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No. 22

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

U. S. Geological Survey.

Mineral investigations resources

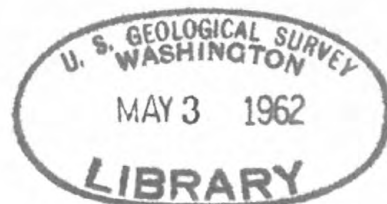
map, MR series. Text to accompany
map MR-22

TO ACCOMPANY MAP MR-22

BISMUTH IN THE UNITED STATES

(Exclusive of Alaska and Hawaii)

By J. R. Cooper



Introduction

The bismuth-bearing deposits in the United States (exclusive of Alaska and Hawaii) are shown on the accompanying map. In compiling the map the deposits were classified into two categories: 1) those that have produced bismuth or are regarded as potential sources based on available information (in general, this category includes the minable base- and precious-metal deposits whose ores or concentrates are reported to contain at least 0.02 percent bismuth); and 2) deposits that have been reported to contain bismuth but which are either unappraised or are regarded as having no potential importance as sources of the metal.

The map also shows by stipple pattern various segments of the southern Piedmont gold belt, which extends from northern Virginia southwestward to Alabama. Numerous gold deposits within this belt contain very minor quantities of bismuth and are, therefore, of general interest.

Each deposit or group of deposits is numbered on the map by state and identified in the index. The index gives the name of each locality, the coordinates to the nearest minute of latitude and longitude, the principal metals in the ore, a very brief geologic description, and references to published reports if any. Both published and unpublished data have been used in compiling this map.

Geology

Bismuth is a rare metal, making up 0.2 part per million of the earth's crust, the same order of magnitude as silver (0.1 ppm), although considerably more silver than bismuth is produced. Most of the bismuth produced in the United States is a byproduct of a few lead refineries which treat crude bullions, flue dusts, and other metallurgical products. The bismuth content of ores and concentrates is generally so low that it is not reported in assays, even from mines known to be relatively bismuth-rich; thus the primary sources of bismuth are known only in a general way.

Bismuth minerals that can be recognized in hand specimens of ore commonly occur erratically in high-grade stringers or pockets, and in many bismuth-rich deposits no bismuth minerals have been identified. A considerable amount of bismuth can enter the crystal structure of galena and other common minerals.

Most of the bismuth mined in the United States comes from hypogene deposits in the Cordilleran region. These deposits generally formed at high to medium temperatures, commonly within or near intrusive igneous rocks. A few small pockets of bismuth ore

have been mined from pegmatite dikes, quartz veins, and contact metamorphic deposits, but most of the bismuth occurs as a minor constituent of ores of silver, lead, zinc, copper, gold, tungsten, and molybdenum. Lead and lead-zinc ores that are high in bismuth also tend to be high in silver, gold, and commonly copper. A distinct association of bismuth with silver is apparent in some mines.

Lead-zinc-silver replacement deposits in limestone have probably been the most important source of bismuth in the United States. Deposits of this type are found at Leadville and Gilman, Colorado; Tintic and Little Cottonwood, Utah; Darwin, California; and Patagonia, Arizona. In these deposits the bismuth occurs in the oxidized as well as in the sulfide ores. Primary bismuth minerals, where known, include bismuth sulfosalts of lead, silver, and copper, bismuthinite, and native bismuth.

Complex lead-copper-silver-bismuth ores have been mined in several contiguous districts in the San Juan Mountains, Colorado (Red Mountain, Poughkeepsie Gulch, Upper Uncompahgre, Mineral Point-Engineer Mountain, and Lake City districts), and also in the Montezuma district in the Front Range, Colorado. The ore bodies are small but some are very rich in precious metals and bismuth.

In the Coeur d'Alene district, Idaho, bismuth in recoverable amounts has been reported from the Sunshine mine and certain other mines in the "Silver Belt". Lead and zinc ores and concentrates from deposits of the Mississippi Valley type contain no detectible bismuth, although traces have been reported in smelter products.

The enargite copper ores at Butte, Montana, have yielded bismuth and are reported to contain some klaprothite ($\text{Cu}_6\text{Bi}_4\text{S}_9$).

Bismuth is present in many gold deposits, as tetradymite, bismuthinite, and other bismuth minerals, but usually only in minor quantities. Small shipments of bismuth and gold-bismuth ores are reported from gold deposits in Riverside County, California, and Grant County, New Mexico. Relatively abundant bismuth minerals are reported in complex gold ores of the Boise Basin district, Idaho; the Goldfield and Yellow Pine districts, Nevada; and the Argenta and Elkhorn districts, Montana.

Bismuth minerals, generally in very minor quantities, have been reported in many gold-quartz veins in the southern Piedmont gold belt in the southeastern part of the United States.

Native bismuth and other bismuth minerals are reported in placer gold deposits at many localities in Alaska and some localities in the southwestern and Rocky Mountain states. These minerals are said to be very abundant in the black sand concentrates in the Boise Basin district, Idaho, and some other localities, but bismuth is not known to have been recovered from this source.

Bismuth is reported to occur in uranium veins in the Ralston Buttes district, Jefferson County, Colorado, and native bismuth and emplectite (CuBiS_2) have been found in some deposits. A fairly clean hand-picked sample of pitchblende from the Schwartzwalder mine reportedly contained 1.5 percent bismuth. Bismuthinite, native bismuth, and their oxidation products are reported in uraniferous veins in the White Signal and Blackhawk districts, New Mexico. Bismuthinite and molybdenite are reported in a vein containing brannerite in Mono County, California. A brannerite-rich mill product from Climax, Colorado, also is reported to contain bismuth. No bismuth is known to have been recovered from uranium deposits in the United States.

Locality Index

Locality	Lat. N.	Long. W.
ALABAMA		
Southern Piedmont gold belt. Small amounts of tetradymite are widely distributed in gold ores. Pardee and Park, 1948.		
1. Hog Mountain mine. Principal metal: Au. Replacement veins in quartz diorite which intrudes schist. Pardee and Park, 1948; Park, 1935; Kaiser and others, 1954, p. 16.	33°04'	85°51'
ARIZONA		
1. Tennessee mine, Chloride (Wallapai) district. Principal metals: Pb, Ag, Zn, Cu, Au. Fissure veins in Precambrian granite and amphibolite near younger granite. Dings, 1951, p. 123-161; Kaiser and others, 1954, p. 22-23.	35°25'	114°11'
2. Cerbat (Wallapai) district. Principal metals: Pb, Zn, Ag. Fissure veins in Precambrian granite, gneiss and schist, near younger granite. Dings, 1951.	35°19'	114°08'
3. Katherine mine, Katherine (San Francisco) district. Principal metal: Au. Epithermal gold quartz veins in granite; small vein containing Bi reported in mine. Lausen, 1931, p. 115-118; Weed, 1920.	35°14'	114°33'
4. Borianna mine, Borianna (Cedar Valley) district. Principal metal: W. Quartz-wolframite veins in	34°57'	113°55'

ARIZONA (cont'd.)

