Selenium Occurrences

The map showing the numbered selenium occurrences is plate 18, on page 47 in volume 2.

FERRY COUNTY

Blaine Republic
(see Republic under gold)

Flag Hill (2)
(see under gold)

Golden Valley
(see Valley under gold)

Lamefoot
(see Valley under gold)

Republic (3)
(see under gold)

Valley (1)
(see under gold)

SILICON

Production—In Washington ferrosilicon is produced in electric furnaces at three plants, those of the Keokuk Electro-Metals Co. at Rock Island, the Ohio Ferro-Alloys Co. at Tacoma, and the Pacific Northwest Alloys, Inc. at Mead. Of these, the first two have produced metallic silicon also.

Prices—Silicon of 97 percent purity sold at 20 cents per pound in 1951; in August 1952 the price dropped to 18½ cents, and was still at that figure 3 years later. One pound of extremely pure silicon for electrical use was imported in 1950, and the quoted value was $517 per pound. Material of similar purity was quoted at $430 per pound in 1952.

Ore minerals and geology—After oxygen, silicon is the most abundant element and makes up nearly 28 percent of the earth’s crust. With the exception of the carbonates, all the common rocks of the earth’s crust are siliceous. Although the element is very abundant, it never occurs free but always in combination in a great variety of minerals, mostly silicates, such as feldspars, amphiboles, pyroxenes, micas, and clays. However, the oxide, quartz is the most abundant of all the silicon minerals, and it is the only mineral which serves as an ore of silicon. In spite of the abundance and widespread distribution of quartz, there are few deposits of the mineral suitable as ore of silicon or ferrosilicon. Ore specifications are hard to meet in that they call for extremely high silica content, low iron, phosphorus, and calcium, and for unusual physical properties.

Silicon Occurrences

Occurrences of massive quartz, the principal ore of silicon, are described in Part I of this report. Also in Part I are descriptions of occurrences of quartzite, some of the most pure of which have been mined for the manufacture of ferrosilicon and which might conceivably be mined as ore of silicon.

SILVER

Properties—Silver is a pure-white metal having a brilliant, perfect metallic luster. It is a little harder than gold, and is exceeded only by gold in ductility and malleability. Polished silver reflects visible light as well as, or better than, other metals, is a good reflector of infrared radiation, but is inferior to aluminum and many other metals as a reflector of ultraviolet light. Silver is the best of the metals as a conductor of heat and electricity. The molten metal in air dissolves 22 times its own volume of oxygen, which, when the melt cools, escapes with a sputtering sound and a flash of light. Silver is not ordinarily oxidized by air, and resists attack by many chemicals, but it tarnishes readily when contacted by sulfur compounds. The element is univalent. Other properties are shown in the table on page 12.

Uses—Silver has been used since earliest times for coins and ornamental articles, and the largest use is still for monetary purposes. Much of it is simply hoarded,
both by individuals and by governments. In the arts and industries the largest use is for sterling and plated tableware. Photography is using increasing quantities, mostly in the form of silver nitrate. Solid silver and alloys and silver plating are used in jewelry, trophies, and as lining in laboratory equipment and in brewing and food-processing machinery. It is used in electrical equipment (especially for its anti-arching properties at contact points), for dental and surgical instruments, dental amalgams, medicines, and for coating mirrors. Alloyed with lead, zinc, and tin, it is used as bearing metal, and in other alloys as solder and brazing rods. A lead-silver alloy is used as anodes for production of electrolytic zinc. Some silver compounds are used as catalysts in certain chemical industries, and other silver chemicals are used to convert sea water to drinking water. During wartime shortages of copper and aluminum, large quantities of silver were used temporarily for electrical conductors.

Production—In Washington, silver production in most years is outranked by that of gold, copper, lead, and zinc. Maximum annual production was 721,450 ounces, valued at $328,070, in 1902. Production in 1850 was 363,656 ounces, valued at $329,127, and total production through 1852 has been 14,871,542 ounces, valued at $10,957,311. In total silver production through 1952, Washington ranks tenth among the states. In 1950 no Washington mine was among the 25 largest producers of silver in the country. It has been many years since any large mine in this state has produced silver as its principal value, although at one time several mines in the Nighthawk, Nespelem, and Ruby-Conconully districts of Okanogan County and in the Chewelah and Colville districts of Stevens County were notable silver producers. Silver is a byproduct of nearly all gold mines and most copper, lead, and zinc mines. The Knob Hill mine (gold ore) was the leading silver producer in 1950, followed by the Holden mine (copper-gold-zinc ore), Bonanza mine (lead ore), Gold King mine (gold ore), and Grandview mine (zinc-lead ore). These 5 mines produced 94 percent of the state total of silver in 1950.

Prices—Silver prices in the past 50 years have fluctuated generally with the prices of the base metals. The highest level was $1.35 per ounce in 1920, but in the same year the price dropped to 65 cents, and the lowest price for silver was 24 cents in 1932. The U.S. Treasury buying price of newly mined domestic silver was set at 71.1 cents in 1969 and changed to 90.5 cents in 1946. The latter price was still in effect in 1955. The New York open-market price for foreign and secondary silver has been from 5 to 20 cents less than the Treasury price.

Ore minerals—Silver occurs native and alloyed with gold, copper, and mercury, and also in at least 55 well-known silver minerals as a sulfide, arsenide, antimonide, telluride, chloride, bromide, and iodide, and as numerous sulfosalts. The commonest ore is silver-bearing galena, and fairly common are silver-bearing pyrite, sphalerite, and minerals of copper and cobalt. Of the copper minerals which carry silver, perhaps the commonest is the silver-rich variety of tetrachalcite known as freibergite. Some of the chief silver minerals are cerargyrite (horn silver), AgCl, containing 75.3 percent silver; argentite, Ag₂S, containing 87.1 percent silver; stephanite, Ag₅Sb₄S₁₀, containing 68.5 percent silver; pyrargyrite (ruby silver) Ag₅Sb₄S₁₀, containing 59.9 percent silver; and proustite, Ag₅As₃S₁₀, containing 65.5 percent silver.

Geology—Although silver occurs in some deposits as the principal value, more commonly it accompanies gold, lead, zinc, and copper, and so its origin and type of deposit may be extremely varied. Most of the silver of the world comes from the North American Cordillera, where it is commonly associated with Tertiary intrusive and volcanic rocks such as diorite, monzonite, granodiorite, rhyolite, and andesite. Most of the silver is in fissure veins or related deposits of irregular shape, in which the ores have been deposited from solution in open spaces or by replacement. The lodes may be in almost any kind of rock, and the common gangue is quartz, calcite, dolomite, or rhodochrosite.

