.....	do.....	Sec 7, T 15 S, R 10 E.	Over 60.....	Two shallow shafts, open pits.	Pods in fault breccia zone and stringers in sandstone.	Mrs. Frank McCollough.	2, 67
Lucky Strike mine..	do.....	Sec 12, T 15 S, R 9 E.	Over 200.....	1,500 feet of underground workings.	In fault gouge and in veins in sandstone.	Chester Ross...	2, 67
Mitchell prospect..	do.....	Sec 2, T 16 S, R 10 E.	Small.....	Short adit, open cuts.	In fractures and disseminated in sandstone.	Henry Stewart..	-
Parker-Carlson prospect.	do.....	Sec 13, T 15 S, R 9 E.	do.....	Surface cuts.....	Pockets along thrust fault in sandstone.	Mrs. Frank McCollough.	2, 67

Valley View mine...	do.....	Secs 7, 8, T 15 S, R 10 E.	Over 300.....	1,600 feet of underground workings, surface cuts.	With metacinnabarite at fault intersections.	Rose Garcia....	2, 49, 67
Yturriarte mine....	do.....	Sec 13, T 15 S, R 9 E.	Small.....	Adits.....	Along breccia zone in sandstone and shale.	Mrs. Frank McCollough.	2, 67
NEW IDRIA DISTRICT							
Alpine mine.....	San Benito.	Secs 13, 14, T 18 S, R 11 E.	Several hundred.	1,400 feet of underground workings.	With native mercury in small lenses of silica-carbonate rock along fracture zone in serpentine.	Leonard W. Knepper.	2, 12, 23, 49
Anita prospect.....	Fresno.....	Sec 17, T 18 S, R 13 E.	Small.....	Short adits, open cuts.	Small bunches along faults in sandstone and shale.	Eugene J. Jacques.	23, 42
Archer mine.....	do.....	Sec 3, T 19 S, R 13 E.	Over 1,000....	Over 2,600 feet of underground workings.	With metacinnabarite in shear zones cutting indurated shale.	Ed Fales, Robert Stoker.	12, 23, 42, 49
Aurora mine.....	San Benito.	Sec 5, T 18 S, R 12 E.	do.....	Five adits, glory hole, drifts, open cuts.	With metacinnabarite along fractures in silica-carbonate rock along fault in serpentine.	E.P. Jarrett (lessee).	2, 12, 23, 49
Breen group.....	do.....	Sec 31, T 18 S, R 12 E; Sec 36, T 18 S, R 11 E.	Occurrence....	300 feet of adits....	Disseminated in fault gouge.	Breen estate.	2, 12, 23
Del Mexico mine....	Fresno.....	Sec 22, T 18 S, R 13 E.	Small.....	800 feet of adits and drifts, open cuts.	Along fractures in indurated sandstone.	Llyle J. Christies.	12, 23, 42, 49
Elkafajo.....	San Benito.	Sec 25, T 17 S, R 11 E.	do.....	Unknown.....	Unknown.....	Karl P. Lippe (operator).	-
Flint group.....	do.....	Sec 11, T 18 S, R 11 E; secs. 2, 11, 12, 18, T. 18 S, R 12 E.	do.....	1,500 feet of adits, open cuts.	With native mercury in bodies of silica-carbonate rock along shear zone in serpentine.	W.C. Webster...	2, 12, 23, 49
Florence Mac mine..	do.....	Sec 32, T 18 S, R 12 E.	do.....	900 feet of underground workings, trenches.	Along shears in indurated shale.	Norman Scazighini.	2, 12, 23, 49
Koski group.....	Fresno.....	Sec 34, T 18 S, R 13 E.	do.....	Short adits, open cuts.	Along shear zones in indurated shale.	J.M. Koski.....	42
New Idria mine.....	San Benito.	Secs 28, 29, 32, 33, 34, 35, T 17 S, R 12 E; secs 3, 4, T 18 S, R 12 E.	Over 500,000..	Over 30 miles of underground workings.	Veins and stockworks in altered rocks.	New Idria Mining and Chemical Co.	2, 12, 23, 29, 49

TABLE 20. - California mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
NEW IDRIA DISTRICT--Continued							
North Star mine....	San Benito.	Sec 36, T 17 S, R 11 E.	Several hundred.	Open cut.....	Disseminated throughout shear zone in serpentine.	Leonard W. Knepper.	-
Picacho group.....	do.....	Secs 19, 20, 29, T 18 S, R 12 E.	Small.....	3,000-foot adit, inclines, open cuts.	In lenses of silica-carbonate rock distributed along shear zone in serpentine.	Hernandez Quicksilver Mining Co.	2, 12, 23, 49
Santa Margarita mine (Edna Bell, New Tirado).	do.....	Sec 31, T 18 S, R 12 E.	do.....	Short adits, open cuts.	Along fractures in indurated shale in fault zone.	Joe Tirado.....	2, 23
Spanish prospect...	do.....	Sec 31, T 17 S, R 12 E.	do.....	Short adit, open cuts.	Cinnabar and native mercury along fractures in shear zones in sandstone.	Raymond J. Lucas.	-
Tirado prospect....	do.....	Sec 13, T 18 S, R 11 E.	do.....	Open cuts.....	In small bodies of silica-carbonate rock along shear zone in serpentine.	Ben and Paul Hilden.	2, 12, 23, 49
Tirado and Shear prospect.	do.....	Sec 12, T 18 S, R 11 E.	1.....	do.....	In small bodies of silica-carbonate rock along shear zones in serpentine.	S. Tirado and William Shear.	2, 23, 49
Wonder mine.....	do.....	Sec 31, T 17 S, R 12 E.	Few hundred...	Open cuts, several hundred feet of underground workings.	Along fractures in a zone of crushed sandstone.	Paul Gonzales..	2, 12, 23 49
PARKFIELD DISTRICT							
Avenal Canyon and Fair View properties.	Kings.....	Sec 22, T 23 S, R 16 E.	Occurrence....	Unknown.....	Unknown.....	Unknown.....	12, 35
Dawson mine.....	do.....	Sec 28, T 23 S, R 16 E.	Over 1,000....	Several hundred feet of underground workings, glory hole.	With metacinnabarite in veinlets and fractures in silica-carbonate rock in a landslide mass of serpentine.	Tom Fortini (lessee).	6, 12, 35, 49
Gillette prospect..	Monterey...	Sec 1, T 23 S, R 14 E.	Small.....	Open cuts, short adits.	In blocks of silica-carbonate rock within a landslide mass.	Henry Ludeke...	6, 12, 49

G.W.D. mine.....	do.....	Sec 2, T 23 S, R 14 E.	do.....	Open cuts, short adits.	In silica-carbonate rock within a landslide mass.	N. Gillette....	6, 49
Kings mine (Fredana).	Kings.....	Sec 20, T 23 S, R 16 E.	Over 1,500....	60-foot shaft, short adits, open pit.	With native mercury in crushed serpentine and sandstone in a landslide area.	Mrs. Ida Twisselman.	6, 12, 35, 49
Patriquin mine.....	Monterey...	Sec 2, T 23 S, R 14 E.	do.....	Glory hole, open cuts, extensive underground workings.	Veinlets in silica-carbonate rock along fault at serpentine contact.	Fred Harber....	6, 12, 49
Poppy prospect.....	do.....	Sec 2, T 23 S, R 14 E.	Small.....	Shallow underground workings.	Narrow zones in silica-carbonate rock.	Gillette and Washburn.	6, 49
Rattlesnake prospect.	do.....	Sec 30, T 23 S, R 16 E.	Occurrence....	Short adit.....	In lenses of silica-carbonate rock along shear zone in serpentine.	Harold G. Dennis.	6
Sommer's property..	do.....	Sec 2, T 23 S, R 14 E.	do.....	do.....	In fault between serpentine and silica-carbonate rock in underlying sandstone.	L.J. Sommer....	6
White property.....	do.....	Sec 30, T 23 S, R 16 E.	Small.....	Adits, drifts.....	In zone between serpentine and silica-carbonate rock.	Lee S. White...	6, 12, 49
BRYSON AND SAN CARPOFORO DISTRICT							
Bryson mine.....	Monterey...	Sec 7, T 24 S, R 8 E.	Small.....	Short adits, open cuts.	In breccia zone between shale and sandstone.	Victor V. Botts, Jr.	24
Dutra property.....	do.....	Sec 28, T 24 S, R 6 E.	do.....	Shallow shaft, short adit, open cut.	In silica-carbonate rock and sandstone along fault zone.	Hearst Corp....	12, 24
North Star and Sunset View prospects	San Luis Obispo.	Sec 13, T 25 S, R 6 E.	Occurrence....	Trenches.....	In breccia zone in graywacke and shale.	do.....	12, 24
Old Murray.....	Monterey...	Sec 28, T 24 S, R 6 E.	Small.....	Unknown.....	Unknown.....	Unknown.....	-
Polar Star mine....	San Luis Obispo.	Sec 13, T 25 S, R 6 E.	Several hundred.	Adits, incline, open pit.	Small pods in breccia zone in graywacke and shale.	Kenneth Emigh..	12, 24, 30, 49
PINE MOUNTAIN DISTRICT							
Hamilton mine.....	San Luis Obispo.	Sec 30, T 26 S, R 9 E.	Slight.....	Seven adits each 100 to 500 feet long.	In silica-carbonate rock and breccia along fault in sandstone and shale.	Walter Warren..	24
Keystone mine.....	do.....	Sec 23, T 26 S, R 8 E.	Over 60.....	300-foot adit, 50-foot winze, open cuts, short adits.	Small veins in silica-carbonate rock in fault zone.	Phelan Land and Cattle Co.	12, 24, 30, 49

TABLE 20. - California mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
PINE MOUNTAIN DISTRICT--Continued							
Pine Mountain group	San Luis Obispo.	Sec 3, T 26 S, R 8 E.	Small.....	Extensive underground workings, open cuts.	In veinlets in large bodies of silica-carbonate rock along fault zone.	Hearst Corp....	12, 24, 30, 49
Quien Sabe and Doty mines.	do.....	Sec 14, T 26 S, R 8 E.	Slight.....	100-foot shaft, three adits, open cuts.	Disseminated in silica-carbonate rock.	Walter Warren..	12, 24, 30, 49
Warren prospect....	do.....	Sec 30, T 26 S, R 9 E.	Occurrence....	Trenches, open cuts..	In body of brecciated chert in fault zone.	do.....	24
Williams prospect..	do.....	Sec 24, T 26 S, R 8 E.	do.....	do.....	In shallow lenses of silica-carbonate rock in fault zone.	Tony Williams..	24
CAMBRIA-OCEANIC DISTRICT							
Cambria mine.....	San Luis Obispo.	Sec 36, T 26 S, R 8 E.	About 4,000...	Over 4,000 feet of underground workings.	In fractures and in silica-carbonate rock in wide mass of serpentine in fault zone.	Tony Williams..	12, 24, 30, 49
Fitzhugh Ranch prospect.	do.....	Sec 24, T 27 S, R 9 E.	Slight.....	800-foot adit, short adits.	Erratic concentrations in serpentine.	William Fitzhugh.	12, 24, 30, 49
Marquart prospect..	do.....	Sec 3, T 27 S, R 9 E.	Occurrence....	Unknown.....	In lenses of silica-carbonate rock along fault in sandstone and shale.	J.L. Marquart..	12, 24
Oceanic mine.....	do.....	Secs 15, 16, 21, T 27 S, R 9 E.	Over 40,000...	750-foot shaft, 2½ miles of underground workings, open cuts.	Disseminated with native mercury in sandstone and silica-carbonate rock.	Ernest, Mina, Henry, and Marianna Curti	12, 24, 30, 32, 49
Vulture prospect...	do.....	Sec 24, T 27 S, R 9 E.	Slight.....	Two short adits, open cuts.	In fault breccia zone in serpentine.	Rudolph Mora...	12, 24
Wittenberg property	do.....	Sec 8, T 27 S, R 9 E.	do.....	Open cuts.....	Small high-grade stringers in sloughed section of silica-carbonate rock.	Walter Warren..	12, 24, 30
ADELAIDE DISTRICT							
Big shaft.....	San Luis Obispo.	Unknown.....	Slight.....	Open cuts.....	Unknown.....	Unknown.....	-
Buena Vista or Mahoney mine.	do.....	Sec 33, T 26 S, R 10 E.	Over 15,000...	Large open pit, several thousand feet of underground workings.	In sandstone and shale fault breccia.	Harold J. Biaggini.	12, 24, 30, 49

Cypress Mountain prospect.	do.....	Secs 1, 2, T 27 S, R 9 E.	Occurrence....	Shallow underground workings.	In fault zone crossing shale and sandstone.	Kenneth Kingsbury.	12, 24, 30
Kismet prospect....	do.....	Sec 7, T 27 S, R 10 E.	do.....	Unknown.....	In silica-carbonate rock along fault zone in shale and sandstone.	Unknown.....	12, 24
Klau property and Capitola mine.	do.....	Sec 33, T 26 S, R 10 E.	About 24,000..	Five miles of underground workings, extensive open pits.	As fracture filling in fault breccia zone in shale.	H.W. Gould Co..	12, 24, 30, 49
La Libertad mine...	do.....	Sec 21, T 27 S, R 10 E.	About 1,100...	About 1,800 feet of underground workings	In silica-carbonate rock along breccia zone in sandstone and shale.	Mrs. Margaret Thompson.	12, 24, 30, 49
Little Bonanza group.	do.....	Sec 17, T 27 S, R 10 E.	Over 1,000....	About 4,000 feet of underground workings	Veinlets in silica-carbonate rock and in sandstone and shale breccia.	Earl Merrifield and others.	12, 24, 30, 49
Madrone mine.....	do.....	Sec 22, T 27 S, R 10 E.	Slight.....	125-foot shaft, 50-foot adit, open cuts.	In silica-carbonate lenses in fault breccia.	Nicholas A. Marquart.	12, 24, 30, 49
Tamney group.....	do.....	Sec 17, T 27 S, R 10 E.	Occurrence....	Two short adits, drifts.	In lenses of silica-carbonate rock in fault breccia.	Fine Enterprises.	-
William Tell prospect (Williams).	do.....	Sec 32, T 26 S, R 10 E.	do.....	Short adits, open cuts.	Silica-carbonate lenses in fault zone	C.C. Thompson..	12, 24
RINCONADA DISTRICT							
Deer Trail mine....	San Luis Obispo.	Sec 32, T 32 S, R 16 E.	About 200.....	Three adits, underground workings.	Seams and vugs in brecciated altered sandstone.	M.H. Stevens	12, 24, 30, 49
Rinconada mine.....	do.....	Secs 21, 27, 28, T 30 S, R 14 E.	About 3,000...	Extensive underground workings, open cuts, trenches.	With metacinnabarite in silica-carbonate alteration in remnants of serpentine.	George Bell, June Anderson, and Carrol Blake.	12, 24, 30, 49
CACHUMA DISTRICT							
Davis and Lost Chord prospects.	Santa Barbara.	Sec--, T 8 N, R 29 W.	Occurrence....	Trenches.....	In fault zone.....	Unknown.....	25
Lion Den mine.....	do.....	Sec 35, T 8 N, R 29 W.	About 330.....	Incline, four levels, short adits.	In fault intersections with limited replacement of wall rock.	National Mining and Milling Co.	12, 25, 49
Lost Chord claim...	do.....	Sec 36, T 8 N, R 29 W.	Occurrence....	Unknown.....	Silica-carbonate replacement in fault breccia-cinnabar not visible.	Unknown.....	25
Red Rock mine (Cachuma Eagle).	do.....	Sec 2, T 7, N, R 29 W; Sec. 35, T 8 N, R 29 W.	Over 3,000....	Four adit levels, 7,000 feet of underground workings, glory holes.	In fault intersections.	National Mining and Milling Co.	12, 25, 49

TABLE 20. - California mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
CACHUMA DISTRICT--Continued							
Sulfur Dome.....	Santa Barbara.	Sec--, T 7 N, R 29 W.	Occurrence....	Trenches.....	Along faults in altered sandstone.	Unknown.....	25
LOS PRIETOS DISTRICT							
Gibraltar mines (Falcon, McAvoy-Millburn, Santa Ynez).	Santa Barbara.	Secs 12, 13, T 5 N, R 27 W.	Over 3,000....	Two adits, glory hole, open cuts.	Fault filling in silica-carbonate lenses along serpentine-shale contact.	Gibraltar Mining Co.	12, 49, 59
Los Prietos.....	do.....	Secs 9, 10, 11, 12, T 5 N, R 27 W.	500 to 1,000..	Extensive underground workings.	Along contact between sandstone and serpentine.	do.....	12, 49, 59
Mitchell.....	do.....	Unknown.....	Small.....	Unknown.....	Unknown.....	Mitchell Mercury Mines.	-
DIAMOND CREEK DISTRICT							
Big Boy Cinnabar group.	Del Norte..	Sec 36, T 19 N, R 2 E.	Small.....	Shallow open cuts and pits.	In joints in soft, highly altered diorite.	Howard Melaney.	13, 45, 49
Sunny Brook prospect.	do.....	Sec 11, T 18 N, R 2 E.	do.....	Shallow shaft, adit, drifts, open cut.	Cinnabar and native mercury in quartz veins.	Lee Brown and John Taggart.	12, 13, 45
PATRICK CREEK DISTRICT							
Webb (Schultz, Simbro) mine.	Del Norte..	Sec 20, T 18 N, R 3 E.	Over 200.....	40-foot shaft, three adits, drifts, trenches, open cuts.	With metacinnabarite and native mercury with pyrite in silica-carbonate rock.	George Webb....	13, 45
KLAMATH RIVER DISTRICT							
Great Northern mine (Empire Canyon)	Siskiyou...	Secs 13, 14, 24, T 47 N, R 8 W.	Over 500.....	Adits, several thousand feet of underground workings, open cuts.	With native mercury in fissures and shear zones near granodiorite contacts.	D.A. Snyder and Russell Hall.	3, 47, 49
Horse Creek prospect.	do.....	Secs 15, 16, T 46 N, R 10 W.	Slight.....	Short adits, trenches.	Nuggets in creek gravel, fracture and fissure filling in hornblende schist.	Robert and Fred Rainey.	3, 12, 47, 49
Ivanhoe group (Cowgill mine).	do.....	Sec 34, T 48 N, R 9 W.	Small.....	Short adits, open cuts.	In soil covering and in fractures in altered mica schist.	Mrs. Ellen Sander.	3, 12, 49

ALTURAS DISTRICT							
Brown prospect.....	Modoc.....	Sec 4, T 39 N, R 14 E.	Occurrence....	Short adits, trenches.	Sparsely disseminated in ribs of opalite.	W.J. Brown.....	-
Deep Creek prospect (Silvertown).	do.....	Sec 9, T 42 N, R 15 E.	Slight.....	Two shallow shafts, trenches.	Along shear zone in andesite, agglomerates and tuffs.	Deep Creek Exploration Co.	52
Red Hawk mine.....	do.....	Sec 25, T 46 N, R 14 E.	None.....	Adits, open cut.....	In fractures in silicified tuff, rhyolite, and altered andesite.	R.S. Hall and others.	12, 49, 52
ALTOONA DISTRICT							
Altoona mine.....	Trinity....	Secs 22, 26, 28, T 38 N, R 6 W.	About 34,000..	Shafts and 10,000 feet of underground workings on six levels.	In lenses with native mercury along faults in altered diorite.	Altoona Quicksilver Mining Co.	4, 12, 49, 56
Carr prospect.....	do.....	Sec 22, T 38 N, R 6 W.	Occurrence....	Trenches.....	Unknown.....	R.L. Smith Lumber Co.	12
Fairview placers...	do.....	Unknown.....	Slight.....	Dredging operation...	do.....	Fairview Placers.	-
Hub.....	do.....	Sec--, T 38 N, R 6 W.	do.....	Open pit.....	do.....	F.L. Woodworth.	-
Integral property..	do.....	Secs 14, 15, 22, 23, T 38 N, R 6 W.	do.....	180-foot shaft, adits, drifts, surface cuts and trenches.	In altered zone of diorite porphyry.	George R. and Zack Anderson.	4, 12, 49
Munko prospect.....	do.....	Sec 14, T 38 N, R 6 W.	Occurrence....	Trenches.....	In fault along serpentine diorite-porphyry contact.	P.C. Munko.....	4
Shasta Lilly mine..	do.....	Sec 14, T 38 N, R 6 W.	Slight.....	Shallow shaft, adits, trenches.	Mineralized zone in serpentine.	George L. Costa	4
Trinity and Taggart group.	do.....	Secs 21, 22, T 38 N, R 6 W.	Occurrence....	Trenches.....	In mineralized faults in altered diorite porphyry.	George R. Anderson.	4, 12
NEW RIVER DISTRICT							
Overland claims....	Trinity....	Sec 17, T 37 N, R 12 W.	Slight.....	Adit, drifts, open cuts.	Pockets along shear zones in serpentine.	A.Z. Allen.....	4, 12
MILL CREEK DISTRICT							
Humboldt Almaden...	Humboldt...	Sec 24, T 9 N, R 5 E.	Small.....	Short adits, test pits.	Ore-bearing dike.....	Mill Creek Mining Co.	12
CLOVER CREEK DISTRICT							
Clover Creek.....	Shasta.....	Secs 4, 5, T 32 N, R 1 W.	Occurrence....	Shallow shafts, drifts, test pits.	Fracture filling along shear zone in silicified basalt.	J.A. Gritsch...	12
OCCIDENT DISTRICT							
Occident prospect..	Mendocino..	Sec 6, T 12 N, R 11 W.	Over 60.....	Underground workings.	In breccia zones in serpentine.	A.L. Dobie and J.G. Cortelyou	12, 46, 49
Empress.....	do.....	Sec--, T 13 N, R 12 W.	Small.....	Underground.....	Unknown.....	Russell Fishback.	-

TABLE 20. - California mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
NASHVILLE DISTRICT							
Bernard property...	El Dorado..	Sec 4, T 8 N, R 10 E.	A few.....	Vertical shaft, adit.	Mineralized zone in slates and quartzites.	Bernard Cinnabar Co.	12, 49
MOGUL DISTRICT							
Mogul Peak prospect	Alpine.....	Sec 30, T 10 N, R 21 E.	A few.....	Two adits, shaft.....	Fissure veins in andesite with siliceous alteration.	Wesley Crothers and Dick Bruce	49
BRIDGEPORT DISTRICT							
Alta plana prospect	Mono.....	Sec 34, T 5 N, R 26 E.	Occurrence....	Trenches.....	In opalized rhyolite tuff and agglomerate	G.A. Peterson and Warren Loose.	-
Calmono mine (Old Timer).	do.....	Sec 25, T 4 N, R 25 E.	10.....	80-foot incline, trenches.	In opalized rhyolite tuff.	Ernest Altenreuther.	-
Isabel.....	do.....	Sec--, T 5 N, R 25 E.	Occurrence....	Unknown.....	Unknown.....	J. Picinnini...	-
Ishter.....	do.....	Unknown.....	Slight.....	do.....	do.....	Judd Boynton...	-
Loughlin prospect..	do.....	Sec 23, T 5 N, R 24 E.	Occurrence....	Three shafts, adit...	Fracture filling in sandstone.	James Loughlin.	-
Paramount mine.....	do.....	Sec 24, T 5 N, R 26 E.	A few.....	Two adits, drifts....	In opalized rhyolitic tuff and agglomerate and in detrital soil	Page Blakemore.	-
COSO DISTRICT							
Coso mine (Nicol, Devil's Kitchen).	Inyo.....	Secs 4, 5, 6, 7, 8, T 22 S, R 39 E.	Several hundred.	Extensive open pits and shallow shafts.	With metacinnabarite along sinter vents of hot springs.	Military reservation.	20, 49, 53, 60
Wheeler area.....	do.....	Sec 16, T 22 S, R 39 E.	A few.....	Open cuts, shallow shafts.	With metacinnabarite in sinter vents of hot springs.	do.....	20, 49, 53, 60
TEHACHAPI DISTRICT							
China Lake.....	Kern.....	Sec--, T 25 S, R 40 E.	Occurrence....	Unknown.....	Unknown.....	Unknown.....	-
Flickert-Durnal property.	do.....	Sec 26, T 31 S, R 32 E.	Small.....	Short adits, shallow shaft.	Ore-bearing rhyolite dike in granite.	Merle Hickson..	12, 49
Martin Beck.....	do.....	Sec 29, T 30 S, R 37 E.	Occurrence....	Unknown.....	Unknown.....	Unknown.....	-
Tardy claims.....	do.....	2½ miles west of Cinco.	do.....	do.....	do.....	do.....	-
Walabu mine (Cuddeback).	do.....	Sec 27, T 31 N, R 32 E.	Over 1,300....	140-foot incline, extensive underground workings, small glory holes.	Ore-bearing rhyolite dike near granite contact; also in fracture and small breccia veins.	Walabu Mining Co.	9, 12, 49

				TUSTIN DISTRICT			
Red Hill mine (Tustin).	Orange.....	Sec 14, T 5 S, R 9 W.	Several.....	Short exploratory adits.	With native mercury in barite veins in tertiary sandstone.	F.B. Browning..	12, 49, 58
				SAN BERNARDINO COUNTY			
Bimetallic (Desert Mercury).	San Bernardino	Sec 33, T 7 N, R 17 E.	Several.....	Shallow shafts, surface pits.	Ore-bearing breccia zones and fractures along contact of granitic gneiss, and quartz-porphyry.	A.B. Day.....	12, 62
City Creek.....	do.....	6 miles from San Bernardino on City Creek.	Occurrence....	Unknown.....	Unknown.....	Unknown.....	12, 66
Idria Quicksilver group (Turtle Dove, Mercury).	do.....	Sec 24, T 9 N, R 18 E.	do.....	Two 25-foot shafts, trenches.	Ore-bearing chalcedony veins in a hornblende granitic schist.	F.H. Chaussee and others.	12, 62
Jack.....	do.....	Sec--, T 16 N, R 15 E.	do.....	Unknown.....	Byproduct of wolframite mine.	Unknown.....	12, 66
Myrick.....	do.....	Sec--, T 18 N, R 1 E.	do.....	do.....	With chalcedony in volcanic rock.	do.....	12, 66
Red Bird.....	do.....	S 28, T 9 N, R 3 W.	do.....	do.....	Unknown.....	C. Davson.....	66
Red Canyon.....	do.....	Sec--, T 2 N, R 2 E.	do.....	do.....	Sparsely disseminated in gouge along fault between quartzite and siliceous limestone.	R.B. Stephenson	66
Red Chief.....	do.....	Secs 17, 18, T 14 N, R 16 E.	do.....	do.....	Unknown.....	W.D. Ford and others.	66
Red Fox.....	do.....	Sec 28, T 3 N, R 5 W.	do.....	do.....	do.....	W.T. Elliot....	66
Redlead.....	do.....	Sec--, T 7 N, R 22 E.	do.....	do.....	do.....	S.E. Kennedy...	66
Rhumba.....	do.....	14 miles north of Barstow.	do.....	do.....	Disseminated in shear zone in granitic rock.	L.E. Martin....	66

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CHAPTER 7. - MERCURY IN IDAHO

by

Bureau of Mines Staff

INTRODUCTION AND SUMMARY

Idaho mercury mines, although now inactive, have produced about 32,000 flasks of mercury. The State has two important mercury-producing districts, one in Washington County and one in Valley County. Both districts contain significant reserves of mercury-bearing material which is marginal at current prices. Other areas in Idaho are believed to contain only insignificant reserves of mercury.

ACKNOWLEDGMENTS

The cooperation and assistance of officials of the Idaho Bureau of Mines and Geology and the many mine operators and individuals associated with the mercury-mining industry is gratefully acknowledged. Much information on the properties listed in this chapter was obtained from Federal and State publications and from county records.

HISTORY AND PRODUCTION

Idaho is a relative newcomer among mercury-producing States. Cinnabar was discovered at the Hermes (later known as the Cinnabar or Bonanza) mine in Valley County in 1902, but the mine did not become a substantial producer until 1942. The Idaho-Almaden mine in Washington County, discovered in 1936, became a substantial producer in 1939. Together, they accounted for the bulk of the 31,601 flasks of mercury produced through 1961 (table 21). Each of these mines contributed about equally to the total. Five other mines had a small output.

Cinnabar occurs in nine counties. Table 22 at the end of the chapter lists the mines and prospects; figure 8 shows their locations.

The mercury reserves in Idaho probably are at least equal to the total mined to date. The Geological Survey reported 20,000 flasks from measured and indicated ore and 6,000 flasks from inferred ore minable at $250 per flask in 1957.[1] These reserves are based on estimates of the larger deposits in Valley and Washington Counties.

The Cinnabar and Idaho-Almaden mines are currently inactive. Reserves of relatively low-grade ore are substantial at both properties, and consequently future production is largely a matter of a favorable cost-price ratio.

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[1]Geological Survey Press Release No. 21902, Aug. 12, 1957. Bureau of Mines. Minerals Yearbook 1957, v. 1, 1958, p. 836.

TABLE 21. - Production of mercury in Idaho, 1917-61

Year	Flasks	Year	Flasks	Year	Flasks
1917.....	5	1933.....	-	1949.....	-
1918.....	21	1934.....	-	1950.....	-
1919.....	-	1935.....	-	1951.....	357
1920.....	-	1936.....	-	1952.....	887
1921.....	1	1937.....	-	1953.....	(1)
1922.....	-	1938.....	-	1954.....	609
1923.....	(1)	1939.....	(1)	1955.....	1,107
1924.....	(1)	1940.....	(1)	1956.....	3,394
1925.....	(1)	1941.....	(1)	1957.....	2,260
1926.....	6	1942.....	(1)	1958.....	2,625
1927.....	-	1943.....	4,261	1959.....	1,961
1928.....	-	1944.....	(1)	1960.....	1,538
1929.....	-	1945.....	627	1961.....	1,073
1930.....	-	1946.....	868		
1931.....	-	1947.....	886	Total.....	31,601
1932.....	-	1948.....	543		

[1] Figure withheld to avoid disclosing individual company confidential data.

PHYSICAL FEATURES

Productive mercury deposits occur in two physiographically different areas. The Weiser district in Washington County is semiarid, almost treeless, and sparsely covered with desert-type vegetation, except along the rivers and on irrigated lands. Altitudes range from 2,500 to 4,000 feet, with low, often flat-topped, steep-sided hills rising 500 to 1,000 feet above wide river valleys. The country is open, and exposed formations are readily prospected. It is accessible from Weiser, the nearest railhead, by numerous county roads open throughout the year. A little more than 11 inches of rain falls each year.

The other area, the Yellow Pine district in Valley County, is in the rugged, well-forested central highlands of Idaho. Altitudes range from 7,000 to 8,000 feet. The nearest railhead is at McCall, 43 miles distant by graded mountain road from the settlement of Yellow Pine. Winters are severe, with snow depths commonly from 6 to 12 feet. Roads are sometimes blocked by snow, and supplies are flown in by a commercial air service from Boise to a landing field at Stibnite.

GEOLOGY

Mercury deposits in the Weiser and Yellow Pine districts are in altered sedimentary rocks.

In the Weiser district, mercury deposits are in the Payette Formation of Miocene age which consists of massive sandstone interbedded with shale and clayey sandstone. The Columbia River Basalt rests conformably on the Payette Formation but in many places has been removed by erosion. Faulting preceded the widespread silicification of the beds by opal and chalcedony. Of the two

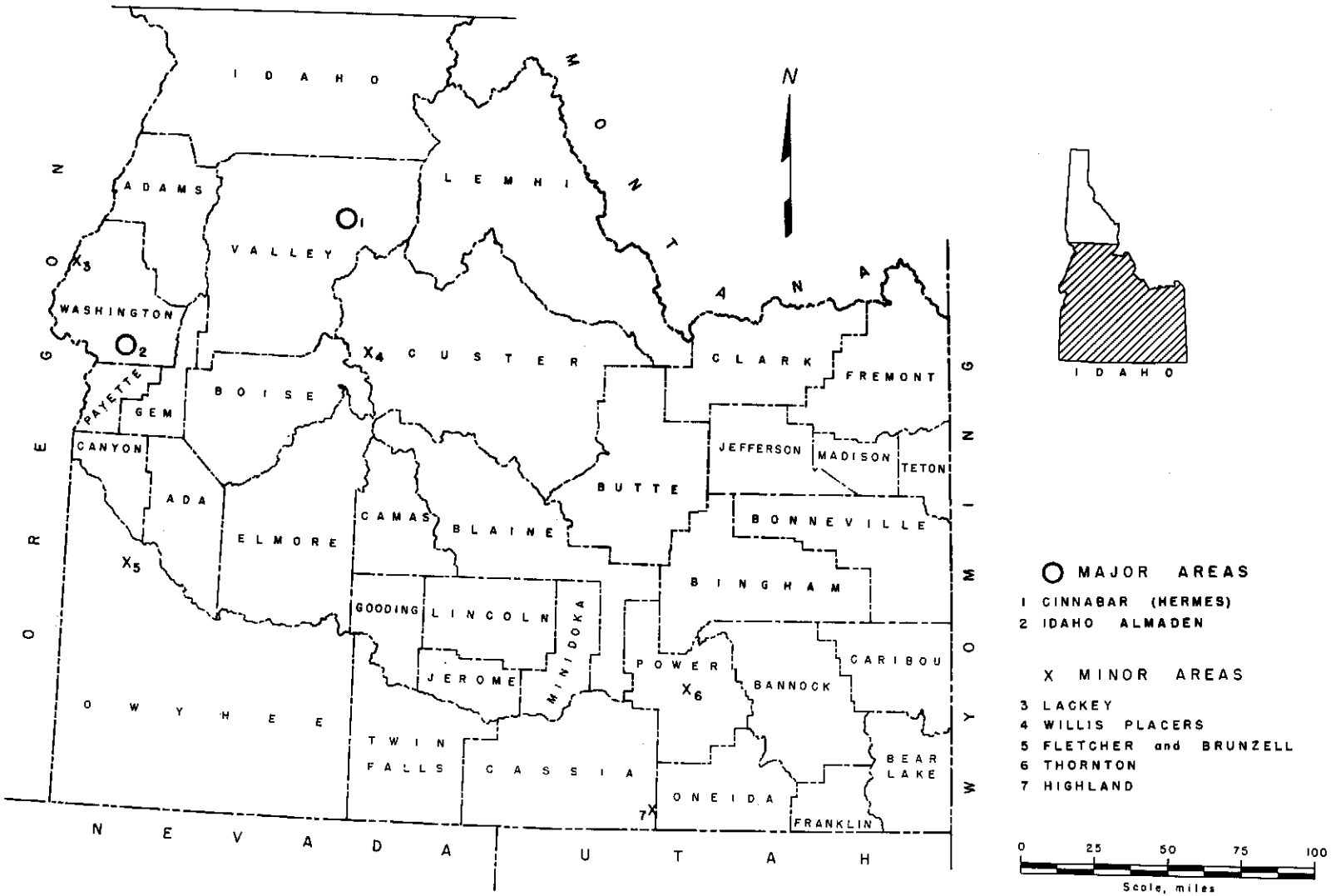

FIGURE 8. - Location Map of Mercury Deposits and Occurrences in Idaho.

periods of opalization, only the younger opal and chalcedony carry cinnabar. The ore is confined to the Payette Formation, although there is some silicification of the basalt. The ore is localized along fissures and also has replaced the permeable sandstone beds, and to a lesser extent, the shale beds.

The greater part of the Yellow Pine district is underlain by granitic rocks of the Idaho batholith (Cretaceous). A northwest-southeast-trending belt of metamorphosed Paleozoic sedimentary rocks forms a roof pendant in the batholith and contains the cinnabar deposits. Quartzite, crystalline dolomitic limestone, and, to a lesser extent, schist constitute the rocks of the roof pendant. Cinnabar occurs as replacements of, and fracture fillings in, the altered dolomitic limestone. Considerable pyrite and some minor stibnite occur with the cinnabar. Prominent gangue minerals are fragmented opal, chert, and chalcedony.

A number of acid dikes cut the sediments and enclosing granitic rock.

MERCURY MINING DISTRICTS

For convenience, the individual mines and occurrences are described with reference to one of three geographic regions rather than mining districts. The mines and reported occurrences are shown in figure 8.

DISTRICTS AND PROPERTIES

The salient facts concerning every mercury property in the State are given in table 22 at the conclusion of this chapter. To avoid unnecessary repetition, the following individual property descriptions do not include location and ownership data or general references.

Deposits, Mines, and Properties in Southwestern Idaho

Mercury deposits occur in Washington and Owyhee Counties in southwestern Idaho. The entire production has come from one mine, the Idaho-Almaden, and the region ranks first in the State. The Idaho-Almaden and several other properties and prospects are in the Weiser quicksilver district, an area north and northeast of Weiser.

Southwestern Idaho has substantial indicated reserves of relatively low-grade cinnabar ore, as shown by exploratory drilling at the Idaho-Almaden property. The market price of mercury compared to production costs will largely control future output. Similar low-grade material is known at other properties in the district which may add to the total potential future output.

Idaho-Almaden Mine

The Idaho-Almaden mine is on Nutmeg Mountain, in Washington County, about 17 miles by road easterly from Weiser. The property comprises 40 acres of deeded land, one patented claim, and 32 unpatented claims.

Cinnabar mineralization occurs chiefly as minute veinlets and scattered grains in opalite and chalcedony which form extensive blanketlike masses, possibly the result of hydrothermal alteration and replacement of the underlying sandstone and shales. In places, clay minerals are present in the ore zones and are mineralized. A siliceous sinter, resembling a soft shale, caps the opalite mass in at least one area. The shale and sandstone country rock is part of the Payette Formation which is regionally folded and faulted. The deposit is localized on the broad crest of an anticline which has been flexed to produce a local structural depression.

Cinnabar was first recognized on Nutmeg Mountain in 1936 by Harry Brown who shortly thereafter staked 17 claims. In 1937 L. K. Requa and Associates formed the Idaho-Almaden Mines Corp. and leased the claims. Exploration and development followed, and a modern reduction plant was constructed. Mercury was first produced in June 1939, and output continued until December 1942. During this period, 3,959 flasks of mercury were produced from 53,000 tons of ore mined, making an average recovery of 5.67 pounds per ton. After 1942 the reduction plant was dismantled and the property remained idle until 1954.

In 1954, Rare Metals Corporation of America acquired the property and began exploratory drilling. Over 500 holes were drilled; results indicated more than 500,000 tons of ore containing an average of 3.5 pounds of mercury per ton. A large reduction plant of modern design was erected in 1955, and production began in September. Output for the period 1955-61, when operations ceased, exceeded 10,000 flasks of mercury. Mining is an open-pit operation in three areas considered as separate ore bodies which range in thickness from 3 to 45 feet. Mining is done by benching the full thickness of the ore.

Deposits, Mines, and Properties in Central Idaho

Mercury deposits in central Idaho occur chiefly in the vicinity of Yellow Pine, in Valley County. Other occurrences have been reported south of Burgdorf near the southern boundary of Idaho County, and in Custer and Blaine Counties. The Yellow Pine district contains a major mercury producer and several small mines and prospects. The Cinnabar mine, known also as the Hermes or Bonanza mine, has the largest production. The Vermillion mine and the Fern mine have produced small quantities.

Outlook is good for future mercury production from Central Idaho, during periods of favorable prices.

Cinnabar Mine (Hermes, Bonanza)

The Cinnabar mine is about 17 miles by road southeast of Yellow Pine, near the head of Cinnabar Creek, in Valley County. The property comprises more than 50 claims.

Cinnabar mineralization occurs in a sheared and brecciated dolomitic limestone of Paleozoic or earlier age. The altered siliceous and dolomitic limestone is about 340 feet thick, strikes N 60° to 80° W, and has been tilted to a nearly vertical position; it lies between beds of dense white quartzite.

The altered sediments constitute a roof pendant or engulfed mass within the Idaho batholith. Cinnabar is found disseminated and as fracture fillings in the limestone. Higher grade portions have been mined to a maximum width of 40 feet, a length of 200 to 400 feet, and a vertical range of 100 to 300 feet.

The original Hermes and two other claims were located by Pringle Smith in 1902 during the Thunder Mountain gold rush. Other than assessment work, little was done on the claims until 1917, when they were acquired by J. J. Oberbilling of Boise. A small retort furnace was erected and five flasks of mercury was produced in 1918. The large number of additional claims comprising the present property were, for the most part, located in the early 1920's. United Mercury Mines Co. acquired control of the property in 1921 and leased it in 1940, under an operating agreement, to Bonanza Mines, Inc., operators of the Bonanza mine in Douglas County, Oreg. Bonanza Mines, Inc., erected a large reduction plant in 1941 and 1942, and developed the mine into a large producer. In 1948, the operating agreement was terminated, and control of the property reverted to United Mercury Mines.

United Mercury Mines reopened the mine in 1950 and operated until 1955. In 1955 the property was sold to Holly Uranium Co., later renamed Holly Minerals Corp. Output of mercury under the new owners was interrupted by a fire which destroyed the reduction plant in August 1956.

During 1957 Holly Minerals Corp. experimented with new recovery methods, including flotation followed by leaching of the concentrate and electrolytic deposition of mercury, and concentration followed by retort furnacing of the concentrate. A flotation and leaching plant was erected and 30,559 tons of ore was treated in 1958 and 1959.

Two adits serve as main haulage levels, and workings comprise about 4,000 feet of drifts and crosscuts connected to sublevels and stopes by numerous raises. More recently some low-grade ore was produced from an open pit.

In 1941 and 1942, as a war emergency project, the Bureau of Mines explored three claims on the Hermes property with 9,118 feet of diamond drilling. An ore reserve, indicated and inferred, of 40,000 flasks of mercury was developed by this work.

Deposits in Southeastern Idaho

Mercury is known to occur in Power and Cassia Counties in southeastern Idaho. Cinnabar mineralization is reported occurring in brecciated limestone, probably the result of recent hydrothermal action.

Retorting of selected material at the Thornton mine in Power County, and at the Miller property in Cassia County was attempted, but results were discouraging and only a few pounds of mercury were reported produced.

The outlook for future mercury production from this section of Idaho is not promising. The area is accessible from nearby major highways and also is near moderately populous areas. The country is for the most part sparsely timbered and open and has been well prospected.

TABLE 22. - Idaho mercury properties

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
SOUTHWESTERN IDAHO							
Castle Creek Mercury.....	Owyhee	Secs 22, 23, 24, 25, T 5 S, R 1 W	Occurrence	Unknown	Unknown	G. V. Kantack and others	-
Coats.....	Washington	Sec 25, T 12 N, R 5 W	do.	Shallow pits and bulldozer cuts	In shale and sandstone	John Coats	13
Consolidated Quicksilver Mining Corp. claims.	do.	Sec 36, T 12 N, R 4 W; sec 1, T 11 N, R 4 W; secs 6, 7, T 11 N, R 3 W	do.	Two churn-drill holes	Opalite in sandstone	State land	-
Edgemont group (Curl Prospects).	do.	Sec 4, T 10 N, R 3 W	do.	20-foot shaft, 20-foot adit	Opalite in sandstone and volcanics	Ralph M. Curl	-
Fletcher and Brunzell.....	Owyhee	Sec 32, T 2 S, R 2 W; sec 4, T 3 S, R 2 W	do.	Several open cuts	Traces in opalite stringers in basalt	Roy Fletcher and Byron Brunzell	-
Helen Zucker property (Parker)	Washington	Sec 32, T 11 N, R 3 W	do.	One short adit and six short winzes	Opal in sandstone boulders	W. R. Parker and Associates	13
Idaho-Almadan mine.....	do.	Secs 4, 5, T 10 N, R 3 W; secs 32, 33, T 11 N, R 3 W	Over 14,000	Open pit	In altered beds of sandstone	Rare Metals Corporation of America	1, 9, 13
MacD Mining Corp. claims.....	Owyhee	Secs 1, 12, T 2 N, R 6 W; secs 6, 7, T 2 N, R 5 W	Occurrence	Surface trenches	In opalite veins in brecciated zone	MacD Mining Corp.	-
March prospect.....	Washington	South and southwest of Idaho-Almaden	do.	Several test pits	Opalite float with little cinnabar	Unknown	13
Mineral Basin.....	do.	1-1/2 miles northeast of Idaho-Almaden	do.	11 test pits	In joints in volcanic ash	H. B. Barnett, et al	-
Rock and Paul Cinnabar.....	Owyhee	Adjoining Fletcher and Brunzell claims	do.	Unknown	Unknown	Minnie Paul and Lillian Rock	-
Taylor Cinnabar claims.....	Washington	About 12 miles south of Robinette, Oreg., on Idaho side of Snake River	A few	Two adits and 50-foot winze	In veinlets	Mrs. Jen Taylor	-
CENTRAL IDAHO							
Bostic or Last Chance Mercury.	Idaho	Sec 36, T 22 N, R 4 E	Occurrence	None	Along quartz veinlets in quartz monzonite	Tran Smith	-
Cinnabar mine (Hermes, Bonanza)	Valley	Secs 1, 2, 12, 13, T 18 N, R 9 E; secs 6, 7, 17, 18, T 18 N, R 10 E	Not available (over 14,000)	Four adit levels, 4000 feet drifts and crosscuts, open pit	Along shear zone in limestone	Holly Minerals Corp.	3, 9, 14
Deer Creek (Dockwell Tunnel)..	Blaine	Near head of Deer Creek about 7 miles northwest of Hailey	Occurrence	Unknown	Unknown	Unknown	-
Fern Quicksilver Mining Co. claims.	Valley	Sec 12, T 18 N R 9 E	Few	Two tunnels and open cuts, caved	In chalcedonic seams in limestone	T. R. Baugh	5, 7, 11, 14
Massacre Mercury claims.....	Custer	On Loon Creek, 10 miles north of Loon Creek ranger station	Occurrence	Several small open cuts	Hot spring deposit	Massacre Mining Co.	-
Ruby Meadows.....	Idaho	Edge of Ruby Meadows about 5 miles south of Burgdorf	do.	Unknown	Unknown	Tim and George Williams	-
Vermillion group.....	Valley	Yellow Pine district, about 2-1/2 miles east of Stibnite	Not available	Trenches	Disseminated in jasperoids	United Mercury Mines Co., Inc.	-
Willis.....	Custer	Stanley Creek	Occurrence	Unknown	In gold-bearing gravels	Unknown	14
SOUTHEASTERN IDAHO							
Ackriell property (Valentine Cinnabar).	Cassia	Sec 35, T 15 S, R 29 E	Occurrence	350-foot adits, raises and winzes	Replacement in limestone, stains, and thin films	J. R. Edison and Capt. A. N. Stephens, Jr.	2, 5, 7, 11
Miller (Highland).....	do.	Secs 27, 34, T 15 S, R 29 E	A few	200 feet in two adits	Stains and thin films on quartz, barite, and calcite crystals in limestone.	Virmyra Gold Mining Co.	2
Thornton mine (Juniper Hill Mercury).	Power	Sec 28, T 8 S, R 31 E	do.	Two shafts, 35 feet deep; several trenches and test pits	Thin film along silicified fracture in limestone	C. P. Thornton	-

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CHAPTER 8. - MERCURY IN NEVADA

by

George H. Holmes, Jr.[1]

INTRODUCTION AND SUMMARY

The majority of Nevada's principal mining districts contain an appreciable potential reserve of mercury. Reserves of measured ore at individual properties are virtually nonexistent, but the collective indicated and inferred reserves are adequate to maintain production, under specific circumstances, for a 10-year period. Stability of market and incentive measures are the principal elements controlling future mining activities in this commodity. An energetic program to outline new sources or extend new reserves would provide a firm foundation for the mercury industry and serve as a safeguard against the results of possible cutoff from foreign sources of supply. The resource evaluation was based on field reconnaissances, interviews with mine operators, industrial executives, and a literature search of relevant data.

The small mercury industry functions during sustained periods of high prices, but it is dependent upon Federal Government action, in the form of price supports, tariff protection, stockpiling, exploration assistance, or other means, to assure a stable production. The Cordero mine, which supplies the greater part of Nevada's output, and several other established producers, can operate at a price of $225 per flask and maintain a 5,000- to 6,000-flask annual production, provided equipment, supply, and operating costs do not substantially increase.

Principal mercury deposits in Nevada are along a northerly trending belt roughly 350 miles long and up to 120 miles wide (fig. 9) in the west-central part of the State. Isolated occurrences have been found outside the main belt. The deposits occur in a great variety of rocks and formations that were subjected to varying degrees of disturbance.

Mercury was discovered in 1875, but no significant production was made until 1909 when the deposits near Ione were developed. Subsequent discoveries in other areas resulted in significant yields during 1912-19 and 1927-31. The development of the Cordero mine in 1941 established Nevada as a major producer, and the greater part of the State's output of mercury since then has come from this property.

Recorded annual production since 1909 has been erratic, ranging from less than 100 to more than 7,800 flasks. Output in 1961 was 7,486 flasks, mainly from the Cordero mine. Twenty-one properties were operating in Nevada during 1961, of which only four had a production greater than 100 flasks.

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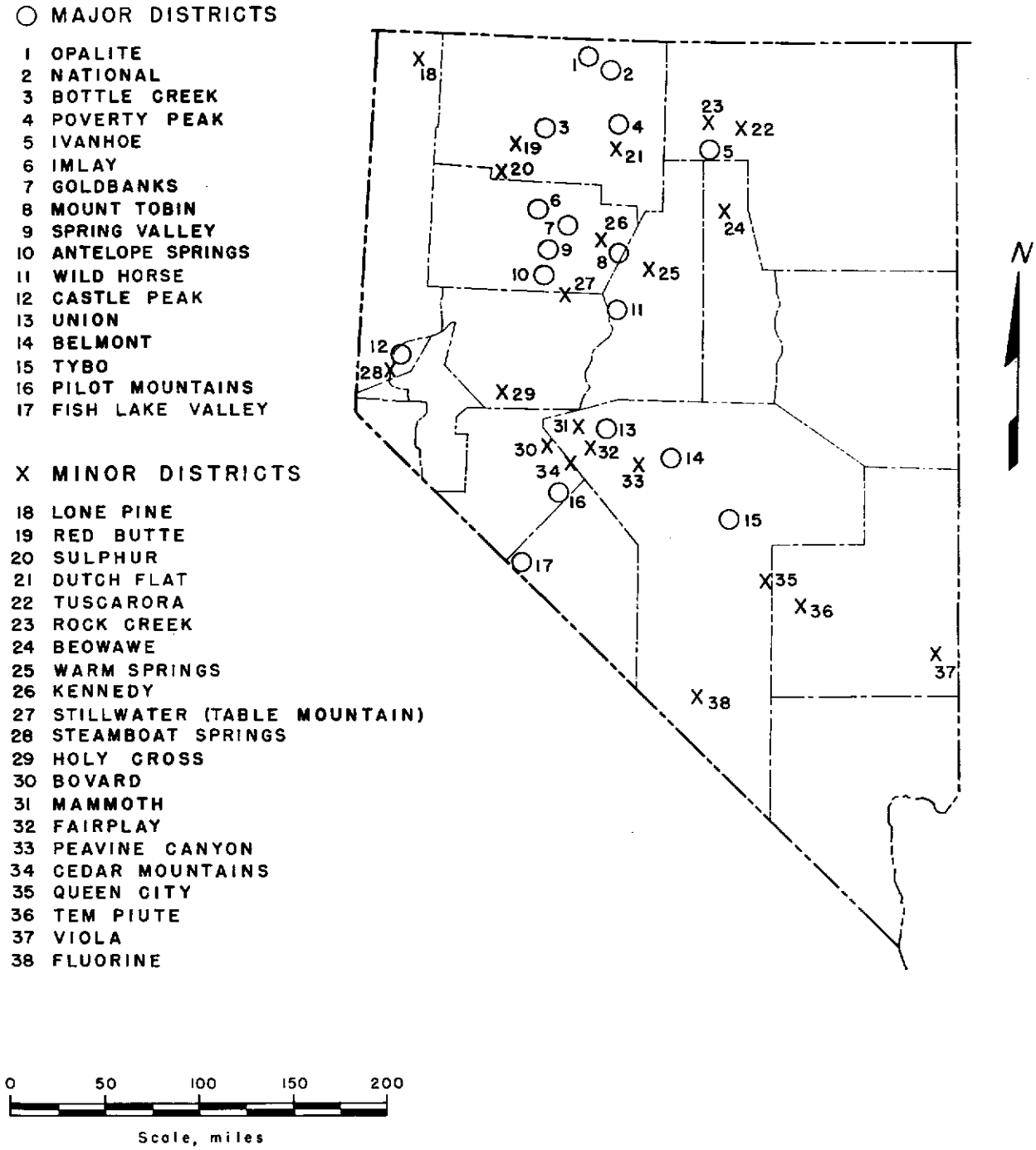

FIGURE 9. - Location Map of Mercury Districts in Nevada.

