60) U.S. Geological Survey. [Mineral investigations resource maps, MR series; text to accompany map] MR-15 SC

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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

TO ACCOMPANY MAP MR-15

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LEAD IN THE UNITED STATES

(Exclusive of Alaska and Hawaii)

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Introduction

The productive lead districts in the United States (exclusive of Alaska and Hawaii) are shown on the accompanying map. The map is at a scale of 1:3,168,000, (50 miles to the inch). Only those districts known or believed to contain 1,000 short tons or more of lead are shown; individual deposits within districts are not represented.

Three categories of districts are distinguished: those containing 1,000 to 50,000 tons, those containing 50,000 to 1 million tons, and those containing more than 1 million tons of lead. The estimated total quantity of metal present before mining was used to rate districts according to size; both production and reserves are included without distinction.

Symbols show the approximate centers of the districts. Some of the more prominent districts are identified by name; and all are numbered to correspond to the Locality Index on the following pages. District names may not correspond to locality names. Because a name established through common usage may not be the legal name of the mining district, more than one name is given in the index for some localities. The index, arranged alphabetically by states, includes a brief description of major geologic features for most districts. Both published and unpublished data were used; principal published sources are given in the Locality Index and identified in the section References Cited.

Distribution of deposits

Most of the lead districts are within a relatively few broadly defined structural units: 1) the Basin and Range region of Nevada, western Utah, southeastern California, southern Arizona, and southern New Mexico; 2) the Rocky Mountain Cordillera, extending from the Canadian to the Mexican borders; 3) a few broad flat domical uplifts within the Mississippi Valley; and 4) the Appalachian Cordillera. The few districts outside these four areas are relatively minor. Deposits in the Mississippi Valley have dominated the domestic lead-mining industry during most of the last century.

Lead is commonly associated with zinc and in most districts is subordinate to zinc in total tonnage. The outstanding exception is southeastern Missouri, which, although it has been a major lead-producing region since the 1870's, has yielded zinc from relatively few areas and no zinc at all from several major areas. Most Utah districts also show a decided dominance of lead over zinc, but the Park City region within the last decade has yielded less lead than zinc. The Coeur d'Alene region, which dominates the base metal production of Idaho, formerly produced more lead than zinc, but in recent years it has produced roughly equal tonnages of the two metals.

Silver is associated with lead in most deposits in the Western States, the amount varying from a minor byproduct to the major value of the ore. Many of the lead deposits mined during the latter part of the nineteenth century were shallow oxidized deposits worked chiefly for their silver content.

Geology

In the upper part of the earth's crust lead is an oxyphile element, commonly occurring in trace amounts in silicate and phosphate minerals such as potash feldspar and apatite. Through magmatic processes, however, lead combines readily with sulfur to form valuable deposits. Galena, the lead sulfide, is the important lead mineral in primary deposits and is the sole lead mineral in most. Its most common associates among the metallic minerals are sphalerite and pyrite or marcasite; less common and usually in subordinate quantity are chalcopyrite, arsenopyrite, tetrahedrite, tennantite, and enargite. Silver, where present, is commonly carried as an impurity in the galena. Gangue minerals are quartz, dolomite, calcite or ankerite, siderite, and barite. Galena is resistant to weathering, but in thoroughly oxidized deposits it is converted to the carbonate, cerussite, with the sulphate, anglesite, appearing as an intermediate product. Plumbojarosite, another lead sulfate, is a principal final product in many western oxidized deposits.

Most of the lead-zinc ore bodies in the United States are replacement deposits in limestone or dolomite. Other types of deposits, however, are also of major importance. The deposits in the Coeur d'Alene region, for example, occur as replacements in fine-grained quartzite; those at Butte, Montana, are veins in quartz monzonite; and those in the San Juan region of Colorado are mostly veins in extrusive rocks, particularly andesite.

Western States.--The deposits of the Western States are in rocks that have been folded and faulted to varying degrees. They occur in areas where intrusive igneous rocks of intermediate to acidic composition are prominent. Particularly striking is the association of lead and zinc with the narrow zone of intrusives in the Colorado mineral belt. In some districts only the dikes and sills that are the normal accompaniment of larger intrusive masses are revealed. In a few districts where no intrusive is exposed, there may be evidence that one exists in depth, as indicated by metamorphism of the country rock or by structural doming which is commonly associated with mineralized districts of igneous affiliation (Wisser, 1960).

The lead-zinc deposits are generally found in the bordering rocks, commonly at some distance from the intrusives, but they may also occur in intrusive rock, as at Butte. Regardless of their precise localization, the ores are related to structural breaks that developed after consolidation of the igneous rock, and they are believed to have been deposited from solutions of deep-seated origin. The ore may occur in veins closely confined to the original fractures in the rock, or it may replace the adjacent wall rocks. Where these are carbonate rock, the ore may replace certain beds for considerable distances.

The igneous bodies with which the deposits are affiliated are typically small bodies of porphyritic texture whose apices are truncated by erosion. Where deposits are associated with larger igneous batholiths, such association is with apical parts, usually the smaller satellitic protuberances or cupolas that project upward from the flatter parts of the roof into the invaded rock. Large phaneritic igneous massifs such as the Sierra Nevada and Idaho batholiths, which have been eroded many thousands of feet below their roofs, contain no important lead-zinc deposits. Furthermore, the adjacent ground bordering steeply inclined sides of such batholiths is in general unfavorable.

Although the host rocks of the deposits range from Precambrian to late Tertiary in age, most lead-zinc deposits of the Western States are of rather limited age span, for they appear to be related to igneous rocks that were intruded from about the end of the Jurassic period to near the end of the Miocene. The peak of lead-zinc deposition appears to coincide with the Laramide revolution, which began at the end of Cretaceous time and extended into early Tertiary time. Only two deposits of significant lead content in Precambrian rocks are described as of Precambrian age, the Iron King deposit in the Big Bug district, Arizona, and the Pecos deposit in the Willow Creek district, New Mexico. Evidence that the lead in the Coeur d'Alene district, Idaho, is also Precambrian has been published recently (Long and others, 1960), but Fryklund (1960) believes that the Main period of mineralization occurred in Cretaceous time.

Post-Laramide lead ores include some of mesothermal type, and they may occur in older sedimentary or igneous rocks and be difficult to date. Many of the important post-Laramide ores are in Tertiary extrusive rocks, however, particularly in andesites and related pyroclastic rocks of Miocene age. These deposits formed in the epithermal ore zone of Lindgren, probably less than 4,000 feet below the topographic surface at time of mineralization. Although Tertiary volcanic rocks are widespread in the West, the epithermal deposits that are largely confined to them carry base metals in only a few places; extensive areas of such terrain as the Columbia River basalt and younger volcanic rocks contain no deposits of any type.

Central States.--The lead-zinc deposits of the Central States form a group of disputed origin commonly called the Mississippi Valley type. They are replacement deposits in relatively undisturbed rocks that have been uplifted, gently warped, and faulted to only a minor extent. Most are on the flanks of broad, flat uplifts, as the Ozark dome and the Wisconsin arch, but the southern Illinois-western Kentucky deposits are not far from the axis of the Illinois structural basin, though clustered about a sharply uplifted, faulted dome. All are in Paleozoic limestones or dolomites. The mineralogic associations are simple, and the galena is remarkably lean in silver, though the associated sphalerite in certain areas may contain some silver.