Occurrences

The maps showing the numbered silver occurrences are plates 19 and 20, on pages 51 and 53 in volume 2.

BENTON COUNTY

Prosser (1)
(see under gold)

CHELAN COUNTY

Allen Magnesium
(see under gold)

Amigo (79)
(see under gold)

April Fool (61)
(see under gold)

Arizona (36)
(see under copper)

Big Chief
(see under lead)

Big Elephant
(see under gold)

Black Warrior (17)
(see under copper)

Black and White (84)
(see under gold)

Blue Jay (29)
(see under copper)

Blue Jay Extension (38)
(see under copper)

Bryan (47)
(see under copper)

Budge (83)
(see under gold)
Buster (22)  
(see under gold)

Butte  
(see under copper)

Caledonia (62)  
(see under gold)

Canada (30)  
(see under copper)

Cascade Consolidated (11)  

Charlotte (86)  
(see under gold)

Chub (26)  

Clagstone (4)  
(see under lead)

Copper King  
(see Pickwick under copper)

Crown Prince and Free Coinage  
(see under copper)

Culver (68)  
(see under gold)

Daisy Dean (74)  
(see under gold)

Davenport (7)  
(see under copper)

Defender (3)  
(see under copper)

Diamond Dick  
(see Black and White under gold)

Dominion  
(see Union and Dominion under gold)

Donaldson (63)  
(see under gold)

Doubtful (13)  
(see under lead)

Drummer Boy (51)  
(see under gold)

Elephant (35)  

Ellen  
(see Van Epps under antimony)

Emma Lee  
(see under gold)

Esmeralda  
(see under gold)

Excelsior  
(see Nevada and Excelsior under gold)

Falls (14)  
(see under lead)

Flamingo (20)  
(see under copper)

Flora  
(see Lake and Flora under gold)

Francis L.  
(see Golden Guinea under gold)

Franklin (10)  
(see under lead)

Free Coinage  
(see Crown Prince and Free Coinage under copper)

Galena (8)  
(see under lead)

Gem (82)  
(see under gold)

Gem (39)  
(see under copper)

Gold King  
(see Golden King under gold)

Gold Knob (85)  
(see under gold)

Golden Guinea (75)  
(see under gold)

Golden King (87)  
(see under gold)

Gordon (80)  
(see under gold)

Grace (31)  
(see under copper)

Gray Eagle  

Great Republic  
(see under lead)

Hidden Treasure (53)  
(see under gold)

Holden (44)  
(see under copper)

Homestake (64)  
(see under gold)

Homestake and Star (18)  

Horseshoe Basin (6)  
(see under lead)

Howe Sound  
(see Holden under copper)

Humbug  
(see under lead)
Hummingbird (69)
(see under gold)

Hunter (41)

Idaho (32)
(see under copper)

Indiana (37)
(see under lead)

Iowa (37)
(see under gold)

Irene
(see Holden under copper)

Isoletta (19)

Ivanhoe
(see Wilder under gold)

Keefar Brothers
(see under molybdenum)

King Solomon (23)
(see under copper)

King Solomon (Pickwick)
(see Pickwick under copper)

King Solomon (Van Epps)
(see Van Epps under antimony)

Kingman
(see Galena under lead)

Lake and Flora
(see under gold)

Lake Shyall (21)
(see under copper)

Leo
(see under copper)

Little Jap (27)

Logan (5)
(see under lead)

Lone Rock (65)
(see under gold)

Lottie S.
(see under copper)

Lucky Queen (56)
(see under gold)

Lulu
(see under gold)

Manistee (70)
(see under gold)

Marcus Stein (42)

Marion
(see under gold)

Maryland
(see under lead)

Meadow Creek Strike (33)
(see under copper)

Meridian (77)
(see under gold)

Michigan
(see under lead)

Minneapolis (2)
(see under gold)

Moscow (24)
(see under copper)

Mountain Sheik
(see under copper)

Nebraska (25)
(see under copper)

Nelson
(see Pickwick under copper)

Nevada and Excelsior
(see under gold)

New York (59)
(see under gold)

North Pole (78)
(see under gold)

North Star (71)
(see under gold)

North Star (46)
(see under lead)

Ohio
(see under lead)

Ombompo (12)
(see under gold)

Orphan Boy (40)
Silver Occurrences—Chelan County

P. I. (52)  
(see under gold)

Panama No. 2  
(see under lead)

Pangborn (54)  
(see under gold)

Phyllis (34)  
(see under copper)

Pickwick  
(see under gold)

Pickwick (Copper King) (58)  
(see under copper)

Prairie Dog  
(see under gold)

Prince of Wales  

Prospect (72)  
(see under gold)

Quien Sabe (15)  
(see under lead)

Rainier (76)  
(see under gold)

Raymond (43)  

Red Cap (48)  
(see under gold)

Red Hill (49)  
(see under gold)

Red Mountain (50)  
(see under copper)

Rex (55)  
(see under gold)

Rogers  
(see Rex under gold)

Roscoe Conkling  
(see under lead)

Rouse (15)  
(see under lead)

Royal  
(see Red Mountain under copper)

Sailor Boy  
(see under gold)

Savage  
(see under gold)

Silver Fiend (57)  
(see under lead)

Silver Trail (45)  
(see under copper)

Snook and Ellen  
(see Van Epps under antimony)

Spokane Boy and Girl  
(see under copper)

Squillchuck  
(see Golden King under gold)

Star  
(see Homestake and Star)

Sunday Morning (28)  

Texas Jack (9)  
(see under copper)

Tiger (Galena)  
(see Galena under lead)

Tiger (1)  
(see under gold)

Union and Dominion (81)  
(see under gold)

Van Epps (Snook and Ellen) (56)  
(see under antimony)

Van Epps Copper  
(see Pickwick under copper)

Velma (60)  
(see under mercury)

Venus (67)  
(see under gold)

Wenatchee  
(see Golden King under gold)

White Elephant  
(see Wilder under gold)

White Star  
(see under lead)

Wilder (73)  
(see under gold)

CLALLAM COUNTY

Deer Park  
(see under copper)

CLARK COUNTY

Silver Star (1)  
(see under copper)

COWLITZ COUNTY

Green Mountain (1)  
(see under gold)

FERRY COUNTY

Ada  
(see Laura S. under lead)

Addie B (163)  
(see under copper)
Addison (176)
(see under copper)

Admiral (18)
(see under gold)

Advance (48)
(see under gold)

Advance (Cabin) (106)

Algonkian (68)

Alpine (25)
(see under gold)

Anchor

Anderson (157)
(see under lead)

Aneicia (26)
(see under gold)

Apex
(see Big Chief under lead)

Apollo
(see California under gold)

Aurum
(see Day Mines under gold)