ACKNOWLEDGMENTS

The author acknowledges the helpful cooperation and assistance of the many mine owners and operators in obtaining information about their properties and operations. Thanks are due the management of Cordero Mining Co., Triangle Mining Co., United Mercury Corp., and Kollsman Mineral and Chemical Corp. for detailed information regarding their operations; Gordon I. Gould Co. and Pacific Foundry Co., San Francisco, Calif., for data on the construction and operation of furnaces and retorts; and technical personnel of the Geological Survey and the Bureau of Mines for their many helpful contributions and suggestions.

HISTORY AND PRODUCTION (1, pp. 5-6; 2, pp. 2-3)[2]

The occurrence of cinnabar in the vicinity of Ione was known to Indians and early settlers. In 1863 mention was made that cinnabar was found near the present Mount Tobin and Goldbanks mines.

In 1875, cinnabar was discovered near Belmont and in the vicinity of Steamboat Springs. Resultant activity yielded only a small production. Between 1875 and 1900 cinnabar was found in some of the placer-gold deposits, but no lodes were developed until 1906, when deposits were discovered in the Humboldt Range and near Goldfield.

The productive period for mercury commenced in 1907 with the discovery of the Nevada Cinnabar and Mercury Mining Co. mines near Ione. These two mines yielded nearly 10,000 flasks of mercury by the end of 1919 and undoubtedly stimulated the search for other sources. New deposits were discovered and exploited before World War I in the Goldbanks, Pilot Mountains, Imlay, and Antelope Springs districts. Table 23 gives production of mercury in Nevada through 1961.

Increased prices during 1927-30 stimulated activity at the Pershing and Juniper mines in the Antelope Springs district, the B and B and Red Rock mines in the Fish Lake Valley district, and the Castle Peak mine in the Castle Peak district, resulting in an output during 1929 of 4,764 flasks of mercury. A sharp break in price during 1932 forced curtailment of operations, and production during that year was only 474 flasks.

Several significant deposits were discovered between 1932 and 1939, but low metal prices prevented extensive development. Total output during this 8-year period was 2,924 flasks. The advent of World War II caused increased production which reached 5,924 flasks during 1940. Production continued at a high level through 1945, with principal output from the Cordero mine in the Opalite district and mines in the Ivanhoe and Antelope Springs districts.

Wide fluctuations and a decline in price during post-World War II years were reflected in decreased production which reached a low of 680 flasks in

[2]Underlined numbers in parentheses refer to items in the bibliography at the end of the chapter.

1950. Rising prices, commencing in 1951, again stimulated activity and culminated in a record production of 7,821 flasks in 1960. The Cordero mine accounted for the greater part of this production. Early in 1958 prices declined to the then Government-guaranteed floor-price of $225 per flask. Lower prices followed the termination of the Government-guaranteed purchase-price program on December 31, 1958, and resulted in a sharp decline in the number of producing mines, but through 1961 there was little change in the quantity of mercury produced.

The total recorded output of mercury from 1909 to 1961 was 134,547 flasks.

TABLE 23. - Production of mercury in Nevada, 1902-61

Year	Flasks	Year	Flasks	Year	Flasks
1902	0	1922	([1])	1942	5,201
1903	65	1923	([1])	1943	4,577
1904	17	1924	([1])	1944	2,460
1905	0	1925	532	1945	4,338
1906	0	1926	194	1946	4,567
1907	0	1927	419	1947	3,881
1908	0	1928	2,867	1948	1,206
1909	312	1929	4,764	1949	4,170
1910	69	1930	3,282	1950	680
1911	69	1931	2,217	1951	1,400
1912	2,516	1932	474	1952	3,523
1913	1,623	1933	387	1953	3,254
1914	2,062	1934	300	1954	4,974
1915	2,296	1935	190	1955	5,750
1916	2,169	1936	211	1956	5,859
1917	984	1937	198	1957	6,313
1918	1,030	1938	336	1958	7,336
1919	746	1939	828	1959	7,156
1920	82	1940	5,924	1960	7,821
1921	([1])	1941	4,238	1961	7,486
				Total	134,547

[1]Figure withheld to avoid disclosing individual company confidential data.

PHYSICAL FEATURES

The mercury-bearing areas of Nevada have characteristic physical features common to the Great Basin region, comprising a series of approximately parallel mountain ranges with a general northwest-southeast trend, separated by troughlike valleys. The mountain ranges are from 6,000 to over 10,000 feet above sea level; altitudes of the valley floors range from 4,000 to 4,500 feet. The principal mines are accessible by good State and country roads, but many smaller properties and prospects can be reached only by mountainous roads and trails. Electric transmission lines serve most of the towns in the western and central parts of the State and extend to a few of the larger properties. Some of the major producers and most smaller operators depend upon locally

locally generated power. Water is usually available from nearby sources. Timber for mine use is trucked from nearby towns.

Local towns, which are usually the county seats and supply centers for machinery, equipment, and provisions, are not too distant from any of the properties. Transport truck facilities are within reasonable distances. Railroad facilities in the northern part of the State are supplied by the Southern Pacific Railroad and the Western Pacific Railroad. The Hazen to Mina branch of the Southern Pacific serves mines in the west-central part of the State.

The climate is typical of the high arid regions of the Great Basin. Operations at high elevations are often hampered by severe winter conditions. Activities in other areas can be carried on all year without difficulty.

GEOLOGY

The mercury deposits in Nevada are hypogene in origin and occur in a great variety of rocks and formations. The most productive deposits have been found in sedimentary and volcanic rocks; lesser occurrences are associated with basic dikes and metamorphic rocks. Frequently the mercury ore is found in opalite, a hydrothermal alteration of the original rocks. The mineral-bearing rocks usually have been subject to varying degrees of faulting and fracturing. Mercury-bearing solutions ascended through faults and breccia zones and were deposited in favorable places to form ore bodies or penetrated porous rocks to form rather widespread low-grade deposits. Ore bodies were localized by structural traps which occur under impervious cappings such as fault gouge and fine-grained rocks, or in rolls and bends in faults.

The deposits vary according to rock types and occur in eight general categories designated as the sulfurous, opalite, volcanic, diabase-dike, interbedded-sediments, limestone, metamorphic, and granite types.

The sulfurous-type deposit is characterized by the presence of abundant sulfur, and in several deposits alum and silica (opal, chalcedony, or quartz) are widespread. Several deposits lie in the vicinity of active hot springs and are believed to have been formed either at the surface, or close to the surface, by hot waters which emerged as hot springs. In a few places these solutions have built up surficial deposits of siliceous sinter containing cinnabar. In Nevada these deposits all lie in either altered tuffs or granitic rocks, and as the cinnabar is spread through the rock rather than being confined by a particular structure, the ores are low grade and have yielded only a small amount of mercury.

The opalite-type deposit is characterized by opalite as the host rock for cinnabar. The term opalite is widely used as the name for a hydrothermally altered rock composed almost wholly of amorphous and cryptocrystalline silica. Most of the Nevada opalite deposits occur in volcanic rocks of Miocene age, but some are in volcanic rocks that may be even younger. Most deposits are nearly horizontal, although some are inclined or flexed, and they have generally been formed in rhyolitic tuffs or ash beds. A few deposits were formed

in flows of similar composition. The typical opalite blanket is from 500 to 750 feet in maximum diameter and 30 to 50 feet thick; it is only partly mineralized. Cinnabar, with minor quantities of native mercury, calomel, and oxychlorides, usually is distributed in the deposit in one of three ways, any or all of which may form minable ore bodies. Mostly, it is disseminated as minute crystals in a particularly favorable bed, forming a thin blanket of ore having the same inclination as the enclosing opalite blanket. In some deposits the cinnabar distribution is controlled by steep faults, cracks, or broken zones, with cinnabar forming crusts or veinlets in the openings; while in somewhat more erratic deposits the cinnabar is disseminated in scattered clouds or bunches which may or may not be connected by discernible veinlets or stockworks. The comparatively thin, flat-lying ore bodies are shallow, relatively low grade, and usually adaptable to open-pit or glory-hole mining. Extensive exploration failed to find feeders or deeper underlying deposits, although a volcanic-type deposit was found to underlie irregular opalite masses at the Cordero mine.

The volcanic-type deposit occurs typically in andesite lava flows and agglomerates and is characterized by the presence of abundant pyrite or marcasite, the scarcity of silica, and alteration of the wall rock to clay. Cinnabar is the dominant ore mineral, but in a few deposits native mercury materially increases the tenor of the ore. Pyrite, and possibly marcasite, also is abundant, and because of the prevalence of sulfate in waters near the surface, jarosite and gypsum are widespread in the outcrops. Clay minerals are always present and their quantity in any deposit seems to be roughly proportional to the quantity of cinnabar. Chalcedony, quartz, and calcite occur in small quantities as vein minerals accompanying the cinnabar. The localization of the cinnabar is controlled by steeply dipping fractures and faults along which there has been only a small amount of movement. Cap rocks and structural traps are generally not apparent. In the smaller deposits the cinnabar is confined to the fractures and forms veins or veinlets; in larger deposits it not only fills the larger openings but also is distributed through pore spaces that result from the alteration of the enclosing volcanic rock. The narrow veins are usually discontinuous, but in many places they consist of nearly pure cinnabar with a little silica and pyrite.

The diabase-dike-type deposits are not widespread, but they contain some of the richest ore bodies found in Nevada. Abundant pyrite with a little silica and calcite are present, and the dikes and their wall rock are extensively altered to clay minerals. Cinnabar partly fills the fractures, but in the better ore bodies it replaces the diabase of the dike. Geologic structures are an important factor in localizing the deposits. The richest ore bodies were found in flat rolls in the dikes and in places where the dikes are fractured and overlain by heavy gouge or shale.

The interbedded-sediments-type deposit occurs in bedded limestone and shale, calcareous sandstone, or chert. Fractures are required for the deposition of the ore; consequently, the ore bodies lie along normal faults and often in bedding faults. Their localization is in many places affected by the intersection of faults with favorable beds. The lack of wall rock alteration, the association of small quantities of stibnite, and the common presence of quartz,

calcite, and barite as gangue minerals are other characteristics. The ore mineral is cinnabar. It generally only fills openings, forming networks of irregular veinlets, high-grade lenses along faults, and distinct veins along fractures. Replacement of rock by cinnabar, although uncommon, locally assumes importance in the more limy rocks. The ore bodies vary both in size and grade, depending upon the kind of sediment in which they are formed. Sandy limestone or dolomite are especially favorable hosts because their brittleness allows the development of many fractures and their chemical composition favors marginal replacement. Large low-grade deposits usually are found in these rocks. In sandstone, the cinnabar is found along the controlling faults and adjacent bedding planes, and the ore, while ordinarily of high grade, occurs as small narrow bodies. In chert, cinnabar generally fills breccia zones, but in some ores it locally replaces the rock. The ore bodies commonly lie along rolls in normal faults and, although very small, are of high grade.

The limestone-type deposit occurs only in relatively thick beds of limestone, and its outstanding feature is the dominance of cinnabar replacing the limestone over cinnabar filling fractures and openings. Other characteristic features are the restricted distribution and extreme richness of the ore, dominance of carbonates as gangue minerals, presence of abundant stibnite, and presence of a capping of shale or other relatively impervious rock. Cinnabar is the only commercially important mineral. The ore bodies are usually localized along a fault or broken zone in a favorable limestone bed capped by relatively impervious shale. They may not, however, extend to the capping and can be localized a short distance below the shale.

The metamorphic-type deposit occurs only in metamorphic rocks such as phyllite and quartzite. The deposits in these rocks are similar to the interbedded sediment deposits, but their unusual occurrence in roof pendants and lack of any pronounced lithologic control places them in a separate classification. The ore mineral is cinnabar. It is locally accompanied by small quantities of stibnite, quartz, barite, and some clays. The cinnabar usually forms fillings and encrustations in highly broken and silicified rock, but some occurs in solid masses along faults and beneath altered zones. Localization of the ore is controlled by faults, gouge zones, and by easily fractured siliceous beds. The tenor of the ore is highest close to the controlling structure; the adjacent wall rock contains lower grade deposits of disseminated cinnabar.

The granite-type deposit is found in any granitic rock and the prevalent ore mineral is metacinnabarite, with small amounts of cinnabar and the gangue minerals barite, quartz, chalcedony, pyrite, jarosite, and some clay. Deposits of this type have yielded only small amounts of mercury. Small, high-grade ore bodies occur in composite quartz-barite veins paralleling the local jointing in the granite. Localization of the ore in the veins probably depends on the amount of shearing and on local variations in strike and dip.

In all of the Nevada mercury deposits, the tenor of the ore varies greatly and ranges from 3 to over 100 pounds of mercury per ton. The grade of ore furnaced in 1956-57 averaged 10 to 11 pounds per ton; ore beneficiated

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by flotation, tabling, or both, ranged from 3 to 10 pounds per ton; and selectively mined and sorted ore for retorting grade, upward from 10 to 20 pounds per ton.

A brief description of the geology, type of deposit, and mode of occurrence is given for each mine under the section entitled "Mines and Properties" (1, pp. 11-25).

MERCURY MINING DISTRICTS

The principal mercury mining districts in Nevada occur along a northerly trending belt in the west-central part of the State, extending from McDermitt on the north to Beatty on the south (fig. 8). This belt comprises an area roughly 350 miles long and up to 120 miles wide. Although the most productive mines lie in the northern part of the belt, major occurrences exist in the central and southern sections. Isolated deposits also occur outside this belt. Districts more or less extensively exploited which have contributed the major part of the State's production are as follows:

District:	County
Opalite	Humboldt
National	Do.
Bottle Creek	Do.
Poverty Peak	Do.
Ivanhoe	Elko
Imlay	Pershing
Goldbanks	Do.
Mount Tobin	Do.
Spring Valley	Do.
Antelope Springs	Do.
Wild Horse	Lander
Castle Peak	Storey
Union	Nye
Belmont	Do.
Tybo	Do.
Pilot Mountains	Mineral
Fish Lake Valley (Oneota)	Esmeralda

Mining districts with a comparatively small production are as follows:

District:	County
Lone Pine	Washoe
Red Butte	Humboldt
Sulfur	Do.
Dutch Flat	Do.
Tuscarora	Elko
Rock Creek	Do.
Beowawe	Eureka
Warm Springs	Lander

District:	County
Kennedy	Pershing
Stillwater (Table Mountain)	Churchill-Pershing
Steamboat Springs	Washoe
Holy Cross	Churchill
Bovard	Mineral
Mammoth	Nye
Fairplay	Do.
Peavine Canyon	Do.
Cedar Mountain	Mineral
Queen City	Nye
Tem Piute	Lincoln
Viola	Do.
Fluorine	Nye

Several mercury occurrences within and outside the main producing belt, which were prospected and explored to a small extent and have had very little or no production, are not included in the above categories nor shown on the location map. Brief descriptions of them are given in the section entitled "Miscellaneous Occurrences."

DISTRICTS AND PROPERTIES

Table 24 at the conclusion of this chapter lists every known mercury property in the State and gives the salient facts concerning each. In the interest of brevity, the following individual property descriptions do not repeat detailed location and ownership data or general references.

Opalite District Mines and Properties

The Opalite mining district in northern Humboldt County has been the State's major mercury-producing district since 1941, with output during 1941-61 of 78,356 flasks, produced entirely from the Cordero mine. A large section of the district extends northerly across the Nevada-Oregon border into Malheur County, Oreg., and contains the Arentz-Comstock (Bretz) and Opalite mines; the former property has become one of Oregon's major producers.

The district comprises the State's largest potential source of mercury with its production rate dependent upon the price of mercury. Based on recent exploration at the Cordero and Bretz mines, it is reasonable to believe that further intensive investigations of developed sections of the district would encounter new mineralized areas. Reserves at the Cordero mine appear adequate for continued production under prevailing mercury prices. Underground operations are high in cost, necessitating selective mining to maintain a grade of ore which can be mined profitably. Higher metal prices would permit recovery of substantial tonnages of lower grade ores remaining underground and in surface deposits and increase the mine's potential reserve.

Cordero Mine

The Cordero mine, owned by Eusabia Aznarez, Tomas Alcorta, and J. Ondarez, McDermitt, Nev., and leased to Cordero Mining Co., Palo Alto, Calif., is about 12 miles southwest of McDermitt. Altitudes at the mine range from 4,700 to 4,900 feet.

The property was discovered in 1924 and was explored intermittently, but with little production, until 1940 when it was acquired by the present operator. Production started in 1941 and has been continuous. The mine has become the largest producer of mercury in the State.

Rocks in the mine area include basic flows, tuffs, volcanic breccia, felsites, and thinly bedded lake deposits, with much opalite alteration. The beds and flows strike northeasterly, dip steeply to the northwest, and are cut by a major series of steeply dipping northeast-trending faults and numerous minor faults. Silica-bearing solutions evidently progressed upward along the faults and altered sections of favorable beds to opalite which later acted as cap rocks, or dams, to the rising mercury solutions.

Two general types of deposits occur, the shallow opalite deposits and the deep-lying occurrences along major fault zones. In the opalite type, cinnabar, with some native mercury and calomel, is disseminated throughout parts of the opalite in sufficient concentrations to form large low-grade ore bodies. It is also disseminated in altered volcanic rocks adjacent to and below the opalite masses, forming comparatively large ore bodies. In the deeper deposits, cinnabar, associated with abundant marcasite, occurs as disseminations and as veinlets and bunches in a zone of altered rhyolite along the hanging wall of a well-defined, steeply dipping fault. Ore bodies have formed along fractures and cross fractures and vary considerably in size.

Original mine workings comprised a series of open pits excavated on mineralized silicified opalized zones. The pits were fairly large in area extending to depths of 90 feet and lengths of 400 feet. The shallow deposits were further developed by vertical shafts and mined by glory-hole or conventional underground stoping methods.

Exploration by churn drilling indicated the downward extension of a mineralized zone beneath an opalite ore body; subsequent work resulted in the development of the deposit to a vertical depth of 700 feet. The main 2-compartment shaft was sunk to the 800 level with levels driven at 75- to 80-foot intervals to the 600 level and at 100-foot intervals below this level. A new 3-compartment shaft is in operation, in which ore is hoisted in bottom dump skips by a 150-hp electric-driven hoist. The steel headframe is 75 feet high. Nearly all production is from underground operations; however, during 1957 approximately 10 percent of the ore came from surface pits. Open-pit operations were discontinued during 1960, and underground development was started at the Corderito about a quarter of a mile southeast of the Cordero workings.

The irregular ore bodies are developed by drifting, crosscutting, and raising. Choice of stoping method depends upon the size of the ore body to be mined and the character of the ground. It is usually square set, although occasionally shrinkage and sublevel methods are used. Cribbing often is required and backfilling is used in heavy-ground areas. Mucking is done by slusher-scrapers to drawpoints.

The flowsheet of the reduction plant is as follows:

Dump trucks haul ore from the mine to a 20-ton bin from which it is put through a 9-inch grizzly to a shaker-feeder and on to a 24-inch inclined conveyor belt which carries it to a 150-ton coarse-ore bin. The coarse ore is screened and oversize material is fed by a wobble-type feeder to a 9- by 21-inch jaw crusher; the crushed ore joins the undersized material on a 12-inch inclined conveyor belt which elevates it to a 250-ton fine-ore bin. The ore is then fed to a second 12-inch inclined belt conveyor which carries it directly to the furnace.

The furnace is 14-foot, 3-inch-diameter, multiple-hearth type containing 13 hearths and having a 100-dry-ton-per-day capacity. It is divided into three zones: The top zone dries and preheats the ore by utilizing waste heat; the middle zone roasts the ore at a temperature of about 1,100° F; and the bottom zone cools the roasted ore before delivering it to a stacker conveyor belt for removal to the calcine dump. The furnace is oil fired, using seven burners placed around the periphery of the middle zone. Oil consumption is 8 gallons per ton.

Gases are exhausted from the furnace by a suction fan located between the condensers and the stack and pass through a cyclone dust collector into a system of 42 cast-iron condenser pipes, each 12 inches in diameter and 16 feet high, and out through a wooden stack. Mercury-bearing soot from the dust collector and condensers is treated in an automatic hoeing machine. The freed quicksilver flows to a bottling plant where it is filtered and bottled. A recovery of 96 percent of the mercury in the ore is made in the furnacing plant. Power is supplied from the California Oregon Power Co. transmission line. Two diesel-electric units are used to augment this power supply and for standby purposes.

During 1959 a 60-ton-capacity Gould Ratarz furnace[3] was installed and the condenser system was enlarged. Present costs, which include mining and furnacing the ore and marketing the quicksilver, are $22 per ton.

Production during 1960 was on a 120-wet-ton-per-day basis, from ore which averaged about 11 pounds of mercury per ton. A force of 85 men was employed.

[3]Reference to a particular manufacturer's product is made for identification only and does not imply endorsement by the Bureau of Mines.

Disaster Peak Property

The Disaster Peak property consists of nine claims along the western edge of the district at an altitude of 5,000 feet. Cinnabar was discovered in the area in 1939, but subsequent exploration during 1940-41 was unproductive.

Mine workings include several open cuts and two short adits which explore a weakly mineralized northeast-trending zone in silicified volcanics.

National District Mines and Properties

The National mining district, in northeast Humboldt County, is primarily a gold-mining district although the presence of cinnabar was known in several areas as early as 1911. Intermittent activity since 1929 has contributed a very small part of the State's mercury production.

The opalite deposit at the Buckskin Peak mine is characteristic of similar deposits in the State, with narrow, discontinuous, flat-lying stringers or layers of cinnabar erratically distributed in a widespread but thin blanket of siliceous sinter. It forms a potential reserve of low-grade ore which can be mined only during periods of very high mercury prices. A high waste-to-ore ratio, the isolated location and high elevation of the property, and a short operating season all make for a high-cost operation.

Buckskin Peak Mine

The Buckskin Peak mine includes 19 claims about 33 miles southeast of McDermitt, at an altitude of 8,600 feet. The mine was located in 1929 and was operated several times during 1929-57. A rotary furnace plant, installed in 1940, was removed the following year after treating about 3,000 tons of low-grade ore. Exploration and access-road construction were in progress during 1957-58. Output from the mine has been small.

A cinnabar-bearing bed of silicified ash and tuff or opalite forms a blanket near the summit of Buckskin Peak. It has a maximum length of 1,370 feet and a maximum width of 770 feet with a thickness that probably does not exceed 125 feet. The bed has a generally northwest strike with gentle dips to the northeast and is underlain by rhyolite.

Cinnabar occurs as thin, high-grade discontinuous stringers and bunches and disseminations in flat-lying layers of chalcedonic material. To a lesser extent, cinnabar occurs as fracture fillings and disseminations in the more porous opalite. The mineralized zones parallel the bedding of the opalite, indicating that the cinnabar and silica were precipitated simultaneously at certain stages of hot-spring activity.

The richest ore occurs in widespread, nearly flat, bedding layers, varying in thickness from a fraction of an inch to several inches. Some cinnabar is scattered along fractures and filling openings in the more porous opalite, but in most places this ore is not as rich or as continuous as the thinner layers. Four cinnabar-bearing zones have been encountered, and it is possible

that additional zones exist. Grade of ore averaged 2 to 3 pounds of mercury per ton, although selective mining and sorting of richer stringers has produced a high-grade retort ore.

Mine workings include a 560-foot tunnel and sublevel, several short adits, numerous shallow shafts, and open cuts. Sorted ore is treated in a 2-pipe inclined retort, about 6 miles west of the property.

Canyon Creek Prospect

The Canyon Creek prospect, about 16 miles southeast of McDermitt, was explored during 1929 with a very small production.

Two short adits connected by a raise explore a weakly mineralized, narrow shear zone within a steeply dipping northeast-striking basic dike.

Stall Property

The Stall property is about 21 miles southeast of McDermitt. The mine was located in 1913 and during 1941-42 a small amount of mercury was produced by lessees.

Mine workings, largely inaccessible, comprise two 50-foot shafts connected with short drifts, several short adits, and numerous surface cuts. These openings explore a volcanic-type deposit in which low-grade cinnabar mineralization occurs as fillings along steep fractures, and as disseminated crystals in flows of silicified and altered rhyolite, and rhyolitic and glassy tuffs.

Bottle Creek District Mines and Properties

The Bottle Creek mining district in west-central Humboldt County, about 65 miles northwest of Winnemucca, has been active intermittently since 1936 with a production of about 6,000 flasks of mercury. Its maximum production period was during 1940-42. Activity resumed in 1956 when Triangle Mining Co. leased several properties, constructed a 70-ton-capacity gravity-flotation concentrator and retort plant, and commenced extensive mine development. Early work was confined to production from small high-grade deposits; activity during 1956-58 was concentrated on development of mineralized dikes and faults in which significant tonnages of lower grade material were known to occur.

The district has a moderate production potential under comparatively high mercury prices. Continued investigations using new exploration techniques could encounter additional mineralized sections along the cinnabar-bearing dikes and faults and in other geologically favorable areas. It is also possible that exploration below productive horizons would indicate downward continuity of the mineralization. Cost of this work would be high in relation to the tonnage that can be expected and expenditures are justified only during extended periods of high mercury prices. The adaptability of some mineralized dikes to open-pit mining will make for initial low mining costs and low cutoff grades. However, the extent of open-pit operations is limited by the character of the deposits.

Ant Hill Mine

The Ant Hill mine, at an altitude of 5,600 feet, produced a small amount of mercury during 1941-42.

Rocks in the mine area include interbedded basalt, tuff, and agglomerate. Cinnabar occurs in an opalite-type deposit and is locally disseminated through a rubbly silicified tuff. It occurs also to a lesser extent as narrow veinlets in clay seams.

Mine workings include 28- and 50-foot shafts, from which about 300 feet of drifts were extended on three levels, and a narrow stope connected with a glory hole.

B and B Prospect

The B and B prospect comprises six claims at an elevation of 5,500 feet. A small production was made during 1940-42.

Cinnabar occurs as small veinlets and disseminations along a northwest-trending fracture zone in silicified tuff. Mine workings comprise a 50-foot inclined shaft with about 100 feet of drifts extending from the bottom of the shaft, two small glory holes, and a stope.

Baldwin Property (Blue Bucket, Blue Bottle)

The Baldwin property comprises the Blue Bucket and Blue Bottle groups of eight claims at an altitude of about 5,400 feet.

The claims were located in 1936, and intermittent operations by lessees during 1937-43 produced about 140 flasks of mercury. No work has been done since 1943.

The opalite-type ore deposits lie in a dike of silicified rhyolite which is locally sheared and brecciated. In and adjacent to the zones of brecciation, cinnabar occurs as veinlets, small replacements, and as a binding medium surrounding breccia fragments. Except for a wedge, 25 feet in diameter, which lies between steeply dipping, northeast and northwest-trending faults, the ore was confined to narrow sections along the faults.

Mine workings comprise a 76-foot shaft, from which several levels were driven, a small glory hole connected with a 50-foot adit, and a 25-foot shaft. Other workings farther south include two shallow shafts, small open cuts, and extensive bulldozer cuts.

Birthday Group

The Birthday group of eight claims was located in 1936, and intermittent operations during 1938-43 produced a few hundred flasks of mercury from ore which ranged in grade from 10 to 60 pounds of mercury per ton. Exploration was done during 1957.

Mine workings, largely inaccessible, include two 50-foot and one 100-foot inclined shafts, and about 400 feet of drifts, crosscuts, and raises, which develop a faulted diabase dike that crosses tuffs and basalt. The mineralized dike is less than 10 feet thick, strikes about N 20° W and dips 45°-50° SW.

The small, extensively faulted ore bodies are confined to the dike and adjacent wall rocks and appear to have been controlled by faults or slips. Cinnabar fills vesicles and fractures in the diabase and locally impregnates the diabase and adjacent tuffs.

Blue Can Mine

The Blue Can mine comprises nine claims at an altitude of 5,500 feet. The property was located in 1936, worked by the owners until 1939, and then leased to Greenan Quicksilver, Inc. A 50-ton rotary furnace plant, installed and operated in 1940, was later removed. Lessee operations continued through 1943.

The mine has been one of the district's larger producers with an output of about 1,700 flasks from ore which varied in grade from 8 to 40 pounds of mercury per ton. Mine development was done during 1957.

Ore bodies are divided into two groups. The eastern group was localized along a diabase dike extending from the surface to a few feet below the 86-foot level. The dike varies from 3 to 15 feet in width and varies considerably both in strike and dip. Cinnabar is confined to the dike and adjacent wall rocks. The western group was localized along an apex between the dike, here vertical, and a heavy layer of clay gouge which dips at a low angle to the east. High-grade ore has almost completely replaced the diabase, in places.

Inaccessible mine workings consist of a 135-foot shaft, about 2,000 feet of drifts on five levels, and extensive stopes. Principal work was from the 86-foot level.

Franklin-Keeney Prospect

The Franklin-Keeney prospect was discovered in 1940 and explored during 1940-42. Mine workings include a 50-foot shaft and two short drifts on the 30-foot level that develop a weakly-mineralized fault in rhyolite and andesite tuffs and flows. No mercury was produced.

Hagan-Hegan Prospect

The Hagan-Hegan prospect was located in 1940. A 400-foot adit, from which several inclines and raises were driven, explores altered tuffs and flows containing scattered crystals of cinnabar. No mercury was produced.

McAdoo Mine

The McAdoo mine comprises 10 and a fraction claims at an altitude of 5,500 feet. The claims were located in 1936. Mine development and production commenced during 1939, and the following year a 30-ton-capacity multiple-hearth furnace was installed. Operations continued until May 1942. Subsequent work included reworking the mine dumps during 1943 and extensive underground exploration during 1952-54. The mine was one of the larger producers in the district with an output of about 1,700 flasks from ore which ranged in grade from 7 to 30 pounds of mercury per ton.

Cinnabar mineralization occurs in brecciated fault zones along the hanging wall of a northerly trending, westerly dipping basic dike that cuts folded and faulted sedimentary and volcanic rocks. Mineralization is spotty and erratic both along the contract and along faults. Ore bodies are confined almost entirely to the dike.

A Defense Minerals Exploration Administration (DMEA) project was completed during the period from July 31, 1952 to November 30, 1954. Work done included 80 feet of vertical shaft sinking, 412 feet of crosscutting and drifting, and 32 feet of winzing at a total cost of $15,804.

Old mine workings, largely inaccessible, include an inclined shaft 107 feet deep and about 1,300 feet of drifts and crosscuts on the 80-foot level. The furnace plant has been removed. Ore is treated in a 3-pipe, 5-ton-capacity inclined retort.

Niebuhr Prospect

The Niebuhr prospect consists of seven claims at an altitude of 5,300 feet. The claims were located in 1939 and during 1940-41, about 40 flasks of mercury were produced.

Mine workings consist of a 60-foot inclined shaft and several open cuts exploring a northeast-striking, southeast-dipping shear zone in broken and silicified rhyolite. Cinnabar occurs as coatings on the rhyolite fragments and impregnations in the finely crushed material. An open cut about 1,400 feet northwest of the shaft explores a shear zone in phyllite. Cinnabar occurs along the shear zone and in fractures and cleavage planes.

Red Ore Mine

The Red Ore mine includes eight claims at an altitude of 5,300 feet. The mine was located in 1937 and intermittent operations to 1943 produced about 130 flasks from ore that averaged 10 pounds of mercury per ton.

Original underground workings, largely inaccessible, include several shallow shafts and short adits that explore two northerly-trending cinnabar-bearing diabase dikes. Work in 1956-58 was confined to successful open-pit development of two comparatively flat ore bodies occurring along a minor fault, which generally parallels a major north-striking Basin Range fault.

The ore bodies range in thickness to 15 feet and are separated by volcanic tuffs. Vertical cinnabar-bearing stringers extend from the deposit to the overlying basalt, which ranges from 10 to 50 feet in thickness.

The open pit has reached a depth of 70 feet and a length of about 400 feet. Total production has been about 1,430 flasks. Ore is trucked to the Triangle mill on the White Peaks property.

Rogers-Burnison Prospect

The Rogers-Burnison prospect was discovered in 1940 and explored during 1940-42. Mine workings include a 20-foot shaft with 30 feet of drifts, a 40-foot shaft, and several trenches, which explore rhyolite flows and tuffs. Cinnabar is said to occur in rich, narrow stringers and as disseminated crystals in the rhyolite. No mercury was produced. The property reportedly has been abandoned.

Vermillion Group

The Vermillion group of five claims, at an altitude of 5,600 feet, was located in 1952 and explored by bulldozer trenching. The S.T.S. Metallurgical Co., Seattle, Wash., leased the property in 1956 and sank a shallow vertical shaft. The work explored a weakly mineralized diabase dike containing erratic distributions of cinnabar. Production was small.

White Peaks Group

The White Peaks group of five claims was located in 1936, and the mine was operated intermittently by the owners and several lessees during 1937-47. A 20-ton-capacity rotary furnace plant, installed in 1937, was later removed. Production during this period approximated 500 flasks of mercury. The mine was reactivated in 1954, and a 70-ton gravity-flotation concentrator and retort plant was completed in 1956 to beneficiate ore from several properties under lease to Triangle Mining Co.

Rocks in the mine area include tuffs, sandstones, and fine gravels cut by a northerly trending, easterly dipping diabase dike and overlain by rhyolite flows. Cinnabar fills fractures in the dike and is disseminated in the dike and adjacent wall rocks. In addition, it has almost completely replaced parts of the dike to form pods and lenses of very high-grade ore. Small amounts of cinnabar occur as irregular veinlets in the overlying rhyolite. The ore bodies, mined along both walls of the dike above the 112-foot level, terminate sharply against the northerly dipping contact with the overlying rhyolite. No ore was mined below the 112-foot level.

Mine workings comprise a 165-foot shaft, about 250 feet of drifts and crosscuts on the 62-foot level, and 300 feet of drifts and crosscuts and extensive stopes on the 112-foot level. A short exploratory crosscut was driven on the 165-foot level.

The gravity flotation plant includes a wood hopper from which the ore is conveyed by a pan feeder to a 36-inch hammer mill, V-belt driven by a 150-hp diesel engine. Crushed ore is carried to a 65-ton circular steel ore bin by a 24-inch inclined belt conveyor. A 24-inch pan feeder then conveys the ore to a 4- by 4-foot ball mill which grinds the ore to 48-mesh. The ball mill discharge passes over an 8- by 12-inch duplex jig; the coarse and fine products go to a rake classifier, and the middlings pass to a 6- by 12-foot concentrating table. The table concentrate flows to a drum filter, and tailings are returned to the ball mill.

The underflow from the rake classifier returns to the ball mill; the overflow goes to a conditioner cell and on to four rougher flotation cells. The rougher concentrate passes to a cleaner cell which makes a final concentrate that goes to a cone dewatering tank and a tailing that is pumped back to the classifier. The rougher tailing flows to three scavenger cells. The concentrates from these scavenger cells go back to the classifier, and the final tailing goes to waste. The dewatering tank discharge flows to a 4- by 6-foot drum filter. Filter cake is dried on top of the retort. The mill makes a 92- to 96-percent recovery of the mercury in the ore. Reagents used in the flotation circuit are a lead nitrate activator, No. 301 xanthate and No. 31 promoters, and No. 65 frother and Palcotan dispersant. Power is supplied by a 62.5-kva diesel generator.

The retort is of company design and incorporates several innovations. It comprises three 3/4-inch-gage steel tubes, 8 inches in diameter by 8 feet long, lying horizontally one above the other in staggered position and encased in a masonry housing. Concentrates are fed to the upper tube by a 2-inch screw feeder and moved along it on a 1-inch bed by a 5-inch screw conveyor. The concentrate drops to the second tube, along which it is carried in a reverse direction by a screw conveyor, then to and along the third or bottom tube by screw conveyor to an automatic discharge gate through which the calcines are discharged to waste. Propane gas is used to fire the retort through three banks of six burners placed 18 inches below and along the bottom tube. A temperature of 1,050° F is maintained, and fuel consumption averages 2 gallons per hour. Daily capacity of the retort is 950 to 1,000 pounds of concentrate, to which an equal volume of lime is added.

Mercury-laden gases pass under a 3- to 6-ounce vacuum to the condenser system which consists of a series of four vertical condensers made from stainless steel air-force oxygen tanks. The No. 1 condenser, which traps the greater part of the mercury, is 12 inches in diameter by 3 feet high and is air cooled. The Nos. 2, 3, and 4 condensers are 12 inches in diameter by 1.5 feet high and are water cooled. Barren gases are drawn through a scrubber and out through a steel stack. Recovered mercury is cleaned in acid before bottling.

Poverty Peak District Mines and Properties

The Poverty Peak mining district in east-central Humboldt County (along the northern part of the Paradise Range) is about 46 miles by road northeast of Winnemucca. Cinnabar was discovered during 1936, and intermittent

operations to 1960 produced about 1,300 flasks of mercury. Principal output was from the Cahill mine.

The district has a small production potential based on high mercury prices and a stable market. Exploration has been extensive and several properties were actively developed. The deposits are small and high grade, although spotty and erratic in occurrence. Ore reserves have been depleted and further exploration in geologically favorable areas is necessary. The character of the deposits makes it unlikely that sufficient reserves could be developed to support a large-scale venture; they are, however, adaptable to small-scale high-grading operations.

Cahill Mine

The Cahill mine comprises nine claims at an altitude of 6,500 feet and has been the most important producer in the district. It was located in 1936 and has been operated intermittently since then by the owners and various lessees. Mine development was done during 1956-57. The mine was idle during 1958, but operations were resumed during 1959-60. Total production was about 1,200 flasks obtained from ore which ranged in grade from 3 to 40 pounds of mercury per ton.

The deposit is the interbedded-sediments type. Mineralization occurs beneath a narrow gouge zone along a gently dipping, northerly trending fault which generally parallels beds of limy quartzite and recrystallized sandy dolomite. Cinnabar occurs as rich veinlets filling openings along and closely beneath the fault, and in small pods replacing highly fractured silicified dolomite in the footwall. The ore bodies are localized where the fault rolls in strike toward the footwall and forms a more or less inverted trough.

Principal mine workings include several thousand feet of underground openings on two levels about 50 feet apart vertically. Extensive stopes extend from above the upper level about 200 feet down dip to below the main haulage level. Other workings comprise several short adits and numerous open cuts and trenches.

Ore is treated in the owner's 10-ton-capacity rotary furnace plant, and in the 75-ton-capacity rotary furnace plant on the adjoining Turillas property.

Grayson or Hapgood Property

The Grayson or Hapgood property consists of six claims located in 1937 and explored intermittently. Principal activity was during 1940-42 when about 90 flasks of mercury was produced. Subsequent operations produced a few additional flasks.

The interbedded-sediments-type deposit comprises northeast-striking, northwest-dipping thin-bedded sandy limestone with thin interbeds of shale. Cinnabar occurs in veinlets along several parallel bedding plane shears and in isolated bunches in limestone away from the shears.

Mine workings comprise about 1,000 feet of adits and numerous open cuts. Principal openings are the upper haulage adit, from which two branches extend, and the lower haulage adit, about 30 feet below. A mineralized zone was developed from the surface to about 30 feet below the lower level.

Holt or Reed Prospect

The Ralph Holt or Reed prospect comprises four claims which have been explored intermittently since 1940. No production was made.

Rocks in the mine area consist of interbedded limestone and quartzite, locally folded and faulted, and cut by quartz and calcite veins. The ore is usually localized along bedding plane shears and cross fractures in limestone and calcareous quartzite.

Mine workings include a 70-foot adit, two shallow shafts, and numerous open cuts and trenches.

Prentiss Prospect

The Prentiss prospect consists of nine claims at altitudes ranging from 5,000 to 6,000 feet. The property was located in 1940, and subsequent exploration was unproductive.

Several trenches and two 30-foot shafts explore steeply dipping, northerly trending bedding plane shears in limestone and calcareous quartzite in which cinnabar occurs as veinlets and disseminations.

Snowdrift or Zilkey Prospect

The Snowdrift or Zilkey prospect, at an altitude of 6,500 feet, was discovered and prospected during 1940. No production was made. Two short adits explore sandy limestone and shale in which cinnabar occurs erratically as small bunches in calcite veinlets.

Turillas or Red Ant Group

The Turillas or Red Ant group of seven and a fraction claims, at an altitude of 5,000 feet, were located in 1940. Intermittent operations have yielded a small amount of mercury. In 1955-57 extensive surface and underground exploration was conducted.

The deposit is an interbedded-sediments type. Rocks in the mine area consist of silicified limestone, quartzite, and phyllite which trend northeasterly and dip both to the northwest and southeast. Cinnabar occurs as large, isolated crystals, narrow veinlets, disseminated crystals along breccia zones in faults and shears, and in cross fractures. Mineralization is spotty and erratic and forms small concentrations of retort-grade ore.

Mine workings include several hundred feet of underground openings and numerous open cuts and bulldozer trenches.

A 75-ton-capacity Gould rotary furnace plant was installed by Sonoma Quicksilver Mines, Inc., to beneficiate ore from the Cahill, Grayson, and Turillas properties. The plant comprises a circular steel coarse-ore bin, jaw crusher, inclined belt conveyor, circular steel fine-ore bin, bumper feeder, 4- by 84-foot oil-fired rotary furnace, cyclone dust collector, suction fan, condenser system consisting of two parallel rows of eight 18-inch by 36-foot vertical cast-iron pipe condensers, two redwood settling tanks, and stack. Soot is hand hoed. Calcine drops to a steel cooling bin and is trucked to the calcine dump.

Wholey Quicksilver Mine

The Wholey Quicksilver mine comprises one claim from which intermittent exploration during 1939-44 produced a small amount of mercury.

Cinnabar occurs as disseminated crystals and veinlets in faults, and replacements in the limestone. Ore bodies are small and discontinuous.

Mine development includes the north and south workings. The north workings consist of an adit and branching drifts totaling about 430 feet. The south workings comprise a 160-foot adit, from which several short crosscuts were driven, and a small stope open to the surface that explore northerly trending bedding faults in sandy limestone.

Ivanhoe District Mines and Properties

The Ivanhoe mining district in western Elko County, about 50 miles by road northeast of Battle Mountain has been an intermittent producer of mercury since 1928 with an output of about 2,800 flasks of mercury. The mines were inactive in 1957; leasing operations on two properties were resumed in 1958. Principal production was from the Butte and Silver Cloud properties with a smaller combined output from the other mines.

The district has been explored extensively since its discovery, and several significant deposits have been developed. Deposits are all of the opalite type and are widespread throughout the area. Mineralization is characteristically low grade and is confined to favorable flat-lying beds and steep faults in the opalite. Blanket deposits have been the most productive.

The district has a moderate production potential only under extremely favorable economic conditions that would permit exploitation of the low-grade deposits. Significant reserves of submarginal grade ore remain at two properties, but much exploration and development are needed to develop reserves adequate to maintain a stable production. This work is justifiable only during extended periods of high mercury prices. It is possible that further geophysical prospecting and intensive exploration would encounter new deposits and extensions of known occurrences. In 1955-56, this type of exploration had favorable results, but the low-grade mineralization encountered would not permit utilization under prevailing mercury prices.

Many of the deposits are adaptable to open-pit mining, although the high waste-to-ore ratios usually involved make for high mining costs. Underground development would,of necessity, be confined to selective mining of higher grade ores.

Butte Quicksilver Mine (Rand, Bowers, Mayflower, Velvet, Ivanhoe)

The Butte Quicksilver mine, known also as the Rand, Bowers, Mayflower, Velvet, and Ivanhoe properties, comprises 20 claims at an altitude of about 6,000 feet.

The claims were located during the early 1920's and worked by various owners and lessees until acquired by Butte Quicksilver Mining Co. in 1941. Company operations continued until 1943. Production during 1930-43 was about 1,000 flasks from ore which varied in grade from 4 to 8 pounds of mercury per ton. Further exploration was done during 1955-56 by Pick Mining Co., Saratoga, Calif., but no production was made. The property was reactivated in 1958 by Big Butte Mining Co., of Battle Mountain.

Rocks in the mine area include an older group of flows and tuffs and a younger group of quartz-rich rhyolite. The older beds are gently folded and cut by faults of small displacement. The ore came principally from the tuff bed, which was altered to opalite, chalcedony, and porous material. Its localization was largely controlled by the porosity of this favorable bed and by small faults and open folds. Cinnabar occurs as small veinlets in the fissures and as disseminated crystals in porous material.

The property was developed in five widely separated areas, designated the Velvet, No. 1, No. 2, Mayflower, and Pit 3 workings. The Velvet development consists of a series of open cuts and short adits on one level, and a haulage level about 50 feet below from which raises were extended to the upper workings. The workings explore a gently dipping opalite blanket deposit, ranging in thickness from 3 to 12 feet, over an area about 240 feet long by 125 feet wide. The No. 1 workings, an open pit and several shallow shafts, yielded a small tonnage of selectively mined ore from an opalized bed lying stratigraphically higher than the Velvet deposit. The No. 2 workings include a shallow pit and two short adits which explored remnants of a mineralized fanglomerate bed underlying the Velvet ore body. The Mayflower workings consist of several short adits, crosscuts, and raises exploring altered and silicified basalt in which cinnabar was encountered along two minor joints. The Pit 3 area explores a 3-foot blanket deposit in the same bed as the Velvet deposit.

The 35-ton-capacity rotary furnace plant erected in 1940 was later dismantled.

Governor Group

The Governor group includes the Coleman, Florence, Combination, Portland, and Sheep Corral properties, at an elevation of 6,000 feet. The several properties were located in the early 1930's and explored intermittently until 1940 when they were acquired by Governor Mercury Mines, Inc. Governor Mercury

installed a 4- by 64-foot rotary furnace and began extensive mine development. Output from 1932 to 1941 was about 100 flasks of mercury from ore ranging in grade from 2 to 15 pounds of mercury per ton. In 1956-57 exploration by various lessees was carried out.

Coleman Mine. - Workings at the Coleman mine include a shallow shaft connected with a short drift, an open cut from which an inclined shaft was extended, and numerous pits and trenches, exploring a thin blanket deposit in opalite.

Governor Workings. - The Governor workings comprise many closely spaced trenches and short adits exploring a northerly trending, westerly dipping fault zone over a strike length of about 3,000 feet. Small bodies of low-grade ore are erratically distributed in opalite along the ash and tuff hanging wall.

Sheep Corral Mine. - Workings of the Sheep Corral mine include a 50-foot inclined shaft and a 150-foot connecting drift that explore a northwest-trending fault zone separating obsidian and silicified tuff. Small, discontinuous ore bodies occur along the fault.

Hatter Prospect

The Hatter prospect includes 32 claims. Shallow shafts, pits, and short adits explore a weakly-mineralized opalite deposit in which cinnabar occurs in, and adjoining, joints in white opalized rhyolite. No production was made.

Jackson and Surprise Claims

The Jackson and Surprise claims were located about 1940, and a few flasks of mercury were produced by lessees. The deposit is an opalite type in which cinnabar occurs as bunches and veinlets disseminated in porous ash along the hanging wall of a minor fault.

Lark Group

The Lark group of 10 claims, at an altitude of 6,000 feet, was located during 1915 and 50 flasks of mercury produced. The mine was active again during 1930-31 and 1940-41 when lessees produced an additional 20 flasks.

Mine development consists of shallow workings exploring northerly trending cinnabar-bearing fractures in a glassy black tuff.

Red Boy Group

The Red Boy group of five claims made a small production of mercury during the early 1940's. Cinnabar occurs erratically along faults in two small opalite deposits developed by numerous shallow open pits and trenches.

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Rimrock and Homestake Properties (Hillside and Opal Groups)

The Rimrock and Homestake properties, renamed the Hillside and Opal groups, produced a small amount of mercury during 1940-41. The property was reactivated in 1958.

Cinnabar occurs in patches, veins, and layers erratically distributed throughout an opalized ash and tuff deposit. Mine workings include several short adits, two shallow shafts, and an open pit. Production came principally from the bedded deposit encountered in the open pit.

Shoshone or Barringer Property

The Shoshone or Barringer property consists of 11 claims at an altitude of 5,000 feet. The claims, located in the early 1940's, were explored at that time and again during 1955-56. No production was made.

Sparsely disseminated cinnabar occurs in a small opalite deposit lying above quartzitic fanglomerate and in a gently inclined blanket deposit of quartz-rich rhyolite that overlies the opalite breccia. Mine workings include an open pit in the opalite deposit and several cuts and trenches exploring the mineralized rholite.

Silver Cloud Mine (Clipper)

The Silver Cloud mine was discovered in 1931 and further explored during 1940-41. It was acquired in 1942 by New Verde Mines Co., a subsidiary of Newmont Mining Co. Extensive mine development was completed during 1942-43, and a 4- by 64-foot Gould rotary furnace and a 3.5- by 50-foot Cottrell rotary furnace were installed. Production during this period was about 900 flasks of mercury. Subsequent operations by lessees since 1943 have yielded a few additional flasks. The property was explored further during 1955-56 by Pick Mining Co., Saratoga, Calif., and reactivated in 1958 by a lessee as the Clipper group.

Rocks in the mine area consist of rhyolitic obsidian overlain by ash and tuff. Much of the obsidian is hydrothermally altered to a dense white chalcedonic rock, and the overlying ash is largely opalized upward for about 10 feet from the contact. Cinnabar is concentrated in the lower 4 feet of the opalized ash to form a minable blanket deposit. It occurs also in lesser amounts as disseminations in the overlying ash.

The mineralized blanket was developed over an area about 600 feet wide by 800 feet long. Mine workings include an open pit about 200 feet wide by 400 feet long, and several inclined drifts and open stopes extending under the overlying formations. Numerous trenches and shallow shafts explore extensions of the deposits. A slusher-scraper was used for underground mining. Grade of the ore produced ranged from 3 to 5 pounds of mercury per ton.

The rotary furnace plants installed by New Verde Mines Co. have been removed.

Silver Fox Mine

The Silver Fox mine, at an altitude of 5,000 feet, was located in 1927. No development was done until the property was leased in 1940 to Governor Mercury Mines, Inc. Company operations were of short duration, and subsequent work by the owner during 1941-47 produced a small quantity of mercury. The property was further explored during 1955-56 by Pick Mining Co., Saratoga, Calif.

Cinnabar occurs in veins, irregularly disseminated masses, and discontinuous lenses and pods in a thin opalized bed of chalcedonized ash and tuff. The mineralized section has a thickness of 4 to 8 feet. Veinlets of chalcedony and opal containing cinnabar occur in overlying black tuff.

Mine workings comprise 30- and 60-foot shafts from which about 300 feet of underground openings were driven, a stope extending northward from these workings, and numerous surface cuts and trenches.

Imlay District Mines and Properties

The Imlay mining district in north-central Pershing County is primarily a gold-silver district, although it contains one mercury mine which has been active intermittently since 1913. Production has exceeded 1,100 flasks of mercury.

The district has a small production potential. Exploration has been thorough, but it is reasonable to expect that continued investigations in geologically favorable areas, and for lateral and downward extensions of known mineralized zones, would encounter commercial-grade ore adequate to support a small operation. Cost of this work would be high in relation to the small tonnage involved and is warranted only during periods of high mercury prices.

Eldorado, Ruby, or Black Jack Mine

The Eldorado, Ruby, or Black Jack mine is about 31 miles northeast of Lovelock, at an altitude of 6,000 feet. Several lessees operated the property through 1959.

The property, discovered in 1906, is the oldest known cinnabar deposit of importance in Nevada. Production did not begin until 1913 when it was operated as the Ruby mine. Its 1913-14 output was 772 flasks of mercury. The mine remained idle until 1939 when it was reactivated as the Eldorado property and operated until 1942 with a production of 199 flasks. Another period of inactivity followed until 1954. Subsequent operations by lessees have produced about 200 flasks.

The deposit is the interbedded-sediments type. Rocks in the mine area include gray limestone with thin interbeds of black shale. Cinnabar and other mercury minerals occur as disseminations and veinlets in the limestone and shale and form small, discontinuous ore bodies along the shale-limestone contacts. Mineralization in the jet black shale is often impossible to observe visually.

The concentration of cinnabar was primarily controlled by a rolling, nearly flat contact between shale and overlying massive limestone. Low-angle splits from this contact also contain some ore. Grade of the ore produced has ranged from 10 to 60 pounds of mercury per ton.

Mine workings comprise extensive exploratory adits, drifts, and interconnecting stopes and numerous open cuts. Two adits on lower horizons were driven to explore beneath the stopes.

Sorted high-grade ore is treated in a 4-pipe inclined coal-fired retort. Lower grade material is roasted in a 25- to 30-ton-capacity, 2- by 30-foot gas-fired rotary furnace. Mercury-laden gases pass through a cyclone dust collector, fan, 10 vertical 1.5- by 24-foot cast-iron pipe condensers, an expansion tank, and a stack. Barren soot is burned in a 1-pipe horizontal gas-fired retort. Power is supplied by a 31-kva diesel generator.

Goldbanks District Mines and Properties

The Goldbanks mining district in eastern Pershing County was first exploited for gold in 1907. Mercury was discovered in 1912, and during World War I over 1,000 flasks were produced. Subsequent intermittent operations have yielded about 600 flasks. Nearly all of the district's output is credited to the Goldbanks Quicksilver mine.