For the most part the deposits of the Central States lack the outstanding characteristic of the western deposits, namely the visible association with intrusive igneous rocks. Exceptions are dikes and pipes of basic rock and explosion pipes (diatremes) in the southern Illinois-western Kentucky region and only a few miles from ore deposits in the southeast Missouri region, which may indicate the presence of intrusive bodies at depth. The association is not close, however, suggesting rather the loose affiliation that western epithermal deposits show with igneous intrusives. Schmitt (1950) has suggested that the Mississippi Valley deposits are simply the epithermal type in carbonate rather than lava wall rocks.

There is no satisfactory basis for dating these deposits. The igneous rocks of central and western Arkansas, some of which are similar to those exposed near ore-bearing districts, are Cretaceous in age. All the known igneous rocks may not be contemporaneous, however, and there is no evidence to suggest that ore deposits in areas where no igneous rocks are exposed are contemporaneous with the others. Ages ranging from late Paleozoic to Recent have been advocated by different authors.

Eastern States.--The eastern deposits occur in the Appalachian Cordillera and on the western side of the Adirondack Mountains in New York. In most deposits zinc predominates over lead, and zinc occurs without lead in numerous deposits which have essentially the same geologic setting. All the deposits are in rocks that have been folded and faulted to a considerable extent. The host rocks include Precambrian dolomite on the west side of the Adirondacks, Precambrian or Cambrian schists in the districts east of the Blue Ridge in North Carolina and Virginia, early Paleozoic dolomites west of the Blue Ridge in Tennessee and Virginia, Silurian conglomerate in southeastern New York, and both Precambrian granitic rocks and Triassic red beds and diabase in southeastern Pennsylvania.

The spatial proximity of igneous intrusive rocks to which the deposits can be related genetically varies from district to district. The western Adirondack deposits are associated with Precambrian granite intrusives, and those east of the Blue Ridge are not far from batholithic masses of granite to which a late Paleozoic age has been ascribed. In other areas, and most notably in the important districts west of the

Blue Ridge, no igneous rocks are exposed. The age of these deposits is uncertain and their mode of origin is controversial.

Locality Index

District or region	Lat. N.	Long. W.
ARIZONA		
1. Hualapai (Chloride Camp). Veins in Precambrian granite, gneiss, schist and amphilbolite. Dings, 1951; Thomas, 1949.	35°25'	114°11'
2. Hualapai (Cerbat Camp). Veins in Precambrian granite, gneiss, schist and amphibolite. Dings, 1951; Thomas, 1949.	35°19'	114°08'
3. Eureka (Bagdad). Vein and replacement lenses along faults in Precambrian mica and chlorite schists. Anderson and others, 1956.	34°35'	113°13'
4. Owens (McCracken mine). Veins in Precambrian quartz mica schist. Bancroft, 1911.	34°28'	113°46'
5. Big Bug (Iron King mine). Replacement lenses in silicified Precambrian schist. Anderson and Creasey, 1958.	34°30'	112°15'
6. Osborn. Veins in Tertiary andesite and rhyolite. Tenney, 1928.	33°37'	112°52'
7. Silver. Veins along faults between Precambrian granite and lower Tertiary (?) andesitic breccia and tuff, or in Precambrian schist. Wilson, 1951a.	33°06'	114°36'
8. Castle Dome. Veins along fault zones in and along diorite porphyry dikes of Cretaceous (?) age and in Cretaceous shale. Wilson, 1951b.	33°02'	114°11'
9. Superior (Pioneer) (Magma mine). Replacement veins along faults in quartz-monzonite porphyry, diabase, and quartzite; bedded replacement deposits in Devonian limestone. Short and others, 1943; Webster, 1958.	33°18'	111°06'
10. Ray (Mineral Creek) (Ray Silver-Lead mine).	33°10'	111°00'
11. Banner (Seventy-nine mine). Vein-replacement bodies in and bordering a sheared dike of rhyolite porphyry; replacement bodies in Pennsylvanian limestone along bedding and bordering igneous masses. Kiersch, 1951.	33°04'	110°48'
12. Aravaipa. Veins and replacement bodies on fault breccia in Pennsylvanian limestone; veins in intrusive rhyolite. Ross, 1925; Wilson, 1950a.	32°59'	110°20'
13. Bunker Hill (Blue Bird mine). Vein in granodiorite stock of Laramide (?) age. Kuhn, 1951.	32°46'	110°28'
14. Old Hat (Mammoth). Replacement veins along shear zones in Mesozoic or Tertiary andesite, dacite, and rhyolite, and in Precambrian (?) quartz monzonite. Creasey, 1950.	32°43'	110°41'
15. Silver Bell. Contact metamorphic deposits in Carboniferous (?) limestone. Stewart, 1912; Richard and Courtright, 1954.	32°25'	111°31'
16. Pima (San Xavier mine). Replacement pipes along fissures in Mississippian and Permian limestones. Wilson, 1950b.	31°58'	111°05'
17. Empire. Replacement bodies and pipes along fissures in Permian limestone, and at contacts with porphyry dikes and sills. Wilson, 1951c.	31°53'	110°36'
18. California (Hilltop mine). Veins and contact deposits.	31°59'	109°14'
19. Tombstone. Replacement bodies along fissures on tops of folds in Pennsylvanian and Lower Cretaceous limestones, quartzites, and shales, and in sheared granodiorite dikes. Butler and others, 1938.	31°42'	110°04'
20. Turquoise. Replacement bodies along fractures and faults in Pennsylvanian limestone. Wilson, 1927; 1951d.	31°44'	109°49'
21. Swisshelm. Replacement bodies in fractured Pennsylvanian limestone above a diorite porphyry sill. Galbraith and Loring, 1951.	31°42'	109°32'
22. Tyndall. Veins in quartz diorite, quartz monzonite, and quartz latite porphyry. Schrader, 1915.	31°36'	110°52'
23. Oro Blanco (Montana mine). Replacement lode along shear zone between intrusive diorite and igneous-pebble conglomerate, or in latter. Fowler, 1938.	31°28'	111°14'
24. Harshaw (Trench and Flux mines). Veins along shear zones in intrusive igneous rocks and replacement bodies in Pennsylvanian (?) limestone. Schrader, 1915.	31°28'	110°44'

ARIZONA (cont'd.)

25.	Patagonia (Duquesne). Contact metamorphic and replacement deposits in Devonian and Pennsylvanian limestones adjacent to intrusive quartz monzonite. Schrader, 1915.	31°23'	110°42'
26.	Bisbee (Warren). Replacement bodies along fractures or adjacent to porphyry dikes and sills in Devonian and Mississippian limestones. Hogue and Wilson, 1950.	31°27'	109°54'

ARKANSAS

1.	Ponca. Replacement bodies along bedding at fracture intersections in Mississippian limestone, chert, and sandstone. McKnight, 1935.	36°01'	93°22'
2.	Upper Cave Creek (Bald Mountain, Confederate mines). Replacement bodies along bedding at fracture intersections in Mississippian limestone and chert. McKnight, 1935.	35°54'	92°58'

CALIFORNIA

1.	Cow Creek (Ingot) (Afterthought mine). Replacement bodies in fractured soda rhyolite and adjacent limy shale of Triassic age. Albers, 1953.	40°44'	122°04'
2.	Blind Spring. Veins along parallel faults in Jurassic granite stock. Ransome, 1940.	37°46'	118°29'
3.	Ubehebe. Veins and replacement bodies within shatter zones in Ordovician and Devonian dolomite. McAllister, 1955.	36°45'	117°35'
4.	Cerro Gordo. Replacement bodies near axis of plunging anticline in Devonian limestone. Knopf, 1918a; Norman and Stewart, 1951.	36°32'	117°48'
5.	Lee (Santa Rosa). Parallel veins across bedding in tactitic Permian limestone and ore shoots along bedding fractures in Mississippian limestone. Hall and Mackevett, 1958.	36°25'	117°43'
6.	Darwin. Replacement bodies near and along faults in tactitic Pennsylvanian limestone adjacent to granodiorite stock. Hall and Mackevett, 1958.	36°17'	117°36'
7.	Modoc. Bedded replacement bodies along small faults in Carboniferous limestone. Hall and Mackevett, 1958; Norman and Stewart, 1951.	36°16'	117°28'

CALIFORNIA (cont'd.)