schist. Hobbs, 1944, p. 248-258.		
5. Antler mine, Cedar Valley (Yucca) district. Principal metals: Cu, Zn. Impregnations and replacement bodies in Precambrian schist. Romslo, 1948.	34°52'	113°58'
6. Rare metals and Alma claims. Principal metals: Rare earths, Be, Bi, W. Bi minerals along edges of unzoned pegmatites.	34°50'	113°44'
7. Williams mine, Aquarius Range district. Principal metal: W. Quartz-huebnerite veins in granite. Hobbs, 1944, p. 259-263; Kaiser and others, 1954, p. 25; Schrader and others, 1917.	34°49'	113°26'
8. Tungstona mine, Bagdad district. Principal metals: W, Be. Quartz-wolframite veins in granite, containing some beryl and bismuthinite. Anderson and others, 1955, p. 21, 80, 97.	34°38'	113°09'
9. Black Pearl mine, Bagdad district. Principal metal: W. Quartz-wolframite vein containing bismuthinite, beryl. Wilson, 1941, p. 21-22; Anderson and others, 1955, p. 80.	34°41'	113°02'
10. Sheldon mine, Walker (Bradshaw Mountains) district. Principal metals: Au, Ag, Cu, Pb. Quartz sulfide veins in small granodiorite stock. Lindgren, 1926, p. 110-111.	34°27'	112°24'
11. McCabe-Gladstone mine, Big Bug district. Principal metals: Au, Ag, Cu, Pb. Complex sulfide vein in Precambrian schist. Lindgren, 1926, p. 130-132.	34°29'	112°17'
12. Hackberry mine, Big Bug district. Principal metals: Au, Ag, Cu, Pb. Quartz-ankerite-sulfide replacement bodies in Precambrian schist. Lindgren, 1926, p. 141.	34°25'	112°17'
13. Crown King mine and others, Pine Grove (Bradshaw Mountains) district. Principal metal: Au. Quartz-sulfide veins in granodiorite and Precambrian schist. Lindgren, 1926, p. 164-170; Kaiser and others, 1954, p. 19.	34°13'	112°21'
14. Minnehaha Flat placers. Principal metal: Au. Gold placers (Quaternary stream gravel), reportedly containing native Bi. Schrader and others, 1917; Lind-	34°11'	112°24'

ARIZONA (cont'd.)

- gren, 1926, p. 54, 177.
15. Swallow mine, Castle Creek district. Principal metals: Cu, Au. Oxidized Cu-Au veins in Precambrian granite. Lindgren, 1926, p. 28, 184-185. 34°03' 112°31'
 16. Humbug Creek placers, Humbug district. Principal metal: Au. Gold placer (Quaternary stream gravel). Native Bi reported. Schrader and others, 1917; Lindgren, 1926, p. 54, 178. 34°02' 112°18'
 17. White Picacho district. Principal metals: Li, Be. Pegmatites. Bi minerals fill fractures in coarse quartz and perthite. Jahns, 1952. 33°59' 112°36'
 18. San Domingo placers. Principal metal: Au. Gold placers. Native Bi reported. Schrader and others, 1917; Wilson, 1932, p. 57-59. 33°56' 112°37'
 19. Belmont-McNeil and Cleopatra mines, Vulture district. Principal metals: Pb, Au, Ag, Cu. Veins in Precambrian schist cut by diabase. Kaiser and others, 1954, p. 17. 33°50' 112°51'
 20. Leadville (Hartzig) mine, Oro Fino district. Principal metals: Pb, Ag, Au. Disseminated galena and high-grade galena lenses in schistose rhyolite. 33°38' 114°18'
 21. Castle Dome mine, Miami district. Principal metal: Cu. Porphyry copper deposit in quartz monzonite and granite porphyry. Peterson and others, 1951. 33°25' 110°58'
 22. Magma mine, Superior (Pioneer) district. Principal metals: Cu, Zn. Replacement deposits along fault in Paleozoic and Precambrian rocks. Short and others, 1943; Wilson, 1950, p. 91-94; Burnham, 1959, p. 14-15, 29. 33°18' 111°05'
 23. Geronimo claims, Silver district. Principal metals: Pb, Ag. Oxidized Pb-Ag veins; bismutite reported. Wilson, 1933, p. 64-65. 33°07' 114°37'
 24. Ray mine, Ray (Mineral Creek) district. Principal metal: Cu. Porphyry copper deposit in Precambrian schist, diabase dikes, and early Tertiary (?) plugs of quartz monzonite porphyry. Ransome, 1919, 1923; Kaiser and others, 1954, p. 18; Burnham, 1959, p. 15. 33°10' 110°59'
 25. C and B mine, Banner (Dripping 33°08' 110°51'

- Springs) district. Principal metals: Pb, Au. Oxidized replacement vein on contact of limestone and diabase. Ross, 1925b, p. 69.
26. London-Arizona mine, Banner district. Principal metals: Pb, Cu. Replacement deposit in Paleozoic limestone. Ross, 1925b, p. 61-62. 33°04' 110°48'
 27. Christmas mine, Banner district. Principal metal: Cu. Pyrometasomatic deposits in Paleozoic limestone. Ross, 1925b, p. 52-60; Peterson and Swanson, 1956, p. 351-370. 33°04' 110°44'
 28. Head Center mine, Aravaipa district. Principal metals: Pb, Ag, Zn. Vein in Paleozoic limestone and rhyolite porphyry sills. Ross, 1925a; Wilson, 1950, p. 51-62; Denton, 1947. 32°59' 110°20'
 29. Grand Reef mine, Aravaipa district. Principal metals: Pb, Ag. Rhyolite porphyry breccia cemented by quartz and sulfides. Ross, 1925a, p. 81-85; Wilson, 1950, p. 60-62. 32°53' 110°19'
 30. Bunker Hill mine, Bunker Hill (Copper Creek) district. Principal metals: Pb, Cu, Mo, Ag. Mineralized shear zone in granodiorite. Kuhn, 1951, p. 56-65. 32°44' 110°29'
 31. Mammoth-St. Anthony mine, Old Hat district. Principal metals: Pb, Zn. Vein deposits in Precambrian granite and Tertiary (?) rhyolite. Peterson, 1938; Creasey, 1950, p. 63-84. 32°42' 110°41'
 32. Control (Leatherwood) mine, Catalina (Control) district. Principal metal: Cu. Pyrometasomatic deposits in limestone. Peterson and Creasey, 1943; Kaiser and others, 1954, p. 18. 32°28' 110°44'
 33. Atlas mine and others, Silverbell district. Principal metals: Cu, Pb, Ag. Pyrometasomatic deposits in Paleozoic limestone cut by Laramide stocks and dikes. Richard and Courtright, 1954, p. 1095-1099; Burnham, 1959, p. 16, 30. 32°26' 111°32'
 34. Mascot No. 1 mine and others, Dos Cabezas district. Principal metal: Cu. Pyrometasomatic deposits in limestone and Cretaceous and Tertiary volcanic rocks. 32°13' 109°35'
 35. Republic, Mammoth, and Moore 32°07' 110°04'

ARIZONA (cont'd.)