Exploration of the district has been extensive, but only one deposit of major importance was discovered. Mineralization occurs in flat-lying zones, or layers, in blanket deposits of the opalite type. The ore is characteristically low grade, although some production has been made from high-grading operations.

The district has a moderate production potential only during extended periods of high mercury prices which would permit economic consideration of the low-grade ores. Although the more promising parts of the Goldbanks deposit have been mined, it is reasonable to expect that a substantial tonnage of submarginal ore remains. It is also possible that additional reserves of commercial-grade ore will be encountered along lateral extensions of the deposit and in other geologically favorable areas.

Goldbanks Quicksilver Mine

The Goldbanks Quicksilver mine is about 38 miles south of Winnemucca at an altitude of 5,550 feet.

The property was first developed in 1913, and during 1913-17, its period of greatest activity, nearly 1,100 flasks of mercury was produced. A 50-ton-capacity, 6-hearth furnace, installed in 1915, was destroyed by fire in 1917. The mine remained inactive until 1934. Intermittent leasing operations were in progress until 1941 when the property was acquired by its present owners. Company operations continued until 1947. The mine was again reactivated in 1956. There has been no reported production since 1958. Total output from the property was 1,600 to 1,700 flasks, from ore which varied in grade from 2 to 10 pounds of mercury per ton.

Rocks in the mine area are all nearly flat-lying volcanics ranging in composition from rhyolite to basalt. The ore bodies occur in opalite formed by silicification of the more acid fragmental rocks lying at the base of the volcanic sequence. Cinnabar occurs in bunches, thin bands, and disseminations in two flat-lying zones of fractured and brecciated opalite. The upper zone varies from 2 to 7 feet in thickness and is developed by an open pit about 275 feet long and 50 feet wide, averaging 20 feet deep. Several short adits were driven from the pit. The lower zone lies a few feet below the upper zone, averages 2 to 3 feet in thickness, and is developed by several hundred feet of adits, drifts, and shallow winzes. One 200-foot and numerous shallow shafts and test pits were sunk to explore for lateral extensions of the deposit.

The reduction plant includes a 3- by 40-foot, 30-ton-capacity gas-fired rotary furnace, cyclone dust collector, a vertical steel condenser 4 by 4 feet by 16 feet high, fourteen 20-foot by 14-inch vertical pipe condensers, a redwood expansion tank, and a stack. Soot was hand hoed; calcines were trucked to the waste dump. Barren soot was treated in a 1-pipe coal-fired retort.

Pronto Plata Property

The Pronto Plata property is about 4 miles northwest of the Goldbanks mine. The property was discovered in 1939 and explored extensively during 1942-43 by Bradley Mining Co. Production was small.

Rocks in the mine area are nearly horizontal flows and tuffs. Cinnabar occurs disseminated in parts of scattered, irregular opalite blankets formed by silicification of the rhyolitic ash and breccia. Mine workings include numerous bulldozer trenches with short adits driven on favorable showings exposed in the cuts.

Mount Tobin District Mines and Properties

The Mount Tobin mining district in the extreme eastern part of Pershing County has been an intermittent producer of mercury since 1938 with an output of over 1,600 flasks. Principal production came from the Mount Tobin mine. The district was most active from 1938 to 1943. Operations were resumed in 1955 with the discovery and subsequent developement of the Eureka deposit. Other small properties were active during 1956-57.

The district has a small production potential under high mercury prices and a stable market which would justify operation of the marginal deposits and stimulate search for new mineralized areas. It is possible that further intensive exploration in geologically favorable areas would encounter other small high-grade occurrences similar to the Eureka deposit.

The character of the deposits requires exploitation by underground mining methods which, with the large amount of exploration and development necessary, makes for high mining costs. This work is justified only during economically favorable periods.

Eureka Mine

The Eureka mine comprises four claims about 56 miles south of Winnemucca, at an altitude of 5,600 feet. The property was discovered in 1955, and operations to 1959 produced over 250 flasks of mercury.

The deposit is classified as an interbedded-sediments type. Cinnabar occurs in a comparatively shallow, steeply dipping, northeasterly striking, lens-shaped ore body along a fault zone in limestone, and along bedding planes adjacent to the fault. The ore body was mined through a shaft, drifts, and an open stope. Mine-run ore averaged 10 to 12 pounds of mercury per ton although several very rich stringers of cinnabar were encountered.

Sorted ore was treated in a double-D oil-fired retort with a capacity of 1.5 tons per 24 hours.

Hot or Beacon Group

The Hot or Beacon group of 10 claims is 65 miles south of Winnemucca, at an altitude of 5,000 feet. The claims were located in 1956. Last activity was in 1958. Production has been small.

Rocks in the area are dolomite and limestone, overlain by shale, that strike northeasterly and dip to the southeast. Cinnabar occurs erratically in barite veins that cut the dolomite and along thin seams in fractured limestone. Development includes extensive bulldozer cuts, a short adit, and numerous shallow test pits.

Last Chance or Rat Hole Prospect

The Last Chance or Rat Hole prospect is 60 miles south of Winnemucca at an altitude of 6,500 feet.

The property was located and explored in 1938. Operations during 1940-42 produced a small tonnage of low-grade ore. No further work was done until the property was acquired by the present owners in 1955 and explored the following year by wagon drilling and drifting. The drill holes reached depths of 20 to 50 feet and reportedly encountered favorable cinnabar mineralization in several areas. A few flasks of mercury were produced.

The deposit is of the interbedded-sediments type in sandstone and shale. Cinnabar is associated with steeply dipping, northeast-trending fractures. It occurs erratically along the fractures and in bedding planes.

The deposit is developed by several hundred feet of drifts and crosscuts and two small glory holes. Ore is treated in a 4-pipe 2-ton-capacity retort.

Mercury King or North Fork Prospect

The Mercury King or North Fork prospect was located in 1941, and 10 flasks of mercury were produced the following year. No further work was done

until the mine was acquired by its present owner in 1956. Cinnabar occurs along fractures in a shear zone crossing sandstone and conglomerate. The mineralized zone has been developed by several hundred feet of adits and drifts, a shallow shaft, and numerous open cuts.

Mount Tobin or Miners' Dream Mine

The Mount Tobin or Miners' Dream mine consists of five claims about 60 miles south of Winnemucca at an altitude of 6,500 feet. The claims were located in 1929 and explored intermittently until 1938, when a 4-pipe retort was installed and 45 flasks of mercury produced. The property was purchased in 1940 by H. W. Gould Co., San Francisco, Calif. A 20-ton-capacity rotary furnace plant was installed, and extensive mine development was started. The company operated the mine until 1942 when it was acquired by the present owner. Total production was over 1,400 flasks from ore which varied in grade from 4 to 18 pounds of mercury per ton.

From October 22, 1957, to November 7, 1957, 31 shallow rotary holes were drilled under DMEA contract. A total of 2,390 feet was drilled at a cost of $9,605 including drill roads and sites.

The deposit is the interbedded-sediments type. Rocks in the mine area consist of interlayered beds of conglomerate and shale, rhyolite, and tuff cut by northerly trending faults. Two deposits, designated the east ore body and the west ore body, have been developed. The east ore body was localized by a northerly trending fault with cinnabar occurring in the footwall shale and conglomerate; the west ore body, localized by a series of northeasterly trending fractures, is narrow and discontinuous.

The east workings consist of a glory hole and connecting stope and a 600-foot haulage level about 40 feet below the base of the glory hole. The west workings include a shallow glory hole and a haulage level about 20 feet below. The property also was explored by extensive bulldozer cuts and trenches.

Spring Valley District Mines and Properties

The Spring Valley mining district in south-central Pershing County, about 32 miles northeast of Lovelock, has been a small and intermittent producer of mercury since 1911 with principal production from the King George mine. Total output was about 600 flasks.

Several favorable areas in the district were entensively explored. The work indicated the occurrence of small high-grade ore bodies erratically distributed along calcite veins and at fault intersections in limestone, and along shear zones in overlying volcanic rocks.

The several mines in the district have only a small production potential. Ore reserves are largely depleted and intensive investigations would be needed to develop new reserves. The extensive exploration required, coupled with underground mining, will make for high operating costs and will justify exploitation only during extended periods of high mercury prices.

Alpine Prospect

The Alpine prospect was located in 1924 and explored intermittently until 1943. One flask of mercury is reported to have been produced.

The deposit is of the interbedded-sediments type and was developed by a shallow inclined shaft and a few open cuts that explored a cinnabar-bearing calcite vein in limestone. A few small lenses of cinnabar were encountered. The property has been abandoned.

Happy Day Mine

The Happy Day mine, at an altitude of 5,200 feet, was located in 1954 and during 1955-56 produced a few flasks of mercury.

Veinlets and small pockets of cinnabar occur erratically along a narrow calcite vein in massive limestone. Workings comprise a 50-foot adit which terminates in a large limestone cavity.

Hillside Mine

The Hillside mine, consisting of five claims, was located in 1942, and intermittent operations have yielded over 150 flasks of mercury. Grade of the ore ranged from 3 to 20 pounds of mercury per ton. Last reported production was in 1958.

Deposits are of the volcanic and limestone types. Cinnabar occurs as scattered stringers and disseminated crystals along a northerly trending, westerly dipping shear zone in volcanic rocks just above a contact with underlying limestone. It occurs also as bunches, stringers, and veinlets erratically distributed along calcite stringers in the underlying limestone.

Mine workings include a 110-foot inclined shaft and about 250 feet of drifts and raises on three levels.

King George Mine

The King George mine comprises one claim at an altitude of 5,000 feet. It has been the major producer of the district. The property was located in 1926 and operated until 1931 with an output of about 250 flasks of mercury. Subsequent work during 1940-43 yielded an additional 75 flasks. The mine was reactivated in 1958.

Rocks in the mine area include limestone overlain by basic tuffs and basalt flows. An irregular vein of white calcite extends at an acute angle to the bedding through the limestone but does not penetrate into the tuff. Several faults of small displacement cut the limestone. Cinnabar occurs as replacements in the calcite vein and as small crystals and veinlets in the limestone near the vein. The ore body was localized at the intersection of the calcite vein with a minor fault.

Mine workings consist of a 440-foot haulage level which connects with an inclined stope that extends about 100 feet to surface.

Mine-run ore is treated in a 12- to 15-ton-capacity reduction plant that includes a jaw crusher, a 1.5- by 22-foot oil-fired rotary furnace, cyclone dust collector, 10 vertical 16-inch by 18-foot cast-iron pipe condensers, expansion tank, and stack. A 4-pipe coal-fired retort is used to treat sorted high-grade ores.

Little Linda Property

The Little Linda property comprises eight claims in the American Canyon section of the district. The property was discovered in 1953 and during 1953-55 produced a few flasks of mercury.

Several short adits explore cinnabar-bearing fractures in a limestone formation along which small ore bodies have formed. Selectively mined and sorted ore is treated in a 2-pipe retort.

Walker Mine

The Walker mine includes two claims, at an altitude of 5,000 feet, in the American Canyon section of the district. The property, one of the oldest in Nevada, was discovered in 1908. During 1910-17, 92 flasks of mercury was produced. Further work in 1927 and again during 1941-43 produced an additional 63 flasks. Sporadic operations in 1951 and 1956 contributed a small amount of mercury.

The volcanic-type deposit comprises a strong shear zone in felsite along which cinnabar is disseminated beneath the shear plane and in related branching shears.

Mine workings consist of numerous open cuts, several hundred feet of near surface stopes and connecting adits, a long haulage adit about 100 feet below the stopes, and several inclined interconnecting passageways.

Antelope Springs District Mines and Properties

The Antelope Springs mining district in south-central Pershing County, about 22 miles southeast of Lovelock, has been one of the major mercury-producing districts in Nevada. Cinnabar was discovered in 1907 and intermittent operations since 1916 have produced about 10,000 flasks of mercury. Principal production was made during 1928-43; the Juniper, Pershing, and Red Bird mines were the leading contributors. Activity was resumed at several properties during 1954-55.

The district has been explored extensively, and several large deposits were developed. Work was limited to mining of the higher grade ore bodies with little consideration given to the development of lower grade, marginal material. Several geologic types of deposits occur, including the interbedded-sediments and limestone types, which contain significant commercial-grade ore bodies.

Based on ores which were marginal under 1957-58 mercury prices, the district comprises one of the State's largest potential sources of mercury. It is reasonable to believe that further investigations in mine areas and other geologically favorable sections will encounter mineralized zones similar to those which supplied the greater part of the district's output. The investigations should also encounter significant deposits of submarginal material.

The low-grade deposits are adaptable to comparatively low-cost open-pit and glory-hole mining methods.

Bunker Hill Group

The Bunker Hill group of six claims and two fractions, at an altitude of 5,300 feet, was discovered in 1928, and sporadic operations during 1936-39 produced 6 flasks of mercury.

Rocks in the area are gray to black limestones with some interbedded shale. Cinnabar occurs with calcite veinlets in the limestone and forms crusts along fractures in some of the more broken rock.

Mine workings consist of scattered pits, a 75-foot shaft, and a long adit about 100 feet below the upper workings.

Crawford Prospect

The Crawford prospect yielded a small amount of mercury from development activities during 1940. Some additional work was completed during subsequent years.

The prospect lies east of the Montgomery mine and is in a similar interbedded-sediments-type deposit. Workings comprise a short inclined adit and a 400-foot drift that explore a faulted bed of sandstone overlain and underlain by conglomeratic dolomite. Cinnabar is localized along the upper contact and disseminated in the conglomeratic dolomite.

Dewitts and Dinge Prospect

The Dewitts and Dinge prospect was located in 1930, and subsequent development resulted in a very small production.

Cinnabar occurs as disseminated crystals and small veinlets along a bedding plane shear in limestone. Mine workings include a shallow inclined shaft and several open cuts.

Eastern Star Mine

The Eastern Star mine consists of two claims at an altitude of 4,400 feet, which were located in 1912 and originally were part of the Pershing group. Principal periods of activity were during 1928-30 and 1941-43; the mine's output of mercury is included with the Pershing mine records. During 1955-59 work was confined to small-scale high-grading operations from which a small production of mercury was made.

The property is located along the same geologic formations as the adjoining Lori and Montgomery mines. Rocks in the area include northerly trending beds of sandstone, shale, and conglomeratic dolomite. Cinnabar occurs as disseminations in sandstone along the sandstone-dolomite contact and as veinlets and disseminations along fracture planes in the conglomeratic dolomite.

Mine workings include several hundred feet of adits, drifts, shallow shafts, and numerous open cuts. Selectively mined and sorted ore is treated in a 1,800-pound-capacity 2-pipe retort.

Good Spot Prospect or Vulture Group

The Good Spot prospect comprises three claims, also known as the Vulture group, at an altitude of 5,000 feet, and was explored during 1941-43 by various lessees, but no production was made. It remained idle until 1954-55 when operations by the present owner produced a few flasks of mercury.

The area is underlain by conglomeratic dolomite which is cut by a weakly mineralized fault. Cinnabar occurs in the fault as small veinlets and cavity fillings. Ore was mined from a 20-foot lens.

Old mine workings include a 40-foot shaft and several trenches. New workings consist of an adit and numerous bulldozer cuts. Sorted ore is treated in a 600-pound-capacity 2-pipe retort.

Hard Luck Property (S and J, E and H)

The Hard Luck property, formerly known as the S and J and E and H mine, at an altitude of 5,000 feet, was discovered about 1931, but no production was recorded until 1943-44 when three flasks of mercury were produced. Operations were resumed from 1955 to 1959. Production has been small.

Rocks in the mine area include a flat-dipping limestone bed overlain by conglomeratic dolomite. Cinnabar occurs in narrow, discontinuous calcite stringers along the contact and disseminated in the overlying dolomite.

Mine workings comprise several hundred feet of crosscut adits, drifts, winzes, several small stopes, and an inclined haulage drift. Broken ore is sorted, screened, and treated in a 2-pipe inclined coal-fired retort.

Juniper or Nevada Quicksilver Mine

The Juniper or Nevada Quicksilver mine, at an altitude of 5,200 feet, was discovered in 1923. Exploration continued intermittently until 1927, the first year of recorded production. During 1928-30 the mine reached its peak production with an output of 3,200 flasks of mercury; operations during 1931-42 made a minor contribution. An output of over 3,300 flasks made the mine the district's second largest producer. No mining has been done since 1942. An 80-ton flotation concentrator was erected at the Juniper during 1956-57 to beneficiate ores from mines in the area.

Rocks in the mine area comprise beds of limestone conglomerate and overlying shale striking northwesterly and dipping about 45° to the northeast. A strong easterly trending, vertical fault which offsets the limestone-shale contact, was important in localization of the major ore body. Other steep diverging faults formed openings for the deposition of cinnabar.

Two comparatively shallow ore bodies were in the limestone conglomerate beneath the contact with the overlying shale. The largest ore body was localized between two intersecting steep faults, into whose common breccia zone the ore-forming solutions were guided by an inverted trough of shale formed by drag along the larger fault. The smaller ore body was localized in the limestone conglomerate beneath a flat segment of the shale-limestone contact. Cinnabar occurs as rich bunches, pods, and as disseminations in calcite veinlets cutting the limestone.

Extensive development includes an inclined shaft sunk to a vertical depth of about 335 feet, with underground openings comprising about 5,000 feet of drifts, crosscuts, and raises on seven levels. Mining was confined to one large stope above the 161-foot level and a smaller stope between the 161- and 193-foot levels.

The 80-ton flotation plant consists of two 200-ton-capacity wooden coarse-ore bins from which the ore is mechanically fed to a belt conveyor that carries it to a 10- by 20-inch jaw crusher. Crushed ore is fed by belt conveyor to a 30-inch cone crusher and to two fine-ore bins. It is then mechanically fed to a 5- by 5-foot ball mill that discharges to a 36-inch screw classifier. The underflow from the classifier is returned to the ball mill; the overflow goes to a 4- by 4-foot conditioner and on to five rougher flotation cells. Rougher concentrate passes to a cleaner cell which makes a final concentrate that goes to a pan filter; the tailing flows to the tailing pond. The filter cake, containing from 40 to 70 percent cinnabar, is sun dried and treated in two single-D oil-fired retorts. Reagents used in the flotation circuit are a copper sulfate activator, Palcotan dispersant No. 31 and xanthate Z-6 promoter, and cresylic acid frother.

Mill heads average 3.5 pounds of mercury per ton; recovery ranges from 93 to 95 percent.

Lori No. 1 Mine

The Lori No. 1 mine, at an altitude of 4,400 feet, was located in 1912 as part of the Pershing group. It was operated extensively during 1928-30 and 1941-43, and its production is included with the Pershing mine records. Operations during 1955-58 resulted in a small output of mercury from ore which averaged 8 to 10 pounds of mercury per ton.

The property adjoins the Pershing mine and is located along a northerly trending sandstone-conglomeratic dolomite formation. Cinnabar occurs as disseminations in sandstone and as veinlets and disseminations along fractures in the conglomeratic dolomite.

Mine workings are extensive and include several crosscut adits, a vertical shaft, numerous drifts and crosscuts, stopes, and a glory hole. Selectively mined and sorted ore was treated in a 2-pipe inclined coal-fired retort.

Montgomery Mine

The Montgomery mine comprising 10 claims is located, at an altitude of 4,200 feet at the southeast end of the 2-mile ridge in which the Pershing, Lori No. 1, and Eastern Star mines are located. It was discovered in 1924 and was operated during 1929-31 by Nevada Quicksilver Co. Intermittent operations by various lessees have been in progress since then. Recorded production was about 200 flasks of mercury, although actual production probably approximates 500 flasks, as much of the 1929-31 output was included with that of the Juniper mine. Most of the ore mined was low grade, but selective mining and sorting has produced some retort-grade ore.

Rocks in the mine area include a northerly trending, east-dipping thin layer of buff sandstone overlain and underlain by beds of conglomeratic dolomite. Mineralization was localized along the upper contact of the buff sandstone and in the overlying dolomite. Cinnabar, associated with small amounts of stibnite, occurs as narrow veinlets in brecciated conglomeratic dolomite and as isolated crystals and disseminations in the conglomeratic dolomite and the upper part of the buff sandstone.

Mine workings include three adits driven along a single contact. These openings, with connecting raises and inclined stopes, exceed 3,000 feet in length and attain depths of about 100 feet. Last reported production was during 1959.

Pershing Mine

The Pershing mine, at an altitude of 4,500 feet, has been the largest producer in the district. It was discovered in 1912 but did not become an active producer until 1916-17. The property was abandoned the following year and relocated in 1922. Pershing Quicksilver Co. acquired the property in 1926. During the ensuing 4 years the company completed extensive mine development, installed a 60-foot rotary furnace, and an 80-ton-capacity, 8-hearth, furnace. During this period about 2,400 flasks of mercury was produced from ore which averaged about 4 pounds of mercury per ton. The mine then was inactive until late in 1941. During 1942-44, about 2,100 flasks of mercury was produced. In late 1946 surface and mining equipment was sold and removed from the property. United Mercury Corp. leased the mine in 1956, extensively explored several favorable mineralized areas, and began open-pit operations. The mine was abandoned during 1958, and the mill was dismantled.

Rocks in the mine area comprise folded and broken, northerly trending beds of sediments cut by a few diabase dikes and sills. Exposed sediments, along the lower part of the west slope of the ridge are variegated shale, containing a few limestone and shaly sandstone beds. A black sandstone lying above the variegated shale is overlain by conglomeratic dolomite that forms the backbone of the ridge. A thin layer of buff sandstone, between the black

sandstone and the dolomite, is followed as a key bed in underground mining. Red shale overlies the conglomeratic dolomite and forms the eastern slope of the ridge.

Most of the productive ore bodies lay in the conglomeratic dolomite just above the buff sandstone, some formed in the buff sandstone, and a few were found in the underlying black sandstone and at the top of the dolomite close beneath the overlying red shale. In 1957 exploration indicated widespread but low-grade mineralization throughout sections of the conglomeratic dolomite.

Cinnabar occurs as disseminated crystals, small veinlets, and cement between dolomite breccia fragments. A small amount of native mercury is also present.

Principal mine workings aggregate several thousand feet of underground openings. They include haulage adits connected by raises to stopes, which in several places extend upward to large glory holes; numerous crosscuts; and several shafts that have been sunk to depths about 100 feet below the main haulage levels. The workings cover a mineralized section about 1,000 feet along the strike, that averages about 15 feet in width and 40 to 50 feet in height. An open pit has been started near the northeast end of the mineralized section.

Broken ore was loaded by power shovel into dump trucks and hauled to the Juniper mill for upgrading and retorting.

Red Bird Mine

The Red Bird mine comprises two claims, at an altitude of 5,500 feet, that were located in 1907. No mercury was produced until 1914 when output was 200 flasks. Intermittent small-scale operations were conducted between 1915 and 1918. Work was resumed in 1927 and continued until 1931, and 140 flasks of mercury was produced. The latest period of activity began in 1939 and has been more or less continuous. The Red Bird Leasing Co. acquired a lease in 1955 and carried out extensive exploration and mine development. The property is the district's third largest producer, with an output of over 1,500 flasks from ore which ranged in grade from 8 to 20 pounds of mercury per ton. Last reported production was during 1958.

Under a DMEA contract, which was in force from July 19, 1955, to February 20, 1958, 686 feet of drifting, 265 feet of raising, and 75 feet of winzing was done at a cost of $31,226.

Rocks in the mine area comprise limestone, limestone conglomerate, and shale. The ore bodies are in the limestone conglomerate which irregularly overlies the limestone and is in turn overlain by shale. Several normal faults localized the deposition of cinnabar. Ore bodies occur along the faults in limestone conglomerate near its contact with the shale capping.

The principal mine workings are on the main haulage level and the higher adit level, and comprise about 2,500 feet of drifts, raises, winzes, and numerous stopes. An intermediate adit was driven between the two main levels.

Exploration by raising and drifting in geologically favorable areas encountered additional significant mineralization. Ore produced from this work was hand sorted and treated in a 2-pipe coal-fired retort.

Wild Horse District Mines and Properties

The Wild Horse mining district in Western Lander County, about 72 miles southwest of Battle Mountain, has been an intermittent producer of mercury since 1919 with a total output of about 1,100 flasks. Principal production was from the Wild Horse mine.

Work in several favorable areas indicated the occurrence of small, widely scattered ore bodies localized along breccia zones in silicified limestone and sandstone. The deposits contained from a few to over 1,000 tons of commercial-grade ore. Reserves have been depleted and extensive exploration failed to encounter sufficient ore to maintain a continuous furnace operation. The small ore bodies are adaptable to high-grading operations, and it is possible that under favorable economic conditions a limited operation could be maintained.

McCoy, Liquid Metal, or United Mercury Mine

The McCoy mine, also known as the Liquid Metal, or United Mercury property, comprises 18 claims at an altitude of 5,000 feet which were located in 1916. During 1919-20 and 1932-34 about 100 flasks of mercury was produced from the property. United Mercury Corp. commenced extensive exploration and development in 1954 and installed a 100-ton-capacity rotary furnace plant. Operations during 1954-60 have yielded about 100 flasks of mercury.

The deposits are the interbedded-sediments type. Rocks in the area are limestone, sandstone, conglomerate, and shale, overlain by fanglomerate, tuff, and rhyolite. Irregular pod-shaped ore bodies are scattered over a strike length of about 1 mile and are formed in breccia zones in limestone and along fractures in sandstone. Cinnabar occurs between breccia fragments and disseminated in the fractures. Grade of ore ranged from 3 to 10 pounds of mercury per ton.

Underground workings include over 1,200 feet of adits, crosscuts, and shallow shafts. Surface workings comprise numerous open cuts, trenches, and three open pits. Ore is treated in a 100-ton-capacity reduction plant. Major equipment includes a jawcrusher, a 64-foot oil-fired rotary furnace, and 24 stainless-steel pipe condensers. Power is furnished by diesel generators.

Wild Horse Mine

The Wild Horse mine, at an altitude of 5,000 feet, includes 14 claims. The property was discovered in 1939 and during the following 2 years produced nearly 900 flasks of mercury. No work has been done since 1941.

Rocks in the mine area include silicified limestone overlain by shale and underlain by sandstone. The limestone member is 20 to 30 feet thick and cut

by numerous northerly trending faults and fractures. Cinnabar is disseminated along the fractures and in several places has formed irregular ore bodies. The main ore body reportedly yielded 2,000 tons of ore averaging 10 pounds of mercury per ton.

Principal workings include four small glory holes and about 2,000 feet of underground openings, most of which are haulageways for ore mined in the glory holes. Numerous open cuts and trenches explore for extensions of the mineralized zones. A 30-ton rotary furnace installed in 1940 has been removed.

Castle Peak District Mines and Properties

The Castle Peak mining district in southwest Storey County, about 10 miles north of Virginia City, was an intermittent producer of mercury during 1929-42. Its output exceeded 2,600 flasks and came chiefly from the Castle Peak mine. No production has been recorded since 1942 although several attempts were made to reactivate the properties.

The Castle Peak mine contained one large and several small productive ore bodies that were thoroughly exploited. Ore reserves are depleted and extensive surface and underground exploration did not encounter new mineralized sections of economic importance. The irregular and comparatively shallow ore bodies occur at fault intersections and along a major fault and are apparently localized within a limited area. Exploration on other occurrences in the district encountered small deposits of submarginal material.

Based on past production records and experience, it is unlikely that the district can again become a significant producer. Existing reserves of low-grade ore are not adequate to support a continuous furnace operation, and it is doubtful if further work would substantially increase these reserves. The character of the smaller high-grade ore bodies makes them adaptable to small-scale leasing operations that could yield a small annual production.

Castle Peak Mine

The Castle Peak mine, located about 20 miles southeast of Reno, comprises 11 claims, at an altitude of 5,800 feet. The property was located in 1927 and was developed extensively during the following year. A 30-ton rotary furnace was installed in 1929, and operations during 1929-35 produced nearly 2,500 flasks of mercury. Subsequent activities by lessees in 1939-42 yielded an additional small output.

Two kinds of volcanic-type ore bodies occur. The first kind, and the most productive, includes pipelike ore bodies localized at the intersection of two sets of steeply dipping joints in andesite. Minable ore occurs as tabular bodies along individual joints and disseminations of cinnabar in the adjacent wall rock. Ore bodies of the second kind are localized along a gently dipping, northerly trending fault and occur in and beneath the fault gouge and along parallel faults in the hanging wall.

The principal ore mineral is cinnabar, although native mercury and calomel also occur. Crystalline cinnabar fills fractures as veinlets, fills openings formed by leaching of the volcanic rocks, and is disseminated in the wall rock.

The main tabular-to-pipelike ore body extended 100 feet down dip, was a few to 60 feet in diameter, and yielded about 20,000 tons of ore averaging 8 pounds of mercury per ton. The smaller ore bodies produced about 3,500 tons averaging 12 pounds of mercury per ton.

Mine workings are extensive and consist of about 4,000 feet of drifts, crosscuts, and small stopes on three main levels and several sublevels; three shallow shafts; and the main inclined winze. Surface workings include a large glory hole and extensive bulldozer cuts and trenches. The 30-ton rotary furnace has been removed.

Washington Hill Prospect

The Washington Hill prospect, about 12 miles southeast of Sparks, at an altitude of 6,000 feet, was located in 1941. During 1941-42 a few flasks of mercury were produced. No recent work has been done.

Rocks in the area comprise a series of older andesite flows, tuffs, and agglomerates, cut by an andesite intrusive, and overlain by a younger andesite flow. The formations are mildly folded and faulted. Cinnabar occurs as disseminated crystals, as small irregular veinlets along fractures in altered tuff and agglomerate, and as scattered crystals in opalite.

Mine workings consist of a small open pit, a 200-foot adit driven southerly beneath the pit, and numerous bulldozer cuts and trenches.

Union District Mines and Properties

The Union mining district in northwest Nye County, about 72 miles northwest of Tonopah, was one of the State's major mercury-producing districts. Its greatest periods of activity were during 1912-19 and 1923-25. Combined output for these periods totaled 10,000 flasks. Intermittent operations since 1925 have yielded about 1,500 additional flasks. Principal output came from the Mercury Mining Co. and Nevada Cinnabar mines.

Activities since the highly productive periods have been confined to small-scale high-grading operations along remnants of known mineralized zones and prospecting for small retort-grade ore bodies.

Based on past production performance, the district is of interest and could have a small-to-moderate production potential under extremely favorable economic conditions. The mine areas have been effectively explored, although little work has been done in undeveloped areas. The erratic mode of occurrence of the highly irregular and shallow ore bodies makes exploration difficult. It is possible that intelligent investigation of geologically favorable areas by geophysical prospecting and other modern exploration techniques would

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be successful in locating significant tonnages of commercial-grade ore. The work could also augment the moderate reserves of marginal and submarginal material existent in and adjacent to known mineralized sections. The irregular character of the deposits, together with the isolated location and high altitude of the district, permit consideration only during extended periods of high mercury prices.

Mercury Mining Co. or Prescott Mine (Ione)

The Mercury Mining Co. or Prescott mine consists of 11 patented claims, at an altitude of 8,000 feet, which were located in 1907. They were developed extensively in 1909 and were operated during 1911-19 with an output of about 6,000 flasks of mercury. Retorts were replaced by a 25-ton-capacity Scott furnace in 1912, which materially increased production. The mine was idle until acquired by Bradley Mining Co. in 1923. This company produced nearly 900 flasks during 1923-25.

Intermittent operations by lessees from 1926 to 1960 yielded an additional several hundred flasks. Grade of the ore produced ranged from 3 to 20 pounds of mercury per ton.

Rocks in the area include slightly metamorphosed limy shale and gray limestone, intruded by and faulted against volcanic rocks. The volcanic rocks comprise two units; a coarse, bouldery andesite agglomerate and a series of overlying rhyolite tuffs and rhyolite which may be, in part, intrusive into the metamorphics.

The principal ore bodies occurred in folded and faulted limy shale near two parallel, almost vertical, faults. These ore bodies were shallow and did not extend to appreciable depths; no ore of importance was found by deeper exploratory workings. A second, but less important, type of ore body occurred in altered andesite agglomerate.

Cinnabar, with small amounts of native mercury, occurs in the limy shales as veinlets and stringers along bedding planes and fractures, close to steep faults, and in the silicified portions of the limestone as disseminated crystals. In the andesite agglomerate, cinnabar forms disseminated crystals in the boulders and films and veinlets in the matrix. Cinnabar occurs in the altered rhyolite tuff as painty films along irregular fractures and as scattered nodules which form high-grade ore.

Mine workings include over 3,400 feet of haulage adits and drifts, four large glory holes, numerous open cuts and bulldozer trenches, and several short exploratory adits. The largest glory hole was 150 feet long, 50 feet wide, and 70 feet deep. Selectively mined and sorted ore produced from high-grading operations is treated in a 1.5-ton-capacity 2-pipe retort and a 5-pipe oil-fired retort.

Nevada Cinnabar or Shoshone Mine

The Nevada Cinnabar or Shoshone mine comprises 15 claims at an altitude of 7,900 feet.

The mine is the district's second largest producer with an output approximating 4,000 flasks of mercury. Discovered in 1907, the property was first worked during 1909-10 with a production of 341 flasks. It was acquired by Nevada Cinnabar Co. in 1912. A 50-ton-capacity Scott furnace was erected and extensive development completed, resulting in production of over 3,000 flasks of mercury during 1914-18. Intermittent lessee operations from 1920 to 1951 produced and additional several hundred flasks. Some small-scale exploration by lessees has been done since.

Rocks in the area include ore-bearing volcanic tuffs and agglomerate against which a fairly thick flow of hornblende dacite was faulted. Ore bodies are of the volcanic-type with localization of the ore along steep fractures. The only productive ore body was localized beneath the fault separating the dacite from the tuffs and agglomerate. Cinnabar occurred along a series of fractures which dip steeply and strike nearly parallel to the major fault. Cinnabar occurs also in silicified tuff and agglomerate as narrow veins and in unaltered tuffs as random disseminated crystals.

Mine workings comprise two large glory holes and two adits, with a combined length of 750 feet, that serve as haulageways for ore mined in the glory holes. A short exploratory adit driven northwesterly from the main glory hole, several other short adits, and numerous shallow open cuts and trenches further explored the mineralized fault.

San Pedro Group

The San Pedro group of three claims, at an altitude of 7,200 feet, was located in 1941. Work by different operators during 1941-43 and in 1953 produced about 50 flasks from ore which averaged 4 to 14 pounds of mercury per ton. A little work was done during 1959 and some production was made.

A small, shallow volcanic-type ore body occurs in a layer of bouldery tuff that is interbedded with ash and tuff beds and overlain by rhyolite and andesite flows. Cinnabar replaces boulders, fills fractures in boulders, and occurs locally in bunches and veinlets in the tuffaceous matrix.

Mine workings consist of a 50-foot inclined shaft with 110 feet of drifts on three levels, a large open cut, and numerous bulldozer cuts and trenches. Early production was custom furnaced; the mine's later output was retorted.

Yellow Cat Prospect

The Yellow Cat prospect, near the Mercury Mining Co. mine, was discovered in 1930. Early production by lessees totaled 19 flasks of mercury from a small tonnage of selectively mined and sorted ore that averaged 37 pounds of mercury per ton. Further exploration was done in 1942, but no mercury was produced. Small-scale activity was resumed in 1961.

Cinnabar occurs erratically as high-grade veinlets and small lenses along a shear zone in interbedded shales and limestones. Mine workings consists of a shallow shaft and about 150 feet of drifts extending from the bottom of the shaft.

Belmont District Mines and Properties

The Belmont mining district in northern Nye County is primarily a gold-silver producing district, although a small amount of mercury has been produced since 1928. Total output was less than 1,000 flasks. The Van Ness mine was the largest producer; there were several smaller producing properties.

Small ore bodies occur in quartz-barite veins in granite intrusives and as tabular bodies in roof pendants of metamorphic rock embedded in the granite. Mineralization is scattered and much exploration is needed to maintain a small operation.

The district has a small production potential based on high mercury prices and a stable market. The character of the deposits precludes adaptability to large-scale furnacing operations and confines exploitation to minor high-grading activities. The isolated location and high altitude of the mines, severe winter conditions, and high exploration and underground mining costs all make for higher than average operating costs.

Flower or Fiorite Group

The Flower or Fiorite group of 11 claims is about 11 miles northwest of Belmont, at an altitude of 7,500 feet. Cinnabar was discovered in 1908, and during 1928-43 intermittent development yielded a small quantity of mercury.

Rocks in the area consist of quartzite, phyllite, and limestone intruded by granite and overlain by rhyolitic tuff and agglomerate. The metamorphic-type deposit comprises a small silicified rib of limy phyllite, with cinnabar disseminated along sheared contacts on each side of the rib. Cinnabar has been developed on several levels by a few hundred feet of shafts and drifts. Selective mining produced small quantities of retort-grade ore.

Cinnabar occurs also in a shallow section of placer ground south of the mine workings. The low-grade concentration was probably derived from small veinlets of cinnabar in the shaly phyllite.

Mariposa Canyon Prospect

The Mariposa Canyon prospect is about 6 miles southeast of Round Mountain. A very small production of mercury was made prior to 1943.

The granite-type deposit is developed by a 45-foot adit with a short raise to the surface. Metacinnabarite occurs as scattered crystals in a northeast-trending, southeast-dipping quartz-barite vein, and cinnabar as disseminations in the micaceous footwall of the vein.

Mariposa Wildcat Prospect

The Mariposa Wildcat prospect is northeast of the Red Bird mine. The property was located in 1939, and some mercury was produced from surface cuts along a series of parallel, narrow quartz-barite vein in granite. Cinnabar occurs erratically in the vuggy parts of the veins.

Red Bird or Senator Mine

The Red Bird or Senator mine, about 7 miles southeast of Round Mountain at an altitude of 8,800 feet, was discovered about 1925. During 1928 considerable mercury was reportedly produced and intermittent lessee activities during 1938-41 yielded an additional small production. The present owners started work in 1955, constructed an access road to the property, and are operating on a small-scale basis. Estimated output from the mine is about 135 flasks.

Rocks in the mine area are granites cut by northeast-trending, southeast-dipping veins that contain metacinnabarite, cinnabar, and abundant barite and quartz. Ore occurs in small, narrow, discontinuous bodies erratically distributed along the veins.

Two veins were developed. Workings along the west vein include two short adits, about 50 feet apart vertically, and a small interconnecting stope. The east vein is developed by bulldozer trenches and by two adits, about 65 feet apart vertically, from which small stopes extend to the surface. A shallow winze has been sunk from the lower level. The ore is selectively mined and sorted to produce a retort-grade product. The reduction plant has an 800-pound-capacity 2-pipe wood-fired retort.

Van Ness Mine

The Van Ness mine comprises a group of eight claims, about 6 miles northwest of Belmont at an altitude of 8,600 feet. It was located in 1928 and was operated during 1930-31 with an output of about 500 flasks, from ore which averaged 9 to 10 pounds of mercury per ton. Work by lessees during 1935-42 and in 1954 produced an approximate 300 flasks. Further exploration was undertaken during 1957-59, but no production was made.

Formations in the area include slightly metamorphosed sedimentary rocks, consisting mainly of phyllites and a narrow bed of chert occurring as a roof pendant in granite. Small tabular ore bodies, containing irregular veinlets of cinnabar, occur in the easterly trending, southerly dipping metamorphosed chert.

Mine workings explore the mineralized zone over a strike length of 800 feet and to a depth of 145 feet. The underground openings include a series of crosscut adits, drifts, raises, two glory holes, and a 135-foot inclined shaft. A 900-foot adit was driven to explore the formations at depth, and extensive bulldozer trenches were excavated along a weakly mineralized section north of the mine workings.

Ore produced from high-grading operations was treated in retorts. A 30-ton rotary furnace, used during the 1930-31 operations, remains on the property.

Tybo District Mines and Properties

The Tybo mining district in north central Nye County has been a silver-lead producer since 1865. Cinnabar was discovered in 1929 and operations during 1936-56 produced about 300 flasks of mercury. Principal output was from the A and B mine; a smaller yield came from the M and M property.

Cinnabar occurs erratically along a shear zone in altered rhyolite tuff. Operations were confined to the selective mining of small high-grade ore bodies.

In 1957 exploration at the A and B mine by bulldozer trenching and diamond drilling indicated low-grade mineralization over a relatively wide area along the hanging wall of the fault. Work was not completed, but it is possible that a significant tonnage of marginal and submarginal material, recoverable under favorable economic conditions, exists in the hanging-wall area. The softness of the ore and the general topography of the area would permit low-cost open-pit mining. The geologic aspect of the adjoining M and M mine suggests similar conditions, and further exploration in this area might also encounter extensive low-grade mineralization.

A and B Mine

The A and B mine, about 45 miles northeast of Tonopah at an altitude of 6,200 feet, was located in 1934. During 1936-56 intermittent operations by several companies and lessee produced about 200 flasks of mercury. Exploration by diamond drilling and shaft sinking was done during 1957-60.

Rocks of the area are rhyolitic tuffs and flows. Cinnabar occurs erratically as small stringers and disseminated crystals within a discontinuous, easterly trending, gently south-dipping shear zone in altered rhyolite tuff. It is also irregularly distributed over a wide area along the hanging wall of the fault.

Inaccessible underground workings include two easterly trending adits connected by small stopes and a sublevel connected to the lower adit by a 70-foot inclined winze. Surface workings comprise extensive bulldozer cuts and trenches. Ore from high-grading operations is treated in two coal-fired 2-pipe retorts. A small rotary furnace, installed in 1940, has been removed.

M and M Mine

The M and M mine, about three-quarters of a mile east of the A and B property, was discovered in 1929. During 1943-58 about 95 flasks of mercury was produced.

Rocks in the area include rhyolitic tuffs and flows. Cinnabar occurs as veinlets and disseminations along steep, southeast-trending joints in the altered tuff. Small ore bodies were found in and beneath a northwest-trending, low-angle, westerly dipping clay zone in rhyolite tuff.

Mine workings consist of an upper and lower adit containing about 500 feet of drifts and crosscuts, a large stope in the upper adit, and a small irregular stope in the lower adit.

Pilot Mountains District Mines and Properties

The Pilot Mountains mining district in southwest Mineral County, 10 to 14 miles southeast of Mina, was one of the State's principal mercury-producing areas from 1916-43, with an output of about 5,000 flasks. Intermittent small-scale activities since then have yielded a small additional production. Principal output was from the Mina Development Co. mine, with significant yields from the Drew, Lost Steers, and Reward mines and smaller contributions from the many other properties in the district.

Two types of deposits occur; the most important is the limestone-type encountered at the Mina Development Co. mine. Deposits at other properties belong to the interbedded-sediments type and are associated with chert, limestone, or sandstone. Ore reserves have been depleted, and extensive exploration at the larger mines failed to encounter additional ore bodies of significant size. Work on several small deposits encountered small rich ore bodies which yielded a limited tonnage of retort-grade ore.

The district has a small production potential, but extended periods of high mercury prices would be necessary to justify the extensive exploration needed to develop reserves adequate to maintain operations. The cost of such work would be high in relation to the small tonnage involved. Past operations have indicated the deposits to be comparatively shallow and localized along, and at the intersection of, faults. Lateral exploration along the mineralized faults and in other geologically favorable areas could lead to the discovery of minable ore bodies.

The character of the deposits makes underground mining mandatory, which is reflected in high operating costs and permits exploitation only under extremely favorable economic conditions.

Allen Mine

The Allen mine, at an altitude of 7,500 feet, was located in 1929. Intermittent operations through 1939 produced about 50 flasks of mercury.

Minable concentrations of cinnabar are localized along a steep northwest-trending fault zone and at the intersection of two normal faults in sandstone and conglomerate. Mine workings consist of two adits, 150 feet apart laterally; over 500 feet of drifts and crosscuts; and several small stopes.

Betty Mine

The Betty mine, at an altitude of 8,100 feet, has been inactive since 1941. Cinnabar was discovered on the property sometime before 1918, and subsequent intermittent operations through 1941 produced about 100 flasks of mercury.

Rocks in the area comprise chert and chert conglomerate overlain by andesite and other volcanic rocks. Two steep northerly trending faults cut the chert and formed narrow breccia zones. Cinnabar forms high-grade lenses in the porous breccia of the faults and fills small fractures in the more broken chert. It also occurs locally along bedding shears in the chert.

Mine workings include over 500 feet of drifts and crosscuts on two levels, with a connecting stope extending to surface.

Cardinal Property

The Cardinal property, at an altitude of 8,700 feet, was located in 1929 and during 1930-42 produced over 100 flasks of mercury. Exploration was carried out during 1957.

A steep fault cuts transversely across a northerly trending ridge of chert. Cinnabar occurs in cracks and fissures in the chert and in gouge and breccia along the fault. Small high-grade ore bodies were localized as lenses along the fault and at its junctions with bedding shears in the chert. Cinnabar was also found along minor faults in the area.

Mine workings include a main haulage drift, from which a small stope extends to an open pit, and several hundred feet of drifts and crosscuts.

Coveney or Fault Line Prospect

The Coveney or Fault Line prospect, at an altitude of 7,500 feet, produced a few flasks of mercury prior to 1943.

Cinnabar occurs in erratic concentrations along a normal fault in crushed and sheared shale lying beneath a major thrust fault. The mineralized zone has been explored by about 100 feet of underground workings.

Drew or Red Devil Mine

The Drew or Red Devil mine consists of eight claims at an altitude of 8,000 feet and is one of the district's larger producers. It was located in 1914 and through 1919 produced over 800 flasks of mercury. Sporadic activities by lessees during 1920-43 produced about 100 additional flasks. No work has been done since 1943.

The country rock is an easterly striking, northerly dipping bed of limy shale with lenses of limestone. The rocks are crushed and sheared because of their proximity to a major thrust fault and a later normal fault. Ore bodies were formed by replacement of the limestone lenses; some ore occurs also along favorable fault zones in the shale. Small stringers of cinnabar parallel the bedding of the shale, and where limestone lenses and favorable fault zones were encountered, bodies of high-grade ore were formed. The largest oreshoot plunged westward from above the 55-foot level to below the 200-foot level. This ore body and a parallel shoot were extensively stoped.

Principal mine workings are inaccessible, but comprise an inclined shaft with several hundred feet of drifts and crosscuts on the 70-, 150-, and 200-foot levels. An old vertical shaft and its shallow workings have also caved.

Fletcher Prospect

The Fletcher prospect, at an altitude of 8,100 feet, has produced little or no mercury. In 1957 surface exploration was in progress.

Mine development consists of about 150 feet of underground workings and several open cuts that explore highly broken cherts, shales, and altered volcanic rocks.

Hasbrouck or Worlock Prospect

The Hasbrouck or Worlock prospect, at an altitude of 7,000 feet, was located in 1929. It was reactivated in 1957, and operations through 1959 resulted in a small production of mercury.

Rocks in the area include west-striking, south-dipping conglomerate and sandstone. Cinnabar occurs erratically along bedding shears, along a normal fault in conglomerate, and in small pockets and veinlets in a narrow fault breccia zone in sandstone. Older workings include a 40-foot inclined shaft and several open cuts; newer workings consist of a short adit and several drifts and crosscuts.

A 410-foot jigback tramway was erected, and a 700-pound-capacity 2-pipe gas-fired retort was installed.

Hitt Mine

The Hitt mine, at an altitude of 7,100 feet, was located in 1927.

No work was done until 1940 when mine development was started and a 40-ton-capacity furnace was installed. Production during 1940-45 was over 50 flasks from ore which averaged 3 to 5 pounds of mercury per ton.

Rocks of the area consist of interbedded red and brown sandstone and red conglomerate that strike east of north and dip gently to the west. A northwest-striking, southwest-dipping fault cuts the formations. Cinnabar occurs in the fault gouge; in cracks, fissures and bedding planes in the sandstone; and disseminated in the more porous sandstone.

Underground workings consist of two adits with about 500 feet of drifts and crosscuts and several small stopes. The upper adit is connected with a small glory hole.

Inman Mine

The Inman mine, at an altitude of 8,000 feet, was located in 1916. Intermittent operations from 1928 through 1940 produced about 70 flasks of mercury from unusually high-grade ore.

Country rocks are broken iron-stained chert and chert conglomerate. These formations strike northeast and dip to the southeast and are cut by a steeply dipping, northeast-trending fault. The bedding planes between chert layers are locally sheared and contain gouge; where cut by the fault they are mineralized. Cinnabar forms high-grade lenses along the fault and fills fractures in the chert in either wall. Below the mine, the surface gravels contain small nuggets of cinnabar concentrated on the chert bedrock.

Mine workings include about 750 feet of adits, drifts, and small stopes on three levels, covering a strike length of about 300 feet through a vertical range of about 80 feet. A short adit and small stope explore the gravel bed.

Keg Prospect

The Keg prospect consists of a group of five claims, at an altitude of 7,000 feet, north of and adjacent to the Mina Development Co. mine. The property was discovered and explored prior to 1917, with a small output of mercury. No work has been done for many years.

The formation comprises crushed and sheared limy shale cut by a small, flat, northwest-trending fault that lies directly under a major thrust fault and contains erratic occurrences of cinnabar. Development consists of a 75-foot inclined shaft and several short adits.

Lakeview or Chong Wong Property

The Lakeview or Chong Wong property, at an altitude of 7,800 feet, was discovered in 1919. Sporadic operations to 1942 produced a small amount of mercury. The property has reportedly been abandoned.

The interbedded-sediments-type deposit comprises limestone cut by steep normal faults. Small high-grade ore bodies were localized by the faults and formed by the concentration of cinnabar in the gouge zones. Cinnabar occurs in small irregular veinlets of calcite and disseminated in the limestone.

Development consists of two adits, with 350 to 400 feet of drifts and crosscuts and numerous small open cuts and trenches.

Lost Steers Group

The Lost Steers group of six claims is southeast of the Mina Development Co. mine, at an altitude of 7,000 feet. The claims, located in 1913, include the original discovery of cinnabar in the district. Operations to 1918 produced 344 flasks of mercury. The property was inactive until acquired by Mina Development Co. in 1939. Subsequent operations to 1941 yielded a small quantity of mercury.

Rocks in the area consist of a bed of jointed and broken limestone underlain by sandy limestone and shale. These rocks are cut by several minor faults and a steep northerly-trending major fault. The only ore encountered occurred as small, discontinuous veinlets of cinnabar localized in the broken

limestone along the main fault. Mineralization was bottomed at the limestone-shale contact.

Development includes a small glory hole, tapped by a lower haulage adit, and several short crosscuts adjoining the glory hole. Ore was trucked to the Mina Development Co. furnace plant for treatment.

Mammoth Mine

The Mammoth mine, at an altitude of 7,000 feet, was located in 1929. Intermittent operations to 1943 produced about 70 flasks of mercury. The property has reportedly been abandoned.

Rocks of the area include interbedded conglomerate, sandstone, and shale cut by northeast-trending, southeast-dipping faults. Cinnabar occurs in the fault gouge and with calcite in veinlets in the country rock adjacent to the faults. Small ore bodies were localized beneath rolls in the faults.

Mine workings consist of two adits, about 55 feet apart vertically and 60 feet apart laterally, connected by a raise and stope to a small glory hole. Total length of the adits and crosscuts is about 380 feet.

Mina Development Co. Mine

The Mina Development Co. mine includes 13 claims, at an altitude of 7,400 feet. The property, which was the district's largest producer, was located in 1913 and was worked by various owners and lessees until 1931, with an output of about 1,400 flasks of mercury. A 30-ton-capacity Cottrell rotary furnace was installed in 1930. Except for sporadic lessee activity, the property was idle from 1932 to 1939. The discovery of a high-grade ore body in 1940 led to a production of about 1,400 flasks during 1941-42. Grade of the ore ranged from 6 to 24 pounds of mercury per ton. Exploration since then has been unproductive.

Rocks of the area consist of interbedded limestone and shales that strike northeasterly and dip moderately to the northwest. The beds are displaced by several different fault systems. Ore bodies are localized in limestone at the intersections of steep southwest-trending faults with relatively flat bedding faults. Three closely associated types were encountered. In the first type, cinnabar partly filled cracks and partly replaced the limestone, forming exceptionally rich ore bodies which yielded most of the production; in the second type, the cinnabar only filled cracks in the limestone; and in the third type, cinnabar was concentrated in gouge of the normal faults.

The extensive mine workings consist of about 5,000 feet of drifts and crosscuts on seven levels. The 120-foot, or main haulage, adit level is connected by inclined winzes and stopes to the 150-, 180-, and 210-foot levels and by raises and stopes to the 60-, 40-, and Keough-tunnel levels.

The reduction plant includes a jaw crusher, a 3- by 30-foot 30-ton-capacity oil-fired Cottrell rotary furnace, automatic feeder; cyclone dust

collector, eight 18-inch vertical cast-iron pipe condensers, redwood expansion tank and stack, hoeing table, and bottling room. A 2-pipe horizontal retort was used for treating sludge. Equipment is driven by a 25-hp diesel engine.

Moser Mercury Mine

The Moser Mercury mine is southeast of the Mina Development Co. Some work was done in 1955, a few flasks of mercury were produced, but the property has been idle since.