8.	Carbonate (Queen of Sheba mine). Replacement bodies along bedding of Paleozoic (?) dolomitic limestone. Norman and Stewart, 1951.	36°00'	116°53'
9.	Slate Range. Replacement bodies along bedding fissures in steeply-dipping Paleozoic (?) limestone. Norman and Stewart, 1951.	35°49'	117°17'
10.	Resting Springs (Tecopa). Replacement bodies along fault intersections in Cambrian dolomite and limestone. Carlisle and others, 1954; Sampson, 1937.	35°50'	116°06'
11.	Clark Mountain (Ivanpah in part). Replacement bodies, in part localized by fractures near quartz monzonite sill, in Mississippian limestone and Devonian dolomite. Wright and others, 1953; Hewett, 1956.	35°29'	115°34'
12.	Eagle Mountain. Vein along quartzite-diorite contact. Tucker and Sampson, 1945.	33°53'	115°33'
13.	Paymaster (Paymaster mine). Vein along fault (?) contact between diorite and granite. Sampson and Tucker, 1942.	33°12'	114°54'
14.	Santa Catalina Island. Lodes in Jurassic hornblende schist and in andesite. Tucker, 1927	33°21'	118°22'

COLORADO

1.	Jamestown (Central). Veins along faults in Precambrian schist and granite; filling of breccia zones in early Tertiary granodiorite. Lovering and Goddard, 1950.	40°08'	105°23'
2.	Gold Hill (Sugar Loaf). Veins and stockworks along faults in Precambrian granite. Lovering and Goddard, 1950.	40°03'	105°23'
3.	Caribou-Grand Island. Veins along faults in monzonite stock of Laramide age and in Precambrian schist, gneiss and granite. Lovering and Goddard, 1950.	39°59'	105°34'
4.	Lawson-Dumont (Montana). Veins in Precambrian gneiss, granite and pegmatite. Lovering and Goddard, 1950.	39°46'	105°38'
5.	Central City-Idaho Springs (including Trail Creek). Veins along faults and foliation in Precambrian gneiss, pegmatite	39°45'	105°32'

COLORADO (cont'd.)

and schist; may follow porphyry dikes of Laramide age. Lovering and Goddard, 1950.

6. Georgetown-Silver Plume. Veins along faults and locally following porphyry dikes in Precambrian granite, pegmatite, gneiss and schist. Lovering and Goddard, 1950. 39°42' 105°43'

7. Argentine. Veins, partly along faults, in Precambrian granite, gneiss, and schist. Lovering, 1935. 39°39' 105°47'

8. Montezuma (Snake River). Veins, partly along faults, in Precambrian gneiss and granite and in Eocene quartz monzonite. Lovering, 1935. 39°35' 105°51'

9. Red Cliff (Gilman Battle Mountain) (Eagle mine). Replacement pipes along intersecting joints or faults in Devonian and Mississippian limestones. Tweto and Lovering, 1947. 39°32' 106°23'

10. Breckenridge. Veins along faults in Eocene (?) monzonite porphyry and in Cretaceous quartzite; stockwork in Eocene (?) quartz monzonite porphyry. Lovering, 1934. 39°29' 106°01'

11. Kokomo (Tenmile). Replacement pipes along fractures in Pennsylvanian limestone beds between unfavorable rock types. Koschmann and Wells, 1946. 39°25' 106°12'

12. Upper Blue River. Replacement bodies adjacent to fractures cutting Devonian, Pennsylvanian, and Permian limestone beds between unfavorable rock types. Singewald, 1951. 39°23' 106°04'

13. Alma (Mosquito, Buckskin, Consolidated Montgomery). Veins along faults in or adjoining lower Tertiary porphyry sills or in Ordovician quartzite; replacement bodies within shattered zones in Ordovician and Mississippian limestones. Singewald and Butler, 1933; 1941. 39°18' 106°06'

14. Sugar Loaf-St. Kevin (Independent). Lodes within shear zones in Precambrian granite, schist and gneiss. Singewald, 1955. 39°17' 106°23'

15. Leadville (California). Replacement bodies along fissures and chiefly below porphyry sills or shale, in Ordovician and Mississippian limestones. Emmons and others, 1927. 39°15' 106°16'

16. Horseshoe-Sacramento (Hilltop mine). Replacement pipes at intersections of faults and fractures with favorable dolomite beds in Devonian and Mississippian strata. Behre, 1953; Singewald and Butler, 1941. 39°13' 106°10'

17. Roaring Fork (Aspen). Breccia filling and replacement bodies in shattered Carboniferous dolomite and limestone. Vanderwilt, 1935; Spurr, 1898; Knopf, 1926. 39°11' 106°49'

18. Rock Creek. Replacement bodies along bedding or cross fractures in limestone beds of Devonian to Cretaceous age. Vanderwilt, 1937. 30°04' 107°06'

19. Dorchester-Taylor Park. Veins and replacement bodies in Carboniferous dolomite and limestone. Vanderwilt, 1947. 38°57' 106°40'

20. Elk Mountain (Keystone mine). Veins and breccia filling along faults in Cretaceous sandstone. Emmons and others, 1894. 38°52' 107°03'

21. Tincup. Bedded replacement bodies and veins in Mississippian and Ordovician limestone and dolomite; fissure veins in Ordovician and Devonian quartzite and in quartz monzonite porphyry of early (?) Tertiary age. Dings and Robinson, 1957. 38°43' 106°29'

22. Chalk Creek (Mary Murphy mine). Lodes in quartz monzonite of early Tertiary age. Dings and Robinson, 1957. 38°40' 106°21'

23. Gold Brick. Replacement veins along faults in Precambrian gneiss and schist. Crawford and Worcester, 1916. 38°37' 106°35'

24. White Pine (Tomichi). Replacement bodies within fault zones or along adjacent bedding in Ordovician and Mississippian limestone and dolomite. Dings and Robinson, 1957. 38°32' 106°23'

25. Monarch (Garfield). Replacement bodies, mostly adjacent to faults, in dominantly Ordovician limestone and dolomite. Dings and Robinson, 1957. 38°32' 106°18'

26. Kerber Creek (Bonanza). Veins in Oligocene (?) andesite and latite. Burbank, 1932. 38°19' 106°08'

COLORADO (cont'd.)