Belcher (177)
(see under copper)

Ben Hur (27)
(see under gold)

Big Bug (107)

Big Chief (108)
(see under lead)

Big Joker
(see Messenger under lead)

Big Lake (64)
(see under lead)

Big Silver

Black Hawk (109)
(see under lead)

Black Tail (110)
(see under lead)

Black Tail (Hope) (26)
(see under gold)

Black Thorn (79)
(see under lead)

Blaine Republic
(see Republic under gold)

Blevens
(see Meadow Creek under copper)

Blue Bird (135)
(see under gold)

Blue Horse (58)

Blue Jacket (59)

Blue Mountain
(see Jennie under gold)

Bodie (29)
(see under gold)

Boston and Butte
(see Butte and Boston under gold)

Boston & New York (Welcome) (9)

Brimstone
(see Paul and Brimstone under gold)

Buffalo (148)

Burlington and Delaware (156)
(see under lead)

Butte and Boston (49)
(see under gold)

Butterfly (111)
(see under lead)
Byrne (Gold Cord) (164)

Cabin
(see Advance)

California (182)
(see under copper)

California (Apollo) (57)
(see under gold)

Chance (112)

Cherokee Strip (97)

Chief
(see Big Chief under lead)

Chief Barnaby (63)

Clay (171)
(see under copper)

Colorado (113)
(see under lead)

Comstock (2)
(see under copper)

Congress (114)
(see under nickel)

Consolidated Mines and Smelting Co., Ltd.
(see under copper)

Copper Key (12)
(see under copper)

Copper Prince

Cougar (174)
(see under copper)

Cuba
(see Big Lake under lead)

Curllew
(see under lead)

Cyprus
(see under gold)

Dan Patch (69)

Day Mines
(see under gold)

Delaware
(see Burlington and Delaware under lead)

Dewey (136)

Drummond (115)
(see under lead)

East San Poil (30)
(see under gold)

El Calph (31)
(see under gold)

Emma
(see Standard and Emma under gold)

Etta (80)
(see under lead)

Eureka
(see Quilp under gold)

Faithful Surprise
(see Morning Star under gold)

Five Hundred (150)

Flag Hill (50)
(see under gold)

Florence

Galena (86)
(see also Gwin)

Gold Cord
(see Byrne)

Gold Crown
Loc: Keller dist. Owner: Bridge Creek Mining Co. (1907). Ore: Silver, lead, copper, gold. Ref: 116, no. 6, 1907, p. 32; no. 9, 1907, p. 18; no. 10, 1907, p. 19.
Gold Hill (Lost Mine)  

Gold Twenty (65)  
(see under gold)

Golden Cord (178)  
(see also Consolidated Mines and Smelting Co., Ltd. under copper)

Golden Eagle (19)  
(see under gold)

Golden Harvest (56)  
(see under gold)

Golden Valley  
(see Valley under gold)

Good Ore (77)  

Grandview (132)  
(see under lead)

Gray (168)  

Greasy Run (137)  
(see under lead)

Great Eastern (70)  
(see under lead)

Great Northern (159)  

Great Scott (71)  
(see under lead)

Great Western (161)  

Gwin (Hall Creek) (67)  
(see also Galena)

Hall Creek  
(see Gwin)

Handy Andy  

Hawkeye (13)  
(see under gold)

High Line  
(see under gold)

Hope  
(see Black Tail under gold)

I. X. L. (138)  
(see under copper)

Iconoclast (183)  
(see under copper)

Ida May (32)  
(see under gold)

Idora (139)  
(see under lead)

Illinois (184)  
(see under copper)

Imperator  
(see Quilp under gold)

Insurgent (20)  
(see under gold)

Iron Creek  
(see Shamrock under nickel)

Iron Mask (33)  
(see under gold)

Iron Monitor (61)  
(see under gold)
Iron Mountain (50)


Ivanhoe (Southern Cross) (149)


J. H. E. (72)

(see under lead)

Jaybird (98)

(see under lead)

Jenny (6)

(see under gold)

Jim Blaine Fraction (52)

(see under gold)

Juliet (81)

(see under copper)

Jumper (185)

(see under copper)

Juno (61)


Kangaroo (34)

(see under gold)

Kentucky Bell (116)

(see under lead)

Keystone (82)


King Richard

(see Meadow Creek under copper)

King Solomon (140)

(see under lead)

Knob Hill (35)

(see under gold)

La Fleur

(see Comstock, Walla Walla under copper)

Lakeview Fraction (117)

(see under lead)

Lame Foot (Valley)

(see Valley under gold)

Lamefoot

(see under iron)

Lancaster (7)

(see under copper)

Last Chance (21)

(see under gold)

Last Chance (175)

(see under copper)

Laura S. (133)

(see under lead)

Laurier

(see Tallman under copper)

Little Cove (36)

(see under gold)

Little Jay (118)

(see under lead)

Little Tom

(see Juliet under lead)

Lone Pine (37)

(see under gold)

Lone Star and Washington (1)

(see under copper)

Longstreet (119)


Lost Mine

(see Gold Hill)

Lucile Dreyfus

(see Morning Star under gold)

Lucky Boy

(see under lead)

McJunkin (152)

Mable T. (153)

(see under lead)

Malachite (179)


Mammoth (22)

(see under gold)

Manila (173)

(see under copper)

Mayflower (141)

(see under lead)

Meadow Creek (172)

(see under copper)

Messenger (120)

(see under lead)

Meteor (53)


Midnight

Loc: Keller dist. Owner: Bridge Creek Mining Co. (1907). Ore: Silver, lead, copper, gold. Ref: 116, no. 6, 1907, p. 32; no. 9, 1907, p. 18; no. 10, 1907, p. 19.

Mineral Hill

(see Morning Star under gold)

Mono (160)

(see under zinc)

Montana (84)


Morning

(see under gold)

Morning Glory (38)

(see under gold)

Morning Star (4)

(see under gold)

Mount Tolman (165)

(see under copper)

Mountain Lion (39)

(see under gold)

Muldoon

(see under gold)

New York (85)

(see under lead)

North San Poil Fraction (40)

(see under gold)

Northern Light (99)


Number Seven

Loc: Keller dist. Ore: Silver, lead, copper, gold. Ref: 116, no. 6, 1907, p. 32; no. 9, 1907, p. 18; no. 10, 1907, p. 19.