- mines, Cochise (Johnson Camp) district. Principal metals: Cu, Zn. Pyrometasomatic deposits in Paleozoic limestone. Cooper, 1950, p. 30-39.
36. Bluebird and other mines, Cochise (Little Dragoon) district. Principal metal: W. Quartz-tungsten veins in and near quartz monzonite. 32°04' 110°05'
37. San Xavier and other mines, Pima district. Principal metals: Pb-Zn, Cu. Pyrometasomatic deposits in Paleozoic limestone. Warner and others, 1959, p. 42, 103-105; Burnham, 1959, p. 16, 30; Irvin, 1959; MacKenzie, 1959. 31°58' 111°06'
38. Near Hilton Ranch, Empire district. Principal metal: W. Tactite containing some scheelite and chalcopyrite within 50 feet of intrusive quartz monzonite. Warner and others, 1959, p. 42, 103. 31°53' 110°38'
39. San Juan, Abril, and other mines, Dragoon district. Principal metals: Zn, Pb, Ag. Pyrometasomatic deposits in Paleozoic limestone. Burnham, 1959, p. 30; Warner and others, 1959, p. 42, 98-99; Wilson, 1951, p. 20-26. 31°52' 109°59'
40. Windy claims, Baboquivair district. Bismuthinite-bearing pegmatites in granite. 31°50' 111°33'
41. Shannon (Copper Belle, Leonard) mine, Turquoise district. Principal metal: Cu. Replacement lenses along contact of Paleozoic limestone and quartz monzonite sills. Wilson, 1927, p. 48-49. 31°44' 109°49'
42. Alto mine, Tyndall district. Principal metals: Pb, Ag, Cu. Veins in quartz latite volcanics and underlying granite porphyry. Schrader and Hill, 1915, p. 197-203. 31°37' 110°52'
43. Flux mine, Harshaw district. Principal metals: Pb, Ag, Cu, Zn. Pyrometasomatic deposits in Paleozoic limestone; and veins in overlying Cretaceous and Tertiary volcanic rocks. Schrader and Hill, 1915, p. 258-263. 31°29' 110°45'
44. Montana mine, Ruby (Oro Blanco) district. Principal metals: Pb, Zn, Ag. Veins in Mesozoic (?) conglomerate near contact with intrusive diorite. 31°28' 111°14'

- Fowler, 1951, p. 41-49; Warren and Loofbourow, 1932, p. 578-585.
45. Isabella mine, Patagonia district. Principal metals: Pb, Ag, Cu. Quartz-sulfide vein between granite porphyry and diorite. Schrader and Hill, 1915, p. 311. 31°24' 110°47'
46. Duquesne mine and others, Patagonia (Duquesne-Washington Camps) district. Principal metals: Cu, Pb, Zn, Ag. Pyrometasomatic deposits in Paleozoic limestone intruded by quartz monzonite and younger granite porphyry. Schrader and Hill, 1915, p. 321-342; Kaiser and others, 1954, p. 19; Warner and others, 1959, p. 42, 105. 31°23' 110°41'
47. Cole, Campbell, Junction, Denn, and Sacramento mines, Bisbee (Warren) district. Principal metals: Cu, Pb, Zn. Replacement deposits in Paleozoic limestone associated with pre-Cretaceous granite porphyry intrusives. Hogue and Wilson, 1950, p. 17-29; Trischka, 1938, p. 32-41. 31°26' 109°54'

CALIFORNIA

1. Quartz Hill mine, Scott Bar district. Principal metal: Au. Gold quartz vein. Averill, 1931, p. 49-51; Murdock and Webb, 1956, p. 323. 41°44' 123°00'
2. Iron Mountain district. Principal metal: Cu. Replacement deposits in alaskite porphyry and some Cu-bearing quartz veins. Averill, 1939, p. 123. 40°40' 122°32'
3. Old Diggings district. Principal metal: Au. Gold quartz veins in meta-andesite. Pearce, 1890; Averill, 1939, 1933. 40°40' 122°26'
4. Providence and Murchie mines, Nevada City district. Principal metal: Au. Gold quartz veins in granodiorite, and on contact of granodiorite with carboniferous argillite, quartzite, and schist. Lindgren, 1896, p. 117; Murdock and Webb, 1956, p. 78, 323. 39°16' 121°01'
5. Dean's mine, W. Walker River Canyon. Pegmatites and associated quartz veins in late Mesozoic quartz monzonite. Pabst, 1954. 38°28' 119°27'
6. Melones and Morgan mines, Carson Hill district. Principal met-

- al: Au. Gold quartz vein in amphibolite schist. Ransome, 1900, p. 9; Murdoch and Webb, 1956, p. 323.
7. Soulsby mine, Soulsbyville district. Principal metal: Au. Gold quartz veins in granite. Murdoch and Webb, 1956, p. 323; Goldstone, 1890, p. 742-744; Turner and Ransome, 1897; Sharwood, 1907, p. 118. 37°58' 120°16'
8. Golden Rule and Jumper mines, Quartz-Mountain district. Principal metal: Au. Gold quartz veins in slate. Sharwood, 1911, p. 28; Ransome, 1900, p. 9; Murdoch and Webb, 1956, p. 323. 37°54' 120°28'
9. Sierra Gold and Silver mine, Minarets district. Principal metals: Ag, Pb, Cu, Zn. Quartz-sulfide veins in schist and rhyolitic volcanic rocks. Turner, 1896; Bradley, 1926. 37°40' 119°08'
10. Pine Creek mine, Bishop Tungsten district. Principal metals: W, Mo, Cu. Scheelite ore bodies in tactite near quartz monzonite contact. Bateman, 1956, p. 22-34. 37°22' 118°43'
11. Mines of Round Valley and Deep Canyon area, Tungsten Hills district. Principal metal: W. Scheelite deposits in calc-silicate rock in roofpendants surrounded by granite and granodiorite. Murdoch and Webb, 1956; Lemon, 1941; Bateman, 1956. 37°21' 118°32'
12. Deep Spring Valley area. Principal metal: Bi. Pyrite-limonite vein in quartzite. Goodyear, 1888, p. 236; Irelan, 1890, p. 46; Knopf, 1918. 37°22' 118°05'
13. Big Pine Creek placers. Principal metal: Au. Knopf, 1918. 37°09' 118°20'
14. Garnet Dike mine, Kings River district. Principal metal: W. Scheelite ore chimneys in tactite. Chesterman, 1957; Logan and others, 1951, p. 532. 36°54' 119°01'
15. Cerro Gordo mine, Cerro Gordo district. Principal metals: Ag, Pb, Zn. Replacement deposits in limestone and veins in quartz monzonite dikes. Webb, 1935; Knopf, 1918, p. 108-116. 36°32' 117°47'
16. Darwin and other mines, Darwin district. Principal metals: Pb, Ag, Zn, W. Replacement deposits and veins in limestone and calc-silicate rocks. Hall, 1959; Hall and Mackevett, 1958; Kaiser and

- others, 1954, p. 35-36; Wilson, 1943.
17. Several mines, Greenhorn (Kernville) district. Principal metal: W. Scheelite deposits in tactite. Kerr, 1946, p. 155; Kaiser and others, 1954, p. 36; Hess and Larsen, 1921, p. 263-264. 35°44' 118°34'-35'
18. Kern mines (Big Blue group), Cove district. Principal metal: Au. Gold quartz veins in Paleozoic and Mesozoic rocks and in granodiorite of Sierra Nevada batholith. Prout, 1940; Chesterman, 1957. 35°43' 118°27'
19. Pat mines, Providence Mountains district. Principal metal: W. Quartz-wolframite-huebnerite veins. Kerr, 1946, p. 164; Kaiser and others, 1954, p. 37; Jenkins, 1942, p. 350-351. 35°04' 115°27'
20. Bagdad-Chase mine, Ludlow district. Principal metals: Au, Cu. Siliceous Au-Cu vein between Tertiary monzonite and rhyolite. 34°38' 116°10'
21. United Tungsten and Gold Eagle mines, Morongo district. Principal metal: W. Scheelite deposit in tactite near granodiorite contact. Chesterman, 1957, p. 79-83; Murdoch and Webb, 1956; Hess and Larsen, 1921, p. 262. 34°15' 116°40'
22. Lost Horse (Long Copper) mine, Pinon Mountain district. Principal metals: Au, Cu, Bi. Quartz-sulfide vein in Precambrian micaceous quartzite. Tucker and Sampson, 1929, p. 483; Chesterman, 1957. 33°57' 116°05'
23. Stewart and other mines, Pala district. Lithium-bearing pegmatites. Jahns and Wright, 1951; Kunz, 1903; Waring, 1905; Schaller, 1904. 33°22' 117°04'
24. Victor pegmatite, Rincon district. Pegmatite in tonalite. Rogers, 1910; Chesterman, 1957; Murdoch and Webb, 1956; Sanford and Stone, 1914. 33°16' 116°56'
25. Jacumba district. Pegmatites. Sanford and Stone, 1914; Chesterman, 1957; Murdoch and Webb, 1956; Jahns and Wright, 1951. 32°41' 116°19'

COLORADO

1. Snowy Range and Eureka mines, Camp Albion district. Principal

COLORADO (cont'd.)