27. Oak Creek (Ilse) (Terrible mine). Lodes within shattered zones adjacent to faults in Precambrian granite. Hunter, 1914. 38°13' 105°15'

28. Hardscrabble (Silver Cliff, Westcliff). Veins and stockworks in lower Tertiary rhyolite and tuff and in Precambrian granite and gneiss. Emmons, 1896. 38°09' 105°27'

29. Uncompahgre (Ouray). Veins and replacement bodies along fissures and bedding and within breccias in quartzites, sandstones, and shales ranging from Pennsylvanian to Cretaceous in age. Burbank, 1940. 38°03' 107°40'

30. Lake City (Galena, Lake). Veins in Miocene andesite, latite, and rhyolite, along fissures in caldera rift zone. Burbank, 1947; Irving and Bancroft, 1911. 38°01' 107°22'

31. Upper Uncompahgre, Poughkeepsie, and Mineral Point. Veins and lodes along faults and filling of breccia chimneys in Miocene extrusive and intrusive igneous rocks. Kelley, 1946. 37°57' 107°37'

32. Sneffels and Telluride (Upper San Miguel). Lode veins, partly along dikes, in Miocene volcanic rocks. Burbank and others, 1947; Ransome, 1901; Burbank, 1941. 37°57' 107°46'

33. Red Mountain. Filling of volcanic breccia pipes with replacement or veining of adjacent volcanic rocks of Miocene age. Burbank, 1941. 37°54' 107°42'

34. Eureka. Lode veins in Miocene andesite and latite. Burbank and others, 1947. 37°54' 107°36'

35. Ophir (Iron Springs) (Alta mine). Lode veins in Tertiary extrusive intrusive igneous rocks, and in conglomerate and sandstone of Permian and Eocene age. Burbank and others, 1947. 37°52' 107°50'

36. Animas (Silverton). Lode veins, partly along dikes, in Tertiary extrusive and instrusive igneous rocks. Burbank, 1933. 37°48' 107°36'

37. Creede. Veins along faults in Miocene rhyolite. Emmons and Larsen, 1923; Larsen, 1929. 37°52' 106°56'

38. Rico (Pioneer). Replacement bodies along bedding and fractures in Pennsylvanian limestone; veins along fractures in sandstone and arkose. Burbank and others, 1947; Ransome, 1901; Cross and Spencer, 1900. 37°42' 108°01'

IDAHO

1. Port Hill (Idaho Continental mine). Replacement bodies along shear zones and fissures in Precambrian sericitic quartzite. Kirkham and Ellis, 1926. 48°56' 116°53'

2. Clark Fork. Replacement veins along shear zones in Precambrian argillite, quartzite, and limestone. Anderson, 1947a. 48°10' 116°10'

3. Talache (Pend Oreille in part) (Armstead mine). Fissure veins in Precambrian argillite. Sampson, 1928. 48°08' 110°29'

4. Lake View. Ore shoots in breccia along fault fissures in Precambrian quartzite and argillite. Sampson, 1928. 47°54' 116°27'

5. East Coeur d'Alene. Composite replacement veins along shear zones in Precambrian sericitic quartzite. Ransome and Calkins, 1908; Umpleby and Jones, 1923. 47°31' 115°50'

6. West Coeur d'Alene. Composite replacement veins along shear zones in Precambrian sericitic quartzite. Ransome and Calkins, 1908; Umpleby and Jones, 1923; Shenon and McConnel, 1939. 47°31' 116°09'

7. Deadwood (Cascade) (Deadwood mine). Replacement bodies in vertical shear zone in "granite." Campbell, 1930. 44°28' 115°35'

8. Seafoam. Replacement bodies in Cambrian (?) dolomitic limestone occurring as xenolith in Idaho batholith. Treves and Melear, 1953. 44°35' 115°04'

9. Bayhorse. Replacement bodies in Cambrian and Ordovician dolomite and argillite. Ross, 1937. 44°21' 114°23'

10. Blue Wing. Veins in Precambrian quartzitic slates and schists. Callaghan and Lemmon, 1941. 44°32' 113°41'

11. Junction (Leadville mine). Replacement bodies adjacent to fault in Paleozoic limestone. Umpleby, 1913. 44°42' 113°18'

12. Texas. Replacement bodies along fissures and bedding in Paleozoic limestone. Umpleby, 44°28' 113°18'

IDAHO (cont'd.)

1913.

13. Nicholia (Viola mine). Replacement bodies along fractures in Upper Ordovician or Devonian limestone. Anderson and Wagner, 1944. 44°22' 112°59'

14. Birch Creek. Replacement bodies along bedding in limestone of Late Ordovician, Devonian and Pennsylvanian ages. Anderson and Wagner, 1944. 44°09' 112°50'

15. Dome (Wilbert mine). Replacement bodies along fracture zones in Ordovician quartzitic dolomite. Ross, 1933; Anderson, 1947b. 43°58' 113°01'

16. Boulder Creek (Livingston mine). Replacement bodies along shear zones in Mississippian siliceous argillite and in shattered rhyolite porphyry dikes of Mesozoic or Tertiary age. Kiilsgaard, 1949. 44°08' 114°36'

17. East Fork. Replacement bodies along conjugate fractures in Mississippian argillite, and along shear zones in quartz diorite stock. Ross, 1937. 44°00' 114°39'

18. Alder Creek. Replacement veins in tactitic Mississippian limestone or along its contact with quartz diorite stock. Ross, 1930. 43°54' 113°41'

19. Warm Springs. Replacement bodies along shear zones in Mississippian argillite. Umpleby and others, 1930; Kiilsgaard, 1950. 43°40' 114°17'

20. Rosetta (Little Smoky). Veins and replacement bodies along crushed zones in Pennsylvanian (?) limestone. Ross, 1930; Umpleby, 1914. 43°36' 114°42'

21. Muldoon (Little Wood River) (Muldoon mine). Replacement bodies along faults in Carboniferous limestone, slate and quartzite, and along contact with quartz diorite sill. Anderson and Wagner, 1946. 43°37' 113°53'

22. Lava Creek. Fissure veins and replacement bodies within brecciated zones in Miocene (?) andesite and latite and in Mississippian limestone. Anderson, 1929; Anderson, 1947c. 43°33' 113°37'

23. Mineral Hill (Wood River). Fissure veins in Carboniferous calcareous shale bordering a monzonitic batholith. Umpleby and others, 1930; Anderson and others, 1950. 43°29' 114°22'

24. South Mountain. Contact metamorphic deposits and replacement veins along vertical fractures in limestone. Sorenson, 1927. 42°45' 116°56'

ILLINOIS

1. Upper Mississippi Valley. Replacement bodies and veins along joints, shears, and faults in Ordovician dolomite and limestone. Heyl and others, 1955; 1960; Agnew and others, 1956. 42°27' 90°25'

2. Cave in Rock. Lode veins and replacement bodies in fault blocks of Mississippian limestone. Oesterling, 1952; Currier and Hubbert, 1944. 37°30' 88°12'

IOWA

1. Upper Mississippi Valley. Replacement bodies and veins along joints, shears, and faults in Ordovician dolomite and limestone. Heyl and others, 1955; 1960; Agnew and others, 1956. 42°30' 90°42'

KANSAS

1. Crestline-Badger Peacock. Smith and Siebenthal, 1907. 37°10' 94°39'

2. Galena. Replacement bodies within breccias in Mississippian limestone and chert. Smith and Siebenthal, 1907. 37°05' 94°39'

KENTUCKY

1. Central Kentucky. Veins along faults in Ordovician limestone and shale. Beck, 1949. 38°29' 84°58'

2. Western Kentucky. Lode veins and replacement bodies in fault blocks of Mississippian limestone. Oesterling, 1952. 37°15' 88°12'

MISSOURI

1. Fortuna. Deposit in matrix of breccia in filled sinks in Cambrian dolomite. Van Horn, 1905; Marbut, 1908; Mather, 1946. 38°35' 92°49'

2. High Point. Interstitial filling of breccia within collapsed sinks in Ordovician dolomite. Van Horn, 1905. 38°29' 92°35'

3. Russellville. Irregular bodies within breccia near outer edges of collapsed sinks in Ordovician dolomite. Schmidt, 1874. 38°28' 92°25'

MISSOURI (cont'd.)