Ohio (121)

(see under lead)

Old Gold

(see Morning Glory under gold)

Old Nell (122)

(see under antimony)

Oom Paul (86)

(see under lead)

Ophir (162)

(see under lead)

Oregon (154)


Oregon

(see Illinois under copper)

Orion (100)


Pacific Mutual

(see Addison under copper)

Panama (8)

(see under gold)

Patterson

(see Jennie under gold)

Paul and Brimstone

(see under gold)

Pearl (41)

(see under gold)

Perry (123)

(see under gold)
Silver Occurrences—Ferry County

Pilgrim (142)
(see under lead)

Pin Money (14)
(see under gold)

Plymouth Rock (143)
(see under lead)

Polaris (124)
(see under lead)

Polepick (186)
(see under copper)

Poor Man’s Hope (181)
(see under lead)

Porcupine

Prince Henry (151)

Princess Maude (53)
(see under gold)

Quilp (23)
(see under gold)

Rattler (73)

Rattlesnake (101)
(see under lead)

Rebate (15)
(see under gold)

Red Chief (95)
(see under lead)

Reliance (125)

Ren Rice (74)
(see under lead)

Republic (54)
(see under gold)

Reserve (96)

Robert E. Lee (126)
(see under antimony)

Romulus (87)
(see under lead)

Rosario (102)
(see under gold)

Rover Bonanza (166)

Royal Ann (127)
(see under lead)

St. Patrick (88)
(see under lead)

St. Paul (75)

San Polo (42)
(see under gold)

San Polo Fraction (43)
(see under gold)

San Polo Monitor
(see Meadow Creek under copper)

Schminski (188)
(see under molybdenum)

Seattle (44)
(see under gold)

Several (89)
(see under lead)

Shamrock (158)
(see under nickel)

Shonee
(see under copper)

Silver Bell (103)
(see under lead)

Silver Crown

Silver Crown No. 2 (144)

Silver Crown No. 3 (145)
(see under lead)

Silver Hill (169)
(see under copper)
Silver King (170)

Loc: Sec. 6, (29-34E), Keller dist. Ore: Silver, lead, copper. Ref: 114, no. 5, 1909, p. 69.

Silver Leaf (104)


Silver Pick

Loc: Keller dist. Owner: Bridge Creek Mining Co. (1907). Ore: Silver, lead, copper, gold. Ref: 116, no. 6, 1907, p. 32; no. 9, 1907, p. 18; no. 10, 1907, p. 19.

Silver Queen (134)

(see under lead)

Silver Spar (90)


Silver Spar (128)

(see under lead)

Silver Tip (62)


Snowstorm (45)

(see under gold)

Snowstorm (White Swan) (91)

(see under lead)

South Penn (16)

(see under gold)

Southern Cross

(see Ivanhoe)

Southern Republic

(see Princess Maude under gold)

Standard and Emma (55)

(see under gold)

Stemwinder


Stray Dog (92)


Summit (129)

(see under lead)

Summit (167)

(see under zinc)

Sunset (146)

(see under lead)

Sunshine (130)


Surprise (46)

(see under gold)

Syndicate (93)

(see under lead)

Syracuse (147)


Talisman (5)

(see under copper)

Tom Thumb (17)

(see under gold)

Trade Dollar (47)

(see under gold)

Truax (78)

(see under gold)

U. S. (155)

(see under lead)

Umatilla (187)

(see under copper)

V Fraction (24)

(see under gold)

Valley (11)

(see under gold)

Veda W.

Loc: Keller dist. Owner: Bridge Creek Mining Co. (1907). Ore: Silver, lead, copper, gold. Ref: 116, no. 6, 1907, p. 32; no. 9, 1907, p. 18; no. 10, 1907, p. 19.
Silver Occurrences—Ferry County

Vesuvius (180)

Victor (76)

Virginia
(see Morning Star under gold)

Wall Walla (La Fleur) (3)
(see under copper)

Washington
(see Lone Star and Washington under copper)

Welcome
(see Boston & New York)

White Horse

White Rose (94)
(see under lead)

White Swan
(see Snowstorm under lead)

White Tail (131)
(see under lead)

Willmot
(see under copper)

Yellowstone (105)
(see under lead)

Zalla M (10)

KING COUNTY

Aces Up (35)

Anderson (1)
(see under iron)

Annie (49)
(see under copper)

Apex (16)
(see under gold)

Baring
(see Anderson under iron)

Bear Basin (39)

Bear Creek
(see Robinson under gold)

?ANT COUNTY

Black-Rosauer (1)
(Probably the same property as Electric City, described under molybdenum)

Electric City (2)
(see under molybdenum)

Hope No. 1 (3)

Silver Queen (4)

KING COUNTY

Aces Up (35)

Anderson (1)
(see under iron)

Annie (49)
(see under copper)

Apex (16)
(see under gold)

Baring
(see Anderson under iron)

Bear Basin (39)

Bear Creek
(see Robinson under gold)
Belle of Tennessee (18)  
(see under gold)

Bergeson (8)  
(see under gold)

Black Jack  
(see under gold)

Bobtail (36)  
(see under copper)

Bondholders Syndicate  
(see Apex under gold)

Bridal Veil  
(see under gold)

Brooklyn (23)  
(see under copper)

Brown Bear (59)  
(see under copper)

Carmack (54)  
(see under gold)

Cascade  
(see Seattle-Cascade)

Cleopatra (40)  

Climax (3)  
(see under copper)

Commonwealth (51)  

Coney Basin (27)  
(see under gold)

Copper Bell  
(see under gold)

Copper Chief (50)  
(see under copper)

Copper Duke (11)  
(see under gold)

Copper Plate  
(see Seattle-Cascade)

Damon and Pythias (17)  
(see under gold)

Dawson (28)  
(see under lead)

Devils Canyon (42)  
(see under molybdenum)

Dutch Miller (24)  
(see under copper)

Eureka (60)  
(see under copper)

Eureka  
(see under copper)

Favorite Gulch (12)  
(see under gold)

Fletcher Webster  
(see under gold)

Foss River (33)  
(see under copper)

Goat Mountain (44)  
(see under lead)

Gold Mountain (9)  

Golden Tunnel (5)  
(see under copper)

Great Republic (8)  
(see under antimony)

Guye (52)  
(see under iron)

Happy Thought  
(see Great Republic under antimony)

Hawkeye  
(see under gold)

Helmke  
(see Lucky Day)

Jack Pot (43)  
(see under zinc)

John Stevens  
(see Una under copper)

Kimball (10)  
(see under gold)

King and Kinney (29)  
(see under copper)

Kinney  
(see King and Kinney under copper)

Last Chance (55)  
(see under gold)

Last Chance (24)  
(see under gold)

Laura Lindsay  
(see under gold)

Lennox (19)  
(see under gold)

Le Roi (37)  
(see under gold)

Leta (48)  
(see under gold)
Silver Occurrences—King County

Lone Star (25)  
(see under gold)

Lost Lode (45)  
(see under molybdenum)

Lucky Day (Helmke) (26)  