A series of open cuts explore a mineralized fault in limestone. Cinnabar occurs erratically along the fault in small veinlets and disseminations. Selectively mined and sorted ore is retorted.

Red Wing Mine (Wildwood)

The Red Wing mine includes seven claims southeast of the Mina Development Co. property. The property was located in 1935, and intermittent lessee operations to 1958 resulted in a small production of mercury.

Rocks of the area consist of limestone and interbedded conglomerate and sandstone cut by steeply dipping northwest-trending faults. These faults provide the structural control and locally contain minable concentrations of high-grade cinnabar. The cinnabar is associated with quartz and calcite in the fault gouge and occurs to a lesser extent in cracks and fissures in silicified limestone.

Mine workings include shallow prospect shafts, short adits, winzes, surface cuts, and test pits. Development ore was screened, hand sorted, and custom retorted.

Reward Property

The Reward property, at an altitude of 7,000 feet, consists of nine claims. The claims were located in 1928, and intermittent operations by various companies and lessees to 1957 produced over 500 flasks of mercury. In 1957 mining was open pit. Underground development during 1960 included over 100 feet of raises and crosscuts. A small quantity of mercury was produced.

Rocks in the area include quartzitic sandstone overlain by sandy limestone and conglomerate. The formations strike northeasterly and dip moderately to the northwest. A northward-trending fault, which dips about 45° to the west, cut the beds of sandstone and limestone and formed the principal channel for the ore solutions. Cinnabar occurs as disseminations in a sandy limestone lens on the hanging wall side of the fault, with calcite as veinlets in the sandstone and as disseminated grains in the fault gouge.

Mine development consists of two adits on about the same level. The west adit contains about 400 feet of drifts and crosscuts and connects with a large stope that extends upward to a glory hole. The east adit contains about 50 feet of drifts and a shallow winze.

Ore was treated in a 50-foot Cottrell rotary furnace, installed in 1942 (later partially dismantled), and coal-fired retorts. Ore from 1957 operations was trucked to a gravity-flotation concentrator for upgrading. Concentrates were treated in 2-pipe gas-fired retorts.

Sullivan or Black Lizard Prospect

The Sullivan or Black Lizard prospect, at an altitude of 8,500 feet, was located in 1940. A few flasks of mercury were produced the following year. Surface exploration was done in 1957.

Rocks in the area are chert and chert conglomerate that strike northwest and dip gently to the northeast. Small ore bodies were localized where steep faults cut the relatively flat bedding shears. Cinnabar occurs along the flat bedding-plane shears and in cracks and fissures in the chert. Development comprises a series of open pits and trenches.

Fish Lake Valley or Oneota District Mines and Properties

The Fish Lake Valley or Oneota mining district, in the northwest corner of Esmeralda County about 25 miles southwest of Coaldale, was one of the State's major mercury-producing districts during 1928-31. Intermittent operations since 1931 have made a minor contribution. The total output of over 6,000 flasks came principally from the B and B and Red Rock mines. Reactivation of the B and B mine during 1955 stimulated activity at several other properties and put the district in active status with a small annual production.

Extensive exploration of the B and B opalite-type deposit by bulldozer trenching and core drilling encountered significant tonnages of marginal- and submarginal-grade ores, making the district a major potential producer under favorable economic conditions. Development of the higher grade metamorphic-type deposits at the Red Rock mine has also been productive, and continued work could develop reserves adequate to maintain a small operation. Further exploration on other known occurrences and prospects could encounter significant mineralized areas that would add appreciably to the district's production potential.

B and B Property

The B and B property comprises nine claims at an altitude of 7,700 feet. The mine was discovered in 1925, and in 1927 B and B Quicksilver Co. was organized to develop the property. Retorts were installed and 116 flasks of mercury was produced. A 50-ton rotary furnace was installed in 1928, followed by installation of a 60-ton unit the following year. Output continued high until mid-1931, with a production of 2,471 flasks from ore which averaged about 4 pounds of mercury per ton. Operations were then suspended, the plant was closed, and the company was declared bankrupt. Intermittent lessee operations were in progress during 1932-43 with an output of 93 flasks of mercury. The property remained idle until acquired in 1955 by Kollsman Mineral and Chemical Corp. The company began an extensive exploration and development

program, including construction of a 1,000-ton-capacity crushing plant and a 500-ton-capacity reduction plant. Considerable mercury was produced during 1958-59.

Rocks in the area are flat-lying volcanics with tuff and breccia more prevalent than flows. The formations are gently folded and cut by a few steep faults. One prominent fault that strikes northeasterly and dips steeply northwest has tuffaceous rocks on its hanging wall and altered andesite breccia on its footwall. North of the fault, the tuff is altered to an extensive blanket of opalite; south of the fault, the andesite is only locally opalized.

The large opalite body was the principal source of the mine's production. The deposit consists of banded silicified layers 1 to 5 inches thick separated by thin chalky bands. Cinnabar is distributed erratically through the silicified layers, and although the margins of the ore cut across bedding in places, the mineralization generally follows the bedding. Fractures across the bedding have assisted penetration of ore-bearing solutions and emplacement of cinnabar. Minable ore occurs also in a small opalite body within a faulted section south of the main fault.

The lateral extent of the main opalite deposit has not been determined. Exploration in 1956-57 encountered mineralized sections beyond the main producing area. Drill holes indicated persistence of cinnabar-bearing zones to a depth of 150 feet. Extensive sampling indicated values of 1.5 to 20 pounds of mercury per ton, with an average grade of 3 to 4 pounds per ton.

Principal mine workings include a large glory hole, an 800-foot haulage adit extending under the glory hole, two adits on a lower horizon, several open cuts, and numerous bulldozer trenches. The lower opalite body is developed by a large open cut.

The crushing plant includes a 1,000-ton-capacity circular steel ore bin from which the ore is moved by grizzly feeder to a jaw crusher. Crushed material is transported by inclined belt conveyor to a 200-ton-capacity steel ore bin, then over a double-deck vibrating screen fitted with 1- and 3/16-inch screens. The plus 1-inch and plus 3/16-inch products go to a cone crusher; the minus 3/16-inch material passes to a feed bin above the furnace. The discharge from the cone crusher is moved by belt conveyor and returned to the primary conveyor belt.

The crushed and screened ore is retorted in a rotating externally fired steel furnace. Mercury-laden gases pass through a cyclone dust collector to a special condensing system. Calcines are washed through a flume to the waste dump. Power is supplied by a 250-kw diesel generator.

Container Mine

The Container mine, at an altitude of 7,300 feet, was discovered in 1927 and produced 32 flasks of mercury. Exploratory work in progress during 1928-43 yielded an additional 49 flasks. Development was resumed in 1957.

The deposit is in a roof pendant of metamorphic rocks consisting of phyllites and marble enclosed in a granite batholith. Cinnabar occurs with quartz and barite as small veinlets and coatings in breccia zones in the silicified rocks. Mineralization apparently is concentrated along or near faults.

Principal mine workings consist of two adits connected by a shaft that extends to the surface, a small glory hole connected by a stope and ore pass to the upper adit, several open pits, trenches, and two short adits.

F and L Property

The F and L property, at an altitude of 8,000 feet, was located in 1934. Intermittent operations during 1937-41 produced a small quantity of mercury. Extensive exploration by bulldozer stripping and trenching was done in 1956.

Rocks of the area include moderately folded tuff, flow breccia, and andesite and rhyolite flows. Cinnabar occurs disseminated in two opalite bodies. Mineralization in the upper opalized area is more widespread than in the lower area. Much of the opalized rock is barren, but the isolated small bunches of ore are sufficient to form marginal-grade bodies.

Mine workings consist of shallow shafts, adits, small open cuts, and numerous bulldozer trenches.

Last One or McNett Prospect

The Last One or McNett prospect consists of four claims, at an altitude of 6,500 feet. The claims were located about 1920 and have been prospected intermittently. No mercury was produced. Exploration and furnace plant construction were done during 1957. Cinnabar occurs sparsely disseminated along fractures in an opalite body, with local concentrations forming small ore bodies. The mineralized zones were explored by a shallow shaft, open pits, and several churn drill holes.

The 20-ton-capacity rotary furnace plant included a 2- by 18-foot furnace, nine vertical pipe condensers, expansion tank, and stack.

O.K. Prospect

The O.K. prospect, at an altitude of 8,000 feet, was located in 1927. It was worked several times between 1939 and 1943. Production was very small.

A flow-banded rhyolite is cut by a narrow, westerly striking, southerly dipping zone of gouge and cemented fault breccia. An earthy ocherous cinnabar occurs in the fault gouge, breccia, and along vertical joints. Crystalline cinnabar occurs as veinlets in the fault breccia. Development includes three short, westerly trending adits. Sorted ore was retorted.

Red Rock Mine

The Red Rock mine comprising four claims, at an altitude of 7,000 feet, was located in 1927. Operations by the owner and several lessees during 1928-55 produced about 2,000 flasks of mercury. Extensive development was done during 1957-58. Production since 1957 has come from open-pit operations.

The mine is in a small roof pendant of metamorphic rocks consisting of interbedded phyllites and marble enclosed in a granite batholith. Flows of basalt, dacite, and some tuffs overlie both the granite and the pendant. Three generally parallel, westerly striking, southerly dipping zones of gouge and alteration are cut off by a northeasterly striking, southeast-dipping fault. The principal ore bodies were located beneath the intersections of the fault with the zones of gouge and alteration. Small high-grade lenses of cinnabar also occur within the fault and the gouge zones.

Underground workings, from which most of the ore was produced, are on two levels, 80 feet apart vertically. The upper level is about 1,250 feet long and is connected by a stope to a glory hole. The lower level is about 480 feet long and is connected by a raise to the upper level. Surface workings include open pits, short adits, and numerous bulldozer cuts and trenches.

Work under a DMEA loan was in progress from December 5, 1951, to October 15, 1953. Two miles of shallow surface trenching was done and five deep trenches were dug at a cost of $7,459.

The reduction plant consists of a jaw crusher, a 30-ton-capacity oil-fired rotary furnace, cyclone dust collector, fan, nine vertical-pipe condensers, two vertical triangle-shaped condensers, two redwood expansion tanks, and stack. A screening and jigging plant is used for concentrating low-grade ore. A double-D retort is on the property.

Red Rose Prospect

The Red Rose prospect comprises four claims, at an altitude of 8,700 feet. The claims were located in 1934 and worked intermittently during 1941-43. Production was small.

Rocks of the area consist of glassy flows, tuffs, and silicified rhyolite cut by an easterly trending, northerly dipping fault. Cinnabar occurs erratically in the fault gouge and sparsely disseminated in the rhyolite footwall. Mine workings include an open cut, a 30-foot inclined shaft sunk from the cut, and a short drift driven from the bottom of the shaft.

Starlight, Mount Montgomery, or Wild Rose Mine

The Starlight, Mount Montgomery, or Wild Rose mine, consisting of four claims at an altitude of 9,000 feet, was discovered in 1916. Production during 1917-18 reportedly was about 150 flasks of mercury. The mine was operated intermittently by various lessees during 1929-43 and a small quantity of mercury was produced. Assessment work was resumed in 1956.

Rocks in the area are rhyolite flows. The rhyolite was locally altered to opalite along a northeast-trending fault zone. Cinnabar is disseminated in the opalized rib along the hanging wall of the fault and distributed erratically in the fault gouge.

Mine workings in two adits aggregate about 1,100 feet. The upper adit is connected by raises to two glory holes; the lower adit is connected by a 105-foot combined raise and stope to the upper adit. Surface workings include several open pits and cuts.

Lone Pine District Mines and Properties

The Lone Pine mining district in northern Washoe County contains widespread occurrences of mercury. Sporadic exploration since 1929 indicated significant deposits of marginal and submarginal material, economic only under extremely high mercury prices. However, the work was not adequate to determine the potential of the deposits, and extensive exploration would be needed to permit an accurate evaluation.

Antelope Property

The Antelope property, comprising 18 claims about 50 miles northeast of Cedarville, Calif., at an altitude of 6,700 feet, was discovered in 1929 and has been explored intermittently by several lessees.

Rocks in the area consist of northerly striking, gently easterly dipping andesite flows and associated tuffs and agglomerates, mildly disturbed by faulting. Cinnabar, associated with pyrite, magnetite, and a little gold, occurs erratically within a series of steeply dipping, northwest-trending shear zones in argillized andesite and to a lesser extent in a wide expanse of alluvial material.

The property was explored sporadically over a 2-mile length by several shallow shafts, numerous open cuts, test pits, and trenches. Development reached a maximum inclined depth of 70 feet. A batch-type furnace plant was installed during 1955-56. Development of the alluvial material was carried out in 1958.

Red Butte District Mines and Properties

The Red Butte mining district in west-central Humboldt County is within the Black Rock gunnery range and is closed to mining activities. Cinnabar was discovered in the district in 1909, and several attempts were made to develop the area during 1912-42. Production was very small.

Based on the character of the deposits, it is improbable that further work would develop significant reserves of commercial ore. The small occurrences, however, might be adequate to support small high-grading operations under a highly favorable price structure.

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Rattlesnake Canyon Property

The Rattlesnake Canyon property has made a production of 13 flasks of mercury.

Rocks of the area comprise thin-bedded limestone cut by narrow andesite breccia dikes. Cinnabar and some native mercury occur as fracture fillings in the dikes adjacent to small shear zones. Concentrations of the minerals are not sufficient to form significant ore bodies.

Mine workings are on two hills about 200 yards apart. Shear zones in the east hill are developed by 20- and 50-foot shafts and several trenches. The west hill development consists of a 50-foot shaft and two small trenches.

Sulphur District Mines and Properties

The Sulphur mining district in southwest Humboldt County has yielded a small quantity of mercury as an adjunct to sulfur operations. Cinnabar mineralization is fairly widespread and occurs as coatings on fragments of tuff and agglomerate within the sulfur deposits. The district has a small production potential, but extensive exploration is necessary to develop reserves adequate to maintain a small operation.

Nevada Sulphur or Black Rock Mine

The Nevada Sulphur or Black Rock mine, about 2 miles southeast of Sulphur, was discovered about 1904. No attempt was made to produce mercury until 1941, and operations by lessees during 1943-46 produced about 70 flasks from ore containing 7 to 12 pounds of mercury per ton. A small output of mercury was made in 1959; no production has been achieved since.

Rocks of the area are flat to gently dipping interbedded rhyolite agglomerates and tuffs, locally silicified and impregnated with sulfur and alum and in places coated and filled with cinnabar. Mine workings include several large glory holes, extensive haulage adits, and exploratory drifts. The cinnabar-bearing areas were developed by crosscuts, adits, and several trenches.

Dutch Flat District Mines and Properties

The Dutch Flat mining district in southeast Humboldt County, about 13 to 20 miles north of Golconda, has been a small, intermittent producer of mercury since 1940. Cinnabar is distributed over a wide area and occurs erratically along shears and faults in altered volcanic flows and tuffs.

The district has a limited production potential under a highly favorable price structure. It is improbable that sufficient ore could be developed to support more than small high-grading operations, restricted to the exploitation of the irregular deposits.

B and D or Red Devil Property

The B and D or Red Devil property, at altitudes of 4,800 to 5,000 feet, was located in 1941. Intermittent operations to 1957 produced a small quantity of mercury.

Cinnabar occurs disseminated in sheared material along a northerly striking, easterly dipping fault in arkose. Development includes several open cuts, and a shallow inclined shaft from which short drifts extend. Ore was upgraded on a concentrating table and treated in a D retort.

Dutch Flat Mine (Paradise)

The Dutch Flat mine, at an altitude of 5,000 feet, was discovered in 1940. Intermittent work by various operators to 1954 produced a small quantity of mercury.

Rocks in the area are volcanic tuffs and flows crossed by a narrow, northeast-trending fault that dips moderately to the southeast. Cinnabar occurs as disseminations in the altered andesite wall rock and as veinlets and veins along the shear zone.

Development is in two areas about 400 feet apart. The north workings include a 160-foot inclined shaft, from which about 300 feet of short drifts and stopes extend, and several open cuts. The south workings consist of a 100-foot inclined shaft and an open cut. The selectively mined and sorted ore was retorted.

Tuscarora District Mines and Properties

The Tuscarora mining district in western Elko County lies north and south of the town of Tuscarora. It is primarily a gold-silver district. The presence of cinnabar was known in the early days but it was not until 1940-41 that the volcanic-type deposits were exploited. Production has been very small.

The erratic occurrence of cinnabar in the deposits justifies consideration only during periods of extremely high mercury prices. Exploration in 1958 indicated continuity of the mineralized shear zones, with the possibility of developing reserves adequate to maintain a small-to-moderate operation.

Berry Creek (Silverado) Group

The Berry Creek (Silverado) group of eight claims, about 3 miles southwest of Tuscarora at an altitude of 6,600 feet, was located in 1941. The deposit was explored intermittently during 1942-59. Production was small.

Cinnabar occurs sparingly as veinlets and narrow stringers along a steeply dipping, westerly striking shear zone in altered andesite. It occurs to a lesser extent as disseminations and small veinlets in the andesite wall rock and as placer material in the soil covering.

Development includes a 180-foot adit, 48-foot inclined shaft, and an open cut excavated along the eastern exposure of the shear zone.

Red Bird (Silverado) Group

The Red Bird (Silverado) group of 10 claims, about 1 mile north of Tuscarora at an altitude of 6,400 feet, was discovered in 1940. It was explored during 1941-43 and reactivated in 1958. Production has been small.

Cinnabar with abundant pyrite and some native mercury occurs along a steep, northwesterly trending shear zone between tuff and altered andesite, as networks of small veinlets, narrow stringers crossing the shear, and disseminations in altered andesite along the footwall of the zone.

Workings include a large open cut which has nearly eliminated two short adits and a 60-foot shaft that originally explored the shear zone.

Rock Creek District Mines and Properties

The Rock Creek mining district in western Elko County, about 25 miles northeast of Midas, is primarily a silver district, but it also contains several small volcanic-type mercury properties. Exploitation of these deposits yielded a small quantity of mercury.

The relatively limited, shallow deposits comprise a small potential reserve, minable during periods of high mercury prices. Additional ore bodies, adequate to support small-scale retort operations, could undoubtedly be developed by further work.

Horse Mountain Property

The Horse Mountain property consisting of six claims was discovered in 1954. Operations to 1957 produced a few flasks of mercury.

A narrow, northerly striking, westerly dipping fault zone in rhyolite contains small, shallow concentrations of cinnabar in fault gouge. High-grade cinnabar was mined from a trench 60 feet long by 8 feet deep. A 220-foot crosscut adit and drift cut the fault at depth, but no ore was encountered. Lower grade mineralization occurs in an opalized area about 500 feet south of the main workings and in the overburden along the strike of the fault. Ore was treated in a 2-pipe ½-ton-capacity retort.

Teapot Prospect

The Teapot prospect was located and explored in 1942. Some work was done in 1954, and a small quantity of mercury was produced.

Andesite is cut by a steeply dipping, northerly trending fault. Cinnabar is disseminated along the shear zone and occurs in narrow quartz veinlets in the wall rock. Mine workings include a 55-foot shaft and numerous small open cuts and trenches.

Beowawe District Mines and Properties

The Beowawe mining district in northwest Eureka County contains several cinnabar occurrences. One deposit of commercial significance was exploited thoroughly, disclosing small irregular ore bodies along fractures in silicified limestone conglomerate.

It is possible that sufficient ore could be developed to support a small retort operation. However, the exploration required in relation to the small tonnage involved would be justified only under highly favorable economic conditions.

Beowawe or Nevada-Mexican Mine

The Beowawe or Nevada-Mexican mine includes three claims about 1 mile south of Beowawe, which were located in 1924. Principal activity was during 1928-29 when Nevada-Mexico Mining Corp. completed extensive development, installed a 30-ton-capacity rotary furnace plant, and produced a reported 132 flasks of mercury. Additional work in 1932 resulted in a small output. The owners did further exploration during 1957.

Rocks in the area are gently dipping, northeasterly striking, silicified limestone conglomerate, underlain by shale. Cinnabar is concentrated along irregular vertical fractures and rubble zones in the limestone conglomerate. The mined ore consisted of conglomerate containing cinnabar veinlets and disseminated crystals.

Development openings include a 150-foot shaft, about 2,000 feet of drifts and crosscuts on two levels about 75 feet apart, five small stopes extending to depths of 60 feet below surface, and numerous surface cuts and trenches.

Warm Springs District Mines and Properties

The Warm Springs mining district in central Lander County contains small and erratic occurrences of cinnabar in volcanic-type deposits. It is unlikely that further work would develop significant reserves, although under abnormally high mercury prices, a small-scale leasing operation might be productive.

Warm Springs or Mercury Prospect

The Warm Springs or Mercury prospect, about 33 miles south of Battle Mountain, yielded a few flasks of mercury during 1939-41. No work has been done since.

Cinnabar occurs in a narrow vein along a steeply dipping, easterly trending fault in altered rhyolite and rhyolitic tuff. Workings include a 20-foot shaft, a connecting 50-foot drift, and several shallow trenches.

Kennedy District Mines and Properties

The Kennedy mining district in southeast Pershing County produced a small quantity of mercury from intermittent operations during 1943-56. Extensive exploration encountered erratic occurrences of cinnabar along minor faults and breccia zones in limestone and interbedded quartzite and shale. The small deposits are adaptable only to small-scale high-grading operations.

Jackpot or Wootan Property

The Jackpot or Wootan property consists of six claims, about 48 miles south of Winnemucca at an altitude of 5,000 feet. The property was located in 1941 and sporadic high-grading operations during 1943-59 produced a few flasks of mercury.

Rocks in the area comprise flat-dipping, northeast-striking limestone and interbedded quartzite and shale, disturbed by faults of small displacement. Cinnabar occurs erratically along fractures, in the limestone and in a segment of the underlying shale.

Underground workings comprise a short adit, a 70-foot inclined shaft, and a 50-foot drift extending from the bottom of the shaft. Surface work includes numerous bulldozer cuts and trenches.

Joe, Coss, or Old Timer Property

The Joe, Coss, or Old Timer property includes nine claims adjoining the Jackpot mine. The property was located in 1941 and explored extensively the following year. No production was made. Further work in 1956 resulted in a small output of mercury.

Rocks in the area are limestone and interbedded quartzite, which strike northeast and dip gently to the southeast. They are cut by numerous calcite stringers and by faults of small displacement along which zones of brecciation were developed. Cinnabar occurs as veinlets and disseminations in the shear and breccia zones.

Mine workings are about one-quarter of a mile apart. The northern workings explore a small shear zone and include a 50-foot adit, a 20-foot winze sunk from the adit, a shallow shaft, and several bulldozer cuts. The southern workings explore a wide breccia zone and consist of numerous bulldozer cuts, a short adit, and an open cut.

Stillwater (Table Mountain) District Mines and Properties

The Stillwater or Table Mountain mining district is in northern Churchill and southeast Pershing Counties, 28 to 38 miles east by southeast of Lovelock. The district contains several small mercury properties with principal production from the Freckles or Roman mine. Total output has been small.

Extensive development in several areas encountered small deposits along limestone-shale contacts and in sandstone. Further work under a favorable price structure for mercury could discover additional small ore bodies, adequate to support small retort operations.

Black Dyke Prospect

The Black Dyke prospect in Pershing County was located prior to 1942 and prospected sporadically but with no record of production. The property has reportedly been abandoned.

Three short adits explore a northeast-trending shear zone between granite and sedimentary rocks. Cinnabar, accompanied by irregular masses of sulfur, is sparsely disseminated in the shear zone.

Freckles or Roman Mine

The Freckles or Roman mine in Pershing County, at an altitude of 4,700 feet, was discovered in 1940. Intermittent operations during 1941-61 produced over 600 flasks from ore averaging 10 to 15 pounds of mercury per ton.

Rocks in the area are interbedded limestone and shale cut by faults of small displacement. Cinnabar occurs in bunches and veinlets in the limestone beneath a flat-lying bed of shale and sparsely disseminated in brecciated limestone along a limestone-shale contact.

Mine workings consist of a 50-foot vertical shaft, from which several hundred feet of drifts extend, small stopes, and numerous short adits and bulldozer cuts. In 1957 a prospect shaft was sunk in an undeveloped mineralized area west of the main mine workings. Selectively mined and sorted ore is treated in a 2-ton-capacity continuous-feed vertical oil-fired retort, equipped with eight 16-foot by 6-inch pipe condensers.

Rosebud Prospect

The Rosebud prospect consists of nine claims in Churchill County, at an elevation of 6,500 feet. The claims were located in 1927 and intermittent work by various lessees to 1943 produced a small quantity of mercury.

Rocks in the area are sandstone, limestone, and shale unconformably overlain by andesite. Cinnabar occurs as disseminated crystals and scattered veinlets in sandstone and closely associated with small calcite veinlets in limestone and silicified limestone.

Mine workings are in two areas: The main development openings include a 400-foot adit and several short adits; the upper workings, 500 feet northwest of and about 300 feet above the main adit, comprise two shallow pits and two short adits.

Victory Prospect

The Victory prospect includes seven claims in Pershing County, at an elevation of 5,000 feet. The claims were located in 1943 and explored sporadically several times since then. No production was made.

Rocks of the area are thinly bedded limestones and shales. Cinnabar is irregularly disseminated in limestone along a sheared limestone-shale contact. Workings consist of three shallow shafts and several open cuts.

Steamboat Springs District Mines and Properties

The Steamboat Springs mining district in southern Washoe County, about nine miles south of Reno, has been of geologic interest since the 1880's. Cinnabar and many other minerals are found in hot spring deposits extending over a wide area. Several attempts were made to exploit the low-grade deposits and a few flasks of mercury were produced in 1929 and 1932. Although mineralization is widespread, its low grade and erratic occurrence precludes the possibility of the district developing into a significant producer of mercury.

Steamboat Springs Mine

The Steamboat Springs mine, at an altitude of 4,500 feet, was discovered in 1875 and early operations started in 1877. A furnace was installed, and for several years both mercury and sulfur were produced. Sporadic activity between 1880 and 1928 was unproductive. In 1929 an unsuccessful attempt was made to recover the cinnabar by flotation. Further work in 1930 was confined to the production of silica, with mercury and sulfur as byproducts. Lessees produced a few flasks in 1932, the last year of recorded production. Since then, several attempts to exploit the deposits were unproductive.

Cinnabar occurs in the sinter beds formed by the solfataric action of hot springs. It is found in hydrothermally altered rock filling incipient fractures in decomposed granite, disseminated in veins of opal cutting the granite, and as painty films and encrustations in altered andesite breccia and basalt. The small, irregular ore bodies occur along faults, and to some extent in the pipelike hot spring channels. The waters of active hot springs also contain detectable amounts of mercury.

The shallow mine workings in two productive areas include several short adits, open pits, and numerous surface cuts and trenches.

Holy Cross District Mines and Properties

The Holy Cross mining district in southwest Churchill County contains small volcanic-type mercury deposits from which a very small production was made. The occurrences are small and are inadequate to comprise a significant reserve. However, it is possible that further work would encounter additional mineralization, capable of supporting a small-scale leasing operation.

Cinnabar Hill or Robinson Mine

The Cinnabar Hill or Robinson mine consists of six claims about 38 miles southeast of Fallon. The property was located in 1938, and intermittent operations to 1940 produced a few flasks of mercury.

Cinnabar occurs as narrow veinlets within a westerly trending, northerly dipping fault zone in altered andesite. Development openings include a short adit and crosscut, a 65-foot inclined shaft with short crosscuts on two levels, and numerous shallow open cuts.

Bovard District Mines and Properties

The Bovard mining district in northeast Mineral County, primarily a gold-silver district, contains a minor deposit of cinnabar from which a small production has been made. Its exploitation indicated commercial concentrations of cinnabar along a shear zone in andesite tuffs and flows, capable of supporting a small-scale high-grading operation. Further work laterally and at depth could augment the small reserve.

Poinsettia Mine

The Poinsettia mine includes two claims about 38 miles northeast of Hawthorne, at an altitude of 5,150 feet. The property was located in 1914 and worked intermittently until the early 1930's. It was acquired by its present owner in 1939, and during 1939-42 extensive underground development was completed. In 1950 significant data on the deposit was obtained by a Bureau of Mines diamond-drilling program. Leasing operations, starting in 1954, have yielded a small quantity of mercury. Underground development was done in 1958.

Rocks in the area are flat-dipping andesite tuffs and flows cut by a steep northwest-trending, northeast-dipping fault, which localized the ore deposits. Cinnabar occurs in isolated, discontinuous, small high-grade pipes, and narrow lenticular veinlets within fault planes in the shear zones.

Underground workings consist of a 188-foot vertical 2-compartment main shaft with drifts and crosscuts on the 70- and 170-foot levels, a shallow winze sunk from the 70-foot level, and small stopes on both levels. Other openings consist of two shallow shafts and a short adit. Selectively mined and sorted ore is treated in a 2-pipe retort.

Mammoth District Mines and Properties

The Mammoth mining district in northwest Nye County is a gold-silver district containing a small deposit of cinnabar. The character of the mineralization precludes development of significant reserves, and it is improbable that sufficient high-grade ore could be encountered to support a small retort operation. Additional work is justified only under abnormally high mercury prices.

Antelope Prospect

The Antelope prospect includes eight claims about 12 miles southwest of Ione, at an elevation of 6,500 feet. The claims were located in 1945, and a few flasks of mercury reportedly were produced. No work has been done since 1945.

Rocks in the area consist of crystalline limestones extensively fractured by faulting and in places considerably altered by hot spring activity. Cinnabar occurs irregularly in a crushed and altered fault zone, as small shoots, bunches, and as a binding media surrounding breccia fragments.

Development comprises several small pits, trenches, and a 40-foot shaft.

Fairplay District Mines and Properties

The Fairplay mining district in northwest Nye County has produced a small quantity of gold, silver, tungsten, and copper and a little mercury. Cinnabar occurs associated with scheelite in recrystallized limestone. Ore bodies are small and discontinuous, and geologic evidence indicates the improbability of developing reserves adequate to maintain a small operation.

North Star or Scheebar Mine

The North Star or Scheebar mine consisting of four claims about 12 miles north of Goldyke, at an elevation of 8,200 feet, was discovered in 1929. Development in 1936-37 produced a few flasks of mercury. Further work during 1943-44 yielded an additional small quantity. The mine has been inactive since 1944.

Rocks in the area are limestone and shale intruded by granodiorite. Metamorphosed sedimentary rocks that strike northwesterly and dip gently to the northeast underlie the property. Cinnabar, associated with scheelite, occurs in the upper part of the marble and reportedly in the overlying limestone.

Three occurrences have been investigated. Workings include a small glory hole and underhand stope, a small trench and adit 150 feet east of the glory hole, and two shallow shafts and several surface cuts located 200 feet northeast of the glory hole.

Peavine Canyon District Mines and Properties

The Peavine Canyon mining district in northwest Nye County has been a small, intermittent producer of mercury since 1942. Work indicated the occurrence of cinnabar in irregular concentrations along shear zones in shale and sandy limestone. High-grading operations, restricted to the selective mining of the small ore bodies, have been moderately successful. Further investigation of geologically favorable areas should be productive and permit continuance of operations.

Horse Canyon Mine (Gabbs)

The Horse Canyon mine comprises 11 claims about 14 miles northwest of Manhattan. The claims were located in 1937, and intermittent operations during 1942-61 produced over 500 flasks of mercury.

Rocks of the area are thin-bedded, contorted, and broken beds of limestone, shale, and chert conglomerate. Cinnabar occurs as veinlets and disseminations in shear zones in shale and sandy limestone. Mineralization is spotty and forms small ore bodies.

Mine workings are on the east and west slopes of a northerly trending canyon. Development includes adits, drifts, several small stopes, and numerous open cuts. Ore is treated in a 2-pipe retort.

Cedar Mountains District Mines and Properties

The Cedar Mountains mining district in eastern Mineral County has been an important silver-lead producing district. In addition to the base metal deposits, cinnabar occurs in several areas along faults in altered volcanic flows. Sporadic operations produced a small quantity of mercury. Although it is improbable that significant deposits of mercury ore will be encountered, the small occurrences are adaptable to high-grading operations under high mercury prices.

Lou Prospect (Costa)

The Lou prospect, about 3 miles north of Simon, was discovered in 1939, and work during 1940-42 produced a few flasks of mercury. Exploration was done in 1956.

Rocks of the area are argillized andesite overlain by silicified rhyolite. Cinnabar occurs in small high-grade lenses along a northerly trending fault. Development includes a short adit, shallow winze and sublevel, and several open cuts.

Queen City District Mines and Properties

The Queen City mining district in eastern Nye County is located along the northern boundary of the Las Vegas bombing and gunnery range. Small occurrences of cinnabar found in limestone caves and along a limestone-sandstone contact yielded a small quantity of mercury.

The limited extent of the mineralization gives the district a small production potential only during periods of high mercury prices.

Black Hawk Mine

The Black Hawk mine consists of 17 claims about 98 miles southeast of Tonopah. The property was located in 1929, and during 1930-35 produced about 70 flasks of mercury. Sporadic activity during 1936-43 and 1956-57 was unproductive.

Rocks in the area are sandstone and limestone cut by quartz veins. Cinnabar occurs along the sandstone-limestone contact. Development includes a shallow shaft, short drifts on two levels, several small stopes, and a few open cuts.

Mercury Prospect (Fallini)

The Mercury prospect includes two claims about 1 mile north of the Black Hawk mine. The property was prospected several times during 1941-55. No production of mercury was made.

Cinnabar occurs as nuggets and as coatings on limestone and quartz gravel, within crevices in a limestone cave.

Tem Piute District Mines and Properties

The Tem Piute mining district in western Lincoln County is best known for its extensive and productive tungsten deposits. Prior to 1941 several small occurrences of cinnabar were prospected, although no mercury was produced. In 1955 a flat-lying, volcanic-type deposit was discovered in the southern part of the district. Extensive exploration indicated a comparatively low-grade mercury mineralization, economic only under high mercury prices. Further work is required to determine the extent of the mineralization.

Andies Property

The Andies property comprises 21 claims 18 miles southwest of Tem Piute, at an elevation of 6,000 feet. The claims were located in 1955 and explored extensively during 1955-56 by underground openings and churn- and rotary-drill holes. A small production of mercury was made.

Rocks of the area are highly fractured andesite and rhyolite flows underlain by a limestone formation that has been disturbed by minor faulting and folding. Small bodies containing disseminated crystals of cinnabar were localized in the volcanics along steeply dipping, northerly trending fractures. The mineralized strata of the comparatively flat-lying deposit are separated by layers of very low-grade or barren material. The deposit, developed over an area about 300 feet long and 100 feet wide, is from a few to 45 feet thick, averaging 15 feet in thickness, and is overlain by as much as 40 feet of overburden. Grade of the ore averages 2 to 3 pounds of mercury per ton; small, high-grade stringers encountered contained up to 30 pounds of mercury per ton.

Development includes a 31-foot single-compartment vertical shaft, a 140-foot incline, several trenches, and numerous prospect cuts and pits.

Viola District Mines and Properties

The Viola mining district in southeastern Lincoln County contains one known cinnabar deposit from which a small production was made. Development has been inconclusive, and further work will be required to determine the district's potential. It is possible that sufficient ore could be developed to support a small, high-grade operation.

Crystal-Bluenose or Larson Prospect

The Crystal-Bluenose or Larson prospect consists of five claims, about 22 miles northeast of Carp at an altitude of 3,500 feet. The property was located in 1939, and intermittent operations during 1940-55 produced a small quantity of mercury.

Rocks in the area are blue and gray limestones, interbedded with thin sections of quartzite, overlain by an altered talcky blanket that caps the formations. Cinnabar occurs as disseminations and narrow veinlets in both the capping and limestone. The cinnabar-bearing stringers in the limestone pinch out at depth; in the capping, cinnabar is present as disseminations and crystal clusters.

Mine openings include a 15-foot shaft and several small open cuts.

Fluorine District Mines and Properties

The Fluorine mining district in southern Nye County has been a small but intermittent producer of mercury since 1912, with an output of about 200 flasks. Several properties were exploited, with principal activity at the Harvey and Tip Top mines.

Two types of cinnabar occurrences have been encountered. The interbedded sediments-limestone type has been the most productive; the opalite type yielded a small output. Exploration of the deposits has been thorough, indicating that further exploration for lateral and downward continuations of mineralized fault zones in the interbedded sediments-limestone type deposits might develop small reserves of commercial-grade ore. It is improbable that additional work on the opalite-type deposits would be productive.

Harvey or Mercury Mine

The Harvey or Mercury mine consists of 10 claims, about 8½ miles east of Beatty at an altitude of 4,500 feet.

The property was located in 1908 and worked for gold and mercury. Subsequent operations during 1912-16, 1937, and 1955-56, produced over 80 flasks of mercury. The Boyd Endsley Mining Co. operated the mine in 1955-56, concentrated the ore by flotation, and retorted the concentrates.

The rock in the area is a northeasterly striking, northwesterly dipping gray limestone. Mineralization is confined to an elongated pod of chalcedony and opal which occurs in a crushed zone between two northerly trending diabase dikes that cut the limestone. The dikes converge at their northern end and form two narrow veins, traceable on surface for only a short distance. At their southern end, the dikes and mineralized zone appear to pinch out. Cinnabar is sparsely disseminated within the siliceous pod.

Development openings exceed 2,000 feet in length and include three shallow shafts, a main adit with two sublevels, and several shorter adits. A large open pit overlies the main adit workings.

Thompson Mine

The Thompson mine includes 36 claims about 12 miles east of Beatty, at an elevation of 3,800 feet. The claims were located in 1929 and explored extensively during 1929-43. Only a little mercury was produced. The property has been inactive since 1943.

Rocks in the vicinity of the mine consist of nearly horizontal rhyolite flows, tuffs, and obsidian. Locally, the volcanic rocks have been silicified to opal and chalcedony; elsewhere they are leached and alunitized. Cinnabar occurs in the upper level of the mine as small disseminations in the silicified rhyolite and as tiny veinlets and painty coatings in sheared and brecciated zones in the silicified rocks. On the bottom (100-foot) level, small quantities of cinnabar occur in veinlets of soft waxy clay.

Development openings consist of an upper level 285 feet in length and a lower level 600 feet in length, connected to the surface by a 100-foot shaft. Above these workings is an open cut about 15 feet wide and 200 feet long. Numerous open pits, bulldozer cuts, trenches, short adits, and a shallow shaft further explored the property.

Tip Top Mine

The Tip Top mine, about 600 feet north of the Harvey property, has an obscure history. No production was reported, but it is said that about 100 flasks of mercury was produced, prior to 1940, from a now inaccessible winze.

Rocks in the mine area are flat-dipping, northeasterly striking limestones cut by a steep, southwest-trending fault zone. Cinnabar is disseminated in the fault gouge and fills a narrow vein along the plane of the fault.

Mine workings include a 100-foot adit with an inclined winze, inaccessible below 40 feet, and several shallow open cuts.

MISCELLANEOUS OCCURRENCES BY COUNTY

The following mercury occurrences, on which some work was done but little or no production made, are tabulated by counties. Their combined production potential is very small, and even under abnormally high mercury prices, it is improbable that they could make a significant contribution to the State's output. Under extremely favorable economic conditions, several properties might support small high-grading operations.

Clark County

Patsy Prospect

The Patsy prospect is in the Eldorado mining district, about 1½ miles west of Nelson. Cinnabar and some native mercury are associated with gold in low-grade deposits in volcanic rocks. Development includes two shafts and several open cuts. No mercury was produced.

Elko County

Golden Eagle Prospect

The Golden Eagle prospect, in an unnamed mining district, 74 miles north of Elko, was owned in 1941 by J. C. Woodward and George Stoker, Winnemucca. Surface trenching of a bedded opalite-type deposit failed to reveal any evidence of cinnabar.

Esmeralda County

Castle Rock or North End Cinnabar and West Side Cinnabar Prospect

The Castle Rock or North End Cinnabar and West Side Cinnabar prospect is in the Gilbert mining district, about 6 miles northeast of Blair Junction. Rocks in the area are locally silicified andesite tuffs. Cinnabar is sparsely disseminated in fractures and shears in a narrow chalcedony-cemented breccia vein, and fills fractures and open spaces in a silicified rib of andesite tuff. Development openings on the breccia zone include a shallow inclined shaft and a short drift from the base of the shaft. The silicified rib was explored by short adits and several trenches. Production was very small.

Montezuma Property

The Montezuma property consists of 15 claims in the Montezuma mining district about 19 miles southwest of Goldfield, at an elevation of 6,500 to 6,800 feet. The mine was acquired in 1958 by the Kollsman Mineral and Chemical Corp., and extensive exploration and development started. Rocks in the area consist of a northwesterly trending, southwest-dipping zone of altered and brecciated rhyolite between overlying lake beds and tuffs and underlying highly-broken and fractured limestone. Cinnabar occurs erratically along ribs of opalitic material, in breccia pipes, and in irregular silicified rubble zones. Development includes a 20-foot shaft, a 150-foot adit driven 15 to 20 feet below surface; a 255-foot crosscut adit and about 250 feet of connecting drifts and crosscuts; and a large open cut about 200 feet long and 50 feet wide.

Production by former owners and lessees was very small.

Riek Prospect

The Riek prospect, in an unnamed mining district, is on the east side of Fish Lake Valley, about 2 miles northeast of the Arlemont ranch. Cinnabar, associated with sulfur, chalcedony, and gypsum, occurs in flat-lying interbedded ash and tuff. The cinnabar is sparsely disseminated in the tuff, and fills tiny seams and fractures in the sulfur. Mine workings extend over a wide area and include two 40-foot shafts, a short adit, and numerous shallow open cuts and trenches. No production was made.

Eureka County

Rossi Prospect

The Rossi prospect is in the Cortez mining district, about 53 miles south of Beowawe, at an altitude of 7,000 feet. A thin flat-lying sandy limestone member is underlain by shale and overlain by 10 to 15 feet of altered iron-stained overburden. The limestone is mineralized with small flecks and tiny seams of cinnabar. Development openings include four shallow shafts, a short adit, and several surface cuts and trenches. No mercury has been produced.

Humboldt County

Gayer-Moo Prospect

The Gayer-Moo prospect is in the Harmony mining district, about 5 miles southeast of Winnemucca. Cinnabar is reported to occur in a rhyolite dike which cuts sandstone, grit, and quartzite breccia. Little exploration was done and no mercury produced.

Plymouth Prospect

The Plymouth prospect is in the Harmony mining district, about 5 miles southeast of Winnemucca. Cinnabar occurs erratically in silicified and altered dikes of rhyolite which cross sandstone and grits. Development includes several short adtis. No production was made.

Lander County

Rast Prospect (Valley View)

The Rast prospect, in an unnamed mining district, is about 21 miles northeast of Austin, at an altitude of 6,000 feet. The property has been abandoned. Cinnabar reportedly occurs in limestone in an interbedded sediments-limestone and quartzite type deposit. Placer cinnabar was found in the soil around the underground workings. Development includes a 50-foot shaft and numerous test pits and trenches. No mercury has been produced.

Mineral County

Montgomery Summit Prospect

The Montgomery Summit prospect is in the Mount Montgomery mining district, about 6½ miles west of Basalt. Several prospect holes were sunk along a weakly-mineralized shear zone in volcanic breccia. No mercury was produced.

Noguez Prospect

The Noguez prospect is in the Mount Montgomery mining district, about 8 miles north of Basalt. Cinnabar, associated with gypsum and sulfur, occurs erratically along faults and broken zones in silicified tuff. Development

openings include three adits, with a combined length of about 600 feet, a glory hole, and several shallow pits and trenches. A very small quantity of mercury was produced.

Stockton Prospect

The Stockton prospect is in the Rawhide mining district, about 4 miles west of Rawhide. Rocks in the area are flat-lying beds of rhyolitic tuff, locally altered to opalite. Cinnabar is sparsely disseminated in the opalite and tuff. Mine workings consist of a 165-foot adit. No mercury has been produced.

Nye County

Diamondfield Prospect

The Diamondfield prospect is in the Goldfield mining district, about 5 miles east of Goldfield. Cinnabar was reported in this area in 1908, and since that time sporadic exploratory work has been done without finding commercial quantities of ore. The rocks consist of altered and locally silicified andesites. Cinnabar occurs as isolated crystals along a poorly defined shear zone and as isolated crystal aggregates in boulders of silicified and alunitized andesite. Workings consist of scattered pits and trenches and two shafts.

Ralston Prospect

The Ralston prospect is in the Cuprite mining district, about 15 miles south of Goldfield. Rocks in the mine area are rhyolite tuff and agglomerate, locally silicified to hard, resistant stringers, and blocky bunches of opal and chalcedony. Cinnabar occurs irregularly in the opalite and chalcedony. Mine workings consist of a 100-foot adit connected with 140 feet of crosscuts and a 30-foot shaft. About 500 feet further south are a 120-foot adit and a 30-foot trench. A very small amount of mercury was produced.

Trojan Prospect

The Trojan prospect is in an unnamed mining district, about 33 miles northeast of Mina. Cinnabar occurs in small seams along an andesite-rhyolite contact. Development includes a 15-foot shaft and several shallow trenches. No production has been made.

White Caps Gold Mine

The White Caps gold mine in the Manhattan mining district, about 50 miles north of Tonopah, is primarily a gold-antimony producer. Pipelike oreshoots occur in limestone and are replacement deposits of pyrite, stibnite, realgar, orpiment, arsenopyrite, and free gold in a gangue consisting essentially of calcite, quartz, dolomite, fluorite, and sericite. Cinnabar has been found occasionally in narrow stringers within the oreshoots. Extensive mine workings are accessible through an 800-foot shaft. Some mercury was reportedly recovered during operations in 1929.

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Ormsby County

Valley View Property

Cinnabar occurs with jarosite in a fracture zone at the Valley View property of J. S. Jewett and V. Cunningham. No production of mercury has been reported.

Pershing County

Paymaster Prospect

The Paymaster prospect is in the Black Knob mining district, about 14 miles northeast of Lovelock. Rocks in the area consist of beds of limestone, limestone breccia, and conglomerate. Cinnabar occurs as disseminated crystals in a northwesterly striking, northeasterly dipping bedding plane shear zone. Development openings consist of a 50-foot inclined shaft and numerous trenches. No mercury was produced.

Storey County

Taylor Branch Prospect

The Taylor Branch prospect is in an unnamed mining district, about 1 mile south of Clark Station. Rocks in the area are altered andesite tuff and breccia, overlain by unaltered flows of andesite. Cinnabar occurs as scattered crystals in the tuff and fills incipient fractures in the silicified rock. Mine workings consist of a 54-foot inclined shaft, 200 feet of drifts on the 32-foot level, and several open cuts and pits. A very small output of mercury was made.

Washoe County

Wheeler Ranch Prospect

The Wheeler Ranch prospect is in an unnamed mining district, about 7 miles south of Reno. Cinnabar occurs as veinlets along northerly trending faults that also contain discontinuous and irregular quartz veins. It is also found in fractures in the quartz and as disseminated crystals in the altered wall rocks. Underground workings reportedly included a 164-foot adit, a 45-foot winze, and drifts extending from the bottom of the winze. Intermittent operations from 1875 to 1940 produced a very small quantity of mercury.