4.	Saline diggings. Filling of joints, pipes, and cave breccias in Ordovician dolomite; masses in residual clay. Ball and Smith, 1903.	38°18'	92°26'
5.	Morrellton. Replacement bodies along bedding at joint zone intersections and within caves in Ordovician dolomite; masses in residual clay. Winslow, 1894.	38°20'	91°05'
6.	Mount Hope (Virginia mine). Fissure filling in Ordovician dolomite and sandstone. Winslow, 1894.	38°18'	90°55'
7.	Sandy Mines. Replacement pods along crevices in Ordovician dolomite. Winslow, 1894.	38°17'	90°31'
8.	Thomas mine. Winslow, 1894.	38°14'	91°03'
9.	Richwoods. Replacement bodies along bedding at joint zone intersections in Cambrian dolomite; masses in residual clay. Winslow, 1894.	38°10'	90°50'
10.	Mammoth-Frumet. Replacement bodies along bedding at joint intersections and within caves in Cambrian and Ordovician dolomites. Winslow, 1894.	38°08'	90°40'
11.	Indian Creek. Replacement bodies within algal reef facies in Cambrian dolomite on flanks of buried Precambrian knobs. Christiansen and others, 1959.	38°03'	90°55'
12.	Old Mines. Replacement bodies along bedding at joint zone intersections in Cambrian dolomite; masses in residual clay. Dake, 1930; Winslow, 1894.	38°01'	90°45'
13.	Valle Mines. Replacement bodies along bedding at joint zone intersections and along fracture in Cambrian dolomite.	38°01'	90°30'
14.	Potosi. Replacement bodies along bedding at joint zone intersections in Cambrian dolomite; masses in residual clay. Dake, 1930.	37°57'	90°47'
15.	Flat River-Bonne Terre. Bedded replacement bodies in Cambrian dolomite near buried Precambrian ridges. Tarr, 1936; Buckley, 1909.	37°52'	90°33'
16.	Palmer. Replacement bodies along bedding at joint zone intersections in Cambrian dolomite; masses in residual clay. Winslow, 1894; Dake, 1930.	37°51'	90°59'

MISSOURI (cont'd.)

17.	Viburnum. Replacement bodies within algal reef facies in Cambrian dolomite on flanks of buried Precambrian knobs.	37°44'	91°05'
18.	Doe Run. Bedded replacement bodies in Cambrian dolomite and granite pebble conglomerate near buried Precambrian ridges. Winslow, 1894; Buckley, 1909.	37°45'	90°30'
19.	Fredericktown. Bedded replacement bodies in Cambrian sandy dolomite near buried Precambrian ridges. Winslow, 1894; James, 1949.	37°35'	90°18'
20.	Annapolis.	37°22'	90°42'
21.	Corry mines. Ore masses in residual clay, partly in sink holes, in Mississippian limestone and chert. Winslow, 1894.	37°28'	93°44'
22.	Ash Grove. Bedded replacement bodies along crevices in Mississippian limestone. Shepard, 1898.	37°17'	93°36'
23.	Joplin (including Carl Junction, Cave Springs, Sherwood, Zincite, Waco, Alba-Neck City, Carthage, Oronogo-Webb City-Duenweg, and Spring City-Beef Branch areas). Replacement bodies along bedding and within breccias and collapsed sinks in Mississippian limestone and chert. Smith and Siebenthal, 1907.	37°08'	94°29'
24.	Pickerel Creek. Replacement bodies along bedding at crevice intersections in Mississippian limestone; masses in residual clay. Shepard, 1898.	37°11'	93°33'
25.	Springfield (Pierson Creek). Replacement bodies and breccia filling along crevices in Mississippian shale. Shepard, 1898.	37°10'	93°12'
26.	Spurgeon. Replacement bodies along bedding at fracture zone intersections, and in breccia along graben block in Mississippian limestone, chert, and sandstone. Siebenthal, 1908.	36°56'	94°29'
27.	Granby. Replacement bodies along bedding at joint zone intersections, and cavity fillings in Mississippian limestone and chert. Buckley and Buehler, 1906.	36°54'	94°16'
28.	Aurora. Replacement bodies along bedding at joint zone intersections in Mississippian limestone and chert. Winslow, 1894.	36°58'	93°43'
29.	Ozark. Fissure filling and re-	36°59'	93°12'

MISSOURI (cont'd.)

placement bodies along bedding within linear shatter zones in Ordovician dolomite and Mississippian limestone, chert, and shale. Ballinger, 1948a; 1948b.