- metals: Pb, Ag. Veins in Precambrian granite and gneiss, and in Tertiary monzonite and syenite. Wahlstrom, 1937.
2. Red Cloud mine, Gold Hill district. Principal metals: Au, Ag. Veins in Precambrian gneiss and schist. Goddard, 1940; Randall, 1893. 40°04' 105°23'
 3. Magnolia district. Principal metal: Au. Gold quartz veins in Precambrian granite. Lovering and Goddard, 1950, p. 227-233; Palache and others, 1944, p. 424. 39°59' 105°22'
 4. Big Four (Kremmling) mine, Green Mountain (Kremmling) district. Principal metals: Ag, Zn. Contact vein between quartz monzonite and Cretaceous shale and sandstone. Burnham, 1959, p. 18, 32. 39°54' 106°21'
 5. Mena and Schwartzwalder mines, Ralston Buttes district. Principal metal: U. Vein in gneiss and amphibolite. Sheridan and others, 1958. 39°51' 105°17'
 6. Alice mine, Alice-Yankee district. Principal metals: Au, Ag, Cu. Deposits in quartz monzonite porphyry. Bastin and Hill, 1917, p. 105, 323-326. 39°49' 105°39'
 7. Several mines, Central City-Idaho Springs district. Principal metals: Au, Ag. Veins in schist and gneiss. Lovering and Goddard, 1950, p. 173, 174, 180, 181, 191; Pearce, 1889-90, p. 447-457; Palache and others, 1944, p. 161. 39°47' 105°33'
 8. Guy Hill pegmatites. Schrader and others, 1917. 39°47' 105°19'
 9. Union Pacific and Ladwig mines, Ralston Buttes district. Principal metal: U. Vein deposit. Adams and Stugard, 1956; Sheridan and others, 1958. 39°47' 105°16'
 10. Burroughs pegmatite. Heinrich, 1947. 39°41' 105°20'
 11. Geneva Creek area, Montezuma district. Principal metals: Ag, Pb, Au. Narrow but commonly high-grade veins. Lovering, 1935, p. 53, 75, 79; Palache and others, 1944, p. 424. 39°35' 105°49'
 12. Missouri mine and others, Montezuma district. Principal metals: Ag, Au, Cu, Pb. Veins in gneiss. Lovering and Goddard, 1950, p. 130-131; Lovering, 1935, p. 87-89. 39°31' 105°51'
 13. Bigger Pegmatite. Heinrich, 1947. 39°33' 105°13'
 14. Eagle mine, Gilman district. Principal metals: Pb, Zn, Ag, Cu. Replacement chimneys and mantos in Paleozoic limestone. Tweto and Lovering, 1947, p. 385; Lovering, 1958, p. 693. 39°32' 106°24'
 15. Four lode mines and one placer, Breckenridge district. Principal metals: Au, Ag, Pb, Zn, Cu. Veins, stockworks and placers. Ransome, 1911, p. 84, 149-157; Randall, 1893; Lovering and Goddard, 1950, p. 122; Pearce, 1890. 39°31' 106°00'
 16. Climax mine, Climax district. Principal metal: Mo. Ores contain traces of Bi. 39°22' 106°11'
 17. Mines on Breece Hill, Printer Boy Hill, and along Tucson Maid fault, Leadville district. Principal metals: Ag, Pb, Zn, Au, Cu. Veins and replacement bodies, mostly in limestone. Emmons and others, 1927; Chapman, 1944; Chapman and Stevens, 1933. 39°14' 106°18'
 18. Boomer mine. Principal metal: Be. Quartz-beryl vein in gneiss-sized Precambrian rocks. 39°05' 105°27'
 19. Twin Lakes district. Principal metals: Au, Ag. Quartz-sulfide veins in granite and quartz monzonite. Chapman, 1935. 39°05' 106°21'-106°27'
 20. Banker Tunnel, Windfield (La Plata) district. Principal metals: Ag, Pb, Au. Quartz-sulfide veins in granite and quartz monzonite. Chapman, 1935; Vanderwilt and others, 1947, p. 48. 38°59' 106°26'
 21. Yard Pegmatite, Trout Creek Pass. Pegmatite, probably Precambrian. Heinrich, 1947. 38°54' 106°05'
 22. Meyer's Ranch pegmatite. Bi minerals fill fractures in pegmatite. Heinrich, 1947. 38°47' 105°35'
 23. Devil's Hole pegmatite. Heinrich, 1947. 38°28' 105°36'
 24. Mica Lode pegmatite and others, Eight Mile Park district. Heinrich, 1947. 38°29' 105°20'
 25. Rawley mine, Bonanza district. Principal metals: Ag, Pb, Cu, Zn. Sulfide-quartz veins in Tertiary volcanic rocks. Vanderwilt and others, 1947, p. 443-446. 38°19' 106°07'

COLORADO (cont'd.)

26. Bassick mine, Rosita Hills (Silver Cliff) district. Principal metals: Au, Ag, Ore chimney in agglomerate filling volcanic rock. Emmons, 1896, p. 435. 38°08' 105°20'
27. Yellow Medicine mine, Galena (Henson Creek) district. Principal metals: Ag, Pb, Zn. Fissure veins at contact of andesite flow and intrusive monzonite porphyry. Vanderwilt and others, 1947, p. 439-443; Irving and Bancroft, 1911, p. 45, 53, 78-79; Kaiser and others, 1954, p. 38. 38°01' 107°28'
28. Monte Queen mine, Lake City district. Principal metals: Ag, Pb, Zn, Au. Fissure vein in flow breccia. Irving and Bancroft, 1911; Randall, 1893; Palache and others, 1944, p. 424. 38°01' 107°19'
29. Several mines, Upper Uncompahgre district. Principal metals: Au, Ag, Pb, Cu. Veins and chimney deposits in Tertiary volcanics and older rocks. Kelley, 1945. 37°59' 107°39'
30. Several mines, Mineral Point-Engineer Mountain district. Principal metals: Ag, Au, Pb, Zn. Late Tertiary veins. Kelley, 1945; Ransome, 1901, p. 187. 37°58' 107°35'
31. Eight mines, Poughkeepsie Gulch district. Principal metals: Ag, Au, Pb, Cu, B. Vein deposits in Tertiary volcanic rocks. Kelly, 1945; Randall, 1893; Ransome 1901; Palache and others, 1944, p. 444. 37°56' 107°38'
32. Several mines, Red Mountain district. Principal metals: Ag, Au, Pb, Cu. Ore chimneys in volcanic rocks. Ransome, 1901. 37°55' 107°43'
33. Alta mine, Iron Springs (Ophir) district. Principal metals: Au, Ag, Pb. Fissure veins in Tertiary volcanic rocks and underlying Paleozoic and Mesozoic formations. Burnham, 1959, p. 19; Vanderwilt and others, 1947, p. 425-527. 37°53' 107°50'
34. Neigold claim, Silverton district. Bismuthinite reported with specularite in quartz. Ransome, 1901, p. 82. 37°50' 107°35'
35. Blackhawk mine, Rico (Pioneer) district. Principal metals: Ag, Pb, Au, Cu, Zn. Veins and blankets in Paleozoic limestone near 37°42' 108°00'

quartz monzonite stock. Burnham, 1959, p. 19; Vanderwilt and others, 1947, p. 414-416.