TABLE 24. - Nevada mercury properties

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
OPALITE DISTRICT							
Cordero mine.....	Humboldt...	Secs 27, 28, 33, 34, T 47 N, R 37 E.	78,356.....	Open pits, vertical shafts, underground workings.	With native mercury and calomel disseminated in opalite bodies.	E. Aznarez, T. Alcorta, and J. Ondarez	1, 12, 15
Disaster Peak property.	do....	Sec 10, T 47 N, R 34 E.	Occurrence....	Open cuts, two short adits.	Small zone in silicified volcanics.	Harry Bretchell	1, 2, 15
Josepa location....	do....	Unknown.....	do.....	Underground workings.	Unknown.....	Unknown.....	-
NATIONAL DISTRICT							
Buckskin Peak mine.	Humboldt...	Sec 11, T 45 N, R 39 E.	Over 100.....	Tunnel, shaft, adits, and open cuts.	Disseminated in flat layer of opalite.	John Dermody...	1, 2, 7, 10
Canyon Creek-prospect.	do....	Sec 13, T 45 N, R 38 E.	Small production.	Two short adits.....	In shear zone within basic dike.	Unknown.....	1
Stall property.....	do....	Sec 31, T 45 N, R 39 E.	Slight.....	Two shafts, drifts, adits, surface cuts.	Fracture filling and disseminated in altered rhyolite.	F. W. Stall....	1
BOTTLE CREEK DISTRICT							
Ant Hill mine.....	Humboldt...	Sec 7, T 40 N, R 33 E.	A few.....	Shafts, three levels, glory hole.	Disseminated in opalite and veinlets in clay.	Mrs. Eva McAdoo	1, 2
B and B prospect...	do....	Secs 6, 7, T 40 N, R 33 E.	Several.....	Incline, drifts, two small glory holes.	Fracture filling in silicified tuff.	do.....	1
Baldwin property (Blue Bucket, Blue Bottle).	do....	Sec 8, T 40 N, R 33 E.	About 140.....	Shaft with several levels, adit, glory hole.	Disseminations in opalite in fault zones.	H. W. Baldwin..	1, 2, 8
Birthday group.....	do....	Sec 18, T 40 N, R 33 E.	A few hundred.	Extensive underground workings.	In diabase dike crossing tuffs and basalt.	D. J., M. R., G. Wootan and others.	1, 2, 8
Blue Can mine.....	do....	Sec 7, T 40 N, R 33 E.	About 1,700...	do.....	Localized in or replaced diabase dike.	C. P. Hoskins and others.	1, 8
Franklin-Keeney prospect.	do....	Sec 29, T 41 N, R 32 E.	Occurrence....	50-foot shaft, short drifts.	In fault zone in rhyolite and andesite tuffs.	Abandoned.....	1
Hagen-Hegan.....	do....	Sec 1, T 40 N, R 32 E.	do.....	400-foot adit with inclines, raises.	Disseminations in altered tuffs and flows.	do.....	1
McAdoo mine.....	do....	Sec 7, T 40 N, R 33 E.	About 1,700...	Extensive underground workings.	In brecciated fault zones along a basic dike.	Mrs. Eva McAdoo	1, 2, 8
Niebuhr prospect...	do....	Sec 36, T 41 N, R 32 E.	About 40.....	60-foot shaft, open cuts.	Coatings on rhyolite fragments in shear zone.	Thomas C. Niebuhr.	1, 8

TABLE 24. - Nevada mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
			BOTTLE CREEK DISTRICT--Continued				
Red Ore mine.....	Humboldt...	Secs 7, 18, T 40 N, R 33 E.	About 1,430...	Shallow shafts, short adits, and surface pits.	Ore-bearing diabase dikes.	James and Arnold Scossa.	1, 8, 12
Rogers-Burnison prospect.	do....	Sec 35, T 41 N, R 32 E.	Occurrence....	Underground workings, trenches.	Narrow stringers and disseminations in rhyolite tuffs and flows.	Abandoned.....	1
Vermillion group...	do....	Sec 1, T 40 N, R 33 E.	Several.....	Shallow shaft and trenches.	Mineralized diabase dike.	Walter L. Low and Charles H. Ogee.	-
White Peaks group..	do....	Sec 7, T 40 N, R 33 E.	About 500.....	Extensive underground workings.	Replacement, fracture filling and disseminations in diabase dike.	James and Arnold Scossa.	1, 8, 12
			POVERTY PEAK DISTRICT				
Cahill mine.....	Humboldt...	Sec 14, T 40 N, R 40 E.	About 1,200...	Several thousand feet of underground workings, open cuts, trenches.	Filling in fault gouge and replacement of dolomite.	Mrs. J. H. Cahill.	1, 10
Grayson property (Hapgood).	do....	Sec 11, T 40 N, R 40 E.	About 100.....	Extensive underground workings, open cuts.	Veinlets along shear zones and in replacements.	Sonoma Quicksilver Mines, Inc.	1
Holt prospect (Reed).	do....	Sec 24, T 41 N, R 40 E.	Occurrence....	Two shafts, adit, open cuts.	Along bedding shears and cross fractures in limestone.	Ralph Holt.....	1, 2
Prentiss prospect..	do....	Sec 11, T 40 N, R 40 E.	do.....	Two shafts, trenches.	Veinlets and disseminations in bedding shears in calcareous quartzite and limestone.	Mrs. J. A. Prentiss.	1
Snowdrift prospect (Zilkey).	do....	Sec 1, T 40 N, R 40 E.	do.....	Two short adits.....	In calcite veinlets in sandy limestone.	W. O. and R. J. Zilkey.	1
Turillas group (Red Ant).	do....	Sec 14, T 40 N, R 40 E.	Several.....	Extensive underground and surface workings	In breccia zones in silicified limestone, quartzite, and phyllite.	Sonoma Quicksilver Mines, Inc.	1
Wholey Quicksilver mine.	do....	Sec 11, T 40 N, R 40 E.	do.....	Underground workings.	Fault filling in sandy limestone.	J. C. Wholey...	1

IVANHOE MINING DISTRICT							
Butte Quicksilver mine (Rand, Bowers, Mayflower, Velvet, Ivanhoe).	Elko.....	Secs 4, 5, T 37 N, R 48 E; Secs 32, 33, T 38 N, R 48 E	About 1,000...	Extensive underground and surface workings.	Small veinlets and fissures in altered tuff.	George Dillon..	1, 2
Clementine.....	do....	Sec -, T 38 N, R 48 E.	A few.....	Unknown.....	Unknown.....	Unknown.....	-
Coleman mine.....	do....	Secs 35, 36, T 38 N, R 47 E.	do.....	Two shafts, surface workings.	Disseminations in opalite.	George Dillon..	1
Fox.....	do....	Secs 4, 5, T 37 N, R 48 E; Secs 32, 33, T 38 N, R 48 E	Occurrence....	Three shafts, drifts.	In opalized bed of ash.	Mrs. Elfrida Pangborn.	1
Governor group.....	do....	Sec 25, T 38 N, R 47 E.	Over 100.....	Closely spaced trenches and short adits.	In opalite beds.....	Governor Mercury Mines, Inc.	-
Halterman prospect.	do....	Unknown.....	A few.....	Unknown.....	Unknown.....	Unknown.....	-
Hatter prospect....	do....	Secs 34, 35, T 38 N, R 48 E	Occurrence....	Shallow shafts, short adits, pits.	In joints in white opalized rhyolite.	Mrs. M. Hatter.	1
Jackson and Surprise claims.	do....	Sec 1, T 37 N, R 47 E.	A few.....	Unknown.....	In bunches and veinlets disseminated in ash along fault.	Pick Mining Co.	1
Lark group.....	do....	Sec 30, T 38 N, R 48 E.	70.....	Shallow workings.....	In fractures in glassy black tuff.	John G. Murdock	1
Red Boy group.....	do....	Sec 34, T 38 N R 48 E.	A few.....	Shallow trenches, open pits.	Two small opalite deposits.	Mrs. M. V. Easterly.	1
Rimrock and Homestake properties (Hillside and Opal groups).	do....	Secs 17, 18, T 38 N, R 48 E.	Several.....	Short adits, two shallow shafts, open pit.	In opalized ash and tuff deposit.	E. T. Carlow and others.	1
Shoshone property (Barringer).	do....	Secs 3, 4, T 37 N, R 48 E	Occurrence....	Open pit, trenches...	In opalite and quartz-rich rhyolite	Pick Mining Co.	2
Silver Cloud mine (Clipper).	do....	Secs 25, 26, T 37 N, R 47 E.	About 1,000...	Large open pit, drifts.	Concentrated in opalized ash.	Mrs. Elfrida Pangborn.	1
Silver Fox mine....	do....	Sec 20, T 38 N, R 48 E.	Several.....	Shafts, underground workings, trenches.	Lenses and pods in opalized ash and tuff.	Mrs. Elfrida Pangborn and George Dillon.	1, 2
IMLAY DISTRICT							
Eldorado mine (Ruby, Black Jack)	Pershing...	Sec 25, T 31 N, R 33 E.	Over 1,100....	Underground workings, open cuts.	With other mercury minerals in ore bodies along limestone-shale contacts	Frank Noble and V. C. Biggs.	1, 13
GOLDBANKS DISTRICT							
Goldbanks Quicksilver mine.	Pershing...	Sec 14, T 30 N, R 38 E.	About 1,600...	Extensive underground workings, open pit.	In opalized rhyolite fragments.	Bradley Mining Co.	1, 4, 13
Pronto Plata.....	do....	Sec 6, T 30 N, R 38 E.	Slight.....	Short adits, trenches	Disseminated in rhyolite ash and breccia	H. W. Baldwin..	1

TABLE 24. - Nevada mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
MOUNT TOBIN DISTRICT							
Eureka mine.....	Pershing...	Sec 29, T 28 N, R 39 E.	Over 250.....	Shaft, drifts, open stope.	Lenses along fault in limestone.	W. W. Low.....	-
Hot group (Beacon).	do....	Sec 25, T 27 N, R 38 E.	A few.....	Short adit, trenches.	In barite veins cutting limestone and dolomite.	Rene and Fern Amat.	-
Last Chance prospect (Rat Hole).	do....	Sec 36, T 29 N, R 39 E.	Several.....	Several hundred feet of drifts, two glory holes.	Fracture filling in sandstone and shale.	Virgil Olson and others.	1
Mercury King prospect (North Fork)	do....	Sec 25, T 29 N, R 39 E.	About 10.....	Underground workings, open cuts.	Fracture filling in sandstone and conglomerate.	W. F. Gertz....	1
Mount Tobin mine (Miners' Dream).	do....	Sec 6, T 28 N, R 40 E.	Over 1,400....	Underground workings, two glory holes, trenches.	Along fault in shale and conglomerate.	W. W. Low.....	1
SPRING VALLEY DISTRICT							
Alpine prospect....	Pershing...	Sec 5, T 27 N, R 35 E.	1.....	Shallow shaft, open cuts.	Ore-bearing calcite vein in limestone.	Abandoned.....	1
Happy Day mine.....	do....	Sec 12, T 28 N, R 34 E.	A few.....	50-foot adit.....	Veinlets and small pockets along calcite vein in limestone.	Virgil Olson and others.	-
Hillside mine.....	do....	Secs 1, 6, 7, T 28 N, R 35 E.	Over 150.....	Shaft, three levels..	Along shear zone in volcanic rocks and limestone.	W. E. Simpson, Sr., and W. E. Simpson, Jr.	1
King George mine...	do....	Sec 1, T 28 N, R 34 E.	About 325.....	Extensive underground workings.	In calcite vein in limestone at fault intersection.	E. N. Honn, and Chas. Stackhouse.	1, 13
Little Linda property.	do....	Sec 12, T 28 N, R 34 E.	Several.....	Short adits.....	In fractures in limestone.	T. A. Cowan....	-
Walker mine.....	do....	Sec 10, T 28 N, R 34 E.	Over 150.....	Underground workings and open cuts.	Shear zone in felsite.	W. M. Fisk.....	1
ANTELOPE SPRINGS DISTRICT							
Bunker Hill group..	Pershing...	Secs 29, 30, 31, 32, T 27 N, R 34 E.	Several.....	A shaft, adit, pits..	Along calcite veinlets in limestone.	C. E. Grelle...	1, 13
Crawford prospect..	do....	Sec 15, T 26 N, R 34 E.	A few.....	Adit, drift.....	Along dolomite-sandstone contact.	Southworth Co..	1
De Witts and Dinge prospect.	do....	Sec 14, T 26 N, R 34 E.	Occurrence....	Shallow shaft, open cuts.	Along bedding plane shear in limestone.	Jack Foster estate.	-
Eastern Star mine..	do....	Sec 16, T 26 N, R 34 E.	Small(included with Pershing mine records)	Shallow shafts, adits, drifts, open cut.	Along sandstone-dolomite contact.	Warner Meissner	-

Good Spot prospect (Vulture group).	do....	Sec 30, T 27 N, R 34 E.	A few.....	Underground and surface workings.	Along fault and veinlets in dolomite.	Harold's Club Mining Co.	1
Hard Luck property (S and J, E and H)	do....	Sec 32, T 27 N, R 34 E.	Small.....	Underground workings.	Along limestone dolomite contact and disseminated in conglomeratic dolomite.	Hugo Muller....	1
Juniper mine (Nevada Quicksilver).	do....	Sec 32, T 27 N, R 34 E.	Over 3,300....	5,000 feet of underground workings.	Calcite veinlets cutting limestone and in breccia zone.	Wayne Stoker and Lewis Dinge.	1, 13
Lori No. 1 mine....	do....	Sec 9, T 26 N, R 34 E.	Small.....	Shaft, adits, drifts, glory hole.	Disseminations in sandstone and veinlets in conglomeratic dolomite.	Allen and Walter Brinkerhoff.	-
Montgomery mine....	do....	Sec 16, T 26 N, R 34 E.	About 500.....	Extensive adits and inclined stopes.	With stibnite in brecciated dolomite and disseminated along dolomite-sandstone contact.	Stanford Bunce and Roy Haukins.	1, 2
Pershing mine.....	do....	Secs 8, 9, T 26 N, R 34 E.	Over 4,000....	Extensive underground workings, open pit.	With native mercury along sandstone-dolomite contact and disseminated in the dolomite.	United Mercury Corp.	1, 2, 13
Red Bird mine.....	do....	Secs 28, 33, T 27 N, R 34 E.	Over 1,500....	Three adits connected by raises and stopes.	Along faults in limy conglomerate under shale capping.	Clarence Young.	1
WILD HORSE DISTRICT							
McCoy mine (Liquid Metal, United Mercury).	Lander.....	Sec 15, T 23 N, R 40 E.	Over 200.....	1,200 feet of adits and shallow shafts, open pits.	In breccia zones in limestone and along fractures in sandstone.	Melvin and Mabel McCoy, and others.	1, 3
Red Bird group prospect.	Churchill..	Sec -, T 23 N, R 38 E.	Several.....	Underground.....	Unknown.....	Unknown.....	-
Wild Horse mine....	Lander.....	Sec 20, T 23 N, R 40 E.	Nearly 900....	Underground workings, glory holes.	Ore bodies in fractured silicified limestone.	Wildhorse Quicksilver Mining Co.	1, 3
CASTLE PEAK DISTRICT							
Castle Peak mine...	Storey.....	Sec 20, T 18 N, R 21 E.	Over 2,500....	Extensive underground workings, glory hole, and trenches.	With calomel and native mercury in pipes and pods along faults.	Castle Peak Mining Co.	1
Taylor Branch location.	do....	Sec 35, T 20 N, R 22 E.	Occurrence....	Unknown.....	Unknown.....	Unknown.....	-
Washington Hill prospect.	do....	Sec 5, T 18 N, R 21 E.	A few.....	Adit, open pit.....	Irregular veins in altered tuff and agglomerate.	H. E. Lufek estate.	1, 2

TABLE 24. - Nevada mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
UNION DISTRICT							
Humphrey location..	Nye.....	1 mile from San Pedro mine.	A few.....	Shaft.....	In alluvium.....	F. Humphrey....	1
Indian Johny Dick location.	do.....	Sec 2, T 12 N, R 39 E.	do.....	Trenches.....	Fault zone in silicified limestone and conglomerate.	Abandoned.....	-
Mercury Mining Co. mine (Prescott, Ione).	do.....	Sec 1, T 12 N, R 39 E.	Over 7,000....	Extensive underground workings, glory holes	With native mercury in limy shales and altered andesite near faults.	Basil Prescott and R. R. Piatt.	1, 2
Nevada Cinnabar mine (Shoshone).	do.....	Sec 12, T 12 N, R 39 E.	About 4,000...	Two large glory holes with haulageways.	In volcanic tuff along fault.	Keough and Larson Development Co.	1, 2
San Pedro group....	do.....	Sec 31, T 12 N, R 40 E.	About 50.....	Underground workings, open cuts.	Disseminated in tuff bed.	L. O. Warfield.	1
Two Injun location.	do.....	Sec 11, T 12 N, R 39 E.	Occurrence....	Trenches.....	Along fault zone crossing silicified limestone and conglomerate.	Abandoned.....	1
War Cloud location.	do.....	Sec 1, T 14 N, R 39 E.	do.....	Unknown.....	In rhyolite and and obsidian.	Obie La Favor and J. F. Schweble.	1
Yellow Cat prospect	do.	Sec 1, T 12 N, R 39 E.	20.....	Shaft, 150 feet of drifts.	Veinlets and lenses in shear zone in interbedded shales and limestones.	L. O. Warfield.	1
BELMONT DISTRICT							
Flower group (Fiorite).	Nye.....	Sec 33, T 10 N, R 45 E.	Small.....	Shallow shafts, short drifts.	Along sheared contacts of phyllite bed.	Frank Warren.	1
Mariposa Canyon prospect.	do.....	Sec 16, T 9 N, R 44 E.	A few.....	45-foot adit, raise.	In micaceous footwall of quartz-barite vein, with metacinnabarite.	J. W. Chapman.	1
Mariposa Wildcat prospect.	do.....	Sec 1, T 9 N, R 44 E.	Small.....	Trenches.....	In quartz-barite veins.	R. E. and M. J. Abernathy and L. J. Larsen.	1
Red Bird mine (Senator).	do.....	Sec 1, T 9 N, R 44 E.	About 135.....	Adits, stopes, trenches.	With metacinnabarite in quartz-barite veins in granite.	do.....	1
Van Ness mine.....	do.....	Sec -, T 9 N, R 44 E.	About 800.....	Extensive underground workings, two glory holes.	Veinlets in narrow bed of metamorphosed chert.	John Connoly...	1

TYBO DISTRICT							
A and B mine.....	Nye.....	Sec 23, T 5 N, R 49 E.	About 200.....	Three levels, surface workings.	Shear zone in rhyolite tuff.	M.F. and Lorena Peterson and others.	1
M and M mine.....	do.....	Sec 23, T 5 N, R 49 E.	About 95.....	Underground workings.	Along joints in altered rhyolitic tuff.	do.....	1
PILOT MOUNTAINS DISTRICT							
Allen mine.....	Mineral....	Sec 20, T 6 N, R 36 E.	About 50.....	Adits, drifts, stopes.	Along fault zone.....	K. W. Dunham...	1, 6
Betty mine.....	do.....	Sec 23, T 6 N, R 36 E.	About 100.....	500 feet of underground workings.	Lenses along breccia zone in chert.	Mrs. Teresa Betty.	1, 6
Cardinal property..	do.....	Sec 14, T 6 N, R 35 E.	Over 100.....	Several hundred feet of underground workings, open pit.	Along fault zone in chert.	K. W. Dunham...	1, 6, 14
Coveney prospect (Fault Line).	do.....	Sec 15, T 6 N, R 36 E.	A few.....	100 feet of underground workings.	Along shear zone in shale.	Clay Coveney and Herbert Pickle.	1, 6
Drew mine (Red Devil).	do.....	Sec 14, T 6 N, R 36 E.	Over 900.....	Several hundred feet of underground workings on three levels.	Limestone replacement near fault zones.	Mrs. Emily Phillips.	1, 5, 6, 14
Fletcher prospect..	do.....	Sec 22, T 6 N, R 36 E.	Occurrence....	150 feet of underground workings, trenches.	In highly broken cherts, shales, and altered volcanic rocks.	J. V. Meiser...	6
Hasbrouck prospect (Worlock).	do.....	Sec 16, T 6 N, R 36 E.	Several.....	Underground workings, open cuts.	Along bedding shears and a fault in conglomerate.	Mrs. Worlock...	1
Hitt mine.....	do.....	Sec 20, T 6 N, R 36 E.	Over 50.....	Several hundred feet of underground workings, glory hole.	Along fault and in bedding planes in sandstone.	K. W. Dunham...	1, 6, 14
Inman mine.....	do.....	Sec 23, T 6 N, R 36 E.	About 70.....	750 feet of underground workings.	Fracture filling in chert.	Clay Coveney and Herbert Pickle.	1, 5, 6
Keg prospect.....	do.....	Sec 15, T 6 N, R 36 E.	Small.....	75-foot shaft, short adits.	Along fault zone in limy shale.	Mina Development Co., A. J. Anderson and L.B. Spencer.	1, 6
Lakeview property (Chong Wong).	do.....	Sec 12, T 6 N, R 36 E.	do.....	Two adits, several hundred feet of drifts, trenches.	In calcite veins in limestones and along faults.	Abandoned.....	1, 5, 6, 14
Lost Steers group..	do.....	Sec 14, T 6 N, R 36 E.	Over 344.....	Small glory hole, underground workings.	Along fault zone in limestone.	A. J. Anderson and L. B. Spencer.	1, 5, 6, 14
Mammoth mine.....	do.....	Sec 17, T 6 N, R 36 E.	About 70.....	Underground workings, glory hole.	As fault filling and in calcite veins near fault in sediments.	Abandoned.....	1, 6

TABLE 24. - Nevada mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
PILOT MOUNTAINS DISTRICT--Continued							
Mina Development Co. mine.	Mineral....	Sec 15, T 6 N, R 36 E.	About 2,800...	Extensive underground workings.	In limestone at fault intersections.	A. J. Anderson and L. B. Spencer.	1, 5, 6, 14
Moser Mercury mine.	do....	Sec 14, T 6 N, R 36 E.	A few.....	Trenches.....	Along fault in limestone.	Carl Moser.....	-
Red Wing mine (Wildwood).	do....	Secs 17, 20, T 6 N, R 36 E.	do.....	Underground workings, trenches.	In fissure filling in silicified limestone	J. A. Berry....	1, 6
Reward property....	do....	Sec 16, T 6 N, R 36 E.	Over 500.....	Several hundred feet of underground workings.	Along fault in sandy limestone.	R. D. Canavan..	1, 2, 6, 14
Sullivan prospect (Black Lizard).	do....	Sec 34, T 6 N, R 36 E.	A few.....	Open pits and trenches.	Along fault in chert.	J. V. Meiser...	1, 6
FISH LAKE VALLEY (ONEOTA) DISTRICT							
Argentite property.	Esmeralda..	Unknown.....	A few.....	Unknown.....	Unknown.....	Unknown.....	-
B and B property...	do....	Sec 1, T 1 S, R 33 E.	Over 4,000....	Three adits, glory hole, trenches.	In opalized layers in tuff.	Kollsman Mineral and Chemical Corp.	1, 2
Buckskin.....	do....	Unknown.....	2.....	Unknown.....	Unknown.....	Unknown.....	-
Container mine.....	do....	Sec 13, T 1 S, R 33 E.	81.....	Underground workings, open pits.	With barite in small veinlets along breccia zones in silicified rocks.	Lee Pitts.....	1
F and L property...	do....	Sec 36, T 1 N, R 33 E.	Several.....	Shallow shafts, adits, trenches.	Disseminated in two opalite bodies.	Kollsman Mineral and Chemical Corp.	1, 2
Last One prospect (McNett).	do....	Sec 21, T 1 S, R 34 E.	Occurrence....	Shallow shaft, open pits, churn drill holes.	Along fractures in opalite body.	Sam and Bill Wright.	-
O.K. prospect.....	do....	Sec 16, T 1 N, R 33 E.	A few.....	Three short adits....	In fault gouge, breccia, and vertical joints.	Guy Tumblin and H. M. Brown.	1
Red Cloud prospect.	do....	Sec 2, T 1 S, R 33 E.	Occurrence....	Unknown.....	Unknown.....	Abandoned.....	-
Red Rock mine.....	do....	Sec 18, T 1 S, R 34 E.	Over 2,000....	Extensive underground workings, open pits.	Near fault intersections in metamorphic rocks.	W. F. Dunnigan.	1
Red Rose prospect..	do....	Secs 34, 35, T 1 N, R 33 E.	Several.....	Incline, open cut....	In fault gouge and in rhyolite footwall.	R. D. Sommerville.	1
Starlight mine (Mount Montgomery, Wild Rose).	do....	Sec 21, T 1 N, R 33 E.	About 150.....	1,100 feet of underground workings, open pits.	In fault gouge in opalite.	Chas. R. Pedro.	1

LONE PINE DISTRICT							
Antelope property..	Washoe.....	Sec 10, T 45 N, R 21 E.	Occurrence....	Incline and trenches.	Along shear zones in argillized andesite.	C. B. Mathews and others.	1, 2, 9
RED BUTTE DISTRICT							
Rattlesnake Canyon property.	Humboldt...	Sec 2, T 37 N, R 30 E.	13.....	Shafts and trenches..	Fracture filling.....	W. S. Low.....	1
SULPHUR DISTRICT							
Nevada Sulphur mine (Black Rock).	Humboldt...	Sec 36, T 35 N, R 29 E.	Over 70.....	Glory holes, adits, drifts.	As coating and filling in agglomerates and tuffs.	H. C. Crofott..	1
DUTCH FLAT DISTRICT							
B and D property (Red Devil).	Humboldt...	Sec 5, T 37 N, R 40 E.	Several.....	Shallow incline, drifts, trenches.	Along shear zone in arkose.	Frank, Cris, and Cleto Bengea.	1
Dutch Flat mine (Paradise).	do....	Sec 8, T 38 N, R 40 E.	do.....	Inclines, short drifts, open cuts.	In altered andesite and along shear zone	Dutch Flat Mines, Inc.	1
Last Chance prospect.	do....	Sec 21, T 38 N, R 40 E.	Small.....	Shallow shaft and trenches.	Along shear zone in andesite.	J. H. Mullinix.	1
TUSCARORA DISTRICT							
Berry Creek group (Silverado).	Elko.....	Sec 7, T 39 N, R 51 E.	Small.....	Adit, incline, trenches.	Along shear zone in altered andesite.	Earl Whinery and Associates	1
Red Bird group (Silverado).	do....	Sec 26, T 40 N, R 51 E.	do.....	Shaft, two short adits, open cut.	With pyrite and native mercury in altered andesite and along shear zone.	Mrs. Nona Trimbath, and Roy Roseberry.	1
ROCK CREEK DISTRICT							
Horse Mountain property.	Elko.....	Sec -, T 40 N, R 49 E.	Several.....	Adit, drift, trenches.	Along fault zone in rhyolite.	G. C. Stagg and A. J. Quilici.	-
Rock Creek.....	do....	Sec -, T 40 N, R 48 E.	Occurrence....	Trenches.....	Along fault zone in altered andesite.	J. W. Gainey...	1
Teapot prospect....	do....	Sec 12, T 40 N, R 49 E.	A few.....	Shaft, trenches.....	Along shear zone in andesite.	Louis Salet....	1
BEOWAWE DISTRICT							
Beowawe mine (Nevada-Mexican).	Eureka.....	Sec 8, T 31 N, R 49 E.	Over 132.....	Extensive underground workings, surface cuts.	Along fractures and rubble zone in silicified limestone conglomerate.	Nevada-Mexico Mining Corp.	1, 11
WARM SPRINGS DISTRICT							
Warm Springs prospect (Mercury)	Lander.....	Sec 24, T 27 N, R 43 E.	Several.....	Shallow shaft, drift, trenches.	Along fault in altered rhyolite and tuff.	Henry Filipini.	1
KENNEDY DISTRICT							
Jackpot property (Wootan).	Pershing...	Sec 22, T 29 N, R 38 E.	A few.....	Trenches, short adit, incline.	Along fractures in limestone and shale.	Walter and Dorothy Low.	2
Joe property (Coss, Old Timer).	do....	Sec 22, T 29 N, R 38 E.	do.....	Adit, shallow shafts, trenches.	Along shear and breccia zones in limestone and quartzite.	Rene and Fern Amat.	1, 2

TABLE 24. - Nevada mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
			STILLWATER (TABLE MOUNTAIN) DISTRICT				
Black Dyke prospect.	Pershing...	Sec 11, T 25 N, R 35 E.	Occurrence....	Three short adits....	Along shear zone in granite-sedimentary contact.	Abandoned.....	1
Freckles mine (Roman).	do....	Secs 27, 34, T 26 N, R 36 E	Over 600.....	Underground shaft, drifts, surface cuts	In limestone along shale contact.	W. J. Baker....	1
Linda K. location..	do....	Sec 30, T 26 N, R 37 E.	A few.....	Unknown.....	Unknown.....	Unknown.....	-
Rosebud prospect...	Churchill..	Sec 20, T 24 N, R 35 E.	do.....	Adits, shallow pits..	Veinlets in sandstone and in calcite veins in limestone.	John Dekinder estate and L. Swycaffer.	1, 2
Storm location.....	Pershing...	Sec 36, T 26 N, R 36 E.	Occurrence....	Unknown.....	Unknown.....	Unknown.....	-
Victory prospect...	do....	Sec 25, T 26 N, R 36 E.	do.....	Three shallow shafts, open cuts.	In shear zone along limestone-shale contact.	Joaquin Aberness and others.	1
			STEAMBOAT SPRINGS DISTRICT				
Steamboat Springs mine.	Washoe.....	Sec 32, T 18 N, R 20 E.	Small.....	Short adits, open pits.	In granite, andesite breccia, and basalt near hot springs.	Unknown.....	1
			HOLY CROSS DISTRICT				
Cinnabar Hill mines (Robinson).	Churchill..	Secs 15, 16 21, 22, T 15 N, R 30 E.	Small.....	Adit, incline, drifts, open cuts.	Along fault in altered andesite.	Unknown.....	1, 10
			BOVARD DISTRICT				
Poinsettia mine....	Mineral....	Secs 33, 34, T 11 N, R 33 E.	Several.....	188-foot shaft, two levels with crosscuts.	Along fault zone in andesite tuff.	V. S. Baxter and Chas. Milan	1
			MAMMOTH DISTRICT				
Antelope prospect..	Nye.....	Sec -, T 12 N, R 37 E.	A few.....	40-foot shaft, trenches.	Along altered fault zone in limestone.	E. H. Berryman	-
			FAIRPLAY DISTRICT				
Finger Rock prospect.	Nye.....	Sec 29, T 11 N, R 36 E.	Some.....	Adits, small glory hole.	Along fault zone in tuff.	Unknown.....	1
North Star mine (Scheebar).	do....	Secs 15, 16, T 11 N, R 37 E.	Small.....	Adit, shafts, glory hole, open cuts.	With scheelite in marble.	James O'Brien and Fred Wallace.	1
			PEAVINE CANYON DISTRICT				
Horse Canyon mine (Gabbs).	Nye.....	Secs 8, 9, T 9 N, R 42 E.	Over 500.....	Adits, drifts, open cuts.	Along shear zones in shale and sandy limestone.	Floyd Miller and Thomas Patterson.	1

CEDAR MOUNTAINS DISTRICT							
Lou prospect (Costa).	Mineral....	Sec 6, T 8 N, R 36 E.	A few.....	Adit, winze, sub-level, open cuts.	In lenses along fault in andesite and rhyolite.	Eric Nelson....	1
QUEEN CITY DISTRICT							
Black Hawk mine....	Nye.....	Sec 13, T 2 S, R 53 E.	About 70.....	Shallow shaft, two levels, open cuts.	Along sandstone-limestone contact.	Mrs. Hazel Mellan.	1
Mercury prospect (Fallini).	do....	Sec 12, T 2 S, R 53 E.	Occurrence....	Unknown.....	As nuggets, and coating on limestone and quartz gravel, within limestone cave.	Fallini Brothers.	1
Oswell property....	do....	6 miles southeast of Cedar Springs.	do.....	do.....	Unknown.....	Unknown.....	1
TEM PIUTE DISTRICT							
Andies property....	Lincoln....	Sec 4, T 5 S, R 56 E.	A few.....	Shaft, adit, trenches	Along faults in andesite and rhyolite flows.	C. A. Anderson and R. R. Robinson.	-
VIOLA DISTRICT							
Crystal-Bluenose prospect (Larson).	Lincoln....	Sec -, T 8 S, R 68 E.	Slight.....	Shallow shaft, trenches.	As veinlets in limestone and disseminated in altered talc capping.	Crystal Mining Corporation of Nevada.	-
FLUORINE DISTRICT							
Harvey mine (Mercury).	Nye.....	Sec 36, T 12 S, R 48 E.	Over 80.....	2,000 feet of underground workings, open pit.	In pods of chalcedony and opal in limestone.	Paul Mix.....	1
Thompson mine.....	do....	Sec 29, T 11 S, R 48 E.	Small.....	Shaft, two levels, open cut.	Coatings in sheared silicified rocks and in veinlets of soft, waxy clay.	A. J. Thompson.	1, 2
Tip Top mine.....	do....	Sec 36, T 12 S, R 48 E.	Unknown.....	100-foot adit, winze, trenches.	In fault gouge in limestone.	Mrs. E. F. Harvey and Dr. H. B. Blenstrub.	1
Wright prospect (Colvin, Lottie).	do....	Sec 30, T 11 S, R 48 E.	Occurrence....	Unknown.....	Unknown.....	Unknown.....	-
MISCELLANEOUS CHURCHILL COUNTY OCCURRENCES							
East Gate district.	-	Sec -, T 15 N, R 39 E.	Occurrence....	Unknown.....	In opalite.....	Unknown.....	1
Erway property.....	-	Sec -, T 22 N, R 27 E.	do.....	Shallow pits.....	With sulfur, and gypsum in silicified tuff near hot springs.	G. W. Erway....	1
Fairview.....	-	Sec -, T 16 N, R 34 E.	do.....	Unknown.....	In gold vein.....	Unknown.....	1
Mountain Wells.....	-	Sec -, T 18 N, R 32 E.	do.....	do.....	Unknown.....	do.....	1

TABLE 24. - Nevada mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
MISCELLANEOUS CLARK COUNTY OCCURRENCES							
Patsy prospect.....	-	Sec -, T 26 S, R 64 E.	Occurrence.	Two shafts, open cuts.	With native mercury and gold in volcanics.	P. A. Simons and J. A. Thacke.	1
Goodsprings (Kirby, Yellow Pine, Fredrickson, Red Cloud)	-	Sec -, T 24 S, R 59 E.	do....	Lead-zinc and gold mines.	Coatings on oxidized lead minerals in limestone.	Unknown.....	1
MISCELLANEOUS ELKO COUNTY OCCURRENCES							
Golden Eagle prospect.	-	74 miles north of Elko.	Occurrence.	Trenches.....	In opalite.....	J. C. Woodard and George Stoker.	-
MISCELLANEOUS ESMERALDA OCCURRENCES							
Alum.....	-	10 miles south of Blair Junction.	Occurrence.	Unknown.....	With sulfur and alum....	Unknown.....	1
Castle Rock (North End Cinnabar and West Side Cinnabar)	-	Secs 21, 28, T 3 N, R 38 E.	do....	Incline, short adits, trenches.	With jarosite and chalcedony in silicified andesite tuff breccia.	F. V. Bovard and others.	1
Montezuma property.	-	Sec 17, T 3 S, R 41 E.	do....	Adits, drifts, open cuts.	Disseminated in opalized tuff.	Kollsman Mineral and Chemical Corp.	1
Riek prospect.....	-	Sec 11, T 1 S, R 35 E.	do....	40-foot shafts, adit, trenches.	With sulfur in fractures in tuff.	W. G. Weatherford and Carl Riek.	1
MISCELLANEOUS EUREKA COUNTY OCCURRENCES							
Lynn district.....	-	20 miles northwest of Carlin.	Occurrence.	Unknown.....	Placer gravels.....	Unknown.....	1
Rossi prospect.....	-	Sec 10, T 26 N, R 48 E.	do....	Four shallow shafts, trenches.	In limestone.....	Tony Rossi.....	1
MISCELLANEOUS HUMBOLDT COUNTY OCCURRENCES							
Gayer-Moo prospect.	-	Sec 1, T 35 N, R 38 E.	Occurrence.	Unknown.....	Along rhyolite dike in sandstone and quartz breccia.	James Gayer and R. W. Moo.	1
Getchell mine.....	-	3 miles north of Golconda.	do....	Large gold mine.....	In quartz with gold.....	Getchell Mines, Inc.	1
Langworthy property	-	5 miles northwest of Winnemucca.	do....	Unknown.....	In calcite veins cutting slates, with gold and silver.	Paul Langworthy..	1
Plymouth prospect..	-	Sec 1, T 35 N, R 38 E.	do....	do.....	Pods and veinlets along rhyolite dikes in sandstone.	F. R. O'Leary....	1
MISCELLANEOUS LANDER COUNTY OCCURRENCES							
Rast prospect (Valley View).	-	Sec 27, T 21 N, R 45 E.	Occurrence.	50-foot shaft, trenches.	In limestone.....	Abandoned.....	1
MISCELLANEOUS MINERAL COUNTY OCCURRENCES							
Montgomery Summit prospect.	-	Sec 36, T 2 N, R 32 E.	Occurrence.	Pits.....	Along shear in rhyolite and tuff.	James Houghton and J. L. Newsom	1

Noguez prospect....	-	Secs 25, 36 T 3 N, R 31 E.	A few.....	600 feet of adits, glory hole, trenches	With gypsum and sulfur in veinlets along shear zone in silicified tuff.	Joseph Noguez....	1
Southview property.	-	2 miles south of Pactolus, north end of Cedar Mts	Occurrence.	Unknown.....	In andesite.....	C. Garrett.....	1
Stockton prospect..	-	Secs 3, 10, T 13 N, R 31 E.	do....	165-foot adit.....	Disseminated in opalite and tuff.	W. W. Stockton...	1
MISCELLANEOUS NYE COUNTY OCCURRENCES							
Bristol group.....	-	Southeast end of Kawich Range.	Occurrence.	Unknown.....	With gold and silver in monzonite.	W. H. Brunton....	1
Diamondfield prospect.	-	Sec 21, T 2 S, R 43 E.	do....	Two shafts, trenches.	Along shear zone in silicified andesite.	Joe Murphy and Mrs. Lee Brotherton.	1
Ralston prospect....	-	Sec 28, T 4 S, R 43 E.	do....	Adits, shallow shaft, drifts.	In opalite and chalcedony stringers in rhyolite tuff.	E. A. Moross.....	1
Trojan prospect.....	-	Sec -, T 9 N, R 37 E.	do....	15-foot shaft, trenches.	In small seams along an andesite-rhyolite contact.	N. F. Kerr.....	-
West End silver-gold mine.	-	Sec -, T 3 N, R 42 E.	do....	Unknown.....	With pyrite and marcasite along fissures in volcanics.	Unknown.....	1
White Caps gold mine.	-	Sec -, T 8 N, R 44 E.	do....	Extensive underground gold mine.	In stringers within gold ore shoots in limestone	White Caps Mines, Inc.	1
MISCELLANEOUS ORMSBY COUNTY OCCURRENCES							
Valley View property.	-	Sec 15, T 15 N, R 20 E.	Occurrence.	Unknown.....	With jarosite in fracture zone.	J. S. Jewett and V. Cunningham.	1
MISCELLANEOUS PERSHING COUNTY OCCURRENCES							
Humboldt.....	-	½ mile south of Humboldt, west side of Southern Pacific R.R.	Occurrence.	Unknown.....	Native mercury with gypsum and sulfur in siliceous sinter deposits.	Unknown.....	1
Paymaster prospect.	-	Sec 14, T 27 N, R 33 E.	do....	50-foot incline, trenches.	Along shear planes in limestone, limestone breccia, and conglomerate.	do.....	1
Placeritas.....	-	9 miles south of Sulphur.	do....	Unknown.....	Placer gravels.....	do.....	1
Rosebud.....	-	Near Barrel Springs 3 miles south of Sulphur	do....	do.....	With cassiterite, hubnerite, and gold in placer gravels.	Monkota Trust Syndicate and others.	1
MISCELLANEOUS STOREY COUNTY OCCURRENCES							
Taylor Branch prospect.	-	Sec 35, T 20 N, R 22 E.	Occurrence.	54-foot shaft, drift, trenches.	Disseminated in tuff and fracture filling in silicified rock.	Unknown.....	1
MISCELLANEOUS WASHOE COUNTY OCCURRENCES							
Wheeler Ranch prospect.	-	Secs 3, 4, T 18 N, R 19 E; secs 33, 34, T 19 N, R 19 E.	Occurrence.	164-foot adit, 45-foot winze, drift.	Veinlets along faults...	Unknown.....	1

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CHAPTER 9. - MERCURY IN OREGON

by

Bureau of Mines Staff

INTRODUCTION AND SUMMARY

Oregon, during the past 40 years, has made a substantial contribution to the domestic production of mercury. Starting in 1926, there was a period of accelerated exploration and discovery of mercury deposits, coupled with an increase in output, which was sustained throughout the thirties. Many small deposits were found and some produced a few flasks of mercury for short periods; some of the major producers also were developed from prospects during this period.

The period of expanding mercury discovery and mining reached its peak during the early World War II years from 1940 to 1942. Since that time, there have been years of substantial production due largely to an increased output from two or three properties, rather than from new discoveries or increase in the number of producing mines. Table 25 clearly indicates this trend. The table also shows that total production reported from Oregon from 1882 through 1961, has been 103,121 flasks of mercury.

TABLE 25. - Production of mercury in Oregon, 1882-1961

Year	Producing mines	Flasks	Year	Producing mines	Flasks
1882-1900.....	1-2	266	1942.....	23	6,935
1901-05.....	1	117	1943.....	16	4,651
1906-10.....	1-2	490	1944.....	8	3,159
1910-15.....	1	5	1945.....	6	2,500
1916-20.....	2-3	1,828	1946.....	6	1,326
1921-25.....	1	61	1947.....	3	1,185
1926.....	-	-	1948.....	1	1,351
1927.....	3	2,055	1949.....	2	1,167
1928.....	4	3,710	1950.....	1	5
1929.....	5	3,657	1951.....	4	1,177
1930.....	7	2,919	1952.....	4	868
1931.....	5	5,011	1953.....	5	648
1932.....	7	2,523	1954.....	9	489
1933.....	5	1,342	1955.....	7	1,056
1934.....	11	3,460	1956.....	13	1,893
1935.....	10	3,456	1957.....	4	3,993
1936.....	13	4,126	1958.....	4	2,276
1937.....	14	4,264	1959.....	4	1,224
1938.....	13	4,610	1960.....	5	513
1939.....	14	4,592	1961.....	5	138
1940.....	23	9,043	Approximate total.....	-	103,121
1941.....	21	9,032			

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All the known mercury mines, prospects, and occurrences in Oregon are listed in table 26 at the end of this chapter. Because of the wide distribution and large number of deposits, the table is divided on a regional basis. An index map (fig. 10) shows the location of the principal deposits and boundaries of the regions. Summarized information on each property is in the table and includes references to the bibliography at the end of the report. References to source of information are not repeated in the text when given in the table.

ACKNOWLEDGMENTS

The information on most of the properties listed in this report was obtained from numerous Federal and State publications, and from county records.

The cooperation and assistance of officials of the State of Oregon Department of Geology and Mineral Industries and the many mine operators and individuals associated with the mercury-mining industry in various capacities is gratefully acknowledged.

HISTORY AND PRODUCTION

Cinnabar is reported to have been discovered in Oregon by early gold placer miners in alluvial deposits in the Jackson district in what is now Jackson County. The heavy, purple-red mineral accumulated in the sluice boxes with the gold.

As far as is known, the history of quicksilver mining in Oregon began with the discoveries at the Nonpareil and Bonanza mines in Douglas County in 1865. The mines were developed more than a decade later, in 1877 and 1879, respectively, but little is known of the production during this early period.

Other discoveries soon followed. Cinnabar was found in the Gold Hill district of Jackson County in 1878. The Black Butte mine in Lane County was found in the early nineties. Almaden Gold and Quicksilver Co. reported production of 3 flasks of quicksilver at Howard, in Crook County, in 1906. Schuette (*27*, p. 84)[1] estimates the total production of Oregon to the end of 1926 as close to 3,000 flasks of quicksilver. Table 25 shows a mercury production in Oregon of 103,121 flasks through 1961, ranking it third among the mercury-producing States of the Nation. The table also shows a remarkably unbroken record of production in Oregon during the period 1927 to 1959. Output has exceeded 1,000 flasks annually for all but 4 years during the period. The record is due largely to the Black Butte, Bonanza, Bretz, Horse Heaven, and Opalite mines which, together, produced 98,390 flasks, or 95 percent of the State total. It is encouraging that a few mercury mines in Oregon have been able to operate continuously through the periods of depressed market price for the metal, which have plagued the mercury-mining industry during the past 30 years.

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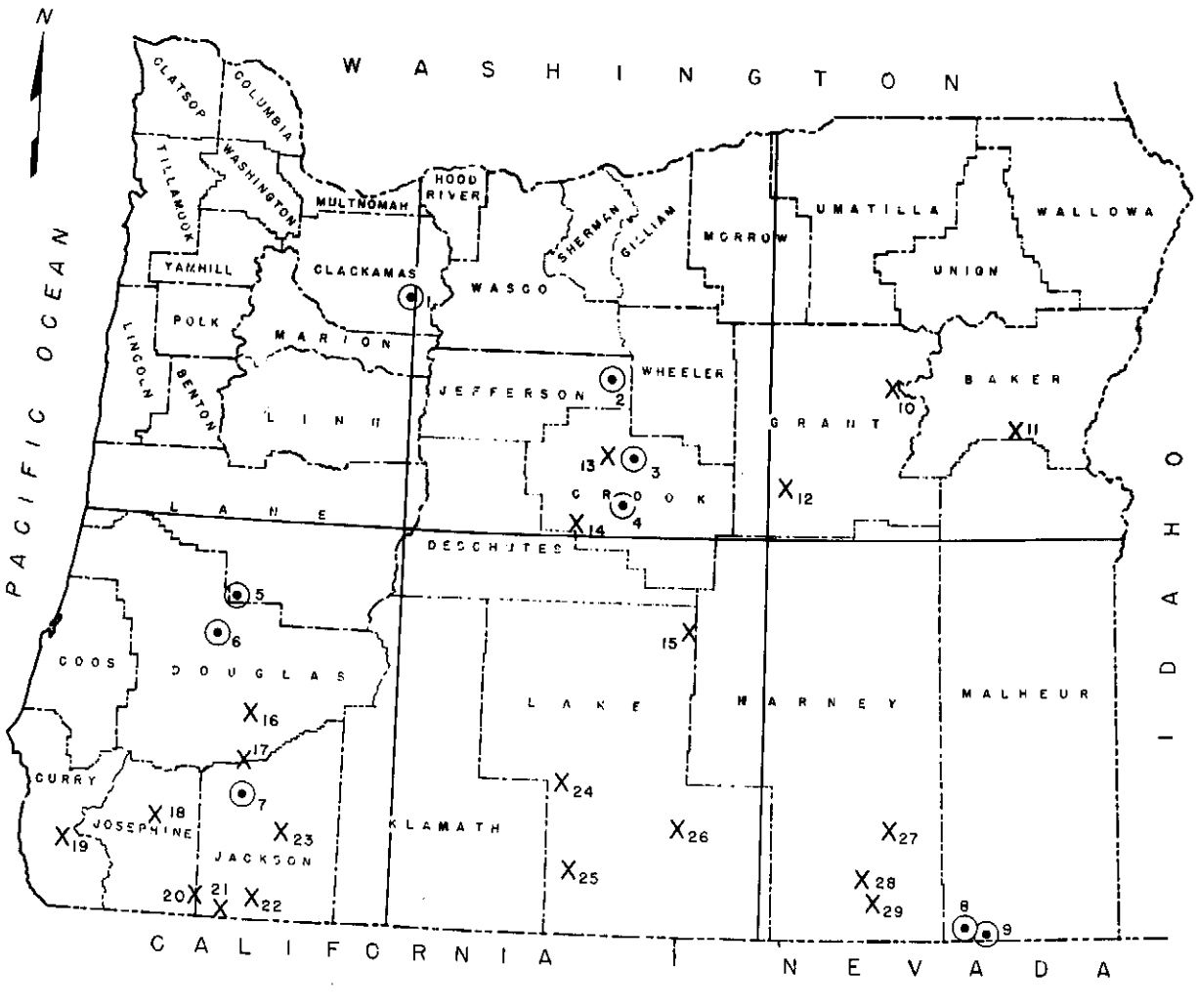
[1] Italicized numbers in parentheses refer to the bibliography at the end of this chapter.



⊙ MAJOR AREAS

1 NISBET MINE
2 AXE HANDLE and HORSE HEAVEN MINES
3 AMITY and MOTHER LODE MINES
4 MAURY MOUNTAIN MINE
5 BLACK BUTTE MINE
6 BONANZA MINE
7 MOUNTAIN KING, PACIFIC SYNDICATE and WAR EAGLE MINES
8 OPALITE MINE
9 BRETZ MINE

X MINOR AREAS

10 PARAMOUNT QUICKSILVER MINE
11 CLARK CREEK PROSPECT
12 ROBA QUICKSILVER MINE
13 BARNEY & STALEY and BYRON & OSCAR MINES
14 PLATNER MINE
15 GLASS BUTTES MINE
16 MAUDE S. MINES
17 OLD CODGER GROUP
18 DUVAL and POWELL
19 PASTORELLI MINING
20 WOODPECKER GROUP
21 RED FEATHER GROUP
22 BRICK PILE MINE
23 BROWN PROSPECT
24 CURRIER MINE
25 FOUR SQUARE CLAIMS
26 WINDY HOLLOW MINE
27 ALEXANDER MINE
28 O'KEEFE MERCURY CLAIMS
29 BLUE BULL MINE

0 25 50 75 100
Scale, miles

FIGURE 10. - Location Map of Mercury Deposits and Occurrences in Oregon.

The mercury reserves in Oregon as of 1957 were 8,000 flasks in measured and indicated ore and 7,300 flasks in inferred ore as estimated by the Geological Survey.[2] These estimated reserves are mostly in the larger and more productive areas and are of a grade minable at a price of about $250 per flask.

Conceivably, Oregon has unknown mercury deposits awaiting future discovery. Few, if any, of the small mines with a recorded production of mercury have been explored beyond the immediate mine area. The deep soil mantle and dense timber and vegetation, characterizing the western slope of the Cascades, the Pacific Coastal Plain, and the Coast Range of Oregon, hide possible ore bodies and make prospecting and surface exploration difficult. A renewed effort toward prospecting, exploration, and exploitation which would increase Oregon's mercury production and reserves must await a higher price for the metal.

PHYSICAL FEATURES

The Cascade Range, extending across the State from north to south, divides Oregon into two physiographic regions.

The western region is generally mild and humid. Water and timber are plentiful, and a thick mantle of residual soil covers much of the bedrock. Altitudes in the quicksilver districts range from 2,000 feet to about 6,600 feet, and the topographic relief is moderate to sharp. Most of the districts are conveniently accessible by railroad and highway transportation.

East of the Cascade Range the climate is generally semiarid to arid. Timber grows only at higher elevations, and the rocks are generally well exposed and outcrops easily visible. Altitudes range from 3,450 to 9,000 feet. Highways and towns are less frequent than in the western region and some quicksilver regions have minor transportation problems.

GEOLOGY

Mercury desposits in Oregon occur at shallow depths in regions of recent volcanic activity. Deposition of cinnabar is believed to have taken place in later Tertiary time and is known to have occurred as late as the Quarternary. Deposits are associated with thermal spring activity along lines of major faults. Ore bodies are found in fault fissures, breccia zones, bedding plane shear zones in sedimentary rocks, and in joint systems.

Host rock for mercury deposits can be either sedimentary or igneous. An important factor in deposition is permeability of the rocks. Coarse-grained tuffaceous sandstones, tuffs, and near-surface lake beds or breccia zones caused by premineral faulting are common host rocks. Sedimentary rocks vary in composition from coarse-grained sandstones to fairly recent lake deposits; igneous rocks from rhyolites to basalts.

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[2] Geological Survey Press Release No. 21902, Aug. 12, 1957.
Bureau of Mines. Minerals Yearbook, 1957, v. 1, p. 836.

The ore mineral is predominantly cinnabar, occasionally associated with metacinnabarite or native mercury. Gangue consists of silica and carbonate vein minerals or hydrothermal alteration products of the country rock such as opal, clay, and sericite. Sulfides of iron and arsenic can also be present. Mercury also occurs in coal and lignite seams.

MERCURY MINING DISTRICTS

The district system of associating mercury properties is not consistent throughout the State, and many quicksilver occurrences lie outside of recognized districts. For convenience, therefore, the mines and prospects in the State have been assigned to six geographic regions instead of mining districts as used in other States. Figure 10 shows the location of all the major mercury mines and many of the minor areas with reference to these six regions. More detailed information is given in the text for those mines which have produced more than 100 flasks of mercury, or for those properties where recent developments justify additional description.

DISTRICTS AND PROPERTIES

Table 26 at the conclusion of this chapter lists all mercury deposits in Oregon and gives the salient facts about each. To avoid unnecessary repetition the following individual property descriptions do not give the location and ownership or general references.

Southwestern Oregon Mines and Properties

Mercury deposits are more numerous and cover a larger area in southwestern Oregon than in any other section of the State. Deposits and occurrences have been found in Lane, Douglas, Coos, Curry, Josephine, and Jackson Counties. A belt 20 miles wide and 120 miles long, trending northward from the Oregon-California boundary to near Cottage Grove, and lying east of Grants Pass and Roseburg, covers the principal mineralized area.

This belt extends along the western foothills of the Cascade Mountains. The northern portion lies somewhat west of the foothills in open country. Toward the south the terrain becomes more rugged, except for the Rogue River and Applegate River valleys. Extremely rugged country prevails in the Siskiyou Mountains on the southern edge of the belt. The climate is mild throughout the year, with heavy rainfall, particularly in the fall and winter months. Except in the wide valleys devoted to agriculture, the region is heavily timbered and, in parts, covered by matted undergrowth.

Prospecting and surface exploration is difficult because of lack of exposures or outcrops. Highways and improved roads to nearby population centers and rail points are within a short distance from all points within the belt of deposits.

The region ranks first in the State in mercury production with 56,157 flasks, or 54.5 percent of the State's total production of 103,121 flasks. Two of Oregon's five largest mercury mines, the Bonanza and Black Butte have

contributed the bulk of this production; many small mines have produced a few flasks, and several have produced over 100 flasks.

Black Butte Mine

The Black Butte mine is on the slope of Black Butte in Lane County, about 16 miles by road south of Cottage Grove.

Mineralization at the Black Butte follows a main fault zone which roughly parallels the crest of the butte; the fault strikes about N 70° W, and dips about 55° northward. Mercury-bearing hydrothermal solutions, rising along the main fault zone, penetrated smaller faults to joints; strongly altered the rocks; and locally produced silicified zones which contain the oreshoots. Development of clay and calcite veinlets is characteristic of the alteration. Cinnabar is the principal ore mineral with smaller amounts of metacinnabarite and native mercury. It occurs as discontinuous veinlets or disseminated as fine specks in the country rock.

The Black Butte deposit was discovered in the 1890's by S. B. Garontte, and was acquired shortly thereafter by W. B. Dennis. In 1905 Dennis erected a reduction plant and by 1908 had opened the mine by extensive development work totaling 15,000 feet. A record of the amount of this early production is not available.

The mine was reopened in 1916 and operated until the end of World War I. Production from 1916 to 1919 was 1,254 flasks. Mining was resumed in 1927 under the Quicksilver Syndicate management. Operations continued except for short periods until 1943. The years 1928 to 1941, inclusive, were the most productive in the mine's history.

The mine is developed by eight adit levels which are connected underground through raises, ore passes, and stopes. Workings extend through a vertical range of about 1,250 feet and laterally along the strike for more than 1,200 feet. Many of the mine openings are still accessible.

The Mercury and Chemicals Corp. leased the property in 1956, and obtained a Defense Minerals Exploration Administration (DMEA) contract for Government assistance to explore for extensions of the ore. Under the contract 418 feet of drifting was completed. The operation was closed down in 1957 after producing about 342 flasks of mercury. Total reported production from the mine through 1957 was about 1,660 flasks.

Bonanza Mine

The Bonanza mine is in Douglas County about nine miles by road east of Sutherlin. It is in low foothills on the north side of the North Umpqua River valley.

Cinnabar, together with siderite and marcasite, was deposited in lenses of hydrothermally altered tuffaceous sandstone along a contact between arkosic sandstone and overlying shale in the lower part of the Umpqua Formation of

Eocene age. Deposition is controlled by shearing and faulting along bedding planes at a definite horizon in the tuffaceous sandstone. The faulting occurred during the formation of a regional anticlinal structure. The bedding strikes about N 20° E and dips 20° to 65° to the southeast. The Bonanza workings extend along the shear zone for more than 1,500 feet on the strike and more than 1,000 feet down the dip.

Discovery of cinnabar at the Bonanza property was made during the 1860's, and mining was started on a small scale shortly thereafter. Intermittent operations by various lessees produced a few flasks of mercury between 1870 and 1935.

In 1935 H. C. Wilmot acquired the property and organized the Bonanza Mines, Inc. A reduction plant was erected on the property in 1937, and during 1938 the mine produced 14,914 tons of ore from which over 1,000 flasks of mercury were recovered. In 1939 the plant was expanded and production was increased so that the Bonanza became the leading producer in the United States in 1940; however, output declined after 1944. Since 1944 the mine has operated on a somewhat reduced scale, and it was shut down in 1960. The mine's most productive period was from 1938 to 1951.

The mine is developed on eight levels through a vertical distance of 965 feet and along strike for nearly 2,000 feet. The ground stands well, and many of the abandoned openings are still accessible.

From June 1953 to December 1956 the Bonanza mine was explored under a DMEA exploration project contract. About 3,100 feet of drifts and crosscuts and 200 feet of raises on the 830- and 1,050-foot levels were completed. The project was successful in discovering new ore bodies.

Mountain King Mine

The Mountain King mine is in Jackson County, on Ramsey Creek about 12 miles northeast of Gold Hill.

Cinnabar mineralization occurs along two major shear zones in the May Creek schist, a metamorphosed sedimentary rock near a granitic intrusive. The schist contains hornblende, pyroxene, some mica, and quartz. Cinnabar was deposited in small openings and in fractures in the altered rock and also in calcite veinlets.