MONTANA

1.	Troy (Grouse Mountain) (Snowstorm mine). Replacement veins and fissure filling in metadiorite dikes that intrude Precambrian argillite. Gibson, 1948.	48°27'	115°59'
2.	Libby. Replacement veins along shear zones in Precambrian argillite. Gibson, 1948.	48°13'	115°38'
3.	Hog Heaven. Replacement bodies in stockwork in porphyritic latite dike of late Tertiary (?) age. Shenon and Taylor, 1936.	47°56'	114°34'
4.	Eagle (Jack Waite mine). Replacement veins along shears in Precambrian fine-grained quartzite and argillite. Hosterman, 1956.	47°40'	115°44'
5.	Packer Creek (Last Chance, Silver Cable mines). Replacement veins along faults and fractures in Precambrian argillite and quartzite. Wallace and Hosterman, 1956.	47°28'	115°34'
6.	Keystone (Iron Mountain) (Iron Mountain, Nancy Lee mines). Replacement veins parallel to foliation in Precambrian quartzite and argillite.	47°16'	114°54'
7.	Heddleston (Mike Horse mine). Tabular breccia filling with some replacement in Precambrian argillite and quartzite and in igneous rocks. Pardee and Schrader, 1933.	47°02'	112°22'
8.	Copper Cliff (Cramer Creek) (Blacktail mine). Replacement bodies in Cambrian (?) magnesian limestone. Sahinen, 1957.	46°47'	113°32'
9.	Curlew (Curlew mine). Fissure filling along fault contact between granite (or Pleistocene gravel ?) and Precambrian (?) quartzite and limestone. Sahinen, 1957.	46°28'	114°10'
10.	Dunkleberg. Veins near axis of anticline in rocks of Cretaceous age, and in dioritic and gabbroic sills; replacement bodies in limestone. Pardee, 1917; Popoff, 1953.	46°31'	113°05'
11.	Philipsburg (Flint Creek). Replacement veins in granodiorite and in Cambrian, Silurian, and Devonian limestones and shales. Emmons and Calkins, 1913.	46°20'	113°16'
12.	Marysville. Fissure veins in Precambrian hornstone bordering a quartz monzonite stock. Pardee and Schrader, 1933.	46°45'	112°19'
13.	Scratch Gravel. Contact metamorphic deposits in Precambrian shale, quartzite, and limestone, and in adjacent quartz monzonite stock. Pardee and Schrader, 1933.	46°40'	112°05'
14.	Elliston. Veins in andesite and quartz monzonite of Laramide age. Pardee and Schrader, 1933.	46°27'	112°24'
15.	Zosell (Emery). Replacement veins along faults in Upper Cretaceous (?) andesite. Pardee and Schrader, 1933; Robertson, 1953.	46°22'	112°36'
16.	Beaver Creek (Winston). Veins in andesite and quartz monzonite of Laramide age. Pardee and Schrader, 1933; Reed, 1951.	46°25'	111°42'
17.	Clancy (Lump Gulch). Veins along fault zones in quartz monzonite and aplite of Laramide age. Pardee and Schrader, 1933.	46°28'	112°01'
18.	Colorado (Wickes). Veins in latitic andesite and quartz monzonite of Laramide (?) age. Pardee and Schrader, 1933.	46°22'	112°07'
19.	Park (Indian Creek) (Iron Mask mine). Veins in lower Tertiary (?) andesite. Stone, 1911.	46°20'	111°39'
20.	Cataract (Basin) and Boulder (Comet, Gray Eagle, Hope-Katie mines). Replacement veins in quartz monzonite and aplite of Laramide age. Pardee and Schrader, 1933.	46°17'	112°13'
21.	Elkhorn (Elkhorn mine). Replacement bodies in Cambrian dolomite. Klepper and others, 1957.	46°16'	111°57'
22.	Radersburg (Cedar Plains). Veins in andesite and latite of early Tertiary (?) age and in rocks of Paleozoic and Mesozoic ages. Pardee and Schrader, 1933; Reed, 1951.	46°10'	111°42'
23.	Butte (Summit Valley). Replacement lodes and veins in quartz monzonite of early Tertiary (?) age. Sales, 1914; Perry, 1933.	46°01'	112°32'
24.	Whitehall (Cardwell). Veins in Precambrian calcareous shale,	45°53'	112°01'

MONTANA (cont'd.)

sandstone, and limestone, and in porphyry dikes. Winchell, 1914.

25. Bryant (Hecla). Replacement bodies along bedding in dolomite on anticlinal crests near contact with quartz monzonite batholith. Karlstrom, 1948; Winchell, 1914. 45°36' 112°55'

26. Rochester (Rabbit). Veins in Precambrian schist and gneiss; replacement bodies along fractures in dolomitic limestone. Sahinen, 1939. 45°37' 112°29'

27. Tidal Wave (Twin Bridges). Fissure veins in Precambrian gneiss and early Tertiary (?) quartz monzonite; replacement bodies along fissures and bedding in limestone of Paleozoic age. Tansley and others, 1933. 45°35' 112°10'

28. Rimini (Vaughn). Lodes in sericitized quartz monzonite of Laramide (?) age. Pardee and Schrader, 1933. 46°28' 112°15'

29. Sheridan. Veins and replacement bodies along faults and bedding in Precambrian limestone and marble. Tansley and others, 1933. 45°28' 112°08'

30. Argenta. Replacement bodies along bedding and fissures in Cambrian, Devonian, and Mississippian limestones; fissure veins in Precambrian shale and in quartz monzonite of Laramide (?) age. Shenon, 1931. 45°18' 112°53'

31. Barker (Hughesville) (Block P mine). Fissure vein in syenitic stock and at contact with Cambrian or Carboniferous limestone. Jackson and others, 1935; Weed, 1900; Spiroff, 1938. 47°05' 110°39'

32. Neihart (Montana). Sheeted replacement veins in Precambrian gneiss and quartzite. Schafer, 1935; Robertson, 1951. 46°57' 110°44'

33. Castle Mountain. Replacement bodies along bedding and fractures in Mississippian and Cambrian limestone, partly along porphyry sills and dikes. Roby, 1950. 46°27' 110°41'

34. New World (Cooke City). Contact metamorphic deposits, veins, and replacement bodies in Cambrian and Ordovician limestone and dolomite. Lovering, 1930; Reed, 1950. 45°02' 109°57'

NEVADA

1. Delano (Cleveland and Delano mines). Replacement bodies along bedding in brecciated Paleozoic dolomite (?). Granger and others, 1957. 41°40' 114°15'

2. Tecoma (Jackson mine). Replacement bodies along fissures on low anticline in Devonian limestone. Granger and others, 1957. 41°26' 114°04'

3. Leadville (Leadville mine). Veins in diorite porphyry dike and in andesite of Tertiary age. Overton, 1947. 41°07' 119°25'

4. Barrett Springs. Veins in shale. Vanderburg, 1938a. 41°08' 117°49'

5. Merrimac (Rip Van Winkle mine). Veins and bedding replacement bodies along faults bordering a graben in Mississippian shale and limestone. Granger and others, 1957. 41°07' 116°00'

6. Battle Mountain. Veins and replacement bodies along faults in Carboniferous hornfels, conglomerate, and quartzite. Roberts, 1951. 40°33' 117°07'

7. Railroad (Bullion). Replacement bodies in near-vertical chimneys at fracture intersections in Ordovician limestone; some contact metamorphic deposits. Granger and others, 1957. 40°31' 116°00'

8. Spruce Mountain. Replacement bodies along bedding, fractures, and faults in Mississippian limestone, partly at contact with porphyry dikes. Granger and others, 1957; Schrader, 1931. 40°34' 114°50'

9. Lewis. Veins, in part with replacement, in granodiorite and in Carboniferous quartzite, limestone, and slate. Vanderburg, 1939. 40°27' 116°52'

10. Arabia. Fissure veins in Cretaceous (?) granodiorite and in xenoliths of Jurassic hornfels. Knopf, 1918b; Vanderburg, 1936. 40°22' 118°24'

11. Bullion. Fissure veins and sheeted lodes in Carboniferous limestone, quartzite, and shale and in andesite and granodiorite. Vanderburg, 1939; Emmons, 1910. 40°22' 116°44'

12. Cortez. Replacement bodies within sheeted zones parallel to porphyry dikes, in Ordovician (?) limestone. Emmons, 1910; Vanderburg, 1938b. 40°09' 116°35'

13. Mineral Hill. Replacement 40°09' 116°06'

NEVADA (cont'd.)

bodies cutting across bedding in Paleozoic limestone. Vanderburg, 1938b.