36. Comstock mine, La Plata (California) district. Principal metals: Au, Ag, Cu, Pb. Vein in Permian redbeds cut by dikes and sills of porphyry. Eckel, 1949, p. 58-59, 103-104; Schrader and others, 1917. 37°23' 108°04'

CONNECTICUT

1. Pelton quarry, Portland district. Pegmatite. Foye, 1922, p. 7; Schairer, 1931, p. 37. 41°37' 72°34'
2. Booth's and Lane's mines, Monroe district. Principal metals: Au, Ag, W, Bi. Quartz-sulfide veins. Schairer, 1931, p. 106; Hobbs, 1901, p. 13. 41°20' 73°12'

GEORGIA

Southern Piedmont gold belt. Small amounts of tetradymite are widely distributed in gold ores. Pardee and Park, 1948; Palache and others, 1944, p. 163; Shepard, 1859.

IDAHO

1. Peak Lode (Talache Mines) mine, Pend Oreille (Talache) district. Principal metals: Ag, Cu, Pb, Zn. Fissure veins in late Precambrian sedimentary rocks. Sampson, 1928. 48°08' 116°29'
2. Gray Wolf group, Beauty Bay district. Principal metals: Pb, Zn. Bi-bearing quartz veins cut by lead-zinc-pyrrhotite replacement bodies in porphyritic quartz monzonite and adjacent quartzite. Shannon, 1926, p. 50; Anderson, 1940, p. 42-43, 49-50. 47°36' 116°37'
3. Coeur d'Alene district. Principal metals: Ag, Pb, Zn, Cu. Veins in the Belt series (Precambrian); significant amounts of Bismuth largely confined to "Silver Belt." Kaiser and others, 1954, p. 51-53; Shenon and McConnel, 1939. 47°30' 116°02'
4. Highland Surprise mine, Pine Creek district. Principal metals: Pb, Zn. Veins in the Belt series of Precambrian. 47°29' 116°10'
5. Moose Creek placer, Elk City (Tennile) district. Principal metal: Au. Reed, 1934, p. 20-21; Kaiser and others, 1954, p. 51. 45°50' 115°36'
6. Seven Devils district. Principal 45°08' 116°38'

IDAHO (cont'd.)

- metal: Cu. Copper deposits in tactite near intrusive quartz diorite. Livingstone and Laney, 1920, p. 51-52, 66; Palache and others, 1944, p. 413.
7. Blackbird mine, Blackbird district. Principal metals: Co, Cu. Lenses and veins in schistose rocks of the Belt series of Precambrian. Reed and Herdlich, 1947, p. 6-11; Shannon, 1926; Kaiser and others, 1954, p. 50. 45°07' 114°20'
 8. Many lode and placer mines, Boise Basin (Quartzburg-Grimes Pass) district. Principal metals: Au, Ag, Pb. Veins and stockworks in the Idaho batholith and younger dikes of porphyry; placers derived from the veins. Ballard, 1924; Palache and others, 1944, p. 430. 43°58' 115°58'
 9. Empire claims, East Fork district. Principal metal: Au. Gold quartz veins in porphyritic quartz monzonite. Shannon, 1926; Umpleby, 1915, p. 244-246; Ross, 1938, p. 156-157. 44°00' 114°38'
 10. Four mines, Lava Creek district. Principal metals: Ag, Pb, Zn. Veins in andesite lavas and tuffs near Miocene granite and porphyry intrusions. Anderson, 1929, 1947. 43°36' 113°35'

MAINE

1. Ten thousand Acre Tract, Chase Stream area. Principal metals: Cu, Ag. Sulfides in sheared meta-volcanic rocks. 45°29' 69°56'
2. Cooper (American Molybdenum) mine. Principal metal: Mo. Mineralized joints in granite associated with pegmatites. Maine Geological Survey, 1958, p. 14. 44°54' 67°27'
3. Golden Circle (Silver Isle?) mine. Principal metals: Au, Ag. Gold quartz vein. Maine Geological Survey, 1958, p. 21. 44°29' 68°10'

MARYLAND

1. Great Falls district. Principal metal: Au. Gold quartz veins and lodes in schist. Weed, 1905; Ulke, 1939. 39°00' 77°14'

MONTANA

1. Flathead mine, Hog Heaven district. Principal metals: Ab, Pb. Replacement deposit in altered

Tertiary (?) latite intrusive into Belt series. Shenon and Taylor, 1936.

2. Mike Horse mine, Hedderston district. Principal metals: Pb, Zn, Ag. Veins in diorite and slate. Pardee and Schrader, 1933, p. 94-98; Kaiser and others, 1954, p. 73. 47°01' 112°22'
3. Silver Dyke mine, Neihart (Montana) district. Principal metals: Ag, Pb, Cu. Lenticular deposit in brecciated quartz porphyry, granite porphyry and gneiss. Schafer, 1935, p. 50-53; Kaiser and others, 1954, p. 77-78. 46°59' 110°41'
4. Fairview mine, Garnet district. Principal metals: Au, Ag. Gold quartz vein. Pardee, 1918, p. 176, 194-195; Palache and others, 1944, p. 163. 46°49' 113°19'
5. Bertha mine, Wickes district. Principal metals: Ag, Pb, Zn. Quartz-sulfide vein in granite. Knopf, 1913, p. 110. 46°23' 112°04'
6. Mount Washington mine, Wickes district. Principal metals: Pb-Ag, Zn. Veins in andesite. Pardee and Schrader, 1933, p. 236-237. 46°20' 112°09'
7. Dolcoath mine, Elkhorn district. Principal metals: Au, Bi. Pyrometasomatic deposit in limestone near diorite sill. Weed, 1901, p. 506-507. 46°17' 111°57'
8. Keating mine, Radersburg district. Principal metals: Au, Ag, Cu, Pb. Pyritic gold vein in post-Cretaceous andesite. Schrader and others, 1917; Winchell, 1914, p. 173-179. 46°11' 111°40'
9. Butte district. Principal metals: Cu, Zn, Pb. Veins and stockworks in quartz monzonite of Boulder batholith cut by quartz porphyry dikes. Weed, 1912, p. 70-71; Kaiser and others, 1954, p. 72-74; Perry, 1932; Hart, 1935; Rogers, 1916. 46°01' 112°32'
10. Highland district. Principal metals: Au, Ag, Cu. Veins and replacement deposits in Paleozoic limestone near Boulder batholith. Sahinen, 1950, p. 35-50; Winchell, 1914, p. 87-90; Palache and others, 1944, p. 161-163. 45°48' 112°31'
11. Sir Walter Scott (Argenta Mining Co.) mine, Argenta district. Principal metals: Au, Bi. Replacement deposits in altered limestone at quartz monzonite 45°17' 112°53'

Locality Index (cont'd.)