Lucky Strike (21)  
(see under gold)

Mastodon  

May Earhart  
(see Robinson under gold)

Metropolitan (38)  
(see under gold)

Mono  
(see Mono under copper)

Monarch (13)  
(see under gold)

Mono (7)  
(see under copper)

Monte Carlo (22)  
(see under gold)

Mt. Logan  
(see Guye under iron)

Mount Phelps (20)  
(see under zinc)

Mountain Gem  
(see under gold)

Neptune (14)  
(see under gold)

Normandie  
(see Bergeson under gold)

Ophir (56)  
(see under gold)

Paymaster  
(see under gold)

Pedro  
(see under copper)

Pythias  
(see Damon and Pythias under gold)

Quartz Creek (46)  
(see under copper)

Rainy (47)  
(see under gold)

Robinson (61)  
(see under gold)

Romeo  
(see under gold)

Salmon Creek (2)  
(see under gold)

San Francisco (15)  
(see under gold)

Seattle (57)  
(see under gold)

Seattle-Cascade (Triple S, Silver Dollar and Copper Plate) (30)  

Silver Dollar and Copper Plate (see Seattle-Cascade)

Silver Star (41)  

Sockless Jerry  
(see Last Chance under gold)

Solomon (53)  
(see under gold)

Stemwinder (58)  
(see under gold)

Stevens  
(see Una under copper)

Summit  
(see Guye under iron)

Sunday  

Surprise  
(see under copper)

Triple S (see Seattle-Cascade)

Triune  
(see under gold)

Una (31)  
(see under copper)

Vandalia  
(see under gold)

War Eagle (32)  
(see under gold)

Western States Copper (see Rainy under gold)

Yellow Jacket (4)  
(see under gold)

KITSAP COUNTY

Chico (1)  
(see under tin)

Cook-Kitchen (see Chico under tin)

Kitchen (see Chico under tin)
KITTITAS COUNTY

American Eagle
(see under gold)

Aurora (1)
(see under gold)

Bear Creek Gold

Beaver (4)
(see under gold)

Big Bug
(see under copper)

Big Z
(see Zerwekh under gold)

Blue Bonnet (17)
(see under copper)

Bonanza
(see Dolphin under copper)

Boss
(see under gold)

Boyles (19)
(see under copper)

Brown Bear
(see under gold)

Camp Creek (18)

Cascade
(see under gold)

Cascade Mining (13)
(see under copper)

Cedar Creek Placer (25)
(see under gold, placer)

Clarence Jordin (24)
(see under gold)

Cle Elum (5)

Dolphin
(see under copper)

Don Tom
(see under gold)

Durrwachter
(see Mineral Creek under copper)

Epha
(see under gold)

Esther and Louisa (12)

Family
(see under gold)

Gold Leaf
(see under gold)

Gold Reef
(see under gold)

Golden Fleece (22)
(see under gold)

Golden Stair

Good Luck (14)
(see under lead)

Granite King (15)
Loc: Sec. 24, (23-11E), on Gold Cr. Owner: Devine Mining Co. (1915). Ore: Silver, copper, lead, gold. Ref: 58, p. 27. 63, p. 61. 158.

Great Western
(see under gold)

Grizzly Bear
(see under gold)

Hans Wagner

Huckleberry (11)
(see under copper)

Ida Elmore (6)
(see under gold)

Ilias (20)
(see under copper)

Just In Time
(see under gold)

King Solomon (3)
(see under copper)

Last Chance
(see under gold)

Legal Tender
(see under copper)

Liberty Lode
(see Mineral Creek under copper)

Little York
(see under gold)

Louisa
(see Esther and Louisa)

Lynch
(see Aurora under gold)

Majestic
(see under gold)
Mammoth
(see under gold)
Mary
(see under gold)
Mercer
(see Golden Fleece under gold)
Mildred
(see under copper)
Mineral Creek (16)
(see under copper)
Morning
(see under gold)
Morning Star (7)
(see under copper)
Mountain Whistler
(see under gold)
Navidad
(see under copper)
 Paramount
(see Aurora under gold)
Ruby (10)
(see under gold)
Ruby King
(see under gold)
Rushing Water
(see under gold)
Silver Bull
(see under gold)
Silver Creek (2)
(see under gold)
Silver Dump (8)
Silver Queen (9)
Sonny Brown (23)
(see under gold)
T-Bone
(see Golden Fleece under gold)
Thorp
(see under gold)
Tip Top
(see under gold)
Tip Top No. 1
(see under gold)
Topping
(see under gold)
Twin
(see under gold)
Valencia
(see under gold)
War Eagle
(see under gold)
Williams
(see Illas under copper)
Zerwekh (21)
(see under gold)

LEWIS COUNTY
Eagle Peak (1)
(see under copper)
Mineral Creek (2)
(see under zinc)
Waterfall
(see under gold)

LINCOLN COUNTY
Crystal (1)
(see under lead)
Egypt
(see Pitney Butte under molybdenum)
Fouress (2)
(see under zinc)
Pitney Butte (Fouress) (3)
(see Fouress under zinc)
Pitney Butte
(see under molybdenum)
Silver Queen
Spokane Molybdenum
(see Pitney Butte under molybdenum)

United Workman

MASON COUNTY
Black and White (1)
(see under copper)

OKANOGAN COUNTY
Abernathy (22)
(see under copper)
Adams
(see Moncosilgo under copper)
Adelia
(see under gold)
Alder (30)
(see under gold)
Allison
(see Okanogan Free Gold under gold)
Alta
(see Chilson under lead)
American Flag (189)
(see under copper)
American Flag (15)
(see under gold)
American Rand
- (see Spokane under gold)

Anaconda (106)
- (see under gold)

Anchor (Great Metals) (234)


Andy O.
- (see Andy O'Neill)

Andy O'Neill (Andy O.) (227)


Anna (232)


Antimony Gold
- (see Abernathy under copper)

Antimony Queen (38)
- (see under antimony)

Apache (225)


Apex (167)
- (see under copper)

Arizona
- (see Horn Silver)

Arizona


Arlington (161)


Atkins (192)
- (see under lead)

Aztec (173)
- (see under iron)

Beaver (182)
- (see under gold)

Bellevue (92)
- (see under gold)

Ben Harrison
- (see Apex under copper)

Bergman
- (see Shaw-Bergman under copper)

Big Boy (16)
- (see under gold)

Big Hole
- (see under gold)

Billy Goat (4)
- (see under copper)

Bi-Metallic (184)
- (see under molybdenum)

Black Bear (103)
- (see under gold)
Black Huzzar

Loc: Galena area, NW. of the Silver Belle group, Concomly dist. Prop: 1 claim. Owner: Gus Lieder and A. D. McKey (1892). Ore: Silver, copper, gold. Ore min: Argentite, chalco-