14. Union. Replacement bodies in limestone. Vanderburg, 1938b. 40°03' 116°03'

15. Hunter. Replacement bodies in breccia along fault contact of Devonian dolomitic limestone with porphyry dikes. Hill, 1916. 39°37' 115°00'

16. Aurum. Replacement bodies along faults and bedding in Cambrian limestone. Hill, 1916. 39°37' 114°32'

17. Eureka. Replacement bodies along fissures, partly along bedding, in Cambrian limestone. Sharp, 1948. 39°30' 116°00'

18. Duck Creek. Replacement bodies along bedding fissures in Ordovician limestone. Hill, 1916. 39°23' 114°45'

19. White Pine (Hamilton). Replacement bodies along veins and bedding in Ordovician dolomite. Hague, 1870. 39°15' 115°30'

20. Ely (Robinson). Replacement bodies along veins and bedding, and contact metamorphic deposits in Devonian and Carboniferous limestones. Spencer, 1917. 39°15' 114°59'

21. Ward. Veins and replacement bodies along contact of quartz monzonite porphyry dikes with Pennsylvanian limestone. Hill, 1916. 39°05' 114°53'

22. Galena (Commonwealth mine). Veins in metamorphosed tuff and hornfels. Overton, 1947. 39°21' 119°46'

23. Quartz Mountain (San Rafael mine). Veins in Triassic limestone along contact with intrusive granodiorite porphyry. Kral, 1951. 39°03' 117°58'

24. Lodi (Illinois mine). Veins in Triassic limestone and limy shale at contact with intrusive granodiorite. Kral, 1951. 39°00' 117°53'

25. Union (Grantsville, Berlin). Replacement bodies in Triassic limestone; veins in Permian (?) meta-andesite, Triassic slate, conglomerate and limestone, and Tertiary andesite. Kral, 1951; Ferguson and Muller, 1949. 38°53' 117°35'

26. Simon (Bell, Cedar Mountains) (Simon mine). Replacement bodies in Triassic limestone along sides of alaskite porphyry dike. Vanderburg, 1937; Knopf, 1921. 38°34' 117°52'

27. Hawthorne. Vein along or near contact of granodiorite with Mesozoic limestone. Hill, 1915; Vanderburg, 1937. 38°28' 118°40'

28. Tybo. Replacement bodies along a fault in quartz latite porphyry dikes that intrude Cambrian and Ordovician limestones. Ferguson, 1933; Kral, 1951. 38°22' 116°24'

29. Candelaria (Columbus). Veins in Ordovician (?) argillites and felsites. Knopf, 1922; Page, 1959; Vanderburg, 1937. 38°09' 118°05'

30. Lone Mountain. Replacement bodies in Cambrian limestone along contact with porphyry dike or with granite intrusive. Ball, 1907. 37°57' 117°25'

31. Bristol (Jackrabbit). Replacement bodies along intersections of fissures in Cambrian limestone. Westgate and Knopf, 1932. 38°05' 114°36'

31. Pioche. Replacement vein and bedded deposits along fissures in Cambrian limestone; veins in quartzite. Westgate and Knopf, 1932. 37°56' 114°29'

33. Comet. Bedded replacement bodies in Cambrian limestone; veins in quartzite. Westgate and Knopf, 1932. 37°53' 114°37'

34. Groom (Groom mine). Replacement bodies along bedding and fissures in Cambrian limestone. Humphrey, 1945. 37°20' 115°46'

35. Las Vegas (Three Kids mine). By-product from sedimentary manganese deposit in Pliocene (?) tuffaceous sandstone lake (playa) beds. Hunt and others, 1942; McKelvey and others, 1949. 36°05' 114°54'

36. Yellow Pine (Goodsprings). Replacement bodies along fissures or folds in Mississippian dolomite. Albritton and others, 1954; Hewett, 1931. 35°52' 115°31'

37. Searchlight. Breccia veins in metamorphosed early Tertiary (?) andesite porphyry, in older volcanic rocks, and in Precambrian gneiss. Callaghan, 1939. 35°27' 114°55'

NEW MEXICO

1. Willow Creek (Pecos mine). Replacement lenses in shear zone 35°46' 105°40'

NEW MEXICO (cont'd.)

in Precambrian micaceous diorite. Krieger, 1932; Harley, 1940.

2.	Cerrillos. Veins and replacement bodies along shear zones in post-Cretaceous monzonite porphyry. Lindgren and others, 1910.	35°29'	106°08'
3.	New Placers. Replacement pipe at intersection of fractured zone with Pennsylvanian limestone bed. Lindgren and others, 1910.	35°15'	106°12'
4.	Gallinas Mountains. Anderson, 1957.	34°12'	105°45'
5.	Magdalena. Replacement bodies in Mississippian limestone, mostly along crests of low folds. Loughlin and Koschmann, 1942.	34°05'	107°12'
6.	Hansonburg (Carthage). Veins and breccia filling along faults in silicified Pennsylvanian limestone. Anderson, 1957; Lasky, 1932; Kottlowski, 1953.	33°50'	106°21'
7.	Hermosa (Palomas). Irregular replacement bodies along a faulted gentle anticline in Pennsylvanian limestone. Harley, 1934.	33°10'	107°43'
8.	Kingston. Replacement bodies along fractures on axes of anticlines in Silurian limestone. Harley, 1934.	32°55'	107°43'
9.	Swartz (Carpenter). Replacement bodies along bedding, shear zones, and fractures in Ordovician limestone. Anderson, 1957.	32°52'	107°48'
10.	Pinos Altos (Cleveland mine). Replacement bodies along fractures in Pennsylvanian limestone. Anderson, 1957; Paige, 1911.	32°52'	108°14'
11.	Steeple Rock. Lode veins in Tertiary extrusive and intrusive rocks. Lindgren and others, 1910; Anderson, 1957.	32°51'	108°59'
12.	Central (Hanover). Replacement veins on faulted contact between porphyry dikes and Carboniferous limestone, or in the dikes; contact metamorphic deposits. Anderson, 1957; Lasky, 1936; Schmitt, 1935.	32°47'	108°06'
13.	Sacramento (High Rolls). Disseminated sulfides in Permian arkosic sandstone. Anderson, 1957.	32°54'	105°50'
14.	Macho. Veins in Tertiary andesite and replacement veins within latite porphyry dikes. Harley, 1934; Jicha, 1954.	32°38'	107°35'

15.	Cook's Peak. Replacement bodies on broad anticlinal arches in Silurian limestone. Anderson, 1957; Jicha, 1954.	32°33'	107°43'
16.	Organ. Replacement bodies along fracture zones or adjacent to porphyry sheets in Ordovician and Silurian dolomite; contact metamorphic deposits in Carboniferous limestone; veins in lower Tertiary (?) quartz monzonite. Dunham, 1935.	32°26'	106°36'
17.	Lordsburg. Veins along faults in granodiorite stock of Laramide age. Lasky, 1938.	32°18'	108°46'
18.	San Simon. Replacement bodies near granite porphyry dikes in Precambrian limestone. Anderson, 1957.	32°09'	109°00'
19.	Victorio. Replacement bodies in Ordovician and Silurian limestones. Anderson, 1957.	32°10'	108°06'
20.	Hachita (Eureka). Veins and replacement bodies commonly along igneous dikes and sills in Cretaceous limestone. Lasky, 1947.	31°55'	108°26'
21.	Tres Hermanas. Veins in rhyolite and granite porphyry; contact metamorphic deposits in adjacent Permian limestone. Anderson, 1957.	31°56'	107°46'

NEW YORK

1.	Rossie (Bigelow, Macomb). Veins in limestone and sandstone of Precambrian and Cambrian ages. Neumann, 1952.	44°25'	75°38'
2.	Balmat-Edwards. Replacement bodies along channels of microbreccias in Precambrian limestone. Brown, 1936; 1947.	44°18'	75°20'
3.	Shawangunk mine. Fissure filling along fault in Silurian conglomerate. Sims and Hotz, 1951; Eilertsen, 1950.	41°37'	74°26'

NORTH CAROLINA

1.	Silver Hill. Replacement bodies and disseminated ore in volcanic rocks. Pardee and Park, 1948.	35°43'	80°14'

OKLAHOMA

1.	Picher field. Replacement bodies along bedding and within breccias in Mississippian limestone and chert. Weidman, 1932.	36°59'	94°50'

OKLAHOMA (cont'd.)