MONTANA (cont'd.)

contact, Shenon, 1931.

12. Barbara Anne and Seismoneit mines, Emigrant district. Principal metals: Au, Ag, Pb, Cu. Fissure veins in Tertiary andesite flows close to intrusive "acidic rock." Reed, 1950, p. 50-51.
13. Excelsior, Gold Bug, Golden Leaf, and Greater mines, Bannack district. Principal metal: Au. Pyrometasomatic replacement deposits in limestone at contact with Late Cretaceous granodiorite. Shenon, 1931, p. 40-43; Kaiser and others, 1954, p. 75.

NEVADA

1. Riley mine and others, Potosi (Getchell) district. Principal metal: W. Scheelite deposits in tactite at base of roof pendant of limestone in granodiorite. Kerr, 1946, p. 173-174; Kaiser and others, 1954, p. 82; Hobbs and Clabaugh, 1946.
2. Placers and veins, Lynn district. Principal metal: Au. Gold veins in Tertiary rhyolite cut by porphyritic intrusives. Lincoln, 1923, p. 94.
3. Majuba Hill mine, Antelope (Cedar) district. Principal metals: Cu, Sn. Mineralized rhyolitic breccia. Trites and Thurston, 1958, p. 183-203.
4. Star tungsten (Valley View, Ogilvie, Hankins) mine, Valley View (Ruby Valley, Ruby Mt.) district. Principal metal: W. Scheelite deposits in silicated limestone adjacent to quartz monzonite porphyry dikes. Kaiser and others, 1954, p. 82; Hess and Larsen, 1921, p. 304-305.
5. White Pine County. Schrader and others, 1917.
6. Lord Byron and Kelly mines, Eureka district. Principal metals: Ag, Au, Pb. Thoroughly oxidized veins in Cambrian limestone. Hague, 1892, p. 313-314.
7. Nevada Scheelite (Leonard claims) Regent (Rawhide) district. Principal metal: W. Scheelite deposits in silicated limestone near intrusive granite. Kaiser and others, 1954, p. 83.

NEVADA (cont'd.)

8. Black Metal (Jackrabbit) mine, Pioche district. Principal metals: Pb, Cu, Ag, Mn. Replacement deposits in Cambrian limestone. Westgate and Knopf, 1932, p. 71-72; Hill, 1916, p. 135-136.
9. Montezuma district. Principal metals: Ag, Au, Pb, Cu. Veins and replacement bodies in Cambrian limestone and shale cut by granite, quartz monzonite, and diorite. Lincoln, 1923, p. 78-79.
10. Mohawk mine and others, Goldfield district. Principal metals: Au, Ag, Cu. Epithermal gold-alunite veins in volcanic rocks. Tolman and Ambrose, 1934, p. 255-279; Ransome, 1909; Lindgren, 1933, p. 512; Wilson, 1944; Searles, 1948, p. 3-21.
11. Tem Piute, Lincoln, and Schofield mines, Tem Piute district. Principal metal: W. Scheelite deposits in tactite adjacent to granite stocks. Binyon and others, 1950; Kaiser and others, 1954, p. 82.
12. Boss mine, Yellow Pine district. Principal metals: Au, Ag, Pt, Pd, Cu. Ore pipe and smaller ore lenses in Paleozoic limestone near early Tertiary granite porphyry. Hewett, 1931, p. 114-118; Knopf, 1916; Weed, 1920, p. 1021.

NEW HAMPSHIRE

1. Sunapee Mountain. Hitchcock, 1878, p. 68.

NEW MEXICO

1. Aztec mine, Baldy (Ute Creek) district. Principal metal: Au. Gold quartz veins in Cretaceous shale and sandstone near monzonite and quartz monzonite intrusives. Lee, 1916, p. 325-330; Crawford, 1937, p. 1065-1069.
2. Fridlund mine and others, Petaca district. Pegmatites mined principally for mica. Just, 1937, p. 63-64; Jahns, 1946, p. 67-68, 180-183; Palache and others, 1944, p. 660.
3. Cimarroncito district. Principal metals: Cu, Au. Deposits in tactite near quartz monzonite porphyry intrusives. Anderson, 1957, p. 36-37; Lindgren and others, 1910, p. 105-108; Warner and others, 1959, p. 44, 109.

NEW MEXICO (cont'd.)

4. Goats Point Prospect, Picuris 36°16' 105°54'
(Copper Mtn.) district. Principal metal: Bi. Gossan on Precambrian granite.
5. Harding pegmatite, Picuris 36°12' 105°48'
(Copper Mtn.) district. Principal metals: Li, Ta, Be. Pegmatite in Precambrian metamorphic rocks. Jahns, 1951, p. 52-53.
6. Pecos mine and others, Willow Creek, (Pecos, Cooper) district. Principal metals: Zn, Pb. Replacement deposit in late Precambrian granite. Krieger, 1932; Warner and others, 1959, p. 46-125; Burnham, 1959, p. 34.
7. Bert Hoover Lode No. 1 and others, El Porvenir (Hermit Mtn.) district. Principal metals: Mo, W. Quartz-sulfide veins in schist and gneiss. Anderson, 1957, p. 110.
8. Magdalena district. Principal metals: Zn, Pb, Ag, Cu. Replacement deposits in Paleozoic limestone. Burnham, 1959, p. 20-34; Loughlin and Koschmann, 1942.
9. Sentinel adit, Cuchillo Negro district. Principal metals: Cu, Pb, Zn. Deposit in tactite at contact of monzonite porphyry sill. Harley, 1934, p. 113-123; Warner and others, 1959, p. 48, 128.
10. Mogollan district. Principal metals: Ag, Au, Cu. Quartz-sulfide fissure veins in Tertiary volcanic and sedimentary rocks. Burnham, 1959, p. 34-35; Ferguson, 1927.
11. Grandview mine, Tularosa district. Principal metal: Cu. Veins and disseminated deposits in Permian limestone near diorite porphyry intrusive. Anderson, 1957.
12. Pioneer (Chief) mine, Grandview Canyon (San Andres) district. Principal metal: Bi. Bi minerals in lenses of quartz along Precambrian schist-granite contact. Lasky, 1932, p. 83-86; Kerr, 1946, p. 97.
13. Snake, Opportunity, Litel King, Golden Era, Begelow, and Copper Flat Claims, Las Animas (Hillsboro) district. Principal metals: Au, Ag, Cu. Veins in Tertiary andesite flows and disseminated deposit in monzonite porphyry stock. Harley, 1934,

p. 133-166; Kaiser and others, 1954, p. 86.