Black Jack (39)

(see under gold)

Black Warrior

(see under gold)

Blanche (77)

(see under gold)

Blue Daisy


Blue Grouse (151)

(see under lead)

Bodie (186)

(see under gold)

Bolinger (38)

(see under gold)

Bornite

(see Peacock under copper)

Boundary (Sheep Mountain)

(see Sheep Mountain under molybdenum)

Boundary


Bridgeport


Brunswick

(see under lead)

Buck Mountain (50)

(see under tungsten)

Buckeye (108)

(see under copper)

Buckeye


Buckhorn

(see Buck Mountain under tungsten)

Bullfrog (88)

(see under gold)

Bunker Hill

(see Silver King under lead)

Butcher Boy (168)

(see under gold)

Caaba

(see Kaaba under lead)

Cabin (236)

(see under lead)

Callahan

(see Plant-Callahan)

Calumet

(see under gold)

Caribou (174)

(see under gold)

Carl Frederick (122)


Carr (5)

(see under copper)

Castle Creek (196)

(see under lead)

Catherine (58)


Central (Trinidad) (124)

pyrrete, pyrite, sphaerite. Deposit: Irregular mineralized zone in aplite porphyry dike intruding argillite and hornblend-

Central (American Flag)

(see American Flag under gold)

Central (Park and Central)

(see Park and Central under lead)

Chesaw (169)

(see under gold)

Chicago (107)

(see under gold)

Chickamun (34)

(see under copper)

Chief Sunshine (Sunshine Chief) (143)


Chilson

(see under lead)
Chloride


Chopaka (55)


Cleopatra

(see under gold)

Combination (109)

(see under gold)

Continental

(see Mazama Queen under gold)

Controller (215)

(see under copper)

Copper Glance (7)

(see under copper)

Copper King (126)

(see under lead)

Copper World (98)

(see under copper)

Copper World Extension (99)

(see under copper)

Copper Zone

(see under copper)

Cornucopia

(see under gold)

Crescent

(see Triune under gold)

Crown Point

(see Imperial under gold)

Crystal Butte (181)

(see under gold)

Crystalite

(see under gold)

Curlew (66)

(see under gold)

Daisy (9)

(see under gold)

Damfino (49)

(see under gold)

Defiance (113)

(see under gold)

Delaware


Denver City

(see Leadville under gold)

Dexter


Diamond (147)


Diamond Queen (51)

(see under gold)

Dividend (81)

(see under copper)

Dixie Queen

(see Antimony Queen under antimony)

Dodd

(see Sheep Mountain under molybdenum)

Double Eagle

(see Dry Bone under lead)

Double Header

(see Little Chief)

Dry Bone

(see under lead)

Duke of Windsor

(see Dry Bone under lead)

Eagle (67)

(see under lead)

Eloise (68)


Emerald (49)

(see under gold)

Empire (97)

(see under gold)

Empress

(see under gold)

Esther (127)

(see under lead)

Eureka (197)

(see under lead)

Eureka (75)

(see under lead)

Eureka

(see under lead)

Eureka


Evening (228)


Evening Star (128)

Excelsior (42)
(see under gold)

Fairview
(see under lead)

Fairview (69)
(see under lead)

Favorite (69)
(see under lead)

Finella
(see under iron)

First Thought (152)

Fluorspar
(see Tonasket under copper)

Four Metals (57)
(see under lead)

Fourth of July (162)

Frankie Boy (148)

Friday (52)
(see under gold)

General Miles (265)
(see under lead)

Goat Creek
(see under copper)

Gold Axe (175)
(see under gold)

Gold Coin (17)

Gold Crown (60)
(see under gold)

Gold Crown (Spokane)
(see Spokane under gold)

Gold Cup

Gold Dust (82)
(see under copper)

Gold Eagle (61)

Gold Hill (105)
(see under gold)

Golden Chariot (83)
(see under gold)

Golden Zone (54)
(see under gold)

Goodenuff (224)

Gould & Curry (237)
(see under lead)

Grand Coulee
(see Little Chief)

Grandview (Leadville)
(see Leadville under gold)

Grandview
(see under lead)

Grant
(see Roosevelt under iron)

Great Divide (229)
Loc: SE¼SE¼ sec. 16, (31-30E), Nespelem dist. Access: 4 mi. W. of Nespelem by road. Ore: Silver, lead, gold. Ore min: Pyrite, chalcopyrite, galena, chalcocite. Gangue: Quartz, sericitized granite. Deposit: Zone 50 ft. or more wide in which the granite is seamcd, fractured, and sericitized. Mineralized along the fractures and in small quartz veinlets. Bunches of ore minerals up to 2 ft. in dia. Dev: 300-ft. adit with 100 ft. of crosscuts, several small shafts and pits. Assays: "Bunches" of ore said to assay as high as 100 oz. Ag. Ref: 58, p. 27. 122, p. 78.

Great Metals
(see Anchor)

Great Western (211)
(see under lead)

Grover Cleveland
(see under lead)
Grubscher (see Grubser under lead)

Gubser (see under lead)

Hanford (186) (see under lead)

Hanks (3) (see under copper)

Hardscraible (130)  

Hargrove (see Silver King under lead)

Hart Stone (see Kelsey under copper)

Hattie (see under gold)

Hehe (see under gold)

Henrietta (44) (see under gold)

Hercules (206) (see under lead)

Hercules (117) (see under gold)

Hiawatha (93) (see under gold)

Hidden Treasure (131)  

Hidden Treasure (209) (see under copper)

Hidden Treasure (Highland) (45) (see under gold)

Hill-Thomas  

Hilo (see St. Paul)

Home Run (225)  

Homestake (132) (see under lead)

Horn Silver (Arizona) (76)  
Loc: S1/2 sec. 21, (40-26E), Nighthawk dist. Prop: 5 claims. Owner: Hornsilver Mining Co. (1902-1915). Ore: Silver, copper, gold. Ore min: Stephanite, cerargyrite, a little proustite, galena, sphalerite, pyrite, chalcopyrite. Gangue: Quartz. Deposit: 3 veins. The one which has been most developed is 4 in. to 4 ft. wide and is composed of well-mineralized quartz. Country rock is argillite and granite. Dev: 750 ft. of drift, a raise of 100 ft., and a shaft 100 ft. deep. Assays: 2 carloads of ore av. $62 per ton. $2.50 of this amount was in Cu and Au, the remainder in Ag. Prod: Several carloads of ore prior to and during 1909. Ref: 97, 1910, p. 604. 104, 12/15/35, p. 26; 6/15/37, p. 32. 106, 8/2/29, 5/1/39, 154, p. 100. 158.