Operations are reported in the early 1900's, but no record has been found of the early production. In 1940 the mine was reopened by the Western Mineral Products Co., and a new furnace and reduction plant were erected in 1942. Operations were continued intermittently until 1945. The mine is developed on six adit levels connected by raises and winzes. A total of 2,000 feet of development was done.

Pacific Syndicate Mine (Webb and Tainor, Lucky Strike, Cinnabar Mountain)

The Pacific Syndicate mine, formerly the Webb and Tainor, Lucky Strike, and Cinnabar Mountain, is about 4 miles southeast of the War Eagle mine on the East Fork of Evans Creek in Jackson County, and is about 20 miles by road northeast of Gold Hill.

Cinnabar mineralization occurs in a fault zone in altered sandstone of the Umpqua Formation. The fissure strikes about N 30° W, and dips about 55° toward the northeast. The richer oreshoots are found near cross fractures cutting the main fissure.

The original cinnabar discovery was probably made by Walter Frank, who sold the mine to Frank Tainor and M. B. Webb in 1928. Tainor and Webb developed the mine over a period of several years and produced a few flasks of mercury up to 1938. The property was leased by the C-M Co. in 1940, and control was transferred to the Pacific Syndicate Co. in 1941. Development work was resumed and a modern reduction plant was erected in 1942. An oreshoot 80 feet long and about 7 feet wide was mined down dip for about 150 feet. The Pacific Syndicate Co. ceased operations in about 1943. Reports of production during the war years are inadequate, but is believed to be less than 50 flasks.

The mine was developed by an adit level, an incline winze, and drifts from the incline, all of which totaled about 800 to 1,000 feet of workings.

War Eagle Mine (Rainier, Utah Quicksilver)

The War Eagle mine, also formerly the Rainier and the Utah Quicksilver, comprises a large group of claims in Jackson County. It is about 21 miles by road from Gold Hill.

Two forms of mineralization are present on the property. In the western part, the Rainier vein is in a fault zone in which cinnabar associated with marcasite occurs in silicified fault breccia. The ore contains considerable arsenic which caused some difficulty in the reduction plant. The fault is in the May Creek schist and strikes N 70° W, dipping steeply toward the northeast. On the bank of Rattlesnake Creek, cinnabar was found in a 4-foot coal or lignite seam interbedded in shales and sandstones of the Umpqua formation. The coal contains variable amounts of cinnabar.

Cinnabar was discovered on the War Eagle claims in 1916 by Carl Burtelson.

Development was first done during 1916 by the Utah Quicksilver Co. and later by the Rainier Mining Company. In 1919 the property was acquired by the War Eagle Mining Co. and operated by them until 1926. During the Rainier Mining Co. operations, in the period between 1917 and 1920, a reported 552 flasks of mercury were produced. The operations and production during this period were all on the Rainier vein. In 1936, George Schumacher discovered the coal seams on Rattlesnake Creek and development work followed. In 1942 Mineral Mines, Inc. constructed a flotation plant to treat the cinnabar-bearing coal seam, the flotation concentrates were reduced in a retort. This plant was operated for only a short period in 1942.

The most productive period of the mine was during 1918-19 when 528 flasks of mercury were produced.

The Rainier vein was developed by two adit levels which opened two ore bodies; one was 175 feet and the other 200 feet in length. Workings totaled more than 2,400 feet.

Northwestern Oregon Mines and Properties

A region of limited mercury mineralization occurs along the Clackamas River and its tributaries in Clackamas County; one occurrence is reported in Multnomah County and one in Tillamook County, in northwestern Oregon.

The mines and prospects in Clackamas County are in the Mount Hood National Forest on the west slope of the Cascades. Altitudes range from 2,000 feet near the Oak Grove Fork of the Clackamas River to near 5,000 feet at the summits of surrounding peaks. The topography is of moderate to sharp relief and covered by a heavy growth of timber. The climate is mild, with heavy rainfall prevailing during part of the year. Travel is difficult through the heavy timber and vegetation away from roads and trails. Exposures are poor and prospecting is difficult.

Mercury occurs in Clackamas County, on the banks of the Oak Grove Fork of the Clackamas River. Cinnabar has filled thin fractures and cavities in the quartz-calcite veins penetrating the basalt country rock. Several veins have been explored which ranged from a few inches to a few feet in width.

George Nisbet is reported to have first discovered cinnabar in this locality in 1924. The property was known for many years as the Nisbet and Kiggins mine, and most of the development was done during the period 1928 to 1938; several flasks of mercury were produced in a crudely constructed furnace, but a complete record of production is not available.

Since 1938, parts of the properties have been worked for short periods under lease and option. The Oregon Quicksilver Co. constructed a larger reduction plant and produced a few flasks of mercury from the Nisbet claims about 1940 to 1942; later, Horse Heaven Mines, Inc., did some exploration in the better mineralized areas.

A total production of 250 flasks of mercury from all the ore mined in the district is an optimistic estimate. No measured ore reserves are known to exist at present; however, additional exploration would probably disclose small areas of mineralization capable of producing a few flasks of mercury. A significant future production of mercury from this district is unlikely.

North-Central Oregon Mines and Properties

The region containing deposits of mercury within Wheeler, Jefferson, and Crook Counties is called the Ochoco Quicksilver district, by Schuette and others, because it is within and adjoining the west boundary of the Ochoco Mountains in north-central Oregon.

The region is almost entirely within the Crooked River Basin and is accessible from Prineville, the nearest rail point, by well-maintained Federal, State, and county roads. Climate is semiarid with moderately cold winters. Rainfall is sufficient on the higher slopes in the vicinity of Lookout Mountain to support the growth of pine forests; sagebrush and juniper predominate at lower elevations. Altitude ranges from 6,600 feet on Lookout Mountain to about 2,800 feet at Prineville. During the winter months snow occasionally blocks the roads for short periods on Lookout Mountain and in the vicinity of Johnson Creek. Rock formations are widely exposed and prospecting conditions are relatively favorable.

The Ochoco district ranks third in production of mercury in the State; output has slightly exceeded 20,000 flasks. The major producer has been the Horse Heaven mine. Other properties which have reported an output of more than 100 flasks are the Axehandle, Mother Lode, Amity, Blue Ridge, Barney and Staley, Taylor Ranch, and the Maury Mountain mines. The district contains over 50 mines, prospects, and occurrences of mercury as listed in table 26 at the end of this chapter. Many of the small mines have produced from 5 to 10 flasks; several have reported an output of 50 to 75 flasks during the various periods of activity.

The outlook for future mercury production comparable to past output in the district is doubtful. Exploration for new ore bodies at the Horse Heaven mine was unsuccessful and active mining at this major producer and largest known deposit in the region has been terminated. Exploration of other deposits have disclosed only small near-surface ore bodies.

The geological environment which has contributed to mercury deposition in the district has been well established by past experience and should be helpful in future exploratory efforts. In the north part of the district, intrusive rhyolitic or andesitic plugs, and the hydrothermally altered marginal zones, are loci for mercury mineralization. In the central and southern end of the district, mercury has been deposited in altered zones in the Clarno andesites in the vicinity of faults and fractures. Marginal and submarginal mineralization is known to occur beyond the mined-out areas in several places, and it is highly probable that a few thousand flasks of mercury may yet be produced in the Ochoco district.

Amity Mine (New Amity, Johnson Creek, International Mercury, Paulson and Saylor)

The Amity mine, known also as the New Amity, Johnson Creek, International Mercury, and Paulson and Saylor, comprises a group of five claims in Crook County. The mine is on Johnson Creek about 32 miles by road east of Prineville, Oregon.

Cinnabar mineralization occurs in silica-calcite veinlets and as fracture filling in brecciated rock along a major fault zone which strikes N 60° E, and dips steeply to the southeast. Wall rocks consist of porphyritic andesite, andesitic breccia, and flows of olivine basalt; the rocks are locally intensely altered by hydrothermal solutions. Clay zones resulting from hydrothermal

activity are, at places, impregnated with cinnabar. The high-grade ore commonly occurs at fault intersections.

The original claims were located in 1929 by W. J. Westerling who soon leased the property to Martin Paulsen and Evan Saylor. A small retort was erected in 1930, and a larger furnace in 1931. Production during the Paulson and Saylor period of operation, from 1930 to 1932, was about 180 flasks. The property had passed through several ownerships since 1938, but very little mercury was produced from these later operations. Since 1949 the operation has been known first as the Amity Mine, Inc., and, from about 1954, as the Ochoco Mines, Inc. During this period, a 25-ton furnace was erected, and relatively extensive exploration and development work was done. More than 1,800 feet of development workings are reported, some of which are open and still accessible.

Axehandle Mine

The Axehandle mine in Jefferson County is about 12 miles by county road southwest of the Horse Heaven mine and about 4.5 miles east of Ashwood.

Cinnabar mineralization is associated with the hydrothermal alteration zone around the margin of a fine-grained andesite plug, intruding a regional porphyritic andesite country rock. The intrusive plug pitches at a moderately low angle westward with an apparent offshoot located about 500 feet to the northwest which pitches eastward and presumably joins the main plug at depth; the contact between the plug and the surrounding porphyritic andesite is irregular in dip. The intrusive andesite is unaltered except near the contact, and mineralization has been found localized exclusively in the alteration zone in both intruded and intrusive rocks.

Commercial cinnabar ore was discovered on Axehandle Butte in 1935 by L. C. and Charles Swanson. A small retort was erected in 1936, and a few flasks of mercury were produced. The Horse Heaven mine leased the property in 1938, and developed an ore body through the No. 1 shaft. Ore was hauled to the Horse Heaven furnace from 1938 to 1943. The International Engineering and Mining Co. of Santa Barbara, Calif., optioned parts of the property consisting of about 320 acres in 1956. A DMEA contract was obtained in August 1957 whereby a project was financed jointly by International Engineering and Mining Co. and DMEA to explore for mercury in limited areas of the property. An exploratory program of dozer trenching and 1,338 feet of churn drilling failed to disclose significant cinnabar mineralization.

Mercury produced from all operations on the property was small. Former underground workings at the No. 1 shaft amounted to several hundred feet on two levels; however, they are completely caved and of no value for possible future operations.

Barney and Staley Mine (Ochoco Quicksilver, Champion)

The Barney and Staley, also known as the Ochoco Quicksilver and Champion, is in Crook County, about 20 miles east of Prineville, Oreg. The mine is about one-half mile north of the Ochoco Creek road.

Cinnabar occurs in a crushed and altered zone along a fault striking N 45°-55° E, and dipping to the southeast. Along this zone, intense hydrothermal alteration has produced a soft clayey material locally impregnated with cinnabar. The surrounding country rock is andesite of the Clarno Formation (Eocene age) cut by dikes of basalt; the best ore is found in the vicinity of, or adjacent to, the intrusive basalt dikes.

The deposit was discovered in 1927 by A. J. Champion, A. Barney, and J. E. Staley. A retort furnace was erected and about 80 flasks of mercury were produced in 1928 and 1929. The Cinnabar Mines, Inc., acquired the mine and produced about 50 flasks of mercury during 1930 to 1933; when this company ceased operations, the mine reverted to the original owners. W. J. Seufert leased the property in 1935 and erected a rotary furnace; from 1935 to 1937 he produced 206 flasks. During 1940-41 J. E. Staley again operated the mine and produced about 89 flasks. No production has been noted since 1942, and the mine has not been active in recent years. It is reported that the mineral rights were owned by Shirley Quant and the surface rights by John A. Hudspeth of Prineville in 1956. The mine was developed by means of an adit, a vertical shaft, and an incline totaling about 1,300 feet of workings, all of which are caved and inaccessible.

Byron and Oscar Mine

The Byron and Oscar mine is on the Ernest Grubbe ranch in Crook County. It is about one-half mile south of the highway, 17 miles east of Prineville.

Cinnabar mineralization occurs in a shear zone in altered andesite adjacent to a tuff. Many cross-fractures are present in the shear zone. Production came almost entirely from a single oreshoot. The surrounding country rock is tuffaceous andesites of the Clarno Formation cut by basalt dikes and sills.

Cinnabar was first discovered on the property in 1929 by A. J. Champion and was developed on a small scale for several years by lessees. The period of greatest productivity was during 1935 and 1936, under a lease to W. J. Seufert, who mined and hauled the ore to the furnace he operated at the nearby Barney and Staley mine. It was acquired by the Byron and Oscar Co. in about 1938, and a small production followed.

Most of the ore was removed through a vertical shaft from which at least two levels were connected to the ore body. The workings are completely caved and inaccessible.

The total production from all operations is believed to be small.

Horse Heaven Mine

The Horse Heaven mine is in Jefferson County, about 44 miles by road east of Madras, the county seat, and about 16 miles east of Ashwood, by county road.

Mercury ore occurs in large pipelike bodies in brecciated zones in a rhyolite plug. The rhyolite plug is roughly circular; it is about 250 feet in diameter near the surface, widens with depth, and pitches about 50° southwestward. Surrounding wall rock is composed of andesite, clays, and tuffs of the Clarno Formation. Locally, cinnabar was deposited along minor faults on the border of the intrusive plug beneath clay cappings; small but high-grade ore bodies were formed in this manner.

Cinnabar mineralization was discovered in 1933, first by A. J. Champion as float in the surface soil and later by Ray Whiting, Jr., and Harry Hoy as mineralized ledges on the north slope of Horse Heaven Mountain. A furnace plant was built in 1934, and the mine soon became the third largest producer in the State. Horse Heaven Mines, Inc., a subsidiary of Cordero Mining Co., purchased the property in 1936, and production was continued until November 1944 when the plant was destroyed by fire. In 1955 a small furnace plant was erected, and production was resumed. The ore came from removal of pillars and ore remnants in old stopes and in an open pit. Further exploration failed to discover new ore bodies of economic grade, and all operations were closed in 1958. During the years 1956-57 a total of 18,838 tons of ore which contained about 6 pounds of mercury per ton was mined and furnaced. The mine workings explore an ore-bearing zone for a length of 1,300 feet, a width of 400 feet, and a vertical range of about 400 feet.

Maury Mountain Mine (Staley and Towner, Lost Cinnabar, Eickemeyer)

The Maury Mountain mine is in Crook County, on a ridge at the foot of the Maury Mountains, about 4 miles southeast of Post and about 33 miles southeast of Prineville. The property has been known as the Staley and Towner, and later, one part as the Towner and the Lost Cinnabar and another part as the Eickemeyer mine.

Cinnabar is found in small high-grade ore bodies along two major fault zones and in intersecting cross-fractures. The ore bodies are irregular and discontinuous; they may occur on either wall of the fault, or across the width of the fault. Cinnabar mineralization is commonly accompanied by calcite and hydrocarbons. The two fault zones trend N 70° W and N 25° W, respectively. The country rock is a series of andesitic tuffaceous flows, coarse breccia, and mud flows of the Clarno Formation.

The deposit was discovered in 1930 by J. E. Staley and Frank Towner, and five claims were located. The Maury Mountain Mining Co. was organized as a partnership, and a furnace plant was erected in 1932. The furnace was operated for only a short period and produced 51 flasks of mercury. The partnership was dissolved in 1932, and the furnace was sold in 1934. Since 1934 the property has been divided and two separate operations have existed, each equipped with a small retort furnace. Frank Towner retained a part of the claims and named his workings the Lost Cinnabar mine. The brothers, Fred D. and Herbert W. Eickemeyer, who had formerly contracted the development work for the Maury Mountain Mining Co., acquired the Staley part of the property which has subsequently been known as the Eickemeyer mine. The Eickemeyers recovered about 240 pounds of mercury per ton of ore which had been hand sorted before going

into the retort. There is no complete record of production. The present owners estimate output from all operations on the Maury Mountain property has exceeded 700 flasks.

The underground development is extensive; adits, drifts, shafts, and inclines total more than 2,500 feet of workings. Several of the adits are open and accessible.

Mother Lode Mine (American Almaden, Canyon Creek, Quicksilver Consolidated, Crams, Inc.)

The Mother Lode mine, also known at various times as the American Almaden, Canyon Creek, Quicksilver Consolidated, and Crams, Inc., is in Crook County, about 33 miles by road east of Prineville.

The cinnabar mineralization occurs in a network of silica-calcite veinlets which commonly follow a larger fissure or shear zone in quartz latite of the Eocene Clarno Formation. The quartz latite is intensely altered to clay minerals where cut by these fissures. Some asphalt accompanies the cinnabar. The veins do not appear to follow any definite course.

The property is the site of the first discovery of cinnabar in the Ochoco district and is reported to have produced 3 flasks of mercury in 1906. A small production also was reported in 1908, 1915, 1929, and 1930; during this period it was operated by the Almaden Gold and Quicksilver Co. as the American Almaden mine. The property was operated as the Canyon Creek mine in 1933, and later was acquired by Crams, Inc. This company operated until 1940 with the help of a Reconstruction Finance Corporation (RFC) loan of $12,000 received in 1935. The Government acquired the property in 1941 and leased it to the Gilkey Brothers of Seattle, who erected a concentrating plant in 1943. This period of operation was terminated in 1948. In 1954, the seven original claims were relocated and in 1956 were acquired under a purchase agreement by Clyde R. Bellows of Seattle.

Prior to acquisition by RFC in 1941, the property had produced about 333 flasks of mercury. The production while operated by the Gilkey Brothers during 1943 to 1948 is not known. Total reported production from all operations in the property is estimated at 355 flasks of mercury. Mine development was fairly extensive and included six adits, with about 2,250 feet of workings. The workings are now virtually caved and of little value to possible future operations.

South-Central Oregon Mines and Properties

The region containing mercury deposits in south-central Oregon is in Lake and Harney Counties. The reported deposits are all in Lake County with the exception of a small prospect in western Harney County near Wagontire. Except for the Glass Buttes Mercury claims in the extreme northeast corner of Lake County, all the known deposits of mercury are within a 45-mile radius of Lakeview. This mineralized area is known as the Lakeview mining district.

The southern half of Lake County has a basin-range type of topography with shallow lakes or playas bordering northsouth-oriented mountain ranges. Rainfall is low, occurring mostly during the winter months, and supports a growth of timber only on the upper slopes. Altitude ranges from 4,800 feet at Lakeview to 8,000 feet at the top of the higher peaks. Winters are moderately severe, and snowfall hinders prospecting and exploration in the higher altitudes. Otherwise, rock formations are well exposed, and conditions are favorable for exploration and geologic observation.

Production from the region has been small. Only the Currier, Glass Buttes Cinnabar, Windy Hollow, and the Four-Square mines have contributed to a production which probably does not exceed a total of 25 flasks.

The outlook for future production depends largely on the success of the newly established operations in the Lakeview district. The size and grade of known or indicated ore bodies are uncertain, pending further development work.

Four-Square Claims (Angel's Peak)

The Four-Square claims are near Quartz Mountain. A 30-ton furnace was erected and was in operation in 1958 and 1959. Output of 16 flasks of mercury was reported.

Glass Buttes Cinnabar Claims

The Glass Buttes Cinnabar claims, numbering 48, are located 52 miles by road west of Burns or 83.2 miles southeast of Bend.

Low-grade cinnabar occurs as fracture filling and replacement in hydrothermally altered volcanic glass.

In May and June of 1959, Oregon Uranium Corp. erected a 20-ton rotary furnace, and did a large amount of exploration work during the year. Prior to 1959, 1-1/2 flasks of mercury was produced by the S. & S. Mining Co. of Salem and Scio.

Southeastern Oregon Mines and Properties

Mercury deposits occur in southeastern Harney County and southwestern Malheur County. The Harney County deposits are in the Pueblo and Steens Mountains north of Denio; those in Malheur County extend southward across the State boundary into Nevada in the vicinity of McDermitt, Nev. The deposits in Malheur County are referred to as the Opalite district because of the type of mineralized rock.

The region is semiarid in the Steens and Pueblo Mountains, with desert conditions at lower elevations along the Oregon-Nevada boundary. The central part of the Steens Mountains is so rugged that it is uninhabited and rarely visited. However, the ridges at the northern end and along the eastern slope bordering the Alvord and Pueblo Valleys are accessible by roads and extending well up the sparsely timbered eastern slope. Along the Oregon-Nevada boundary

near McDermitt, low, rolling, sagebrush-covered, treeless plains predominate. Winters are cold, but with only a small amount of snowfall. Where not covered by lake-bed deposits, formations are well exposed and conditions are favorable for prospecting and exploration.

Only two mines in southeastern Oregon have produced substantial quantities of mercury, the Bretz and the Opalite; they have been such important producers that this district ranks second in output in Oregon with a total in excess of 26,000 flasks. Moreover, the Bretz has been recently reactivated on a large scale and was the leading mercury producer in Oregon in 1958.

The future outlook for the region depends largely on the continuing success of the present exploration for new ore bodies in the vicinity of the Bretz and Opalite mines. The Cordero mine operating in the same district and in a similar geologic environment a few miles to the southeast in Nevada, has been outstandingly successful in developing large reserves of ore. This would encourage the belief that future exploratory drilling in the Bretz and Opalite mine areas will disclose new ore bodies to support a future production comparable to the recent past output.

Bretz Mine

The Bretz mine is near the Oregon-Nevada border in Malheur County, and is 13 miles by road northwest of McDermitt, Nev., the nearest town.

Cinnabar mineralization occurs chiefly in unsilicified lake-bed strata composed of clay and sand in contact with masses of silicified tuffs. A major eastwest-trending fault is the north limit of the ore bodies. The lenticular masses of silicified lavas and lake beds are the result of hydrothermal activity which, in a later stage, probably deposited the cinnabar; the later hydrothermal solutions probably used the fault as a channelway in their upward movement. The silicified tuffs and lake beds are called opalite and are composed of a mixture of chalcedony, quartz, and opal; at the Bretz property the opalite contains only a very minor amount of cinnabar mineralization. This condition is unusual and may be the result of a change in hydrothermal channelways between the periods of opalite formation and mercury deposition.

Cinnabar was discovered on the Bretz property by William S. Bretz in 1917, following which, for many years, work was confined to exploration of the low-grade mineralized opalite exposed at the surface. In 1931 Bretz discovered high-grade cinnabar ore in the unsilicified lake beds near his original discovery and soon thereafter leased the property to Bradley Mining Co., who were operating the Opalite mine about 11 miles to the northwest. The ore was mined by open pit and trucked to the Opalite furnace plant. From 1931 to 1936, a total of 50,485 tons of ore was mined and 9,773 flasks of mercury was recovered. In 1940 a new discovery was made about 2,000 feet northwest of the former workings, and mining was resumed. This period of activity lasted until 1944, when operations ceased. The mine was idle between 1944 and 1955. The third period of activity was between 1956 and 1961. Total recorded production of the Bretz mine exceeds 15,000 flasks of mercury.

Several of the former Bretz claims were relocated in 1954 by John Ruiz, who leased them to the U.S. Mercury Corp. which was absorbed in 1955 by the Shawano Development Corp. Exploratory drilling was begun in April 1955 and continued through rest of the year.

Two new ore bodies were discovered about 200 feet northwest of the 1940-44 workings. Under an operating combine called the Arentz-Comstock Mining Venture, development of an open-pit mine was started in April 1956 and construction of a flotation plant was begun in August 1956. About 25,000 tons of ore containing 3 to 4 pounds of mercury per ton was stockpiled during stripping operations. Mining of the main ore body was begun in May 1957. The flotation plant was completed and started operating in December 1956.

The concentration of cinnabar by flotation and the furnacing of the concentrates is not a common method of treating mercury ores; however, in this instance the method seems to have been successful for the type of ore found in the Bretz deposit. The mill processed 36,950 tons of ore in 1957 and 38,207 tons in 1958. The plant operated intermittently during 1959-61.

Opalite Mine

The Opalite mine is in Malheur County near the Oregon-Nevada border, about 20 miles by road northwest of McDermitt, Nev.

The cinnabar at the Opalite deposit occurs mixed with silica in brecciated zones of an opalite mass about 1,200 feet long, 800 feet wide, and a little more than 100 feet thick. A minor amount of cinnabar is also mixed with the unsilicified lake beds below the opalite. Mineralization decreases toward the bottom of the opalite mass. The opalite may have been formed by silicification of the surrounding lake bed deposits by hydrothermal activity. The cinnabar mineralization took place during the last stages of silification.

The Opalite deposit was discovered in 1924 by William Bretz and his partner Murphy; they sold the property to the Mercury Mining Syndicate organized by F. W. Bradley in 1925. A large furnace plant was completed late in 1926, and mining was begun in 1927. The operation continued with some interruptions through 1944. The Mercury Syndicate was dissolved about 1931, and the Bradley Mining Co. continued as operator and still owns the property. Production during the period 1927-44 is reported to have exceeded 10,000 flasks. Since 1945 the only activity has been small leasing operations and cleanup activity.

Northeastern Oregon Mines and Properties

The northeastern Oregon region containing mercury deposits is in Grant, Baker, and Malheur Counties. This area includes the John Day, Greenhorn, Mormon Basin, and Connor Creek mining districts. Occurrences are widely distributed but total production has been small.

Cinnabar, initially, was an accessory mineral in gold deposits of the districts. Only after the high-grade gold ore became mined out and the price

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of mercury advanced, did cinnabar become important enough to warrant exploration.

Cinnabar occurs in zones of serpentine or argillite breccia and in opalized syenites or tuffs.

The region is part of the high plateau of eastern Oregon. The mountain ranges trend roughly southeastward, generally separated by wide areas of rolling hills and plains. Altitudes range from 3,450 feet at Baker to about 9,000 feet in the higher mountains. The areas of lower altitude are semiarid with an annual rainfall of about 10 inches; higher altitudes receive a greater amount of moisture. Timber does not grow at altitudes below about 4,000 feet, and areas of lower elevation are barren or covered by sagebrush. Timbered slopes are common at higher elevations. Rock formations are well exposed and conditions are favorable for prospecting and exploration.

It is doubtful that mines in the region can produce significant quantities of mercury.

Paramount Quicksilver Mine

The Paramount Quicksilver property consists of 5 claims in Grant County on Greenhorn Ridge, just west of the Grant-Baker County line.

Cinnabar is found in zones of brecciated serpentine. Exceptionally high-grade ore was reported in some places in the deposit, but it was limited in extent and was quickly mined out.

Initially the mine was operated for gold. In 1941, however, it was leased by the Paramount Quicksilver Mines, Inc., who set up a retort furnace. The total production has been estimated at about 25 flasks.

Roba Quicksilver Mine (Deer Creek)

The Roba Quicksilver mine, comprising 4 claims, is in Grant County.

Cinnabar mineralization occurs in a fault gouge. The country rock is a fine-grained light-gray argillite.

A retort furnace was erected on the property in 1951, and 8 flasks of mercury were reported to have been produced.

Between June 1953 and December 1954 the mine was explored under a DMEA exploration project. A 100-foot shaft was sunk and 300 feet of drifting completed from the bottom of the shaft. The exploration disclosed only minor cinnabar mineralization and operations were terminated.

TABLE 26. - Oregon mercury properties

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
			SOUTHWESTERN OREGON				
Abeene prospect	Douglas	Sec 18, T 25 S, R 4 W	Occurrence	Unknown	Unknown	Unknown	14
Allen prospect	do	Sec 21, T 23 S, R 4 W	do	do	do	do	14
Ash prospect	Jackson	Secs 35, 36, T 33 S, R 1 W; sec 1, T 34 S, R 1 W	do	Three adits, shallow shaft.	Along fault in altered volcanics.	E. E. Ash	44, 45
B. and W. Mining Co., Inc., Rattlesnake or Noe claims.	do	Secs 8, 9, 16, T 40 S, R 4 W	do	Shallow underground workings.	In narrow stringers	M. F. Murphy and others.	27
Bald Butte and Cinnabar Mountain prospect.	Lane	Secs 17, 20, 21, 28, T 23 S, R 3 W	do	Underground workings.	Near fault zone in altered andesite lavas.	J. F. Woodard and others.	44
Baldwin prospect	Douglas	Sec 7, T 29 S, R 8 W	do	Unknown	Unknown	Unknown	14
Birdseye Creek mine	Jackson	Secs 11, 2, 1, T 37 S, R 4 W	do	do	do	do	-
Black Butte mine	Lane	Sec 16, T 23 S, R 3 W	Over 1,600	Extensive underground workings.	In silica-carbonate veins.	Mercury and Chemicals Corp.	4, 11, 12, 23, 36, 44
Blue Ridge Cinnabar claim.	Jackson	Sec 8, T 37 S, R 3 E	Occurrence	Unknown	Unknown	Unknown	-
Bonanza mine	Douglas	Sec 16, T 25 S, R 4 W	Over 39,000	Underground workings.	Along fault zone in altered tuffaceous sandstone.	Bonanza Oil and Mines Corp.	5, 6, 14, 20, 22, 44
Bonita or Salt Creek mine.	Jackson	Sec 13, T 33 S, R 3 W	Some	Three adits, trenches, open pit.	With calcite in silicified brecciated shale.	D. W. Chase and others.	27
Booth prospect	do	Sec 3, T 36 S, R 3 W	Occurrence	Unknown	Unknown	Unknown	14
Brick Pile mine	do	Secs 4, 9, T 40 S, R 1 W	Some	Several adits, shaft, trenches.	In silicified part of country rock.	Timber Products Co.	27
Brown prospect (Brownsboro Clay, Quicksilver).	do	Sec 11, T 36 S, R 1 E	do	Trenches, 100-foot adit, crosscuts.	Disseminated in altered tuff.	R. A. Brown	27
Brushy Butte mine	Douglas	Sec 18, T 28 S, R 4 W	Occurrence	Two tunnels	Brecciated tuffaceous sandstone.	Martha Preble	-
Buena Vista mine	do	Secs 27, 33, 34, T 29 S, R 2 W	A few	1,000 feet of adits and raises.	Along shear zone in porphyritic andesite.	B. A. and A. J. Young and S. J. Cooper.	14, 25, 43
Carnagie mine	Josephine	Sec 33, T 35 S, R 7 W	Occurrence	Unknown	Unknown	E. T. Carnegie and Laura Farrington.	14, 28

TABLE 26. - Oregon mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
			SOUTHWESTERN OREGON--Continued				
Centennial group (Columbian mine).	Josephine	Sec 25, T 35 S, R 5 W	Occurrence	Two adits, development cuts.	Along ledges in granite near granite-greenstone contact.	C. E. Pruess, Sr.	28
Chaney prospect.....	Douglas..	Sec--, T 28 S, R 4 W	do.....	Unknown.....	Unknown.....	Unknown.....	14
Chimney claim.....	do.....	Sec 17, T 29 S, R 1 W	do.....	do.....	do.....	D. F. Wilkinson and J. H. Howell	-
Chisholm claims.....	Jackson..	Secs 17, 20, T 34 S, R 2 W	do.....	Adits, trenches...	In gougy fault zone.	S. F. and J. W. Chisholm.	30, 44, 45
Clarno prospect.....	Curry....	Sec 9, T 35 S, R 14 W	do.....	Unknown.....	Unknown.....	Unknown.....	14
Copper Queen mine.....	Josephine	Sec 15, T 34 S, R 6 W	do.....	Gold, silver, copper mine.	do.....	do.....	14
Copus prospect.....	Jackson..	Sec 2, T 40 S, R 3 W	do.....	Unknown.....	do.....	do.....	14
Dave Force mine (Quicksilver Producers Co. claims).	do.....	Sec 20, T 34 S, R 2 W	Some.....	2,110 feet of adits on three levels.	In veinlets with calcite and quartz gouge in chalcedony breccia.	C. L. and W. E. Moore.	14, 44
Dawson Mercury prospect.	do.....	Sec 2, T 34 S, R 1 E	Occurrence	80-foot adit and 8 open cuts.	Along breccia zone in rhyolite.	Carl Dawson.....	-
Drew prospect.....	Douglas	Sec 11, T 31 S, R 2 W	do.....	Unknown.....	Unknown.....	Unknown.....	14
Duvall and Powell property.	Josephine	Sec 33, T 35 S, R 7 W	do.....	70 feet of drifts, shallow shafts, winzes.	Associated with quartz and calcite.	Grant Powell and E. F. Duvall.	-
Eggers and Hance prospect.	do.....	Sec 15, T 41 S, R 9 W	do.....	Unknown.....	Unknown.....	Clarence Hunt and G. H. Grover.	28, 37
Elkhead mine.....	Douglas..	Sec 21, T 23 S, R 4 W	About 100.	Open cuts and adits.	In rhyolite.....	Moneta Porcupine Mines, Ltd.	14, 25, 44
Elkhorn Creek Manganese.	Josephine	Sec 13, T 36 S, R 9 W	Occurrence	Pits and trenches.	Manganese (rhodonite) deposit.	Abandoned.....	1
Empire mine.....	do.....	Sec 3, T 36 S, R 7 W	do.....	Two adits, 35-foot shaft.	Disseminated in porphyry.	Leila Briggs and others.	14, 28
Evans group.....	Douglas..	Secs 5, 6, T 32 S, R 2 W	do.....	Unknown.....	Unknown.....	S. E. Evans.....	-
Flat claim.....	do.....	Sec 1, T 32 S, R 2 W	do.....	do.....	do.....	Le Roy Wehde.....	-
Forty-Nine Diggings...	Jackson..	Sec 31, T 38 S, R 1 E	do.....	do.....	In placer ground with gold and in veinlets.	E. K. Anderson estate.	9, 14

Fuller Quicksilver mine (Thompson).	Coos.....	Sec 10, T 32 S, R 10 W	do.....	do.....	Unknown.....	Unknown.....	9, 14
Garden mines.....	Douglas..	Sec 1, T 31 S, R 5 W	do.....	do.....	do.....	Wm. L. Garden and others.	-
Glade Creek Quicksilver mine (Pistol River, Chapin).	Curry....	Sec 29, T 37 S, R 13 W	do.....	do.....	do.....	Mrs. Mary Sandberg and others.	8
Glide prospect (Blakely).	Douglas..	Secs 23, 26, T 26 S, R 4 W	do.....	do.....	do.....	Unknown.....	14
Gopher mine (Pennell, Stephen).	do.....	Sec 12, T 29 S, R 1 W	do.....	Test pit.....	Placer and traces in rhyolite.	Guy Pennell	13, 14, 25
Harkins prospect.....	do.....	Sec 22, T 31 S, R 2 W	do.....	Unknown.....	Unknown.....	Unknown.....	14
Hobart Butte prospects	Lane.....	Sec 31, T 22 S, R 3 W	do.....	Clay quarry.....	do.....	Willamina Clay Products Co.	4, 44
Juby lode.....	Jackson..	Sec 31, T 40 S, R 3 W	do.....	Trenches.....	In stringers and float.	Wade Crawford....	27
Last Chance group.....	Josephine	Sec 15, T 37 S, R 9 W	do.....	Unknown.....	Unknown.....	Unknown.....	13, 14
Lucky Cuss Cinnabar lode.	Douglas..	Sec 31, T 30 S, R 2 W	do.....	do.....	do.....	Edna Rauch and D. O. Crispen.	-
Lucky Cuss mine Nos. 1, 2, 3, and 4.	do.....	Sec 24, T 31 S, R 1 W	do.....	do.....	do.....	David Crispen and others.	-
Lucky Strike claim....	do.....	Sec 10, T 31 S, R 2 W	do.....	do.....	do.....	R. H. Dale and R. E. Folley	-
Lucky Strike No. 1 prospect.	do.....	Sec 25, T 24 S, R 4 W	do.....	do.....	do.....	Robley Hopkins...	-
Manning prospect.....	do.....	Secs 2, 3, T 25 S, R 4 W	do.....	do.....	do.....	Unknown.....	14
Maude S. mines.....	do.....	Sec 34, T 29 S, R 2 W	do.....	600-foot adits and raises.	Along shear zone in prophyritic andesite.	B.A. Young and others.	13, 25, 43
May prospect.....	do.....	Sec 27, T 30 S, R 2 W.	do.....	Unknown.....	Unknown.....	Unknown.....	14
Meridian mine (Phillips).	Jackson..	Sec 36, T 38 S, R 1 W	do.....	40-foot shaft.....	In place and in float.	Mrs. A.E. Phillips.	14, 27
Midnight and Eagle claims.	do.....	Sec 28, T 33 S, R 1 E	do.....	Unknown.....	Unknown.....	Joseph Madden and Orval H.Peterson	14
Mills prospect.....	Douglas..	Sec 15, T 29 S, R 1 W	do.....	do.....	do.....	Unknown.....	14
Mock Gulch claims (Max Gulch).	Jackson..	Sec 17, T 40 S, R 4 W	do.....	175 feet of trenches.	In altered volcanic rocks.	R.A. Mitchell and D.A. Wright	-
Monte Carlo claims (Crispen, Last Chance).	Douglas..	Sec 17, T 29 S, R 1 W	Occurrence	Unknown.....	Unknown.....	Cora and Bette G. Calhoon.	14
Morris prospect.....	do.....	Sec 6, T 31 S, R 4 W	do.....	do.....	do.....	Unknown.....	14

TABLE 26. - Oregon mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
SOUTHWESTERN OREGON--Continued							
Mother Lode mine (Red Cloud).	Douglas..	Secs 16, 21, T 32 S, R 2 W.	Several....	Adits, open cut...	In shear zone.....	Mrs. B.E. Hanson and association.	14, 25, 44
Mountain Boomer claim (Feheley).	Curry....	Sec 16, T 41 S, R 10 W.	Occurrence.	Unknown.....	Unknown.....	Unknown.....	14
Mountain King mine....	Jackson..	Sec 36, T 34 S, R 3 W.	About 100..	About 2,040 feet of underground workings on 6 levels.	In shear zones.....	Western Minerals Products Co.	27, 29
Myrna-Thelma Nos. 1 and 2.	Douglas..	Sec 17, T 29 S, R 1 W.	Occurrence.	Unknown.....	Unknown.....	H.E. Rogers and others.	-
Nivinson prospect.....	do.....	Sec 16, T 32 S, R 2 W.	do.....	Three adits, shallow pits.	In mica schist.....	F.E. Nivinson and F.M. Adams.	14, 25, 44
Nonpareil mine.....	do.....	Secs 3, 10, T 25 S, R 4 W.	About 100..	2,000 feet of adits.	In sandstone.....	Bonanza Oil and Mines Corp.	6, 14, 44
Old Codger group.....	Jackson..	Sec 21, T 32 S, R 2 W.	Occurrence.	Trenches.....	Unknown.....	J.M. McConnockie and George Culy.	-
Olson and Needham claims.	Curry....	Sec 35, T 32 S, R 13 W.	do.....	Unknown.....	do.....	Unknown.....	14
Pacific Syndicate mine (Webb and Tainor, Lucky Strike, Cinnabar, Mountain).	Jackson..	Sec 34, T 34 S, R 2 W.	About 50...	150-foot incline, four drifts.	Along fissure vein in sandstone and conglomerate.	Pacific Syndicate	27
Palmer Creek prospect (Davison, Contrell, Hyde).	do.....	Secs 2, 3, T 40 S, R 4 W.	Occurrence.	Adits, trenches...	Along breccia zone..	F.E. MacFarlane and others.	10, 27, 46
Pastorelli Mining claims.	Curry....	Secs 20, 29, 30, T 37 S, R 12 W.	do.....	Unknown.....	Unknown.....	Alfred Pastorelli	-
Pence and Howell prospect (Ross).	Douglas..	Secs 17, 18, T 29 S, R 1 W.	do.....	do.....	do.....	Unknown.....	14
Pennell prospect.....	do.....	Sec 11, T 29 S, R 1 W.	do.....	do.....	do.....	do.....	14
Pitcher prospect (Shoestring Creek).	Lane.....	Sec 26, T 21 S, R 1 W.	do.....	do.....	do.....	Ben Pitcher.....	14
Pitt View prospect....	Jackson..	Sec 22, T 33 S, R 1 W.	do.....	do.....	do.....	T.P. Adams.....	-
Pollanz prospect (James R.).	Douglas..	Sec 34, T 29 S, R 2 W.	do.....	Two adits.....	In stringers in altered andesite.	do.....	14, 44
Poole prospect (Rodgers).	Jackson..	Secs 2, 36, T 33 S, R 1 W.	do.....	Open cuts.....	Unknown.....	A.G. Rodgers.....	44
Postem prospect	Josephine	Sec 36, T 35 S, R 8 W.	do.....	Unknown.....	do.....	Unknown.....	14

Rayomes Cinnabar prospect.	Jackson..	Sec 32, T 33 S, R 1 E.	do.....	Three open cuts...	In fault gouge in altered basalt.	R.C. Brewer.....	45
Red Chief (Rogue Elk, Rogue River).	do.....	Sec 33, T 33 S, R 1 E.	do.....	300-foot and 50-foot adits.	Along breccia zone.	Allen Rogers.....	44, 45
Red Devil (Red Ledge, Mercury King).	Josephine	Sec 12, T 36 S, R 8 W.	do.....	Trenches.....	Disseminated in serpentine, once a gold prospect.	J.E. Hamlin.....	-
Red Feather group (Ruby).	Jackson..	Secs 34, 35, T 40 S, R 3 W.	Some.....	70-foot incline adit, winze.	Along fault zone....	Arthur Jeldness..	27, 42
Red Flats placers.....	Curry....	Secs 18, 19, 30, T 37 S, R 13 W.	Occurrence.	Pits.....	Serpentine country rock.	Mrs. Mary Smedberg and associates.	18, 25
Red Hill No. 1.....	Douglas..	Secs 6, 7, T 32 S, R 3 W.	do.....	Unknown.....	Unknown.....	S.E. Evens.....	-
Red Ridge Mining Co...	Curry....	Secs 18, 19, T 37 S, R 13 W.	do.....	do.....	do.....	Harry Hedderley and associates.	-
Red Star Cinnabar.....	Jackson..	Sec 17, T 41 S, R 2 W.	Some.....	Open cuts.....	In seams.....	Eugene Moe and John O'Brien.	25
Red Wing Cinnabar prospect (Rhodes, Jeldness).	do.....	Sec 6, T 41 S, R 2 W.	Occurrence.	38-foot shaft, 240-foot adit.	Unknown.....	Andrew Jeldness.	-
Rhyolite.....	Curry....	Sec 30, T 32 S, R 10 W.	do.....	Shallow open cuts.	do.....	M.J. Carmichael..	14, 25
Rowe prospect.....	Douglas..	Sec 16, T 30 S, R 4 W.	do.....	Unknown.....	do.....	Albert Rowe.....	14
Roxana prospect (Hill Top Mercury).	Jackson..	Sec 5, T 34 S, R 2 W.	6.....	Two adits, trenches, and pits.	Along highly silicified zone in mica schist.	W.M. Thomason and Paul Matteson.	25, 45
Sager and Hull mine (Long Branch).	do.....	Sec 24, T 34 S, R 2 W.	Occurrence.	60-foot adit and 40-foot shaft.	Unknown.....	Unknown.....	-
Seventy-Three Cinnabar	do.....	Sec 1, T 35 S, R 3 W.	do.....	Unknown.....	do.....	do.....	14
Shull prospect.....	do.....	Sec 13, T 34 S, R 2 W.	do.....	do.....	do.....	do.....	14
Singler prospect.....	do.....	Sec 21, T 34 S, R 2 W.	do.....	Two prospect pits.	In cherty material..	August Singler...	-
South Umpqua Mining Co. mine (Banfield).	Douglas..	Sec 34, T 31 S, R 2 W.	do.....	Five adits aggregating about 3,500 feet.	Copper mine.....	South Umpqua Mining Co.	14, 25
Steamboat Cinnabar prospect (Curl).	Jackson..	Sec 18, T 40 S, R 4 W.	A few.....	Open cut, three adits, and an old stope.	In calcite veinlets.	C.C. and E.W. Kubel.	14
Sullivan prospect.....	Lane.....	Sec 9, T 23 S, R 3 W.	Occurrence.	Unknown.....	Along silica-carbonate veinlets in altered andesite.	Unknown.....	44
Sutherland prospect...	Douglas..	Sec 30, T 25 S, R 4 W.	do.....	30-foot adit.....	Unknown.....	do.....	14, 44

TABLE 26. - Oregon Mercury Properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
SOUTHWESTERN OREGON--Continued							
Table Mountain.....	Jackson..	Sec 35, T 36 S, R 2 W.	Occurrence	Unknown.....	Unknown.....	Unknown.....	14
Thomason or Elk Horn claims.	Douglas..	Sec 16, T 32 S, R 2 W.	do.....	Shallow shaft.....	In mica schist.....	Mrs. N. J. Bergman and Carl Bergman.	14, 25
Thompson prospect.....	do.....	Sec 15, T 23 S, R 4 W.	do.....	Unknown.....	Unknown.....	Marvin Thompson..	14
Victory placer.....	do.....	Sec 33, T 32 S, R 7 W.	do.....	do.....	do.....	W. R. Purvine....	14
Walker or Steelhead claims.	Jackson..	Sec 33, T 33 S, R 1 E.	do.....	do.....	do.....	C. E. Wright and others.	-
War Eagle mine (Rainier, Utah Quicksilver).	do.....	Secs 7, 8, 9, 16, 20, 21, T 34 S, R 2 W.	Over 600..	More than 2,400 feet of drifts and crosscuts.	In lignite seam; an silicified fault breccia.	Elmer W. Steinbeck.	27, 44
Williams Mercury claims.	do.....	Sec 20, T 40 S, R 4 W.	Some	Trenches.....	Unknown.....	J. M. Williams...	14
Wilson prospect.....	Douglas..	Sec 8, T 23 S, R 4 W.	Occurrence	Unknown.....	do.....	Harry Paselk.....	14
Wolfe prospect.....	Josephine	Sec 16, T 35 S, R 7 W.	do.....	do.....	do.....	Unknown.....	14
Woodpecker group.....	Jackson..	Secs 16, 21, T 40 S, R 4 W.	do.....	Open cuts.....	With scheelite along fractures in metavolcanics.	Valoris Haskins and Paul Seldel.	27
Young prospect.....	Josephine	Sec 6, T 33 S, R 5 W.	do.....	Unknown.....	Unknown.....	Unknown.....	14
NORTHWESTERN OREGON							
Ames and Bancroft mine	Clackamas	Sec 5, T 6 S, R 7 E.	A few.....	280-foot adit and shafts.	Along calcite-silica veins in basalt.	Mrs. Elizabeth Ames and E. A. Bancroft.	7, 14, 15
Kiggins mine.....	do.....	Sec 5, T 6 S, R 7 E.	71.....	Three adits, trenches.	Along calcite, zeolite, and silica veins in basalt.	Bill, Howard, and Edward McCabe.	14, 29
Nisbet mine.....	do.....	Secs 4, 5, T 6 S, R 7 E.	102.....	Five adits, 500 feet of drifts, crosscuts, incline.	Along calcite, zeolite, and quartz veins in altered basalt.	do.....	7, 14, 15
North Fork claims.....	do.....	Secs 7, 8, T 4 S, R 5 E.	Occurrence	Several short adits, shallow shaft, open cuts.	Free mercury along faults in agglomerates and tuffs.	Jacob Hauck.....	14, 29
Portland tunnel.....	Multnomah	Sec 30, T 1 N, R 1 E.	do.....	Unknown.....	Unknown.....	City of Portland.	14
Watrous prospect.....	Tillamook	Sec 20, T 2 N, R 10 W.	do.....	do.....	do.....	Unknown.....	14

NORTH-CENTRAL OREGON

Allison prospect.....	Crook....	Sec 23, T 13 S, R 17 E.	3.....	Short adit.....	Unknown.....	Melvin Viles.....	14
Amity (International Mercury, Johnson Creek, New Amity, Paulsen and Saylor).	do.....	Secs 15, 22, T 14 S, R 20 E.	Over 300..	Over 1,800 feet of underground workings.	Near shear zone in altered andesite.	Ochoco Mines, Inc.	4
Amundson Mercury prospect.	do.....	Sec 25, T 18 S, R 16 E; secs 30, 31, T 18 S, R 17 E.	Occurrence	Trenches, 42-foot adit.	Disseminated in altered diorite.	H. Campbell and others.	-
Antko prospect.....	do.....	Sec 33, T 13 S, R 19 E.	do.....	Open cuts, 50-foot adit.	In veinlets.....	Andy Antko.....	-
Ashwood (Swanson) prospect.	Jefferson	Sec 6, T 10 S, R 17 E.	35.....	Adits, trenches, churn drill holes, incline.	In contact of rhyolite plug.	Cliff Mosley and Jim Hudson.	14
Axehandle mine.....	do.....	Secs 34, 35, T 9 S, R 17 E.	About 100.	Extensive underground workings.	In andesite plug intruded into porphyritic andesite.	Guy Wharton and others.	14
Barnes Butte prospect.	Crook....	Sec 28, T 14 S, R 16 E.	Several...	70-foot adit, shallow shafts, open cuts.	In altered opalized rhyolite and tuff.	J. E. McKenzie and others.	14
Barney and Staley mine (Ochoco Quicksilver, Champion).	do.....	Sec 7, T 14 S, R 19 E.	Over 400..	1,100-foot adit, 125-foot incline, 80-foot vertical shaft.	With pyrite, calcite, and opalite along clayey shear zone in faulted andesite.	Shirley Quant and J. A. Hudspeth.	14
Beale prospect.....	do.....	Sec 18, T 13 S, R 17 E.	Occurrence	Unknown.....	Unknown.....	Unknown.....	14
Bear claims.....	Wheeler..	Sec 32, T 12 S, R 20 E.	do.....	35-foot incline, open cuts.	In small quartz vein.	Carl Fisher and G. L. Brazee.	14, 17
Bear Creek mine (Humboldt Metallics Corp.)	Jefferson	Sec 35, T 11 S, R 19 E.	5.....	Two adits, glory hole.	In tuffs, faults, etc.	Humboldt Metallics Corp., Inc.	14
Beaver Guard prospect.	Wheeler..	Secs 27, 28, T 12 S, R 20 E.	Occurrence	Unknown.....	Unknown.....	Unknown.....	14
Blevins prospect.....	Crook....	Sec 18, T 14 S, R 19 E.	do.....	do.....	do.....	Ike Blevins.....	14
Blue Ridge and Whiting No. 1 mine.	do.....	Sec 15, T 14 S, R 20 E.	Over 270..	100-foot inclined shaft, 75-foot winze, 100-foot drifts.	Along faults and fault intersections	Roy C. Stanton...	4, 14
Botz prospect.....	do.....	Sec 19, T 18 S, R 17 E.	Occurrence	1,250-foot and 55-foot adits, trenches.	Unknown.....	Charles W. Sullivan.	-

TABLE 26. - Oregon mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
NORTH-CENTRAL OREGON--Continued							
Butte and View claims (Custer Young).	Jefferson	Sec 6, T 10 S, R 17 E.	Occurrence.	Adits, drifts, open cuts.	Along brecciated zone on contact of altered rhyolite.	Custer Young.....	-
Byron and Oscar mine..	Crook....	Sec 23, T 14 S, R 18 E.	63.....	Adit, vertical shaft with two or more levels, open cuts.	Along shear zone in an andesite flow.	George Oscar estate and others.	14
Carnagey Cinnabar claims (Mill Creek Cinnabar).	do.....	Sec 23 or 24, T 13 S, R 17 E.	Unknown....	47-foot shaft, short adit, trenches.	Large low-grade cinnabar deposit.	C.A. Carnagey and Walter Lindstrom	-
Champion mine.....	do.....	Sec 3, T 14 S, R 19 E.	37.....	Vertical shaft, shallow incline, open cuts.	Along fault zone in andesite, shales, and agglomerates.	William Elmer and associates.	14, 17
Cherry Creek prospect.	Jefferson	Secs 16, 21, T 10 S, R 19 E.	Occurrence.	Short adit, shallow open cut.	Unknown.....	Glen Stephenson..	14
Crosby Mercury claims (Yates and Degner).	do.....	Sec 2, T 10 S, R 18 E.	Occurrence.	Unknown.....	do.....	W.B. Yates and E.G. Degner.	14
Devil's Food mine (Endicott).....	Crook....	Secs 16, 21, T 14 S, R 20 E.	Occurrence.	150-foot adit, 33-foot crosscut, shallow pits, cuts.	Along fault zone....	William Endicott.	14
Dunham mine (Oronago).	do.....	Sec 31, T 17 S, R 17 E.	A few.....	Short adits, shallow shafts, open cuts.	Sparingly along vein	Max Stevens and Claude Dunham.	14, 17
Friend prospect.....	Jefferson	About 3 miles northeast from Ashwood on Friend's Ranch.	Occurrence.	Unknown.....	Unknown.....	Byron Friend.....	-
Gage Ranch prospect...	Wheeler..	Sec 31, T 11 S, R 21 E.	do.....	do.....	do.....	Unknown.....	14
Gray Butte prospect...	Jefferson	Sec 13, T 13 S, R 13 E.	do.....	Trenches.....	In surface soil.....	A. Rodman and associates.	14
Gray Prairie prospect.	Crook....	Secs 16, 21, T 15 S, R 20 E.	do.....	30-foot vertical shaft, shallow pits.	In narrow stringers.	Bert Tolliday and Gordon Glover.	14
Horse Creek prospect..	Jefferson	Sec 9, T 11 S, R 19 E.	do.....	Two adits.....	In highly altered rhyolite.	Bert Roark and Glen Stephenson.	14
Horse Heaven mine.....	do.....	Sec 12, T 10 S, R 18 E.	17,212.....	Extensive.....	Along breccia zone in rhyolite plug.	Cordero Mining Co.	14, 16, 41