14. Slick Gold, Houston-Thomas, and Cleveland mines, Pinos Altos district. Principal metals: Au, Pb, Zn, Ag. Replacement deposits in Paleozoic limestone near diorite intrusive. Warner and others, 1959, p. 46, 118.
15. Grandview mine, Carpenter (Swartz) district. Principal metals: Zn, Pb, Ag. Pyrometamorphic replacement deposits in Paleozoic limestone near quartz monzonite intrusive. Warner and others, 1959, p. 44, 114-116.
16. Many mines, Central district. Principal metals: Zn, Pb, Fe, Cu. Some Bi in calc-silicate ores and vein deposits in Zn, Zn-Pb, Zn-Pb-Cu, Fe-Cu-Zn. Burnham, 1959, p. 20-21, 35-36; Kaiser and others, 1954, p. 87-88; Warner and others, 1959, p. 44, 116-118.
17. Black Hawk, Alhambra, Silver King, and other mines, Black Hawk district. Principal metals: Ag, Ni, Co. Fissure veins in Precambrian quartz diorite gneiss near Laramide monzonite porphyry stock. Gillerman and Whitebread, 1956.
18. Bismuth Lode mine, Burro Mtn. district. Principal metal: Bi. Vein in Precambrian granite.
19. Apache Trail mine, White Signal district. Principal metals: Au, Bi, U. Veins in Precambrian granite and diabase dikes. Lovering, 1956, p. 341-344.
20. Merry Widow mine and Homestake claim, White Signal district. Principal metals: Au, U. Quartz-pyrite veins in Precambrian granite and diabase dikes. Lovering, 1956, p. 329-341; Granger and Bauer, 1952.
21. Mormon and other mines, Gold Camp, Organ district. Principal metals: Au, Cu. Quartz-sulfide veins in Precambrian granite. Anderson, 1957, p. 41; Dunham, 1935, p. 209-210.
22. Many mines, main part of Organ district. Principal metals: Cu, Zn, Pb, Ag. Base-metal deposits in tactite, and silver-rich veins in intrusive quartz monzonite. Dunham, 1935; Warner and

NEW MEXICO (cont'd.)

- others, 1959, p. 44, 113-114; Burnham, 1959, p. 20-36.
23. Texas Main (Texas Canyon) mine, Organ district. Principal metals: Au, Ag. Veins in quartz monzonite. Dunham, 1935, p. 203-205. 32°21' 106°31'
 24. Five mines, Lordsburg district. Principal metals: Cu, Ag, Pb. Quartz-sulfide veins in Cretaceous basalt and intrusive granodiorite. Lasky, 1938; Kaiser and others, 1954, p. 86-87; Warner and others, 1959, p. 46, 120; Burnham, 1959, p. 21, 36. 32°19' 108°45'
 25. McGhee mine and others, San Simon district. Principal metals: Cu, Pb, Zn, Ag. Deposits in tactite near monzonite porphyry dike. Anderson, 1957, p. 88-89; Warner and others, 1959, p. 46, 120-121. 32°10' 108°58'
 26. Eloi, Morlock, Tungsten Hill No. 3, Bogle, and other mines, Victorio (Gage) district. Principal metals: W, Be. Quartz-wolframite veins and disseminated deposits in tactite near granite plug. Warner and others, 1959, p. 46, 122-125. 32°11' 108°07'
 27. Monarch and Little Mildred mines, Eureka (Hachita) district. Principal metals: Cu, Pb, Zn. Veins in Cretaceous sedimentary rocks. Lasky, 1947, p. 67; Burnham, 1959, p. 21; Warner and others, 1959, p. 46, 119-120; Palache and others, 1944, p. 161. 31°55' 108°26'
 28. Apache and other mines, Apache No. 2 (Anderson) district. Principal metals: Cu, Zn, Pb, Au, Ag. Deposit in tactite at intrusive porphyry contact. Anderson, 1957, p. 82-84; Lasky and Wootton, 1933, p. 25, 138. 31°51' 108°18'
 29. Gold Hill, Ridgewood, Handcar, Wake up Charlie, Golden Eagle, Little Mildred, Pearl, and other mines Sylvanite (Hachita) district. Principal metals: Au, Ag. Veins in late Cretaceous and early Tertiary monzonite and sedimentary rocks. Lasky, 1947, p. 208; Warner and others, 1959, p. 46, 119-120. 31°49' 108°27'
 30. Eagle mine, Fremont district. Principal metals: Pb, Ag, Bi. Replacement bodies and quartz-

carbonate sulfide veins in limestone cut by granite porphyry and lamprophyre. Anderson, 1957, p. 84.

NORTH CAROLINA

Southern Piedmont gold belt. This portion of the belt in North Carolina contains the largest and most productive gold mine and also appears to contain the most bismuth. Pardee and Park, 1948; Genth, 1853, 1875, 1891; Keith and Sterrett, 1931; Little, 1874; Shepard, 1853.

1. Hamme mine. Principal metal: W. Quartz-huebnerite veins in granite, and veins in adjacent schist. Espenshade, 1947, p. 6-14; Kaiser and others, 1954. 36°31' 78°28'
2. Virgilina district. Principal metals: Cu, Au. Veins in schist. Laney, 1917. 36°32' 78°47'

OREGON

1. Chloride mine, Rock Creek district. Principal metals: Ag, Pb, Au, Cu. Quartz vein in argillite containing galena, arsenopyrite, pyrite, chalcopyrite and argentite. Oregon Dept. Geology and Mineral Industries, 1939, p. 86. 44°52' 118°08'
2. Standard and other mines, Quartzburg district. Principal metals: Au, Cu, Co. Quartz-carbonate-sulfide veins valuable chiefly for gold. Gilluly and others, 1933, p. 85-105. 44°32' 118°41'
3. Irwin molybdenum prospect, Gold Hill district. Principal metals: Mo, Au. Gold quartz vein containing molybdenite. Lowell, 1942, p. 573-574, 583; Oregon Dept. Geology and Mineral Industries, 1942, p. 79-80. 42°26' 123°08'
4. Carter and Jewett mines, Grants Pass district. Principal metal: Au. Gold quartz vein. Lowell, 1942, p. 581-583; Oregon Dept. Geology and Mineral Industries, 1942, p. 82. 42°24' 123°17'
5. Humdinger and Red Rose Mines, Lower Applegate district. Principal metal: Au. Gold quartz veins. Lowell, 1942, p. 577-579. 42°15' 123°18'
6. Frog Pond mine, Waldo district. Principal metal: Au. Gold quartz vein. Lowell, 1942, p. 577-579; Oregon Dept. Geol. and Mineral Industries, 1942, p. 199. 42°01' 123°31'

SOUTH CAROLINA

Southern Piedmont gold belt. Small amounts of tetradymite common in gold ores. Pardee and Park, 1948, p. 106-111.

SOUTH DAKOTA

1. Homestake mine, Lead district. Principal metal: Au. Noble, 1950. 44°21' 103°46'
2. Etta mine, Keystone district. Pegmatite containing Li, Be, mica. O'Harra, 1902, p. 64. 43°53' 103°26'
3. Rough Rider mine and others, Custer district. Principal metal: Au. Gold quartz veins. Allsman, 1940, p. 126,129. 43°48' 103°43'

TEXAS

1. Heath mine, Llano district. Principal metal: Au. Gold-quartz veins associated with pegmatites. Paige, 1911, p. 71-73. 30°48' 98°37'
2. Kiam prospect, Llano district. Principal metals: Bi, Mo. Stenzel and Barnes, 1939. 30°38' 98°31'

UTAH

1. Park City district. Principal metals: Ag, Pb, Zn, Cu, Au. Bedded replacement deposits in limestone, and lodes in limestone, quartzite, and intrusive porphyry. Burnham, 1959, p. 24; Butler and others, 1920, p. 285-311; Rogers, 1916, p. 583-585. 40°38' 111°31'
2. Sells tunnel (Alta United Mines Co.) and South Hecla mine, Little Cottonwood district. Principal metals: Pb, Cu, Ag, Au. Replacement bodies in limestone which is cut by Laramide (?) granodiorite and quartz monzonite stocks. Calkins and Butler, 1943; Kasteler and Hild, 1948. 40°35' 111°38'
3. Bingham district. Principal metal: Cu. Butler and others, 1920, p. 340-362; Burnham, 1959, p. 24. 40°31' 112°09'
4. Wilson Consolidated, Lucy L., Copper Bloom, Rube, and United States mines, Gold Hill district. Principal metals: Au, Ag, Pb, As. Replacement deposits in limestone, and veins in quartz monzonite. Nolan, 1935; Butler and others, 1920. 40°09' 113°50'
5. Mammoth, Boss Tweed, Opo-honga, Carisa, Ajax, Emerald, Iron Blossom, Victoria, Eagle, and Bluebell mines, Tintic dis-

trict. Principal metals: Ag, Pb, Au, Cu, Zn. Contact metamorphic aureole surrounding Silver City monzonite stock. Lindgren, and Loughlin, 1919; Palache and others, 1944, p. 62.