Hotchkiss (see Mazama Pride under gold)

Hudnut (Hudnutt) (233) (see under zinc)

Hunter (46) (see under gold)

Ida (183) (see under gold)

Idaho  

Imperial (13) (see under gold)

Independence  

Independent (207) (see under lead)

Iron Cap (see under gold)

Iron Cap and Snow Cap (23) (see under gold)

Iron Crown (see under gold)

Iron Dike (195) (see under zinc)

Iron Mask (see Copper World Extension under copper)

Iron Master (100) (see under gold)

Ivanhoe (111)  
Kodak
(see under gold)

Kyota (101)

Lady of the Lake (149)
Loc: NE ¼ sec. 6, (35-25E), on S. extremity of Homestake Mtn. Elev: 2,350 ft. Access: ½ mi. E. of Conconully by road. 18 mi. by road to railroad at Okanogan. Prop: 2 claims; Lady of the Lake, Hidden Springs. Owner: Wm. P. Shirk, Spokane, Wash. (1981). Sie Walter leasing to J. E. Lindstrom (1942). Ore: Silver, copper, lead, zinc, gold, tungsten. Ore min: Galena, pyrite, chalcopyrite, sphalerite, molybdenite, scheelite. Gangue: Quartz, calcite. Deposit: Sheared and fractured mineralized zones mostly 3 to 5 ft. but in places 20 ft. wide in fine-grained metamorphic rocks. Zones are principally vein quartz. Dev: 150-ft. adit, 50 ft. of drifts, several open cuts, a caved adit, and a 21-ft. adit below high-level water of Conconully Lk. Assays: 70 to 125 oz. Ag, 11% to 15% Pb, tr. Au. 13 samples across widths of 4 to 12 ft. gave weighted av. of 0.163% WO. and showed 0.02% to 0.06% Cu, 0.1% to 0.3% Pb, 0.1% to 0.4% Zn, 0.02% to 0.06% Mo. Ref: 12, p. 58. 13, p. 92. 37, pp. 43-44. 73, p. 29. 157. 158.

Laena (see Laena)

Lakeview (see Prize under lead)

Last Chance (154)

Last Chance (43)
(see under gold)

Launa (see Leuna)

Leadville (101)
(see under gold)

Leonora (155)
(see under lead)

Leuena (Laena, Launa) (145)
Lilman (217)


Little Chief (Double Header, Grand Coulee) (218)


Little Chopaka (71)

(see under lead)

Little Johnnie (238)

Loc: Sec. 27, (31-30E), adjoining Apache claim on W., Nespelem dist. Ore: Silver, gold. Ref: 158.

London

(see Methow under gold)

Lone Pine (Submarine) (78)


Lone Star (11)

(see under gold)

Lone Star (Star) (146)

(see under lead)

Louisa

(see Standard and Louisa under gold)

Lucky Jim (21)

(see under copper)

Lucky Lady (Silver Queen) (119)


Luke

(see Molly under copper)

Lulu


McGrath

(see under zinc)

MacLean

(see Roosevelt under iron)

Majestic

(see under gold)

Mammoth (135)


Maquaue

(see under gold)

Marguerite (156)

(see under copper)

Mazama Pride (16)

(see under gold)

Mazama Queen (10)

(see under gold)

Methow (47)

(see under gold)

Mid Range (24)

(see under gold)

Mills

(see under gold)

Mineral Hill (Washington Consolidated, Seven Devils) (136)


Minnehaha (138)

Minnie (35)  
(see under gold)

Modoc (212)  
(see under copper)

Mohawk  
(see under lead)

Mohawk  
(see under zinc)

Molly (12)  
(see under copper)

Molly (Sheep Mountain)  
(see Sheep Mountain under molybdenum)

Molson  
(see Poland China under gold)

Moncosilgo (86)  
(see under copper)

Moneymaker (193)  
Loc: Near SW. cor. sec. 26, (34-31E), Park City dist.  
Ore: Silver, gold. Gangue: Quartz, manganese oxides. Deposit: Zone of sheared silicified granite in which are 2 or more streaks of vesicular iron-stained quartz from 1 to 3 or 4 ft. wide. Dev: Large open pit 15 ft. deep. Assays: Sample from one of the streaks assayed 2.72 oz. Ag. Ref: 152, p. 101.

Monitor (140)  
(see under lead)

Montana (219)  

Monterey (177)  
(see under copper)

Montgomery  
(see Tonasket under copper)

Mother Lode  
(see Crystal Butte under gold)

Mountain Beaver (6)  
(see under gold)

Mountain Boy (199)  
(see under lead)

Mountain Sheep (56)  

Mule Deer  
(see under gold)

Multnomah (213)  
(see under copper)

Myrtle  
(see St. Paul)

Nevada (157)  
(see also Peacock)  

New Deal  
(see Antimony Queen under antimony)

New Hope (8)  
(see under copper)

New London  
(see Methow under gold)

Nighthawk (72)  
(see under lead)

Nina Lu (220)  

Nip and Tuck (178)  
(see under copper)

North Star (28)  
(see under gold)

Northern Gold  
(see Bodie under gold)

Number One (73)  
(see under lead)

O. K. (85)  
(see under copper)

Occident (94)  
(see under gold)

Oceanic  
(see under gold)

Okanogan Belle (137)  

Okanogan Free Gold (87)  
(see American Flag under gold)

Oro Fino  
(see under gold)
Inventory of Washington Minerals—Part II, Metallic Minerals

Oversight (239)
(see under lead)

Overtop
(see Poland China under gold)

Owasco
(see Okanagan Free Gold under gold)

Palmer Mountain Tunnel (115)
(see under gold)

Panama (240)

Par Value (221)

Parallel
(see under gold)

Park and Central (200)
(see under lead)

Pateros
(see Sullivan under gold)

Pay Day (25)
(see under gold)

Peacock (150)
(see also Blue Grouse, Republic under lead, Nevada under silver, Wyoming under copper)

Peacock (Bornite) (2)
(see under copper)

Pendennis (170)
(see under gold)

Pennsylvania

Peoria (32)
(see under gold)

Phil Sheridan
(see Sheridan)

Pinnacle (102)
(see under gold)

Pittsburg (231)

Plant-Callahan (158)

Pointer

Poland China (166)
(see under gold)

Poorman
(see under lead)

Prize (65)
(see under lead)

Pthomigan
(see under cobalt)

Pyrrargyrite
(see Ruby)

Q. S. (123)
(see under copper)

Rainbow (112)
(see under gold)

Ramore (208)
(see under lead)

Ramsey (210)
(see under copper)

Rattlesnake (31)
(see under gold)