Ideal	Crook	Secs 25, 36, T 17 S, R 16 E.	Occurrence.	Unknown	Minute disseminations in fault.	H.W. Carter and associates.	14
Independent	do	Sec 20, T 14 S, R 20 E.	do	Adits, open cuts, 8 diamond-drill holes, trenches.	Along fault zones...	George Dreis and Adrian Dante.	14
Israel prospect	do	Sec 9, T 18 S, R 17 E.	do	Unknown	Unknown	J.H. Israel	-
Little Hay Creek prospect (Miller's Flat).	do	Secs 22, 27, T 13 S, R 19 E.	do	25-foot adit, 25-foot shaft, open cuts.	Along kaolinized shear zone in altered andesite.	Bert Tolliday and R.R. Whiting.	-
Lowery (Garnet No. 1, Roark).	Jefferson	Sec 3, T 10 S, R 18 E.	do	Test pit	In altered andesite.	Bert Roark and Elvin D. Lowery.	-
Lucky Lost mine	Wheeler	Sec 19, T 13 S, R 25 E.	do	Unknown	Unknown	A.A. Wiegner and others.	-
Maury Mountain mine (Staley and Towner, Lost Cinnabar, Eickemeyer).	Crook	Secs 10, 15, T 17 S, R 19 E.	Over 700	Considerable workings underground.	In breccia along two major fault zones.	H.W. Eickemeyer	14, 39
McTimmonds Ranch mine.	Wheeler	Sec 15, T 12 S, R 20 E.	Occurrence.	20-foot incline, short adits, trenches.	Along fault slip in altered rhyolite.	Robert Woodward	14
Mercury King prospect.	do	Sec 31, T 12 S, R 20 E.	do	Two short adits, 60-foot shaft, pits.	In silicified zone in altered basalt.	R.H. McManners and M.V. Kingwell.	14
Moore prospect	Crook	Sec 15, T 16 S, R 18 E.	do	Unknown	Unknown	Unknown	14
Mother Lode mine (Canyon Creek, American Almaden, or Quicksilver Consolidated, Crams, Inc.).	do	Secs 20-29, T 14 S, R 20 E.	355	Six adits, about 2,250 feet of drifts, trenches.	Along fissures in latite.	Frank Reid and others.	14
Neglected (Gervais)	do	Sec, 9, 10, T 18 S, R 17 E.	Occurrence.	Open cuts, 14 and 40 feet.	In tuff	W.C. Hudson	-
Ochoco	do	Sec 30, T 13 S, R 20 E.	do	Unknown	Unknown	Unknown	14
Opal Creek prospect	Jefferson	Sec 25, T 11 S, R 18 E.	do	do	do	A.J. Champion	14
Opal Mountain prospect	do	Sec 35, T 11 S, R 18 E.	do	do	do	do	14
Orion Mining Co. claims.	Crook	Secs 16, 21, T 14 S, R 20 E.	do	1,100 feet of diamond drilling, shaft, trenches.	In rhyolitic, pipe-like breccia zone.	Orion Exploration and Development Co.	-
Peaslee Creek	do	Sec 18, T 14 S, R 20 E.	do	Open cuts.	In creek gravels	Frank O'Kelly	14
Platner mine (Bear Creek Mercury Co. Wiltsie).	do	Secs 18, 19, T 18 S, R 17 E.	24	600-foot adit and 1,500 feet of underground workings.	Quartz veinlets and disseminations.	Mrs. Thompson and William Holly.	14

TABLE 26. - Oregon Mercury Properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
NORTH-CENTRAL OREGON--Continued							
Roark prospect	Jefferson	Secs 22, 27, T 11 S, R 19 E.	Occurrence	Unknown	Unknown	Unknown	14
Round Mountain prospect.	Crook	Sec 33, T 13 S, R 20 E.	2	500 feet of adits, trenches.	do	Frank Reid	14
Salt Creek prospect	do	Sec 3, T 18 S, R 17 E.	Occurrence	Trenches	do	W. A. Beaver and Earl Hale.	-
Strickland Butte Cinnabar mine.	do	Sec 14, T 13 S, R 17 E.	10	450 feet of adits, two short winzes, shallow shaft, two churn-drill holes.	In narrow stringers.	Morris L. and Charles J. Page.	14
Taylor Ranch mine (Whiting).	do	Sec 34, T 13 S, R 19 E.	248	130-foot shaft with three levels	Localized at fault intersections.	John Hudspeth	4, 14, 39
Viewpoint	do	Secs 27, 28, T 12 S, R 19 E.	Occurrence	Unknown	Unknown	Unknown	14
Westerling	do	Sec 14, T 14 S, R 20 E.	do	Open cuts	do	W. J. Westerling.	14, 17
SOUTH-CENTRAL OREGON							
Adel prospect	Lake	Sec--, T 39 S, R 24 E.	Occurrence	Unknown	Unknown	Unknown	14
Batman and Wilson prospect	do	Sec 4, T 41 S, R 18 E.	do	do	do	G. L. Batman and Frank Wilson.	14
Big Surprise claims	do	Sec--, T 41 S, R 18 E.	do	do	do	G. L. Batman	-
Bot Cat claim	do	Sec 4, T 41 S, R 18 E.	do	do	do	G. L. Batman, A. G. Huntley, and Don Morrison	-
Chewaucan River prospect.	do	Secs 9, 16, T 34 S, R 18 E.	do	do	do	Unknown	14
Currier mine	do	Sec 36, T 32 S, R 16 E.	2	130-foot adit, trenches.	Several small pockets.	Manley Currier	14, 32
Digmore mine	do	Sec 12, T 38 S, R 20 E; sec 7, T 38 S, R 21 E.	Occurrence	Trenches	In opalized tuffs	J. W. Rehart	-
Dozer and Lucky Strike claims.	do	Sec 2, T 41 S, R 21 E; sec 1, T 41 S, R 21 E.	do	Unknown	Unknown	John Rauch	-
Four-Square claims (Angel's Peak).	do	Sec 32, T 37 S, R 17 E.	16	Overburden stripped.	do	Western Minerals Co.	-
Glass Buttes Cinnabar claims.	do	Sec 34, T 23 S, R 23 E; sec 3, T 24 S, R 23 E.	93	46-foot shaft, adit, trenches.	In brecciated opalite.	E. W. Pringle	14, 31, 32

Hart Mountain prospect	do.....	Sec--, T 36 S, R 25 E.	Occurrence	Unknown.....	Unknown.....	Unknown.....	14
Horse Head Mountains prospect.	Harney...	Sec--, T 27 S, R 25 E.	do.....	do.....	do.....	Fred McWhinney and A. Johnson.	14
Kingwell prospect.....	Lake.....	Sec 32, T 32 S, R 19 E.	do.....	do.....	do.....	Unknown.....	14
Muddy Claims.....	do.....	Sec--, T 39 S, R 18 E.	do.....	do.....	do.....	C. H. Gilmore and others.	-
Quartz Mountain Cinnabar claims.	do.....	Secs 26, 27, 34, 35, T 37 S, R 16 E.	do.....	Trenches, pits....	Many scattered occurrences.	Unknown.....	14, 19
Windy Hollow mine and Hot Spot claims (Grey prospect).	do.....	Sec 15, T 35 S, R 23 E.	3.....	Shaft, adits, stope, and trenches.	In kaolinized volcanic tuffs.	Stanley and Zane Gray.	14
			SOUTHEASTERN OREGON				
Aile Rouge Mercury claim (Stewarts).	Harney...	Sec 30, T 34 S, R 34 E.	Occurrence	Unknown.....	Unknown.....	Unknown.....	14
Alcorte prospect.....	Malheur..	Sec--, T 39 S, R 43 E.	do.....	do.....	do.....	do.....	14
Alexander mine.....	Harney...	Sec 30, T 34 S, R 34 E.	6.....	30-foot incline trenches.	3-foot breccia zone.	Harry Alexander and others.	49
Apache prospect.....	do.....	Sec 7, T 40 S, R 35 E.	Occurrence	Unknown.....	Unknown.....	Dewey Moore and Paul Cramer.	14, 49
Arizona claims (Valley View).	do.....	Sec 6, T 40 S, R 35 E.	do.....	do.....	do.....	L. N., D. N., and A. J. Stockton.	14, 33
Blue Boy, Crimson Rose, White Pick, and Globe and Spring claims (Nellie B.).	do.....	Sec 25, T 37 S, R 32 3/4 E.	do.....	do.....	do.....	M. N. and R. E. Doan.	14, 49
Blue Bull mine.....	do.....	Sec 24, T 39 S, R 34 E.	do.....	60-foot shaft, 30-foot drift, pits, trenches.	In narrow veins.....	Ora and M. N. Doan and others.	14, 33, 49
Brandon prospect.....	Malheur..	Sec 6, T 25 S, R 43 E.	do.....	Trenches.....	In opalite.....	Ivan and Virginia Brandon.	-
Bretz mine.....	do.....	Sec 3, T 41 S, R 41 E.	Over 15,000.	Open pit, underground working.	In tuffs and lake beds.	Arentz Mining Ventures.	2, 4, 12, 14, 34
Burnell-Larson.....	do.....	Secs 34, 35, 36, T 40 S, R 40 E.	Occurrence	Trenches.....	Disseminated in silica rock.	Herbert Henne and M. B. Larson.	-
Cash group.....	Harney...	Sec 25, T 39 S, R 34 E.	do.....	Unknown.....	Unknown.....	Unknown.....	14
Connor-Blair claims...	do.....	Sec 26, T 37 S, R 32 3/4 E; sec. 23, T 37 S, R 32 3/4 E.	do.....	30-foot adit, trenches.	In brecciated lava..	Rube Blair.....	14, 33
Double Link prospect..	do.....	Sec 13, T 41 S, R 34 E.	do.....	35-foot shaft, trenches.	In opal-chalcedony matrix.	J. B. Fine and B. T. Fiscal.	14, 49

TABLE 26. - Oregon mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
			SOUTHEASTERN OREGON--Continued				
Duncan prospect	Harney	Sec 26, T 23 S, R 29 E.	Occurrence.	Unknown	Unknown	Unknown	14
Eileen group	do	Sec 26, T 37 S, R 32-3/4 E.	do	do	do	Ben O'Keefe	-
Eldorado group	do	Sec 7, T 37 S, R 33 E.	do	Shallow shaft, pits.	Two narrow parallel veins.	Ben O'Keefe and others.	14, 49
Farnham group	do	Secs 8, 17, T 40 S, R 35 E.	do	780-foot adit, 260-foot adit, short adits.	In three veins	E.D. Farnham	14, 33, 49
Fields lode	do	Sec 18, T 37 S, R 33 E.	do	Unknown	Unknown	Ida Kusisto and others.	14, 49
Fisher and Regal group	do	Sec 29, T 36 S, R 33 E.	Some	Trenches, pits	do	Steens Mountain Mining Co.	14, 33, 49
Harmony and Surprise groups and Ajax claims.	do	Sec 2, T 39 S, R 34 E.	Occurrence.	80-foot adit, shallow pits.	do	C.M. and M.N. Doan and others.	14, 49
Idle City placers prospect.	do	Secs 4, 9, T 21 S, R 32 E; secs 29, 32, T 20 S, R 32 E.	do	Unknown	do	Unknown	14
Indian Creek claims	do	Sec 30, T 34 S, R 34 E.	do	do	do	do	14
Last Chance and Indian Chief claims.	do	Sec 30, T 34 S, R 34 E.	do	do	do	do	-
Lucky Boy	do	Sec 16, T 37 S, R 36 E.	do	do	do	do	14
Lucky Strike group (Doan's).	do	Secs 25, 36, T 37 S, R 37-3/4 E.	do	do	do	do	14, 33, 49
McLean's Copper claims (Blue Copper).	do	Sec 12, T 39 S, R 34 E.	do	do	do	Delmer McClean and others.	-
Mile High group	do	Sec 17, T 40 S, R 35 E.	do	do	do	R.R. McCulloch and others.	-
Mogul group	do	Sec 26, T 37 S, R 32-3/4 E.	Over 30	Incline, 120- and 180-foot levels, stopes.	In veins of opalite and in breccia.	Pete Cachenaut and Joe Ergainaga.	14
O'Keefe copper claims.	do	Secs 10, 11, T 39 S, R 34 E.	Occurrence.	Pits, caved	Silicified zone with chalcopyrite and schwatzite.	Ben O'Keefe	33, 49
O'Keefe Mercury claims	do	Sec 23, T 37 S, R 32-3/4 E.	do	Surface cuts	In opalite	do	33, 49
Old Faithful No. 1	do	Sec 25, T 37 S, R 32-3/4 E.	do	Unknown	Unknown	Judd Currey and others.	14

Old Hopeful and New claims.	do.....	Sec 19, T 34 S, R 34 E.	do.....	do.....	do.....	C.W. Hutchins....	-
Opalite mine.....	Malheur..	Sec 33, T 40 S, R 40 E.	Over 10,000	Glory hole.....	Disseminated in silica rock.	Bradley Mining Co.	3, 7, 14, 15, 32, 34, 36, 51
Pike claim.....	Harney...	Sec 30, T 34 S, R 34 E.	Occurrence.	Unknown.....	Unknown.....	Andrew Shull.....	14
Pueblo and Wonder Rock group (Farnham).	do.....	Secs 5, 6, 7, 8, T 40 S, R 35 E.	do.....	do.....	In veins.....	H.A. Jensen and others.	14
Pueblo Mining Co. claims.	do.....	Secs 7, 8, 9, T 40 S., R 35 E.	do.....	do.....	Unknown.....	W.M. Cooney, Sr.	14
Rabbit Hole and Spring Creek claims.	do.....	Sec 12, T 39 S, R 34 E.	Some.....	63-foot shaft, 25-foot adit, trenches.	In opalite with copper minerals.	Ora and C.M. Doan and D.E. Wheeler	14, 33, 49
Red Dome and Lucky Star claims.	do.....	Sec 18, T 37 S, R 33 E.	Occurrence.	Shallow pits.....	Unknown.....	Ida Kusisto and others.	14, 49
Red Hill and Derose groups.	do.....	Sec 30, T 37 S, R 33 E.	do.....	Unknown.....	do.....	Ben O'Keefe and others.	14
Red Hill groups (Red Bull).	do.....	Secs 11, 14, T 39 S, R 34 E.	do.....	Shallow shaft, 100-foot adit, trenches.	With copper minerals in silicified andesite.	Gregory Shull, and others.	14, 33, 49
Red Rock No. 1 prospect.	do.....	Secs 19, 20, T 22 S, R 36 E.	do.....	Unknown.....	Unknown.....	Zelma M. Jordan and others.	-
Sheepherder claims....	do.....	Sec 29, T 36 S, R 33 E.	do.....	do.....	do.....	Steens Mountain Mining Co.	14
South O'Keefe claims..	do.....	Sec 2, T 39 S, R 35 E.	do.....	do.....	do.....	Unknown.....	14
Spring Creek claims...	do.....	Sec 12, T 39 S, R 35 E.	do.....	do.....	do.....	do.....	14, 49
Steens Mountain mine (Stephenson and Bradley).	do.....	Sec 19, T 34 S, R 34 E.	Over 20....	Adit, 265 feet of underground workings.	Three fissure zones with high-grade pockets.	Glen Stephenson and Bert Roark.	14, 33, 49
Sunset Mercury claims and Bretz prospects.	Malheur..	Sec--, T 41 S, R 41 E.	Occurrence.	Unknown.....	Unknown.....	Earl and Perry Mock.	14
Valley View Mercury prospect.	Harney...	Sec 11, T 23 S, R 33 E.	do.....	Small prospect pits.	In opalite.....	Don Robbins.....	14
Yellow Jacket claims..	do.....	Sec 30, T 37 S, R 33 E.	do.....	Unknown.....	Unknown.....	H.E. and Bessie Blair.	-
NORTHEASTERN OREGON							
Chandler and Haight prospect.	Grant....	Sec 33, T 14 S, R 31 E.	do.....	Unknown.....	Unknown.....	P.F. Chandler and C.P. Haight.	14
Cinnabar Mountain claims (Macheney, Johnson, Cain).	do.....	Sec 18, T 14 S, R 30 E.	do.....	100-foot shaft, drifts.	On wall of 3-4-foot vein.	H.J. Johnson and J.C. Macheney.	14, 30
Clark Creek prospect..	Baker....	Sec 21, T 12 S, R 41 E.	do.....	Unknown.....	Unknown.....	Unknown.....	14
Clay Cinnabar prospect	Malheur..	Sec 26, T 15 S, R 45 E.	do.....	do.....	do.....	do.....	14
Columbia Gold mine....	Baker....	Sec 5, T 9 S, R 37 E.	do.....	do.....	do.....	do.....	14

TABLE 26. - Oregon mercury properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
NORTHEASTERN OREGON--Continued							
Connor Creek	Baker	Sec 34, T 11 S, R 43 E.	Occurrence.	Unknown	In opalized syenite.	Frank Butchart	-
Crater Chimney (Gold Crater).	do	Secs 25, 26, T 11 S, R 39 E.	do	do	Unknown	International Gold Corp.	-
Dead Horse Creek prospect.	Grant	Sec 30, T 14 S, R 30 E.	do	do	do	Unknown	14
Diadem and Brindle Horse.	Baker	Secs 16, 17, T 10 S, R 35 E.	do	do	do	Etta D. Mantle	14
Gray prospect	Grant	Sec 29, T 13 S, R 28 E.	do	do	do	Unknown	14
Hiller Chrome-Cinnabar mine.	Baker	Sec 9, T 14 S, R 36 E.	do	do	do	Ed Hiller and Jim Demastus.	14
Hope Butte prospect (Jordan, Riddle).	Malheur	Secs 16, 21, 22, 27, 28, T 17 S, R 43 E.	do	Adit, winze, churn and diamond drilling.	In tuffs and opalite	John Stringer and others.	-
IXL (Hidden Treasure).	Grant	Sec 10, T 10 S, R 35 E.	do	Unknown	Unknown	Gertie O'Rourk	14, 26, 30
Lackey Cinnabar group (Stan and Berry).	Malheur	Secs 22, 27, T 15 S, R 45 E.	do	do	do	Unknown	14
Morton Mercury prospect.	do	Secs 18, 19, T 13 S, R 42 E.	do	20-foot incline, open cuts.	Crack filling, disseminated.	Carl Morton	14
Mulkey Cinnabar claims (White Wonder)	Baker	Secs 35, 36, T 9 S, R 35½ E.	do	Unknown	Unknown	L. Rand and C. Mulkey.	14
Paramount Quicksilver mine.	Grant	Sec 16, T 10 S, R 35 E.	25	1,200-foot adit, 400-foot adit.	In brecciated zones in serpentine.	Inkerman Helmer	14, 26
Quicksilver and Easy Money claims.	Baker	Sec 11, T 13 S, R 41 E.	Occurrence.	Unknown	Unknown	John Joseph and others.	14
Red Boy mine	Grant	Sec 10, T 9 S, R 35 E.	do	do	do	Unknown	14
Roba Quicksilver mine (Deer Creek).	do	Sec 6, T 16 S, R 29 E.	8	128-foot shaft, 300-feet of drifts.	In fault gouge, cutting argillite.	L.H. Roba	-
Rose Lee	Baker	Sec 34, T 11 S, R 45 E.	Occurrence.	Unknown	Unknown	L.P. Kane and John Flynn.	-
Sumpter placer	do	Sec 20, T 9 S, R 37 E.	do	do	do	Unknown	14
Susanville placer	Grant	Sec 7, T 10 S, R 33 E.	do	do	do	do	14
Wild Cat Basin	do	Sec--, T 15 S, R 33 E.	do	do	do	do	14
York and Reynolds prospect (Broadway).	do	Sec 7, T 16 S, R 29 E.	do	do	do	do	-

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CHAPTER 10. - MERCURY IN TEXAS

by

J. W. Chester[1]

INTRODUCTION AND SUMMARY

This chapter summarizes available information on all significant mercury occurrences in Texas.

The Terlingua mining district in southwestern Texas was one of the leading mercury-producing districts of the United States from 1905 to 1935. The total reported output of Texas from 1897 to 1960 amounted to at least 147,211 flasks of mercury, about 9 percent of the new mercury produced in the Nation during the period. Most of the production in Texas was from the Terlingua district in southwestern Brewster County, but mines in outlying districts (fig. 10) of Brewster and Presidio Counties also contributed to the total.

Mercury mining in Texas ceased at the close of 1945. A smaller scale resumption of exploration, mining, and furnacing activities after 1951 came to a close in 1960.

No developed ore reserves remain in the mercury districts of Texas. The substantial resources of mercury-bearing material, which have been indicated and inferred in several of the areas, would not support any commercial production under present economic conditions, but favorable exploration potentials exist in several of the mercury-bearing areas.

ACKNOWLEDGMENTS

The information on most of the properties listed in this report was obtained from numerous Federal and State publications and from county records. A numbered list of the publications is contained in the bibliography at the end of the chapter.

The cooperation and assistance of the many mine operators and individuals associated with the mercury mining industry is gratefully acknowledged.

HISTORY AND PRODUCTION

Cinnabar in the Big Bend region was first used by the Indians (*2*)[2] for making red war paint. Occurrences of cinnabar in the area were reported as early as 1850 (*1*). The occurrences are believed to have been prospected by white men at various times before the actual discovery of mercury ore on California Mountain in 1894. Mining, first recorded in 1897, was continuous

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[2]Italicized numbers in parentheses refer to items in the bibliography at the end of this chapter.

until 1945. The district was virtually idle until 1951 when the sharp rise in price of mercury stimulated explorations which resulted in some production of mercury in the ensuing years to 1960.

Reports of production are known to be incomplete, but available records, together with all other information from the operations, indicate that mining in the Texas districts produced more than 150,000 flasks of mercury during the periods 1897-1945 and 1951-60. This is about 9 percent of the national output from 1897 to the end of 1960. The reported production of mercury in Texas is shown, by periods, in table 27.

TABLE 27. - Production of mercury in Texas, 1899-1960

Period:	Production flasks
1899-1910	44,252
1911-20	47,991
1921-30	22,020
1931-40	23,503
1941-45	7,889
1946-50	None
1951-60	1,556
Total	147,211

The history of mercury production in Texas has been similar to that in most other mercury districts in the United States. The industy has been plagued by unstable prices and severe foreign competition which resulted in substantial fluctuations of mining, exploration, development, and metal output. Depletion of developed ore reserves during World War II and the virtual collapse of the mercury market in 1944 resulted in abandonment of the Texas districts from 1946 to 1951. Higher prices prevailing since have stimulated only a few explorations and some sporadic mercury mining operations have failed to reestablish Texas as a significant producer.

PHYSICAL FEATURES

The Terlingua mining district and the other mercury districts of Texas are located in the Big Bend region of southern Brewster and Presidio Counties (fig. 11). Alpine, on the Southern Pacific Railroad in northern Brewster County, is the nearest railroad point. Paved State Route 118 extends from Alpine to Study Butte, 80 miles to the south. The Terlingua district is accessible from Study Butte over paved State Route 170.

The Terlingua mercury district extends 12 miles westward from Study Butte in a zone about 4 miles wide. The region is sparsely populated mountainous desert near the Rio Grande; altitudes range from 2,300 to over 4,000 feet. The main supply center is Alpine, but some emergency rations may be obtained at Study Butte or at Lajitas near the west end of the district.

Housing for workers is now virtually nonexistent. Terlingua, a company-owned town that had a population of 600 in 1945, and the neighboring mining camps of Mariposa, California Mountain, and Study Butte are now almost deserted. Most of the dwellings, which were not modern, have fallen into ruin. Very few habitable buildings are left in the rest of the camps. The company-owned town of Bueno Suerte, near the Fresno mine in Presidio County, has been kept intact but is uninhabited.

GEOLOGY (3, 4, 8)

The stratified rocks exposed in the mercury districts of the Big Bend region in Texas consist of greatly deformed and heavily eroded marine sediments. The sediments consist almost entirely of limestone and clay beds of both Upper and Lower Cretaceous age. The igneous outcrops include outliers of rhyolitic Tertiary extrusive lavas and associated clastic beds (collectively named the Chisos Volcanics) and also many scattered exposures of subsequent Tertiary igneous intrusives.

The oldest rocks exposed in the mercury-bearing localities of Texas are of Lower Cretaceous age, represented by the Devil's River Limestone which has a thickness of over 1,500 feet. Some of the mercury mines and prospects extended in depth into its upper member called the Georgetown Limestone. Many of the mercury occurrences are in the overlying strata of the Upper Cretaceous, which has been subdivided in ascending order into the Grayson formation, a pyritiferous, marly clay (sometimes called the Del Rio Clay); the Buda Limestone; the Boquillas Flags, a flaggy limestone interbedded with bituminous shale and bentonitic clay seams (also called Eagle Ford); the Terlingua Clay; and some outliers of younger clayey beds.

The igneous rocks include intrusive sills, laccoliths, dikes, and plugs that range in composition from rhyolite through analcite syenite to olivine basalt, and extrusives of rhyolitic volcanics.

The outstanding structural feature of the Terlingua district is a long, low, irregular dome known as the Terlingua uplift (4, 7, 8). This dome extends for a distance of at least 15 miles south and east of the great Solitario dome, which is superimposed upon it, and has a structural relief of several thousand feet. Numerous smaller domes, such as are identified with cinnabar occurrences in the Adobe Walls and Christman Mountain districts (fig. 11) are scattered over the area, some being superimposed on the larger Terlingua uplift.

The most productive mercury mines are alined from west to east in a narrow zone of fracturing, along the axis of the Terlingua monocline, a steep, southward-dipping fold exposed along the south flank of the Terlingua uplift. The cinnabar-bearing fracture zones discovered in 1949 in the Maravillas district (fig. 11) are in a similar structural situation along the south flank of the larger Marathon dome (3). The Viviana mercury mine (9) in the Mariscal district (fig. 11) is on the axis of a sharp, northward-plunging, anticlinal fold about 8 miles north of its crossing of the Rio Grande from Mexico.

These structures have been further modified by faults, echelon fracture zones, and collapse areas. The major faults of the mercury districts are normal faults bounding grabens. The largest which have been mapped are along the Long Draw graben, Well Creek Valley, Cigar Mountain graben, Lowes Valley, and the Black Mesa graben zones. The collapse structures probably resulted from dissolution of limestone along subterranean solution channels of the fault systems, subsequently forming large sinks or the smaller breccia pipes from collapse of overlying beds. Many have surface expressions as roughly circular mounds or sinks with jumbled fragments of younger rocks in evidence. Some of the breccia pipes, as at the "248" mine, have been intruded by igneous rocks after formation of the "cave" breccia. The smaller domes, as at the "248" mine, are probably due to the most recent igneous intrusions.

The known ore deposits in the Texas district are of four general types:

1. The "manto" or blanket-type ore bodies, which occur as replacements, or disseminations, in limestone in trap structures (5) at or near contacts with an overlying impervious clay.

2. Small, irregular oreshoots, generally as fissure fillings, or narrow calcite veins in limestone, clay, or igneous rocks, but most abundant in the Boquillas Flags and Buda Limestone.

3. Ore bodies occupying the breccia pipes, or in the peripheral limestone beds.

4. Replacement bodies associated with fault zones at depth in the Georgetown Limestone strata (Lone Star mine and Maravillas prospect).

A variation of the type 2 ore deposits was mined on the eastern end of the Terlingua district in the Study Butte mines; on the west, in some Contrabando dome prospects of the Bueno Suerte district; and far to the southeast, in the Viviana mine of the Mariscal district. Those deposits occur in narrow, almost vertical fissures in thick, still-like igneous intrusions and in the contact zones of the overlying and underlying clayey formations.

Ross (4) classified the deposits thus:

1. Deposits localized along the contact between the Del Rio Clay and the Devil's River Limestone. This is the manto-type deposit previously described.

2. Deposits associated with faults and other openings in strata overlying the Del Rio Clay.

3. Deposits in and close to igneous rocks.

The only ore mineral of economic importance is cinnabar (HgS), although small quantities of native mercury and metacinnabarite have been produced. The following rare minerals (2) of mercury also have been identified in Texas deposits: eglestonite (Hg_4Cl_2O), terlinguaite (Hg_2ClO), montroydite (HgO), calomel (Hg_2Cl_2), kleinite (mercury-ammonium chloride), and modesite (a mercury-ammonium compound).

MERCURY MINING DISTRICTS

Texas mercury production has come from six districts which are shown on figure 11. Terlingua is the dominant district and has produced 97 percent of the mercury credited to Texas. The Buena Suerte and Mariscal districts each contain one prominent mine; the Adobe Walls, Christmas Mountain, and Maravillas districts contain only prospects.

DISTRICTS AND PROPERTIES

About 32 mercury occurrences are known in Texas, of which 28 have been mentioned in the literature (8). Most of the mercury mining in Texas was in the Terlingua district (fig. 11) which includes the Terlingua, Study Butte,

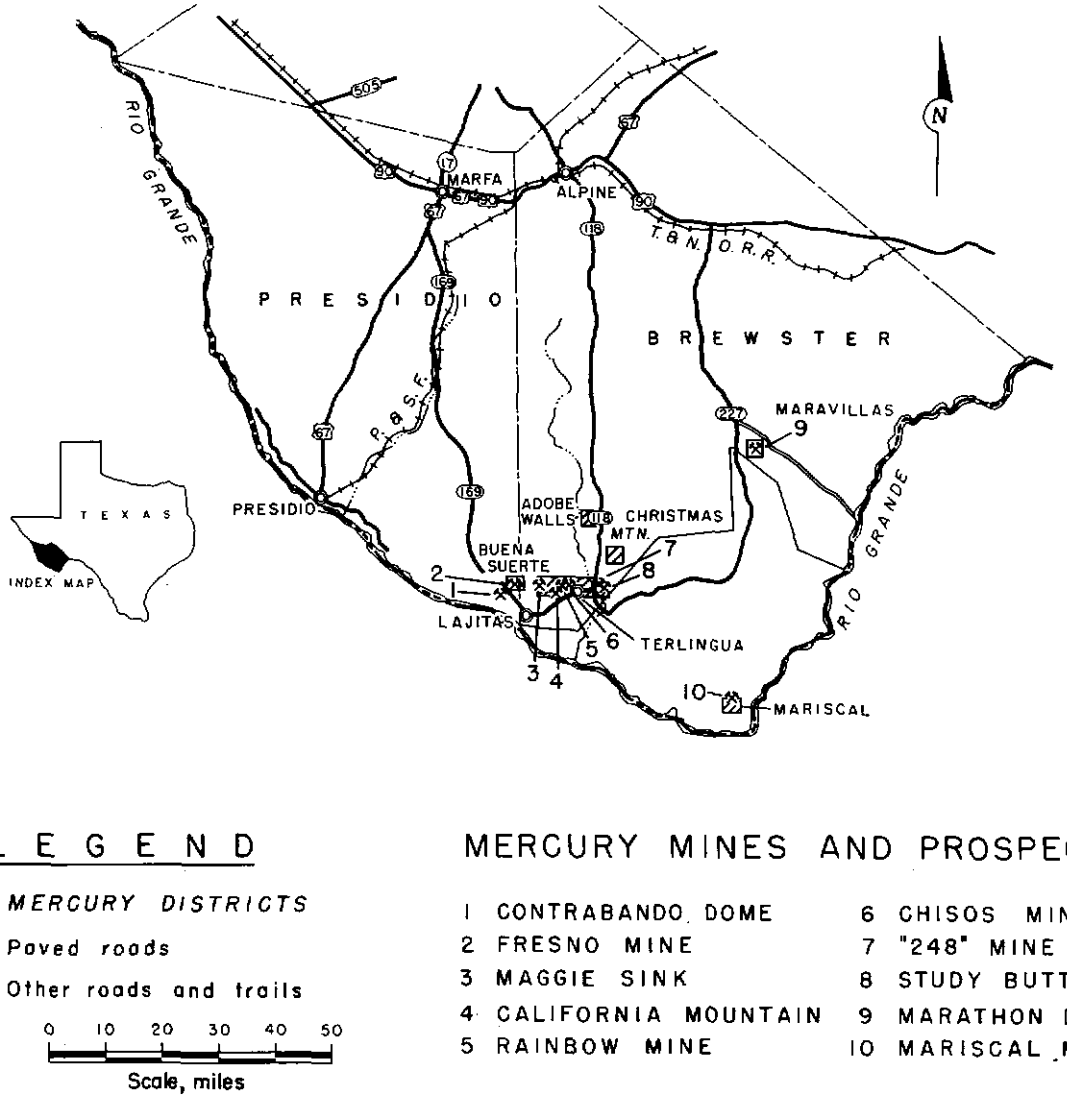

FIGURE 11. - Location Map of Mercury Districts in Texas.

"248", California Mountain-Mariposa, Waldron, and Tres Cuevas Mountain camps. Certain deposits or related deposits were worked through more than one mine; for example, the Chisos and Rainbow mines produced ore from interconnected underground workings on the manto ore body, and the Big Bend and Texas-Almaden mines were on the same system of cinnabar veinlets and dissemination zones of the Study Butte igneous intrusive and related contact deposits. Other mines won their ores from associated groups and intricate networks of small, fracture-zone ore bodies as in the California Mountain-Mariposa area.

The major mercury-producing mines or groups of mines in Texas were the Chisos, California Mountain-Mariposa, Mariscal (Viviana), Study Butte (Big Bend-Texas Almaden), "248" (Flecha), Rainbow, Maggie Sink (Lone Star), and Fresno, which are described in the following pages.

Table 28 at the conclusion of this chapter lists the known mercury occurrences in the State and provides basic information about each. In the interest of brevity the following individual property descriptions do not repeat the location, ownership, and general references.

Buena Suerte District Mines and Properties

Contrabando Dome Prospect

The Contrabando Dome prospect, located in Presidio County, was discovered about 1935. Mercury was produced from shallow prospecting and mining operations, but the only production reported was a few flasks by B. L. Shoemaker in 1943.

The cinnabar at Contrabando Dome is a hard crystalline variety and was the only mercury ore in Texas which was concentrated prior to furnacing. The processing plant consisted of a small flotation mill and 6-tube retort, installed on Fresno Creek, a mile west of Buena Suerte.

Under a Defense Minerals Exploration Administration (DMEA) project by Big Bend Mining Co. in 1956-57, nine holes aggregating 5,333 feet, were diamond drilled at widely scattered sites selected along the cinnabar-bearing fracture zones in the outcrops of Boquillas Flags and rhyolitic dikes in all three sections of the Contrabando Dome properties. No significant mercury mineralization was cut in the fracture zones, but even the deepest hole (662 feet) failed to reach through a large underlying rhyolitic laccolith to the prime objective, which was the postulated contact zone at the top of the Georgetown Limestone. Costs of the project totaled $35,780, of which the government contributed 75 percent. The leases were relinquished to the owners, and no further mercury exploration has been done.

Fresno Mine

The Fresno mine, in Presidio County, discovered in 1935 and owned and operated by Harris S. Smith and Homer M. Wilson, became the largest producer of mercury in Texas during World War II and is one of the two mines that have been productive since. About 3,500 flasks of mercury was reported to have

been produced from 1940 to 1959, mostly from a shallow manto deposit, 60 by 250 feet in area. In 1943 after most of this manto ore deposit had been mined, the Bureau of Mines diamond-drilled six holes on the Fresno property but failed to indicate any ore. The mine was idle from 1945 to 1952, and in 1954, 1957, and 1958. About 440 flasks of the Fresno mine production was reported from 1952 to 1959.

The mine was worked through two vertical shafts, and ore was mined by a modified room-and-pillar method on the slope of the manto deposit, from surface to the 100-foot level. The ore occurred in the Georgetown Limestone along its contact with the overlying Grayson clay formation. Ore and waste were sorted underground, dropped separately through mill holes to the 100-foot level, and hoisted to the surface.

From January to August 1953, exploration work by Amerimex Mining Co., under a DMEA contract at the Fresno mine included surface trenching, shaft sinking, underground drifting, and diamond drilling. Project costs totaled $61,953, of which the government contributed 75 percent. The work resulted in a DMEA certification of discovery.

Surface equipment included a Gould-type rotary furnace of 20-ton-per-day capacity, crusher, 325-cubic-foot compressor, hoisting plant, mining equipment, and shops. The company dwellings, store, office, schoolhouse, and former Post Office of Buena Suerte are one-half mile west of the mine on the unimproved road from Study Butte to Marfa. Water was hauled from Fresno Creek, a mile west of Buena Suerte. Although uninhabited since 1960, all the facilities have been kept intact.

Incidental to the exploratory work on the Fresno property, the Amerimex Mining Co., organized by Robert N. Pulliam in 1951, produced some mercury in 1953 and 1955-56. Reorganized by Mr. Pulliam and Associates in 1956 as the Terlingua Mercury Corp., it continued sporadic explorations to 1959, with only incidental production, and the lease on the Fresno properties was canceled by the owners. Dow Chemical Co. did much exploratory drilling in 1960, under a temporary option arrangement.

Terlingua District Mines and Properties

California Mountain-Mariposa Area

The second largest output of mercury in Texas was from the California Mountain-Mariposa area, including groups of mines of various owners in Brewster County. Production, ending in 1918, from the innumerable shallow workings in this area was reported to have exceeded 32,000 flasks of mercury. Some production was obtained from dumps and from the Perry open-pit mine during World War II by the Esperado Mining Co. (Brown & Root, Inc.) of Houston, Tex., which acquired all the properties of Waldron Quicksilver Co. in 1941, and installed and operated a central furnacing plant at the "248" mine, described later in this chapter.

The shallow ore bodies in the area were mined from many open pits, trenches, shallow shafts, and drifts along the inticate networks of mineralized faults in the Georgetown Limestone, and on contact with scattered overlying outliers of the Grayson clay formation. Mineralization was widespread on the surface and in the shallow workings, but some deep exploratory shafts failed to develop oreshoots at depth. The deposits were reputed to have been exhausted during World War I, although prospecting and small-scale mining continued sporadically until 1945.

Chisos Mine

The Chisos mine, located at the town of Terlingua, Brewster County, was the largest producer of mercury in Texas. Its reported output (1901-45) was over 84,000 flasks of mercury. Much of this mercury was produced during 1916-31 from the "Pipe" ore body which has been referred to as "the richest single stope in the United States". The mine was operated almost continuously from 1901 to 1941 by Chisos Mining Co. and until 1946 by Esperado Mining Co. (an affiliate of Brown & Root, Inc.) of Houston.

Three types of ore bodies--manto, veins, and pipe--were found and worked in the Chisos mine. Mining was begun after the discovery of cinnabar on one of the many outcrops of calcite veinlets in the Boquillas formation. Early in World War I, the rich breccia pipe deposit was found on the 550-foot mine level. The pipe ore body had an arched roof of Boquillas Flags at that level, but extended downward about 250 feet through the Buda Limestone and Grayson formations to the water table at the top of the Georgetown Limestone where the ore appeared to be cut off. The cinnabar occurred with calcite in the interstices of the "cave" breccia. An offset downward extension of the pipe ore body deeper in the Georgetown Limestone was inferred from underground diamond core drilling about the close of World War II but was not delineated or developed. High-grade ore bodies of the manto type had been mined in certain fault zone areas upslope in the topmost strata of the Georgetown Limestone at the contact with the overlying Grayson formation. The manto ore bodies mined on the Georgetown-Grayson contact extended upslope into the adjoining Rainbow property on the 635-foot level.

The Chisos mine was worked through three main vertical shafts and several auxiliary shafts. These shafts served 17 levels and sublevels, with the deepest 825 feet beneath the surface. The mine has about 23 miles of underground workings.

During 1943 the Bureau of Mines explored for mercury near the Chisos mine. Eleven holes were core drilled south and east of the Chisos mine on the Susano prospect, also included in properties acquired by Esperado Mining Co. Six holes were drilled to prospect outcropping calcite veins, four to prospect a breccia pipe, and one to explore for a flat-lying ore body in the deeply covered Georgetown Limestone strata near the breccia pipe. Only one of the holes penetrated mercury-bearing rock and this material was low-grade.

Surface equipment included a 625-hp electric generator; hoisting plants; a rotary furnace with a capacity of 65 to 100 tons per day, complete with

condensing units; all other equipment needed for mining; a company store; and dwellings for employees. Potable water from a horizontal diamond-drill hole into the Georgetown Limestone on a deep mine level was hoisted for the needs of the town of Terlingua.

The furnace, generating plant, and hoisting equipment were removed at the close of World War II, and the headframes have collapsed. All usable materials were salvaged from most of the buildings. Only two or three of the crude dwellings have been occupied in recent years, and the Terlingua Post Office moved to a dwelling 4 miles to the east. All developed ores were exhausted and cleanup of mercury in the furnacing plant and dumps was completed in 1945.

Maggie Sink, Lone Star Mines (Neyland-Davis, Mitchell-Gillette)

Cinnabar-bearing material was discovered in 1937 at the Maggie Sink elliptical surface depression over a breccia pipe, 535 feet long by 210 feet wide. O. L. Neyland and Associates of Del Rio, operating as Continental Mining Co., acquired the Maggie and adjoining State-awarded mining claims in Brewster County about 1940. Numerous open cuts, pits, and shallow shafts had been excavated, and cinnabar-bearing material had been stockpiled during previous prospecting and mining operations while the holdings were known as the Neyland-Davis or the Mitchell-Gillette group of claims. Based on ore indications in a 35-foot shaft on the limestone contact along the periphery of the Maggie sink, its entire area was stripped, and a crushing plant, a Gould-type rotary furnace of about 20-ton-per-day capacity, and a steel-tube condenser system were installed about 1942. The operations were discontinued after furnacing 400 or 500 tons of selected material from the Maggie pit and some ore sorted from open cuts as deep as 40 feet on cinnabar showings of adjoining claims. The amount of production was not reported.

About 1942 Robert N. Pulliam of Alpine formed Bob's Mining Co., Inc., acquired the holdings of the Continental Mining Co. Following intensive surfical prospecting in the area from 1940 to 1942, the Maggie Sink area was mapped by the Geological Survey in cooperation with the Bureau of Mines on the program of war minerals reports.

At a point on the west slope of Tres Cuevas Mountain, Bob's Mining drove a 550-foot adit into the Maggie breccia pipe, about 175 feet beneath its outcrop, and sank a 462-foot winze from the floor of the adit in the west edge of the pipe. Exploratory crosscutting, drifting, and some underground angle diamond-core drilling was done on the mine levels at 50-foot intervals below the adit. Although sparse, isolated pods of specimen cinnabar ore were found, no ore reserves were indicated and the explorations to a total depth of over 700 feet below the surface failed to reveal any significant amount of mineralization in the limestone breccia of the collapse filling of the pipe. The operations were suspended in 1946 and all mining equipment and buildings salvaged, but the Maggie furnacing plant was kept intact on the properties. Except for some exploratory drifting in 1959 by Terlingua Mercury Corp. at Mr. Pulliam's Campo de los Angeles prospect, a few hundred feet eastward from the Maggie Sink, and test runs in the Fresno furnace on selected mercury-bearing material, no further mining has been done in section 44.

In connection with bulldozing of access roads in 1954 for prospecting planned mostly for areas adjacent to the Maggie claims, a rich cinnabar outcrop, later called the Lone Star deposit, was discovered on top of Tres Cuevas Mountain, about one-half mile south of the Maggie mine. The Lone Star deposit on this rugged mountain crest occurred where erosion had cut deepest into the Georgetown Member of the Devil's River (Lower Cretaceous) Limestone, but still topographically and structually on the highest point along the axis of the eastward-striking Terlingua monocline.

Lone Star Mercury Co., organized in 1954 by Skubic Bros. Iron Ore Co. of Virginia, Minn., mined most of the rich pipelike deposit in 1955 and 1956. Slightly over 1,000 flasks of production was reported (1955-60), making these mines the largest mercury producer in Texas since World War II. The principal mine is an irregular open pit, roughly averaging about 50 feet in diameter and 80 feet deep. A small stiff-legged quarry-type derrick was used to hoist the mine buckets of ore from the pit. The mercury from this mining, plus some from low-grade cinnabar disseminations in limestone partly developed from 1957 to 1960 by several large exploratory adits started on nearby slopes, was recovered in the Maggie furnacing plant operated by Lone Star during 1955-59 on a rental arrangement with the owner, Robert N. Pulliam. However, in 1959 Lone Star moved a crusher and two large rotary furnaces from the Big Bend mine at Study Butte and installed them and a new steel-tube condenser system on the south slope of Tres Cuevas Mountain. A switchback road was cut from the steep limestone slope up to the Lone Star mine on top of the mountain, and another adit was driven about 400 feet below in limestone with faint cinnabar showings, near the new furnacing plant. Following the death of one partner in the company, a few hundred tons were furnaced as a test run of the new plant, and then all operations were discontinued in mid-1960. The furnace superintendent maintains the property and equipment intact.

Rainbow Mine

The Rainbow mine, in Brewster County, has a recorded production of over 8,000 flasks of mercury. The mine was developed by a 670-foot shaft, sunk during World War I, and by drifts on several levels. The main workings extend upslope from the 635-foot level in a manto ore body. This ore body was discovered and mostly mined before 1935 through workings extending upslope on the Georgetown-Grayson contact from the 800-foot level of the Chisos mine. Developed ore in the Rainbow mine was depleted before 1942. Some prospecting and rehabilitation of the shaft and furnacing plant were done by Paulsel Mining Co. in 1951-52, and by others, but no discoveries were reported. The shaft and Herrshoff furnacing plant, reconditioned by Rainbow Quicksilver Mines, Inc., of Fort Worth in 1956, and a few buildings remain on the property.

Study Butte Mines (Big Bend, Texas-Almaden)

The Study Butte mines are situated at Study Butte, on numerous patented State mining claims in Brewster County, about 6 miles east of Terlingua. This mine, or group of connected mines, ranks as the third largest producer of mercury in the district. Its reported production was over 14,000 flasks from 1905 to 1944. The Texas-Mercury Co. operated the mines of both the

Texas-Almaden Mercury Co., owned by Sanger Investment Co. of Fort Worth, and the Big Bend Mining Co., owned by Texas Mercury Co. of Del Rio, during the final productive years of 1940-44. Southern Geophysical Co. of Fort Worth acquired the lease on the Texas-Almaden mining property and core-drilled three deep holes in 1958 in partial fulfillment of a DMEA contract.

The ore occurred as cinnabar, in thin, almost vertical fracture zones in the sill-like Study Butte intrusive igneous rock, and in calcite veinlets and mantos on the contact with the overlying Terlingua Clay Formation, and in the Boquillas Flags on the contact underneath the 400-foot intrusive sill or sphenolith.

The ore deposits at Study Butte were developed by several shafts and interconnecting levels and mined in some places to a depth of 440 feet. Ore was sorted from waste in the stopes and hand cobbed on the surface. The Scott furnacing plant was replaced in 1928 by two Gould-type rotary furnaces, connected to a tile condenser system, and the combined daily capacity was about 80 tons of ore. During the mining activities, the adobe buildings of Study Butte housed over 100 workers and their families. Water was hauled from Terlingua Creek, 1 mile to the West. Except for a small store, no habitable buildings remain, and all mine and plant facilities have been removed.

"248" Mine (Flecha)

The "248" mine, located in Brewster County, was developed by a shaft, and levels at 50-foot intervals, to a depth of 852 feet during 1940-46 by Esperado Mining Co. (Brown & Root, Inc.). Reported production (1942-45) totaled about 600 flasks of mercury. Ore mined above the 300-foot level by earlier operations was not reported, but it occurred mostly on the periphery of a breccia pipe, about 100 feet in diameter, and in stopes along a few mineralized veinlets radiating from the pipe into the enclosing Boquillas Flags. The ore found in exploration of the lower levels contained varying amounts of oil or bitumen, with cinnabar in the cave breccia. In parts of the ore bodies, the hydrocarbon content was sufficient to provide the fuel for furnacing the ore and, in some instances, was so abundant as to cause furnace overheating and difficulty in recovering the mercury. This necessitated blending with ore from Mariposa and Chisos mines and dumps. A heavy inflow of water, encountered in ore along the periphery of the breccia pipe on the 850-foot level, and the disastrous collapse of mercury prices in 1945 halted the exploration and development work permanently in 1946.

Surface equipment consisted of a hoisting plant, a 40-ton-per-day Herreshoff furnace, condensing system, mining equipment, shops, office and warehouse, and company-owned dwellings. Abandoned in 1946, the property has been ransacked; no equipment and virtually no usable material or facilities remain.

Mariscal District Mines and Properties

Viviana Mine (Mariscal, Ellis, Lindsey)

The Viviana mine and neighboring prospects of the Mariscal mercury mining district, about 30 miles southeast of Terlingua, are surrounded by the vast mountain area established in 1944 as Big Bend National Park in the southernmost part of Brewster County. This district in the north end of the Mariscal Mountain range is along the axis of a sharp, northward-plunging, anticlinal fold which crosses the Rio Grande from Mexico. The widely disseminated cinnabar in outcrops of sedimentaries and an igneous intrusive sill, believed to have been discovered about 1900, evidently is localized in trap structures along a system of fractures across the anticline. Mine production, reported only from 1917 until abandonment of the Mariscal district in 1923, amounted to 898 flasks of mercury.

Mine workings consisted of the vertical two-compartment Main shaft, 437 feet in depth; the North shaft, 100 feet in depth; some half-dozen other shafts; and over 2,000 feet of underground workings on mine levels at intervals to 250 feet below the surface. Equipment at the mine included a 4-shaft, 4-tile Scott-type mercury furnacing plant.

With the impetus of World War II, the newly-formed Viviana Mining Co. reopened and reequiped the mine. Production of 97 flasks of mercury was reported for the 1942-43 periods of operations, mostly on ore showings in the North shaft workings. The new equipment included two small hoisting plants, miscellaneous mining tools, an air compressor, a Caterpillar 100-kva diesel-electric generator, and a Gould-type rotary furnace with a daily capacity for treating 25 tons of ore.

The idle Viviana property was acquired in 1945 by Robert N. Pulliam of Alpine in the name of Bob's Mining Co., Inc. Following additional years of inactivity in the Mariscal district, in 1953 the hoists, mining equipment, compressor, and electrical generating plant were transferred to the Amerimex Mining Co. for use at the Fresno mercury mine in Presidio County. Also, with access permission of the National Park Service, the rotary furnace was removed about 1954, and sold by Mr. Pulliam's company for use in a uranium processing plant in Arizona. Thus, the inactive status of the Mariscal mining district has been almost continuous since 1923, except for the brief flurry of rehabilitation and production in the early part of World War II; virtually no usable mining facilities remain and no developed ore reserves are known.

Maravillas District Mines and Properties

Marathon Dome Prospect

Cinnabar discoveries on the Marathon Dome property in Brewster County, have been the subject of considerable exploration effort, including two DMEA contracts. The first projects, conducted by Maravillas Minerals Co. from October to December 1951, consisted of access road building and test pitting. This work inferred possible continuity of the cinnabar which had been

discovered in 1949 along the northeasterly trending fracture zones in Georgetown Limestone outcrops on the south flank of Marathon Dome. Costs of the work totaled $2,970 of which the government contributed 75 percent. Dow Chemical Co. acquired the mining claims and from July to October 1957 conducted the second project. It consisted of eight holes aggregating 2,408 feet of diamond drilling. Cost totaled $20,356 on which the government contributed 75 percent. The work failed, however, to show mercury minerals at depth in the fracture zones, sink structures, or postulated traps underneath the Kiamichi marl strata. Two of the holes penetrated about 450 feet below the surface.