2. Peoria. Replacement bodies along bedding in Mississippian limestone. Snider, 1912. 36°55' 94°40'

OREGON

1. Bohemia. Veins and replacement bodies along breccia zones in extrusive and intrusive volcanic rocks of Miocene (?) age. Callaghan and Buddington, 1938. 43°35' 122°38'

PENNSYLVANIA

1. Phoenixville. Veins along joints and faults in Triassic red beds and diabase dikes, and in Precambrian gneisses and granodiorites. Reed, 1949; Miller, 1924. 40°06' 75°31'

SOUTH DAKOTA

1. Galena (Bear Butte). Bedded replacement bodies along fractures in Cambrian dolomitic quartzite and sandy dolomite. Connolly and O'Harra, 1929. 44°20' 103°38'

TENNESSEE

1. New Prospect-Straight Creek. Replacement bodies and fissure filling along fractures and faults in Ordovician dolomite. Secrist, 1924. 36°25' 83°43'
2. Embreeville. Ore masses within residual clay; veinlets and disseminations in Cambrian dolomite. Secrist, 1924. 36°10' 82°29'
3. Cleveland. Disseminated ore in chimney near fault. Secrist, 1924 35°06' 84°53'

TEXAS

1. Sierra Blanca. Veins within sheeted zone in quartz syenite porphyry of post-Cretaceous age. Sellards and Baker, 1934. 31°11' 105°30'
2. Shafter. Replacement bodies along fracture zones and thrust faults in Permian limestone. Ross, 1943. 29°48' 104°20'

UTAH

1. Lucin. Replacement bodies adjacent to fissures in Carboniferous limestone. Butler and others, 1920. 41°15' 114°00'
2. Lakeside. Butler and others, 1920. 40°52' 112°48'
3. Little Cottonwood and Big Cottonwood. Bedded replacement bodies, pipes, and fault breccia filling along crosscutting fissures in Cambrian, Devonian, and Mississippian limestones and dolomites; veins in Precambrian and Cambrian quartzite and shale. Calkins and Butler, 1943. 40°36' 111°38'

4. Bingham (West Mountain). Bedded replacement bodies along faults in Pennsylvanian limestone beds between quartzite beds. Hunt and Peacock, 1948; Boutwell, 1905. 40°31' 112°09'
5. Stockton (Rush Valley). Bedded replacement bodies along fissures in Pennsylvanian limestone beds between quartzite beds. Gilluly, 1932. 40°28' 112°20'
6. Ophir. Bedded replacement bodies, pipes, and veins along fissures in Cambrian, Devonian, and Mississippian limestone, dolomite, and hornfels. Gilluly, 1932. 40°23' 112°15'
7. Park City. Bedded replacement and lode deposits along fissures in Pennsylvanian, Permian, and Triassic limestone; lode deposits in Pennsylvanian quartzite and in Upper Cretaceous (?) diorite porphyry. Boutwell, 1933; 1912. 40°37' 111°31'
8. American Fork. Bedded replacement bodies in Cambrian limestone; fissure veins in Precambrian and Cambrian quartzite. Calkins and Butler, 1943. 40°32' 111°37'
9. Gold Hill (Clifton). Replacement bodies along fractures in Cambrian and Carboniferous limestones and dolomites; veins along faults in Tertiary quartz monzonite. Nolan, 1935. 40°10' 113°50'
10. Willow Springs (Oro Del Rey mine). Replacement bodies in Cambrian limestone (?). Butler and others, 1920; Nolan, 1935. 40°00' 113°52'
11. Dugway. Veins with local replacement along faults in Cambrian and Mississippian quartzite, limestone and dolomite. Butler and others, 1920. 39°59' 113°12'
12. Fish Spring. Replacement bodies along fissures and along wall of porphyry dike in Ordovician (?) and Silurian (?) limestone. Butler and others, 1920. 39°51' 113°27'
13. North Tintic. Bedded replacement bodies along fissures in Mississippian (?) limestone. 40°03' 112°12'

UTAH (cont'd.)

Lindgren and Loughlin, 1919.

14. Tintic. Replacement bodies along fractures in Cambrian, Ordovician and Mississippian limestone and dolomite; veins in Tertiary igneous rocks. Lindgren and Loughlin, 1919; Billingsley and Crane, 1933. — 39°57' 112°05'

15. West Tintic. Replacement bodies along fissures in Paleozoic dolomite and limestone. Butler and others, 1920; Stringham, 1942. — 39°51' 112°25'

16. Mount Nebo. Veins, pipes, and bedded replacement bodies adjacent to faults in Cambrian and Mississippian limestone. Butler and others, 1920. — 39°52' 111°47'

17. San Francisco and Preuss (Horn Silver, Cactus mines). Replacement veins along faults in Tertiary quartz latite or at its contact with Cambrian (?) limestone. Butler and others, 1920. — 38°28' 113°17'

18. Star. Replacement bodies, including pipes, along fissures in Silurian (?), Mississippian (?), and Triassic limestones. Butler and others, 1920. — 38°22' 113°08'

19. Ohio and Mount Baldy. Bedded replacement bodies in Jurassic limestone; veins along faults in Jurassic quartzite and Tertiary dacite. Butler and others, 1920. — 38°24' 112°18'

VIRGINIA

1. Valzinco-Mineral area. Veins along fissures and faults in Precambrian and Cambrian schists. Grosh, 1949; Currier, 1935. — 38°06' 77°51'

2. Dillwyn. Disseminated ore in schist. Pardee and Park, 1948; Park, 1936. — 37°34' 78°26'

3. Austinville-Ivanhoe. Ore along limb of anticline in brecciated Cambrian dolomite. Currier, 1935; Watson, 1905. — 36°51' 80°57'

WASHINGTON

1. Oroville-Nighthawk. Fissure veins in marginal areas of granodiorite of Laramide age. Patty, 1921. — 48°57' 110°40'

2. Northport. Replacement bodies along bedding and within shear zones in Cambrian (?) dolomite. Jenkins, 1924; Weaver, 1920. — 48°52' 117°43'

3. Metaline. Replacement bodies in Cambrian dolomite and brecciated dolomitic limestone. Park and Cannon, 1943. — 48°52' 117°22'

4. Bossburg. Replacement bodies along fractures and bedding in Cambrian (?) limestone and argillite. Jenkins, 1924; Weaver, 1920. — 48°44' 117°58'

5. Colville (Old Dominion mine). Replacement bodies along low-dipping fractures in Cambrian (?) limestone. Weaver, 1920; Jenkins, 1924. — 48°33' 117°47'

6. Springdale (Cleveland mine). Replacement veins along bedding fractures in dolomitic limestone and argillite of Paleozoic age. Jenkins, 1924. — 48°07' 118°01'

WISCONSIN

1. Upper Mississippi Valley. Replacement bodies and veins along joints, shears, and faults in Ordovician dolomite and limestone. Heyl and others, 1955; 1960. — 42°49' 90°26'

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