- 5a. North Lily mine, East Tintic district. Principal metals: Pb, Ag. Replacement deposits in limestone. 39°58' 112°04'
6. Scotia and Desert Tungsten mines, West Tintic district. Principal metals: Au, W. Scheelite deposit in tactite and oxidized Au-Ag-Pb vein. Stringham, 1942. 39°50' 112°24'
7. E. P. H. claim, Detroit (Drum) district. Principal metals: Au, Cu, Ag. Replacement vein in limestone cut by monzonite porphyry dikes. Butler and others, 1920, p. 463-465. 39°33' 113°02'
8. Major (Bismuth) mine, Granite district. Principal metals: Bi, Mo. Tactite bed near Tertiary quartz monzonite porphyry intrusive contains bismuthinite, molybdenite, pyrite, and fluorite. Butler and others, 1920, p. 531-534. 38°26' 112°47'
9. St. Mary's mine, Star district. Principal metals: Pb, Ag, Cu. Pyrometasomatic deposits in limestone near Tertiary quartz monzonite stock. Butler, 1913, p. 204. 38°20' 113°09'

VIRGINIA

Southern Piedmont gold belt. Small amounts of tetradymite are widely distributed in gold ores. Pardee and Park, 1948; Dietrich, 1953; Schrader and others, 1917.

1. Valzinco mine, Louisa-Spotsylvania district. Principal metals: Pb, Zn, Cu. Lenticular vein in sericite schist. Currier, 1935, p. 91-93; Kaiser and others, 1954, p. 110. 38°11' 77°46'
2. Irish Creek district. Principal metal: Sn. Greissenized granodiorite with quartz veins. Glass and others, 1958. 37°50' 79°12'

WASHINGTON

1. Wolframite (Hatfield, Ferris R. Ford) mine. Principal metal: W. Quartz-wolframite veins in granite. Huntting, 1956, p. 346. 48°58' 120°07'
2. Kaaba mine, Loomis-Oroville 48°58' 119°39'

WASHINGTON (cont'd.)

- (Nighthawk) district. Principal metals: Pb, Ag, Zn. Quartz-sulfide vein on lamprophyre-granite contact. Kaiser and others, 1954, p. 112-113; Huntting, 1956, p. 220.
3. Talisman (Laurier) mine. Principal metals: Cu, Zn, Pb, Ag. Deposit in calc-silicate schist. Huntting, 1956, p. 55. 48°59' 118°15'
 4. Melrose (Maple Leaf, Paragon) mine. Principal metals: Ag, Zn, Pb, Cu. Quartz vein in argillite containing scattered bunches of ore. Huntting, 1956, p. 329. 48°57' 117°38'
 5. Mountain Beaver mine. Principal metals: Au, Cu, Ag. Pyrite-chalcopyrite ore in andesite agglomerate. Huntting, 1956, p. 144. 48°48' 120°19'
 6. Sierra Zinc (Aladdin, Blue Ridge) mine. Principal metals: Zn, Pb, Ag, Au. Disseminated deposit in limestone. Kaiser and others, 1954, p. 114-115; Huntting, 1956, p. 380. 48°47' 117°41'
 7. Key prospect. Principal metals: Ag, Pb. Quartz-sulfide vein in granite and schist. Huntting, 1956, p. 305. 48°34' 119°45'
 8. Peacock mine, Conconully district. Principal metals: Ag, Pb. Quartz veins on contact of quartz diorite and metamorphic rocks. Huntting, 1956, p. 308. 48°31' 119°45'
 9. Arlington mine. Principal metals: Ag, Pb, Cu. Veins in granite and adjacent schist. Huntting, 1956, p. 300. 48°28' 119°44'
 10. Daisy-Tempest mine, Kettle River district. Principal metals: Ag, Pb. Quartz-sulfide veins in argillite and quartzite cut by granitic rock. Huntting, 1956, p. 325. 48°22' 118°05'
 11. Cannon, Calispell Peak, Railway Dike mines. Principal metals: Be, U, Nb, Ta. Pegmatites. Huntting, 1956, p. 356. 48°24' 117°32'
 12. Silver Coin and Lucky Strike mine. Principal metals: Ag, Pb, Zn, Cu. Mineralized fracture zones in granite and schist. Huntting, 1956, p. 87, 164. 48°07' 121°37'
 13. Holden mine, Chelan Lake (Railroad Creek) district. Principal metals: Cu, Zn. Disseminated deposit in roof pendant of metamorphic rocks cut by

- granite dikes, Kaiser and others, 1954, p. 112, Huntting, 1956, p. 48.
14. Keefer Brothers mine. Principal metals: Mo, Cu. Narrow veins in granodiorite. Huntting, 1956, p. 268. 48°09' 120°50'
 15. Germania and Keith mines, Deer Trail district. Principal metal: W. Quartz-wolframite veins in granite. Huntting, 1956, p. 348; Kaiser and others, 1954. 48°00' 118°06'
 16. Tungsten King and other mines, Deer Park district. Principal metal: W. Quartz-huebnerite veins in argillite and quartzite. Huntting, 1956, p. 349; Kaiser and others, 1954, p. 115; Bancroft, 1914, p. 132. 48°06' 117°30'
 17. Black-Rosauer mine. Principal metals: Ag, Bi. Quartz vein in granite. Huntting, 1956, p. 295. 47°55' 119°03'

WYOMING

1. Yankee Jack mine, Bridger district. Principal metal: Ag. Native Bi associated with argentite in a vein in slate. Osterwald and Osterwald, 1952, p. 20; Birch, 1955, p. 40. 43°07' 107°34'
2. Jasper mine, Douglas district. "Bismuth" reported in pegmatite with mica, tantalum, lepidolite and garnet. Osterwald and Osterwald 1952, p. 20; Birch, 1955, p. 40. 42°35' 105°31'
3. Independence mine, Centennial(?) district. Principal metals: Bi, Au, Ag. Osterwald and Osterwald, 1952, p. 20. 41°16' 106°15'
4. Taylor claim, Encampment district. Principal metals: Au, Cu. Gold-quartz vein containing copper and reportedly bismite and bismutite. Osterwald and Osterwald, 1952, p. 20; Birch, 1955, p. 40. 41°11' 106°54'
5. Jelm Mountain district. Principal metals: Bi, Au, Cu. Contact vein between granite and schist. Osterwald and Osterwald, 1952, p. 20; Schrader and others, 1917, p. 342. 41°05' 105°59'

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