TABLE 28. - Texas mercury properties

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
BUENA SUERTE DISTRICT							
Contrabando Dome prospects..	Presidio	Secs 104, 105, 108, 109, blk 341	A few	60-foot shaft, crosscuts, trenches, diamond drilling	In rhyolite	Harris S. Smith	1, 8
Fresno mine.....	do.	Sec 106, blk 341	Over 3,500	Two shafts, large stope	In limestone	Mr. and Mrs. E. G. Bledsoe	8
TERLINGUA DISTRICT							
Black Mesa.....	Brewster	Sec 58, blk G-12	A few	Shallow shafts, drifts	In limestone	Natural Resources, Inc.	1, 4, 8
Brown Prospects.....	do.	Sec 286, blk G-4	Occurrence	100-foot shaft, trenches, and pits	Unknown	Guy E. Brown	-
California Mountain (Mariposa).	do.	Secs 40, 41, 58, blk G-12	Above 32,000	Pits, trenches	Mineralized faults in limestone	Esperado Mining Co.	1, 2, 4, 5, 8
Canyon group.....	do.	Sec 42, blk G-12	Occurrence	80-foot shaft, 400 foot drift	Unknown	Unknown	8
Chisos mine.....	do.	Sec 295, blk G-4	Over 84,000	About 23 miles of underground workings	Limestone breccia pipe	Esperado Mining Co.	1, 2-5, 7
Coltrin's Camp.....	do.	Sec 68, blk 341	Occurrence	Unknown	Unknown	Unknown	-
Colquitt Tigner mine (Waldron).	do.	Sec 38, blk G-12	Several hundred	900 feet of drifts, stopes	Cavity filling	do.	1, 8
Duncan group.....	do.	Sec 58, blk G-12	A few	150 feet of tunnels, 900 feet of trenches, shallow shafts	In limestone fractures	do.	1, 4, 8
La Farelle prospect.....	do.	Sec 32, blk G-12	Occurrence	Two shallow pits	Unknown	do.	1, 4, 8
Le Roi prospect.....	do.	Sec 70, blk G-12	do.	Trenches	In calcite vein	do.	8
Little 38 mine.....	do.	Sec 38, blk G-12	About 100	250-foot shaft 2,000 feet of drifts	In limestone	Tarrant Mining Co.	1, 8
Lowe prospect.....	do.	Sec 100, blk G-5	Occurrences	Short adits, pits, trenches	In rhyolite	Unknown	8
Lone Star mine.....	do.	Sec 57, blk G-12	Over 1,000	Open pit, adit	In limestone	Lone Star Mercury Co.	-
Maggie Sink mine (Nayland-Davis, Mitchell-Gillette).	do.	Sec 44, blk G-12	Unknown	Large open pit, underground workings	In limestone along breccia pipe	R. N. Pulliam	8
Margaret D lode.....	do.	Secs 40, 41, blk G-12	Occurrence	Shallow workings	Along limestone-clay contact	Unknown	8
Monte Cristo (Croesus).....	do.	Sec 58, blk G-12	Several	Two small stopes	In clay	Tarrant Mining Co.	8
Prospects.....	do.	Sec 98, blk G-5	Occurrences	Trenches	Unknown	Unknown	8
Do.....	do.	Sec 197, blk G-4	do.	Adits	do.	do.	8
Rainbow mine.....	do.	Sec 70, blk G-12	Over 8,000	670-foot shaft, drifts on several levels	In limestone	Rainbow Quicksilver Mines	1, 4
Rio Grande claims.....	do.	Sec 40, blk G-12	Occurrence	100-foot shaft, 150-foot drift	Unknown	Unknown	8
Rio Grande prospect.....	do.	Sec 70, blk 341	do.	75-foot shaft	do.	A. E. Owens	8
Sample group.....	do.	Sec 44, blk G-5	About 100	100-foot adit, 25-foot shaft, trenches	do.	Frank Duncan	8
Star.....	do.	Sec 70, blk G-12	Unknown	80-foot shaft, 250-foot drift	do.	Tarrant Mining Co.	8
Study Butte mines (Big Bend, Texas-Almaden).	do.	Sec 216, blk G-4	Over 14,000	Several shafts and interconnecting drifts	Associated with sill-like intrusive igneous rock	Southern Geophysical Co.	1, 4, 5, 8
Tarrant.....	do.	Sec 39, blk G-12	Few hundred	130-foot shaft, 250-foot shaft, 3,500 feet of drifts	Unknown	Tarrant Mining Co.	1, 4, 8
"248" mine (Flecha).....	do.	Sec 248, blk G-4	Over 600	Shaft and several levels	In breccia pipe and stringers	Esperado Mining Co.	8
Waldron.....	do.	Sec 40, blk G-12	Several	80-foot shaft	Unknown	Unknown	1, 8
CHRISTMAS MOUNTAIN DISTRICT							
Destolin (Scott).....	Brewster	Secs 96, 127, 128, blk G-4	A few	Unknown	Unknown	J. F. Fernandez	4, 8
MARISCAL DISTRICT							
Viviana mine (Mariscal, Ellis, Lindsey).	Brewster	Sec 33, blk G-3	Over 900	Shallow shafts, over 2,000 feet of workings	Associated with igneous rock	R. N. Pulliam	4, 5, 9
MARIVILLAS DISTRICT							
Marathon Dome prospect.....	Brewster	Sec 28, blk 235	Occurrence	Shallow shafts, diamond drilling	In limestone	Dow Chemical Co.	-
ADOBE WALLS DISTRICT							
Adobe Walls Dome.....	Brewster	Sec 6, blk G-11	Occurrence	Three 30-foot shafts	In limestone	Armstrong Minerals Co.	-

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CHAPTER 11. - MERCURY IN UTAH

by

Robert T. Beckman[1] and William H. Kerns[2]

INTRODUCTION AND SUMMARY

Mercury occurrences have been known in Utah for 90 years, but the deposits have yielded only a small quantity of mercury. Mercury output has been reported from three districts; however, most of the production came from one district, as a byproduct of gold from the Sacramento Gold mine. The known mercury deposits have been largely exhausted and the future production of mercury will probably be insignificant.

HISTORY AND PRODUCTION

Occurrence of mercury was reported in Utah as early as 1873 (5)[3] in the Camp Floyd district. Some mercury was produced from the Lucky Boy mine, near Marysvale, Piute County, from 1881 to 1887. Mercury was produced as a byproduct from the Sacramento Gold mine, Tooele County, from 1903 to 1907. A small quantity of mercury also was produced from this mine in 1933. Mercury output was reported from one group of claims (Ruby, Cinnabar, and Cougar Hill) in Tooele County in 1936, 1940, 1941, and 1942.

Mercury output in Utah has been minor, totaling only 0.1 percent of the U.S. total from 1850 to 1959. The major mercury production came from the Sacramento Gold mine, as a byproduct, from 1903 to 1907 (table 29).

MERCURY MINING DISTRICTS

The three deposits in Utah that produced mercury are Lucky Boy in Mount Baldy district, Piute County; the Sacramento Gold in the Camp Floyd (Mercur) district, Tooele County; and the Ruby, Cinnabar, Cougar Hill claims group in the Clifton (Gold Hill) district, Tooele County (fig. 12). Pertinent data on mercury mines, occurrences, and prospects are summarized in table 30.

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[3]Italicized numbers in parentheses refer to items in the bibliography at the end of the chapter.

TABLE 29. - Production of mercury in Utah, 1881-1961

Year[1]	Lucky Boy mine		Sacramento Gold mine		Ruby, Cinnabar Cougar Hill mines		Total, flasks
	Flasks	Grade of ore, percent	Flasks	Grade of ore, percent	Flasks	Grade of ore, percent	
1881-87.....	88	([2])	-	-	-	-	88
1903.....	-	-	14	6	-	-	14
1904.....	-	-	741	6	-	-	741
1905.....	-	-	1,118	6	-	-	1,118
1906.....	-	-	996	6	-	-	996
1907.....	-	-	431	3.28	-	-	431
1933.....	-	-	7	6	-	-	7
1936.....	-	-	-	-	25	0.16	25
1940.....	-	-	-	-	53	.95	53
1941.....	-	-	-	-	19	.58	19
1942.....	-	-	-	-	5	1.44	5
Total.....	88	-	3,307	-	102	-	3,497

[1]Nonproductive years omitted.
[2]Data not available.

Mount Baldy District

The Mount Baldy district is about 5 miles southwest of Marysvale. The Lucky Boy mine is on a steep mountain just north of Cottonwood Canyon. The ore occurred adjacent to fissures as a replacement of limestone by tiemannite and onofrite, selenides of mercury. The gangue minerals in the ore were limestone and barite. The mine was operated from 1881 to 1887, yielding an estimated 88 flasks of mercury. Apparently the deposit was superficial and when visited by McCaskey (4) in 1910, it had been completely worked out.

The deposit is of interest because it is the only known commercial producer of mercury selenides.

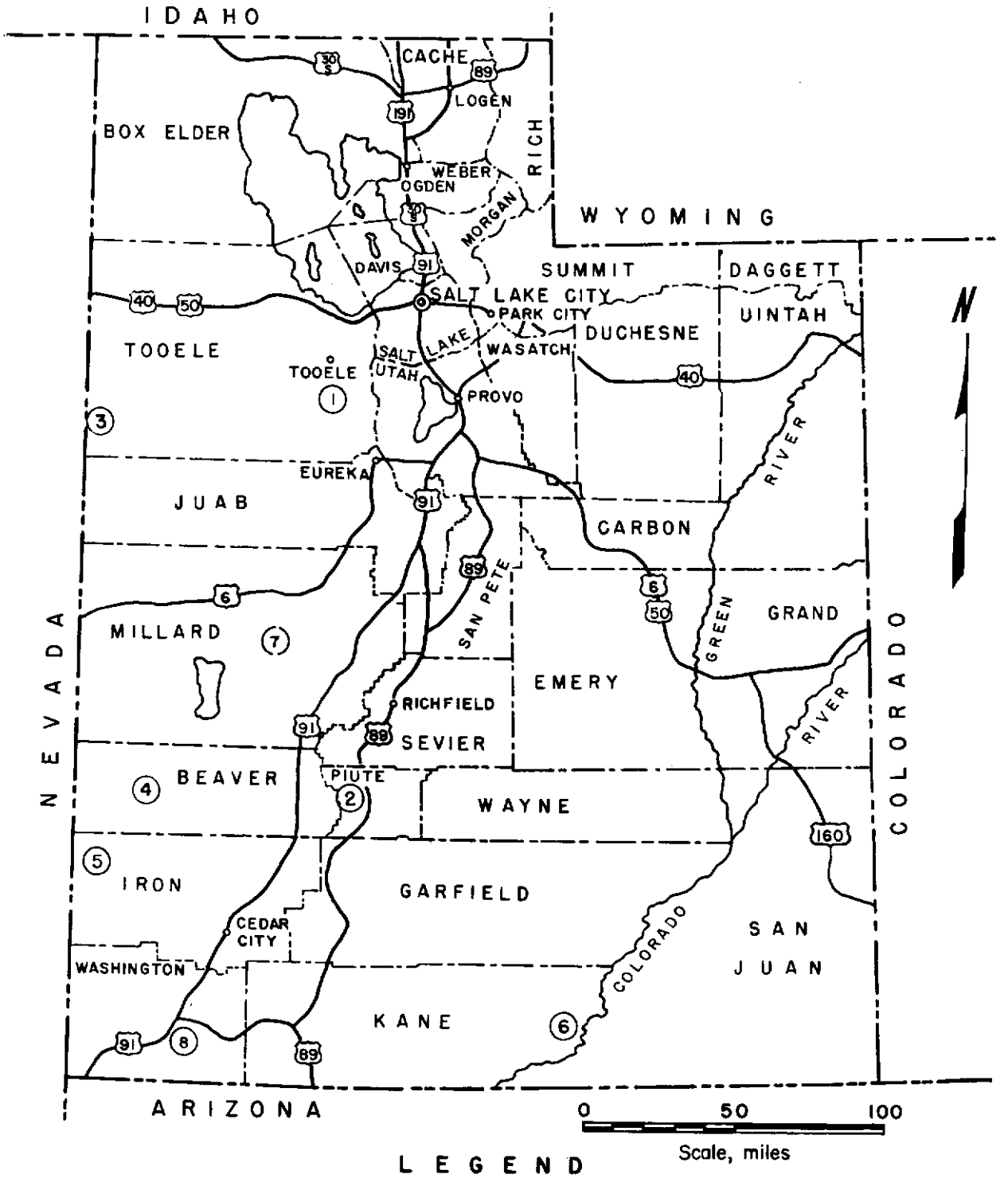
Appreciable quantities of cinnabar have been found in the Deertrail mine, several hundred feet from the Lucky Boy.

Camp Floyd (Mercur) District

The Camp Floyd district is about 55 miles south of Salt Lake City, in Tooele County. Mercur is in Lewiston Canyon in the Camp Floyd district.

Mercury was produced from the Sacremento Gold mine as a byproduct of gold production from 1903 to 1907 and in 1933. The ore, an earthy cinnabar in a siliceous gangue, averaged 6 percent mercury.

Cinnabar has been identified in the Mercur, Geyser, and Marion mines in the district, but there has been no production from these mines.



L E G E N D

DEPOSITS

1 Camp Floyd (Mercur) District
2 Mt. Baldy District
3 Clifton (Gold Hill) District

OCCURRENCES

4 Champion Group
5 Gold Springs District
6 Paria & Colorado River
7 Marietta Claims
8 Harrisburg District

FIGURE 12. - Location Map of Mercury Deposits and Occurrences in Utah.

Clifton (Gold Hill) District

The Ruby, Cinnabar, Cougar Hill claims group is about 7 miles southwest of Ibapah, Tooele County. Production of over a hundred flasks of mercury was reported from the property for 1936 and 1940 to 1942.

Miscellaneous Occurrences

Native mercury, found in various mines in the Gold Springs district, Iron County, was panned from ore taken from the Homestake mine. Occurrence of mercury as cinnabar and native mercury has been reported at the junction of the Paria and Colorado Rivers in Kane County. Mercury reportedly occurs on the Marietta claim in Millard County; on the Champion group in Beaver County; and is contained in the mill tailings from the Silver Reef mill in Washington County.

TABLE 30. - Utah mercury properties

Reported property name	County	Reported location	Production flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
MOUNT BALDY DISTRICT							
Lucky Boy mine.....	Piute.....	Unknown..	88	Unknown.....	Tiemannite and onofrite as replacement of limestone along fissures.	Unknown	1, 4
CAMP FLOYD (MERCUR) DISTRICT							
Sacramento Gold mine..	Tooele....	Unknown..	3,307	Medium-sized gold mine.	In altered cherty limestone along a dike and fracture zone.	Unknown	1, 2
CLIFTON (GOLD HILL) DISTRICT							
Ruby, Cinnabar, and Cougar Hill claims.	Tooele....	Unknown..	Over 100	Unknown.....	Unknown.....	Unknown	-
MISCELLANEOUS OCCURRENCES							
Champion group (Willard).	Beaver....	Unknown..	Occurrence	Sulfur prospect, adits, and pits	Small and discontinuous though fair grade.	Unknown	-
Gold Springs.....	Iron.....	do.....	do.....	Small gold mines	Slight amount of native mercury in gold quartz veins.	do...	1
Paria River.....	Kane.....	do.....	do.....	Unknown.....	Placer from weathering of Chinle formation.	do...	3, 4
Marietta claim.....	Millard...	do.....	do.....	do.....	Unknown.....	do...	-
Silver Reef mine.....	Washington	do.....	do.....	Operating silver mine.	Secondary mercury.....	do...	-

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CHAPTER 12. - MERCURY IN WASHINGTON

by

Bureau of Mines Staff

INTRODUCTION AND SUMMARY

Washington ranks third in mercury production in the Pacific Northwest, with a total of 6,624 flasks of mercury. Remaining mercury reserves are believed to be small and are mainly in the Morton mining district, which supplied the bulk of the State's production.

The productive areas are within the Puget Sound drainage basin on the western flank of the Cascade Mountains and consist of a series of secimentary and intrusive rocks ranging in age from Eocene to Pliocene. The bedrock series is heavily blanketed by glacial drift and recent alluvium. Prospecting such terrain is difficult, expensive, and usually unproductive. Future production will come from the extension of known deposits only under the stimulus of higher prices for mercury.

ACKNOWLEDGMENTS

The information on most of the properties listed in this report was obtained from numerous Federal and State publications, and from county records. A numbered list of the publications is contained in the bibliography at the end of the chapter.

The cooperation and assistance of officials of the State of Washington, Division of Mines and Geology, and the many mine operators and individuals associated with the mercury mining industry are gratefully acknowledged.

HISTORY AND PRODUCTION

Mercury deposits were first recognized in Washington about 1913 by Edward Barnum, in the Morton district. This is much later than discoveries in Oregon and somewhat later than in Idaho.

Except as a minor constituent of other metallic deposits such as gold, manganese, and nickel, important mercury deposits have been found only in the Puget Sound Basin west of the Cascades, in close proximity to the western Washington coal fields. Productive mines have been developed in King and Lewis Counties.

Table 31 shows the mercury production in Washington from 1916 to 1961. The total output is 6,624 flasks. Virtually all of this production, except a very small output in 1957 and 1958, has come from the Morton area in Lewis County. The mercury mines in the Morton area have been closed since 1942.

TABLE 31. - Production of mercury in Washington, 1916-61

Year	Flasks	Year	Flasks	Year	Flasks
1916.....	74	1932.....	407	1948.....	-
1917.....	-	1933.....	(1)	1949.....	-
1918.....	-	1934.....	330	1950.....	-
1919.....	-	1935.....	106	1951.....	-
1920.....	-	1936.....	(1)	1952.....	-
1921.....	-	1937.....	(1)	1953.....	-
1922.....	-	1938.....	(1)	1954.....	-
1923.....	-	1939.....	-	1955.....	-
1924.....	-	1940.....	(1)	1956.....	-
1925.....	-	1941.....	(1)	1957.....	(1)
1926.....	482	1942.....	(1)	1958.....	(1)
1927.....	559	1943.....	-	1959.....	-
1928.....	(1)	1944.....	-	1960.....	-
1929.....	1,397	1945.....	-	1961.....	-
1930.....	1,079	1946.....	-		
1931.....	560	1947.....	-		

[1]Figure withheld to avoid disclosing individual company confidential data.

The Geological Survey in 1957 estimated the combined remaining mercury reserves in Utah and Washington to be 1,000 flasks of inferred ore.[1] This estimate is helpful only to show the limited extent of reserves.

PHYSICAL FEATURES

The topography of the Puget Sound Basin is of moderate to sharp relief. Bordering Puget Sound, the terrain is gently rolling, then becomes progressively steeper, and finally shows the bold, rugged topographical features of the Cascade Mountains to the east.

The climate of the basin is mild throughout the year. Precipitation, mostly in the form of rain, averages about 50 inches per year and promotes a luxuriant growth of vegetation consisting of dense underbrush and large stands of fir and cedar.

The mercury districts are accessible from Morton and Tacoma by good paved roads; however, unimproved mine roads are virtually impassable during periods of heavy rainfall.

GEOLOGY

The Puget Sound Basin is underlain by a series of shales, carbonaceous shales, siltstones, sandstones, and coalbeds of the Eocene Puget Group. The sedimentary rocks were later intruded by Pliocene basic dikes and sills, then folded into north to northeasterly trending structures and buried beneath Pleistocene glacial drift and recent alluvium. Good exposures of bedrock are uncommon.

[1]Geological Survey Press Release No. 21902, Aug. 12, 1957.
Bureau of Mines Minerals Yearbook, 1957, v. 1, 1958, p. 836.

Mineralization appears to be controlled both by structure and stratigraphy. Brecciated zones along faults were the main avenues for the upward movement of mineralizing solutions. Concentrations of cinnabar are found in the breccia zones when they are capped by an impervious gouge due to faulting or where the feeder fault enters a more pervious sandstone bed.

MERCURY MINING DISTRICTS

Only two quicksilver mining districts have produced commercially in Washington--the Morton district in Lewis County and the Green River district in King County. The locations of the principal mines in the State are shown on figure 13.

DISTRICTS AND PROPERTIES

Table 32, at the conclusion of this chapter, lists every known mercury property in the State and gives the salient facts about each. In the interest of brevity, the following individual property descriptions do not repeat location and ownership data or general references.

Morton Mercury District Mines and Properties

This limited region of mercury deposits is about 2 miles east-southeast of Morton, Lewis County. The area extends along the west slope of a north-trending ridge at altitudes ranging from 1,000 to 2,000 feet.

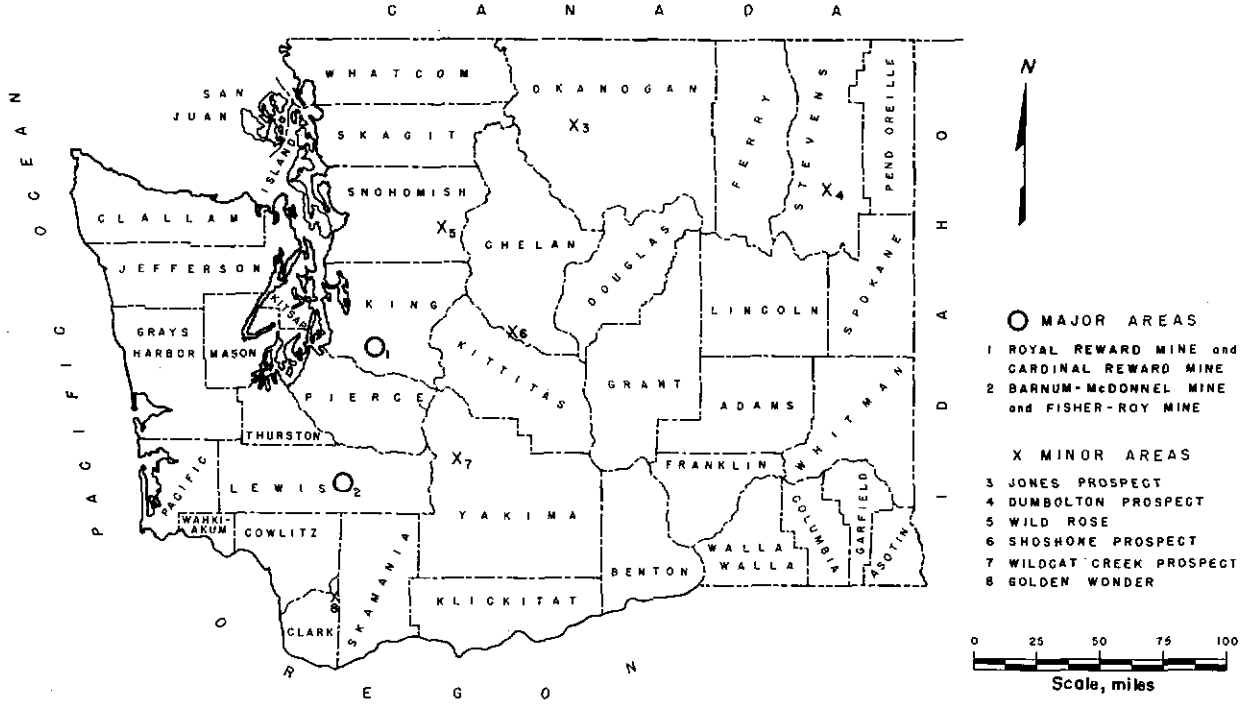

FIGURE 13. - Location Map of Mercury Deposits and Occurrences in Washington.

The district has been the most productive in the State, with an output exceeding 6,000 flasks. Two properties, the Fisher-Roy and the Barnum-McDonnell mines, have been credited with all the production; however, some ore may have been mined under lease from other smaller properties and included as part of the output of these two mines. About 17 other small mines and prospects in the district are listed in table 32 along with their location.

Future outlook for the Morton district is uncertain; the existence of additional ore bodies is a possibility and some future production is not ruled out.

Barnum-McDonnell Mine

The Barnum-McDonnell mine is on deeded land, about 2 miles southeast of Morton on the Morton-Kosmos Highway in Lewis County.

Cinnabar mineralization, accompanied by intense hydrothermal alteration, is found in breccia zones along faults which have probably provided channelways for movement of the solutions; also in sandstone beds adjoining the fault zones where solutions have passed from the fault zones into wall rocks; and at fault intersections where concentrations of mineral-bearing solutions produced relatively high-grade ore bodies. Three faults have controlled the mineral deposition; the north-trending Barnum fault, the Black Wall thrust fault striking N 10°-15° W, and the Opalite fault trending N 52° E. The Barnum fault has been mined laterally along the strike for about 1,300 feet and through a vertical range of about 350 feet; the breccia zone ranges in thickness from a few inches to 3 feet or slightly more. The rocks exposed by mine workings are shales containing coal seams, siltstone, and tuffaceous sandstones, which have been intruded by basic sills and dikes.

The first discovery of mercury on the property was made in 1913 by Edward Barnum, who noted cinnabar in a coal seam while engaged in logging operations. In 1916 a retort furnace was erected and several flasks of mercury were produced, according to local reports. Again, in 1926, a larger retort furnace was installed by the Barnum-McDonnell Mining Co., and a substantial production ensued during 1926-29 and again in 1931. At various times, a number of mining companies have operated the property, including Consolidated Mercury Mining Co., Puget Sound Mercury Mining Co., The Hermes Mercury Mining Co., Cascade Mining Co., The Mercury Corporation of America, The Pacific Mining Co. (1937-40), and American Mercury Corp., (1940-42). The latter corporation acquired control of most of the other properties in the district and erected a 300-ton flotation plant and a retort furnace. This plant was unsuccessful and operations ceased in 1942.

Because the many operators were at times also leasing and mining other properties in the district, the output from the Barnum-McDonnell mine cannot be determined accurately.

The mine was developed on six levels with a total of 4,000 feet or more of lateral workings connected by raises, winzes, and stopes. All workings are presently inaccessible.

Fisher-Roy Mine (Morton, Gillespie, Fern Hill)

The Fisher-Roy mine, (also called the Morton, the Gillespie, or the Fern Hill), adjoins the Barnum-McDonnell mine to the northwest. The property consists of about 120 acres of deeded land. It is 2 miles by the Morton-Kosmos Highway southeast of Morton, in Lewis County.

The Fisher-Roy is in the same mineralized fault zones, and ore bodies are extensions of those explored in the Barnum-McDonnell mine.

The mine is on lands owned by Ole Gillespie and was leased by the Morton Cinnabar Co. in 1926. The mine was developed, and a reduction plant was erected in 1926-27. Its most productive period of operation was from 1928 to 1930. The Roy Mining Co. was the next operator; production was continued under this management between 1933 and 1938, and again between 1940 and 1942. There has been very little activity and little or no production since 1942. An estimate of total production from the Fisher-Roy workings is difficult, because of the close connection with the Barnum-McDonnell mine.

The mine has been developed by about 6,000 feet of lateral workings on five levels and with connecting raises, winzes, and stopes. All workings are presently caved.

Green River Mercury District Mines and Properties

Mercury deposits were discovered in 1957 in the Green River Gorge in King County, about 30 miles by road east of Tacoma and about 2.5 miles north of Cumberland, the nearest settlement. The discoveries were made near the edge of the river in the lower part of the gorge where the bedrock is exposed in the canyon walls. A mild climate with rainfall of 30 to 40 inches annually promotes dense growth of timber and vegetation which, coupled with the thick mantle of glacial drift and alluvium, effectively conceals the underlying bedrock so that exposures are limited to areas where streams and rivers have cut through the overburden. Prospecting is difficult because of lack of outcrops.

Two prospects are in process of development: the Royal Reward and the Cardinal Reward mines. They are about 1 mile apart.

Royal Reward Mine

The Royal Reward mine is in the Green River Gorge, King County, about 2.5 miles by county and mine access road north of Cumberland.

Cinnabar, associated with realgar and orpiment, occurs as fracture fillings in a shear zone and as disseminations in carbonaceous shale and bony coal along the crest of a north-trending, faulted, anticlinal fold. An altered andesite sill lies above the coal and shale beds, all of which are overlain by glacial till. The bed rocks are an alternating series of Eocene carbonaceous shales, coal beds, and sandstone intruded by andesite dikes and sills.

The original discovery of cinnabar was made on a 40-acre tract of deeded land which was purchased by the Washington Mining Corp. in 1957. Development was started, and a few flasks of mercury were produced in 1957 and 1958. In May 1959, a 95-foot adit, at an elevation of 15 feet above the river, disclosed a lens of high-grade cinnabar ore from which some mercury was produced. Other workings consist of a 160-foot shaft and about 120 feet of lateral workings at the 138-foot level below the shaft collar.

Cardinal Reward Mine

The Cardinal Reward is about 1 mile southwest of the Royal Reward mine and about 2 miles north of Cumberland.

Cinnabar mineralization associated with realgar and orpiment is similar to that found in the nearby Royal Reward mine; however, there is no structural relationship between the two deposits. The minerals occur disseminated in a steeply dipping carbonaceous bed and as fracture fillings in the sandstone beneath the carbonaceous bed.

Discovery of the deposit was made in September 1958, by the Washington Mining Corp., operators of the Royal Reward mine, while building a road. The discovery was made on land leased by the mining company, and owned by the Northern Pacific Railway. Development by May 1959 comprised an upper level of 200 feet of workings, and a lower level 25 feet above the river, and 102 feet vertically below the upper level. The lower level consists of about 500 feet of workings. A reduction plant was under construction during 1959, and 500 tons of ore had been stockpiled near the new plant site.

The outlook for mercury production in Washington, at least in the near future, will depend largely on the success of new development in the Green River mining district.

TABLE 32. - Washington mercury properties

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
			WESTERN WASHINGTON				
Apex (Gallagher, Miller, Consolidated)	Lewis....	Sec 6, T 12 N, R 5 E.	A few.....	930-foot adit, 5 short adits.	In sandstone and fault breccia.	Apex Mercury Mining Co.	12
Barnum-McDonnell mine.	do.....	Sec 7, T 12 N, R 5 E.	About 2,100	4,000 feet of adits, crosscuts, raises, and winzes.	In breccia along faults.	Floyd Ray.....	3, 5, 12
Beaver Creek mine (State lease).	Clallam..	Sec 16, T 30 N, R 12 W.	Occurrence.	Unknown.....	Unknown.....	Leased to J. C. Krueger.	6, 14, 16
Byrd prospect.....	King.....	Sec 9, T 21 N, R 7 E.	do.....	do.....	do.....	Unknown.....	-
Cardinal Reward mine..	do.....	Sec 17, T 21 N, R 7 E.	do.....	700 feet of underground workings.	With realgar and orpiment.	Northern Pacific Railway.	-
Chapman.....	Lewis....	Morton district...	do.....	Unknown.....	Unknown.....	Unknown.....	8
Chestnut or Cinnabar Quartz lode.	do.....	Sec 6, T 13 N, R 3 E.	do.....	do.....	do.....	Rhoda Coblentz...	-
Clallam prospect (Snider).	Clallam..	Sec 28, T 30 N, R 11 W.	do.....	do.....	do.....	Harry Sweed and others.	6, 8
Clara Thompson, Webster, Commonwealth, McCombs, and Jasperson.	Snohomish	Sec 36, T 29 N, R 10 E; sec 6, T 28 N, R 11 E.	do.....	do.....	do.....	Lawrence Thompson and others.	8
Crescent mine.....	Clallam..	Secs 23, 24, T 30 N, R 10 W.	do.....	do.....	do.....	C. S. Anderson and others.	8
Dahl, Eclipse, and Taft.	Snohomish	Secs 17, 18, 19, T 30 N, R 10 E.	do.....	do.....	do.....	R. D. Taft.....	4
Eight-Seventeen.....	Lewis....	Secs 8, 17, T 12 N, R 5 E.	do.....	do.....	do.....	Unknown.....	8
Fisher Lease prospect.	do.....	Sec 36, T 13 N, R 4 E.	do.....	do.....	do.....	State of Washington.	8
Fisher-Roy mine (Morton, Gillespie, Fern Hill).	do.....	Sec 6, T 12 N, R 5 E.	About 3,500	6,000 feet of underground workings on five levels.	In breccia along fault zone.	O. Gillespie.....	12
Forest Hope prospect..	Snohomish	Sec 18, T 32 N, R 10 E.	Occurrence.	Unknown.....	Unknown.....	Unknown.....	2, 8
Golden Wonder.....	Clark....	Sec 32, T 6 N, R 4 E.	do.....	do.....	do.....	V. V. Rand.....	8
Granite Falls prospect	Snohomish	Sec 33, T 30 N, R 7 E.	do.....	do.....	do.....	Washington State Forest Board.	-
Green River prospect..	Cowlitz..	Sec 4, T 10 N, R 2 E.	do.....	do.....	do.....	Weyerhauser Timber Co.	8
June prospect.....	Clallam..	Sec 19, T 30 N, R 10 W.	do.....	do.....	do.....	Unknown.....	8

Justin prospect.....	Snohomish	Sec 19, T 32 N, R 10 E.	do.....	do.....	do.....	do.....	2
La Conner.....	Skagit...	Sec 35, T 34 N, R 2 E.	do.....	do.....	do.....	do.....	8
Ladd prospect.....	Lewis....	Sec 12, T 14 N, R 4 E.	do.....	do.....	do.....	do.....	8
Lost Kremer prospect..	Clallam..	Sec 25, T 30 N, R 11 W.	do.....	do.....	do.....	do.....	8
Lytle-Lynch, Charlotte Ann, Kropolis.	Lewis....	Sec 6, T 12 N, R 5 E.	A few.....	Three adits and two open cuts.	Along seams in fault breccia and adjacent rocks.	Baker Fentress Co.	8
Mashel River prospect.	Pierce...	Sec 18, T 16 N, R 6 E.	Occurrence.	Short adits.....	In quartz vugs....	St. Paul and Tacoma Lumber Co.	-
Mount Eldorado.....	Skagit...	On Mount Eldorado	do.....	Unknown.....	Unknown.....	A. G. Mosler.....	8
Myrtle C. prospect....	Snohomish	Sec 19, T 32 N, R 10 E.	do.....	do.....	do.....	Unknown.....	8
N. P. prospect.....	Lewis....	Sec 31, T 13 N, R 5 E.	do.....	do.....	do.....	Northwest Improvement Co.	8
Nineteen Creek prospect.	do.....	Sec 19, T 13 N, R 5 E.	do.....	do.....	do.....	Unknown.....	-
Parmenter prospect....	do.....	Sec 6, T 12 N, R 5 E.	A few.....	425-foot adit, short drift.	do.....	Ralph Gillespie..	12
Roy No. 5.....	do.....	Sec 6, T 12 N, R 5 E.	Unavailable	Adit.....	In breccia zone...	Roy Mining Co....	12
Royal prospect.....	Clallam..	Sec 10, T 31 N, R 14 W.	Occurrence.	Unknown.....	Unknown.....	Unknown.....	6
Royal Reward mine.....	King.....	Sec 8, T 21 N, R 7 E.	Several....	Shaft, adit.....	In black coaly shale.	Washington Mining Corp.	-
St. Regis property....	Clallam..	Secs 20, 21, T 30 N, R 10 W.	Occurrence.	Unknown.....	Unknown.....	S. Garrett.....	-
Section One prospect..	Lewis....	Sec 1, T 12 N, R 4 E.	do.....	do.....	do.....	Northern Pacific Railway.	8
Section Thirty-six prospect.	do.....	Sec 36, T 13 N, R 4 E.	do.....	Two adits, trenches.	do.....	State of Washington.	8
Seipman property.....	do.....	Sec 7, T 12 N, R 5 E.	do.....	Prospect pits.....	do.....	Goldbel Mining Co. (lease).	-
Sekiu River prospect..	Clallam..	Sec 27, T 32 N, R 14 W.	do.....	Unknown.....	do.....	Unknown.....	6, 8
Smith.....	Clark....	Sec 16, T 2 N, R 4 E.	do.....	do.....	do.....	C. L. Smith (State lease).	8
Spencer prospects.....	Lewis....	Sec 1, T 12 N, R 4 E.	Several....	Two adits, two shafts, trenches.	In veins through altered porphyry.	Northern Pacific Railway.	1, 8, 12
Tilton River, East Fork.	do.....	Sec--, T 13 N, R 5 E.	Occurrence.	Unknown.....	Unknown.....	Unknown.....	8
Tilton River, West Fork.	do.....	Sec 13, T 13 N, R 4 E.	do.....	do.....	do.....	do.....	8
Wild Rose prospect....	Snohomish	Sec 32, T 29 N, R 11 E.	do.....	do.....	do.....	do.....	7

TABLE 32. - Washington Mercury Properties--Continued

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
EASTERN WASHINGTON							
Bartlett prospect.....	Chelan...	Sec 29, T 23 N, R 17 E.	Occurrence.	Unknown.....	Unknown.....	Harry Bartlett...	9
Ben Nevis prospect....	Kittitas.	SW corner, T 23 N, R 15 E.	do.....	do.....	do.....	Ben Nevis Quicksilver Co.	8, 17
Big Thing.....	do.....	Sec 8, T 22 N, R 16 E.	do.....	do.....	do.....	Unknown.....	8
Black Jack mine (Blewett and La Rica)	Chelan...	Sec 1, T 22 N, R 17 E.	do.....	do.....	do.....	Gold Bond Mining Co.	8, 9
Boulder Creek prospect	Kittitas.	Sec 8, T 22 N, R 16 E.	do.....	do.....	do.....	Phil Denny.....	8, 23
Clear Lake prospect...	Yakima...	Sec 12, T 13 N, R 12 E.	do.....	do.....	do.....	Unknown.....	-
Denny.....	Kittitas.	Sec 36, T 23 N, R 14 E.	do.....	do.....	do.....	Fred Denny and others.	8
Dumbolton.....	Stevens..	Secs 11, 12, T 31 N, R 39 E.	do.....	do.....	do.....	P. S. Dumbolton..	8
Elsener prospect.....	Kittitas.	Sec 6, T 22 N, R 15 E.	do.....	do.....	do.....	Adolph Elsener...	8
H-O-M-E prospect (Silver Tip, Gold Crown).	do.....	Secs 26, 27, 28, 34, T 19 N, R 15 E.	Some.....	1,000 feet of drifts and crosscuts.	do.....	C. C. Merriman, H. M. Hoyt, and V. C. Denny.	8, 11
Indian Creek prospect.	Yakima...	Secs 11, 23, T 14 N, R 12 E.	Occurrence.	Two short adits, trenches, diamond drill holes.	Disseminated in altered zone.	Indian Creek Mercury Mines.	8, 18
Jones prospect.....	Okanogan.	Sec 24, T 35 N, R 21 E.	do.....	Unknown.....	Unknown.....	State of Washington Department of Game.	8
Keystone prospect.....	Kittitas.	Sec 33, T 23 N, R 15 E.	do.....	do.....	do.....	Ben Nevis Quicksilver Co.	7
King Creek.....	Chelan...	Sec 10, T 22 N, R 17 E.	do.....	do.....	do.....	Unknown.....	8
Morning Glory.....	Kittitas.	Sec 8, T 22 N, R 16 E.	do.....	Open cuts.....	In silica-carbonate dike.	Leroy Smith and E. J. Green.	-
Northpole prospect....	Chelan...	Sec 4, T 22 N, R 17 E.	do.....	Unknown.....	Unknown.....	Unknown.....	-
Orondo or Leavenworth.	do.....	Sec--, T 25 N, R 21 E.	do.....	do.....	do.....	do.....	8
Quicksilver, Cinnabar, Quartz lode.	Yakima...	Sec 3, T 13 N, R 13 E.	do.....	do.....	do.....	Lester George....	-

Shoshone prospect.....	Chelan...	Sec 4, T 22 N, R 17 E.	do.....	do.....	do.....	G. J. Niemeyer, Z. T. Parker, and Roy Fontaine	9
Squaw Saddle.....	do.....	Sec--, T 22 N, R 20 E.	do.....	do.....	do.....	Unknown.....	8
Tenaway River.....	Kittitas.	Sec 36, T 23 N, R 14 E.	do.....	do.....	do.....	do.....	8
Tom Burke.....	Chelan...	Sec--, T 22 N, R 17 E.	do.....	do.....	do.....	do.....	8
Velma prospect.....	do.....	Sec 32, T 23 N, R 17 E.	do.....	do.....	do.....	L. G. Olds.....	8, 18
Washington Quicksilver prospects.	Kittitas.	Sec 6, T 22 N, R 15 E.	do.....	do.....	do.....	Unknown.....	-
Wildcat Creek.....	Yakima...	Secs 27, 28, T 14 N, R 13 E.	do.....	115 feet of adits, shafts, trenches.	In quartz veinlets.	W. C. Thorp and others.	8

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CHAPTER 13. - MERCURY IN OTHER STATES

COLORADO, MONTANA, NEW MEXICO, SOUTH DAKOTA AND WYOMING

by

Robert T. Beckman[1] and William H. Kerns[2]

INTRODUCTION AND SUMMARY

Mercury occurrences have been reported in Colorado, Montana, New Mexico, South Dakota, and Wyoming, but many of the reports have been disproved. The deposits in these States have not been and probably will not be productive.

LOCATION AND DESCRIPTION OF DEPOSITS

Colorado

Mercury has been reported in Boulder, Clear Creek, Gunnison, La Plata, Saguache, and Teller Counties. (See fig. 14 and table 33.)

Boulder County

Native mercury, natural amalgam, coloradoite, and cinnabar have been reported in minor occurrences usually associated with quartz, gold, and gold tellurides.

Clear Creek County

Several nonproductive occurrences of cinnabar have been reported in various localities.

Gunnison County

Cinnabar occurs along Cochetopa Creek on the Elisha group of claims. This property was formerly mined for uranium.

La Plata County

Mercury occurs, near Trimble Springs, as native mercury with gold and tellurium minerals.

Cinnabar and native mercury occur in sandstone south of Cumberland Peak on a tributary of Junction Creek.

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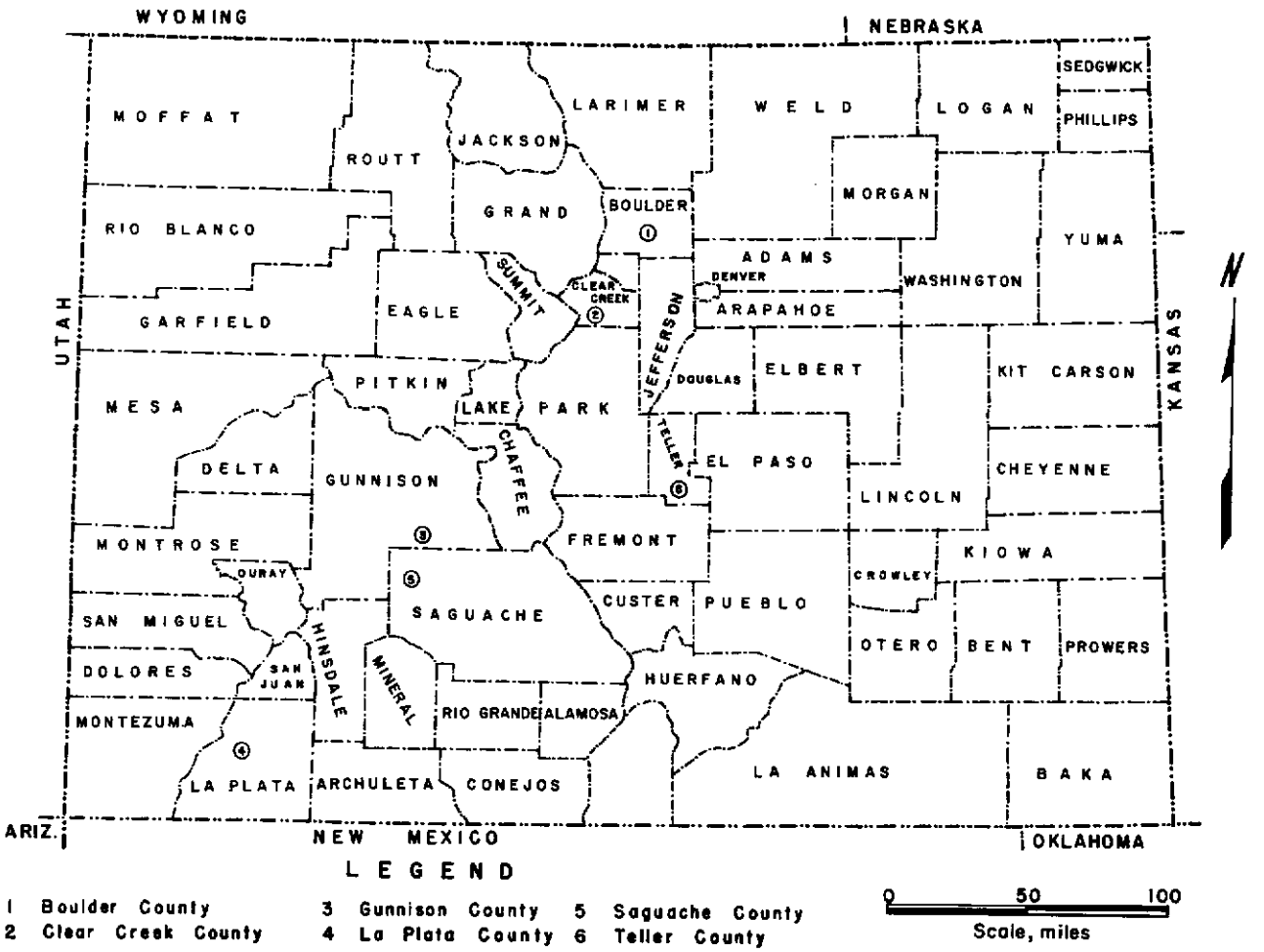

FIGURE 14. - Location Map of Mercury Occurrences in Colorado.

Natural amalgam has been found at the Neglected mine, at the head of Junction Creek, 15 miles from Durango.

Saguache County

Cinnabar has been found on Cochetopa Creek, 20 miles south on State Route 114 from its junction with U.S. Highway 50. The Smith Mercury mine was examined by Bureau of Mines engineers in 1942 in conjunction with work authorized under the Strategic Minerals Act. Several samples were taken; however, they were found to be low grade.

Teller County

Rare occurrences of cinnabar associated with quartz, chalcedony, pyrite, calcite, and fluorite have been identified in several of the Cripple Creek mines.

TABLE 33. - Colorado mercury occurrences

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
Bessie G and Durango Girl gold mines.	La Plata...	Unknown.....	Occurrence	In gold mines.	In gold-bearing vein.	Unknown.	1
Cochetopa Creek....	Saguache...	Secs 20, 28, 29, 32, 33, T 47 N, R 2 E	do.....	72-foot shaft, trenches.	With quartz and pyrite in a breccia of quartzite and silicified porphyry.	do....	1, 4, 5
Cripple Creek mines	Teller.....	Unknown.....	do.....	In gold mines.	In veins with quartz, chalcedony, pyrite.	do....	1
Elisha group.....	Gunnison...	do.....	do.....	Unknown....	Unknown.....	do....	-
Unknown.....	Clear Creek	do.....	do.....	do.....	do.....	do....	1

Montana

Montana (fig. 15) is notably lacking in mercury deposits. There are only two reported occurrences in the state; neither have been substantiated.

Calomel is reported as occurring in a streambed at the head of Mulkey Gulch in Granite County (table 34). The calomel has been identified megascopically; however, its primary source is not known. The area is underlain by rocks of the Precambrian belt series.

Cinnabar is purported to occur at the Boulder Mercury group of uranium-silver claims in Jefferson County. The area is underlain by quartz monzonite of the Boulder batholith. The occurrence can be attributed to the name of the claim group rather than an actual occurrence of mercury, as a field examination disclosed no mercury mineralization.

New Mexico

Numerous mercury occurrences have been reported in New Mexico. Nearly all of these occurrences were proved to be hematite or some other material that appeared to be a mercury mineral.

Northrop reported an occurrence of mercury in New Mexico in the Ladrones Mountains district of Socorro County. A second occurrence, the Harper mercury prospect, is about 5 miles northeast of Redrock, Grant County (table 35). The prospect is at a contact of the rhyolite and a basic dike.

South Dakota

Occurrences of cinnabar have been reported on Victoria Creek, and near Pactola and Rochford (fig. 16, table 36).

Wyoming

Mercury occurrences, including some native mercury in the sands of the Bighorn River, have been reported in Fremont and Laramie Counties. Some exploration work has been done on the occurrence in Fremont County (table 37).

Fremont County

Reportedly, mercury occurs in the Wind River Formation. Fourteen picked samples averaged 1.5 pounds of mercury per ton. The deposit supposedly covers a very large area.

Laramie County

Mercury has been reported to occur in minute quantities in the black ores in the western part of the Silver Crown district.

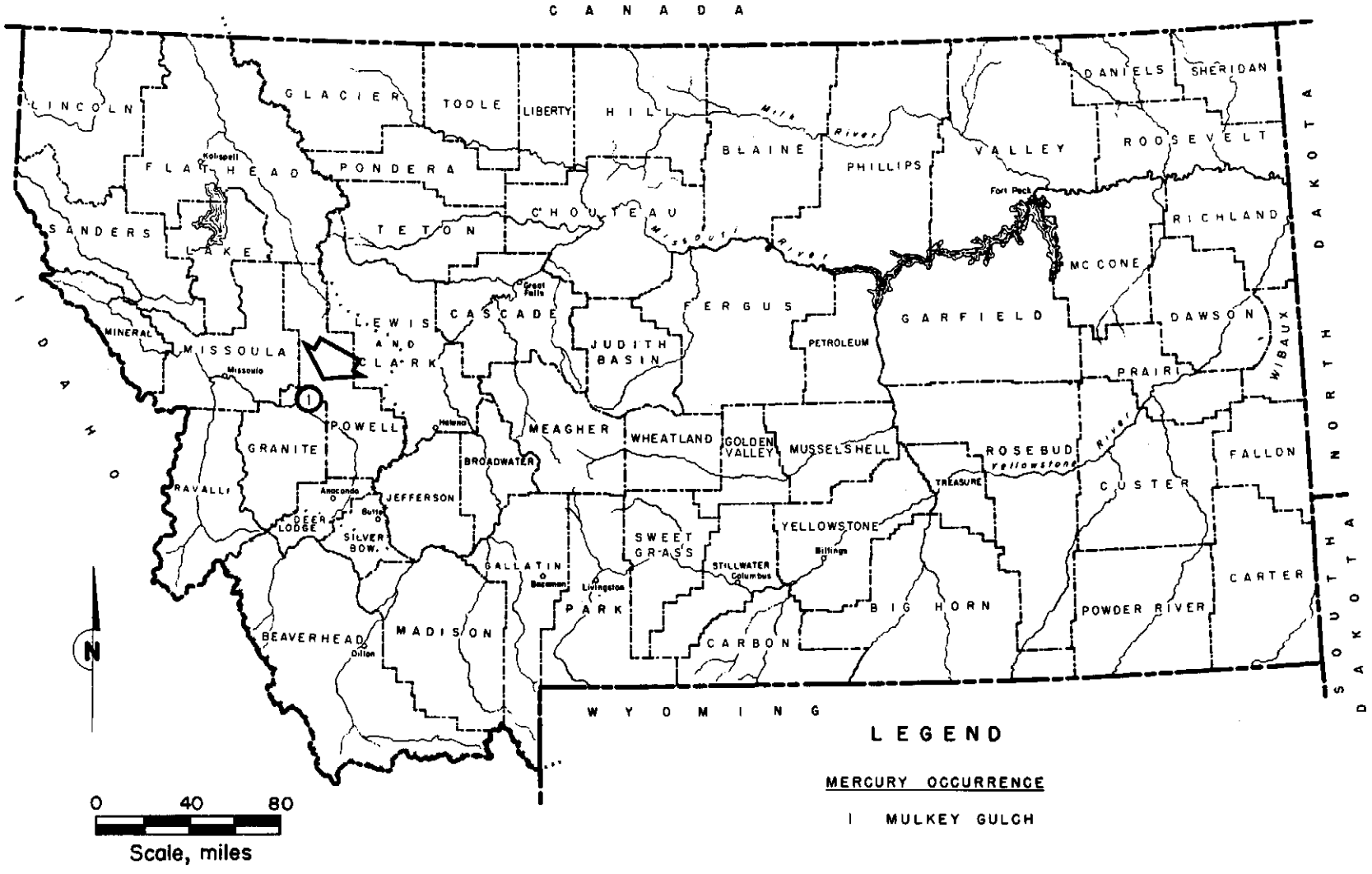

FIGURE 15. - Location Map of Mercury Occurrences in Montana.

TABLE 34. - Montana mercury occurrences

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
Mulkey Gulch.....	Granite...	Sec 15, T 12 N, R 13 W	Occurrence	Unknown	Calomel in stream....	Unknown.	-

TABLE 35. - New Mexico mercury occurrences

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
Ladrones Mountains...	Socorro...	Unknown.....	Occurrence	Unknown	Unknown.....	Unknown.	2
Harper.....	Grant.....	do.....	do.....	do...	At contact of rhyolite and basic dike.	do....	-

TABLE 36. - South Dakota mercury occurrences

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
Victoria Creek.....	Meade.....	Unknown.....	Occurrence	Unknown	Unknown.....	Unknown.	6
Pactola.....	Pennington	do.....	do.....	do...	do.....	do....	6
Rochford.....	do.....	do.....	do.....	do...	do.....	do....	6

TABLE 37. - Wyoming mercury occurrences

Reported property name	County	Reported location	Production, flasks	Development	Mode of occurrence (mineralization, cinnabar unless otherwise noted)	Reported owners	References in bibliography
Golden Dome.....	Fremont...	Secs 12, 14, 24, T 39 N, R 93 W	Occurrence	Test pit	In Wind River formation gravels.	Unknown.	3
Silver Crown district	Laramie...	Unknown.....	do.....	Unknown	Unknown.....	do....	3
Bighorn River.....	Unknown...	do.....	do.....	do....	Native mercury in river sands.	do....	3

FIGURE 16. - Location Map of Mercury Occurrences in South Dakota.

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