Rebecca (243)
(see under copper)

Reco (171)
(see under lead)

Red Bird (216)
(see under copper)

Red Jacket (116)
(see under gold)
Silver Occurrences—Okanogan County

Red Shirt (33)
(see under gold)

Reedy
(see Antimony Queen under antimony)

Republic (159)
(see under lead)

Rich Bar (79)
(see under copper)

Riverside
(see under gold)

Rock House
(see under gold)

Roosevelt (179)
(see under iron)

Ruby (Pyrrargyrite) (62)

Ruby

Ruby Silver

Rush (63)
(see under gold)

Russia
(see under copper)

Safe Deposit
(see under copper)

Saint (80)
(see under gold)

St. Anthony (41)
(see under gold)

St. Lawrence
(see under gold)

St. Paul (Hilo, Myrtle) (241)

Salmon River (139)

San Marino (222)
(see under gold)

Schulz and Chesney (53)
(see under gold)

Seven Devils
(see Mineral Hill)

Sharp
(see Silver King under copper)

Sharp and Balthus (201)
(see under zinc)

Shaw-Bergman
(see under copper)

Sheep Mountain (1)
(see under molybdenum)

Shelby

Sheridan (Phil Sheridan) (187)
Silver Queen  
(see Lucky Lady)

Silver Seal  
(see Antimony Queen under antimony)

Silver Star  

Silver Star (121)  
(see Silver Mountain)

Six Eagles  
(see Little Chopaka under lead)

Snow Cap  
(see Iron Cap and Snow Cap under gold)

Snowshoe (202)  
(see under lead)

Sonny Boy (163)  

Spokane (27)  
(see under gold)

Spokane (American Rand) (91)  
(see under gold)

Standard  
(see Sherman under lead)

Standard and Louisa (48)  
(see under gold)

Star  
(see Lone Star under lead)

Stemwinder (188)  

Sterling (226)  

Stone  
(see Kelsey under copper)

Submarine  
(see Lone Pine)

Sullivan  
(see under gold)

Summit (74)  
Summit (114)
(see under gold)

Summit (203)
(see under lead)

Sunnyside
(see under gold)

Sunrise

Sunshine
(see Hidden Treasure under gold)

Sunshine Chief
(see Chief Sunshine)

Surprise (223)

Teddy Roosevelt
(see Roosevelt under iron)

Thomas
(see Hill-Thomas)

Three Links
(see under gold)

Three L's (204)
(see under lead)

Tom Hal
(see Friday under gold)

Tonasket (125)
(see under copper)

Tough Nut (142)

Triangle
(see Hidden Treasure under gold)

Trinidad
(see Central)

Trinity (89)
(see under gold)

Triune (96)
(see under gold)

Twin Pine (214)
(see under zinc)

Twisp View (29)
(see under gold)

Uncle Sam

Utica (118)
(see under gold)

Valley View (14)
(see under gold)

Virginia
(see under gold)

War Eagle (104)
(see under gold)

War Eagle

Warsaw
(see under gold)

Wasco (194)

Washington

Washington Consolidated
(see Mineral Hill)

Wehe (110)
(see under gold)

West King

Western Star (180)
(see under copper)

Whitestone (185)
(see under gold)

Windfall
Wolverine (26)
(see under gold)

Woo Loo Moo Loo (164)
Wyandotte (59)
(see under gold)

Wyoming (160)
(see under copper)

Yakima (172)
(see under copper)

Yellow Girl
(see under copper)

PEND OREILLE COUNTY

Ace High (19)

D. Aldrich
(see Lead King under lead)

Alger and McCullough (43)
(see under copper)

American Zinc, Lead and Smelting Co.
(see under zinc)

Baker City (49)

Barefoot (40)

Bead Lake (55)
(see under lead)

Bella May (82)
(see under zinc)

Berkin
(see Wolf Creek under lead)

Best Chance
(see Rainbow under copper)

Blazing Star
(see under gold)

Blue Bucket (34)
(see under zinc)

Blue Jim (West) (36)

Tennantite, malachite, siderite, chalcopyrite, galena, sphalerite, pyrite, chalcocite. Deposit: Zone in limestone is laced with mineralized quartz veinlets over a width of 7 to 20 ft. for an exposed length of 200 ft. Dev: 40-ft. adit, 400-ft. adit. 4 open cuts. Ref: 29, p. 43. 714, no. 5, 1908, p. 54. 158.

Bromide
(see La Sota)

Buck (62)

Bunker Hill
(see Lead Hill under zinc)

Campbell (57)
(see under copper)

Champagne-Hoosier
(see Hoosier under copper)

Clark
(see Josephine under zinc)

Cliff (1)
(see under zinc)

Comstock (54)
(see under lead)

Conquest
(see Kootenai Conquest under lead)

Copper Queen (3)
(see under copper)

Corzine (38)
(see under lead)

Cougar (20)
(see under copper)

Dan Fieldner

Deemer (17)
(see under gold)

Eagle
(see Ries under lead)

Elliot (23)
(see under lead)

Eureka (12)
(see under zinc)

Fairview Copper
(see Skippy and Queen Bess under lead)

Fissure

Flussey
(see Flussey-Hoopa under lead)

Flussey-Hoopa (6)
(see under lead)

Flying Squirrel
(see Giant-Flying Squirrel under zinc)

Galena Hill
(see Whoopee-Galena Hill under zinc)
Silver Occurrences—Pend Oreille County

General MacArthur (60)
(see under lead)

Giant-Flying Squirrel (2)
(see under zinc)

Glass
(see General MacArthur under lead)

Gold Arrow
(see Ries under lead)

Gold Coin-Hardtack (Snyder) (50)

Golden Anchor
(see Ries under lead)

Grandview (Reuther) (16)

Grandview mine (24)
(see under zinc)

Grandview Mines, Inc.
(see under zinc)

Gray Eagle
(see Hawkeye-Gray Eagle-Last Chance under copper)

Gypsy (18)
(see under copper)

Haliday (11)
(see under lead)

Hanley (4)
(see under zinc)

Hardrock Thomas (46)
(see under copper)

Hardtack
(see Gold Coin-Hardtack)

Hawkeye-Gray Eagle-Last Chance (58)
(see under copper)

Hoosier (28)
(see under copper)

Huffman
(see Mule Deer under lead)

Independence (Star) (52)

Isabelle (45)
(see under gold)

Jim Creek (37)
(see under lead)

Josephine (26)
(see under zinc)

Katydid
(see Ries under lead)

Key Fraction (51)
(see under lead)

King Tut (15)
(see under lead)

Kootenai Conquest (56)
(see under lead)

Kroll
(see Blue Bucket under zinc)

Lakeview (5)
(see under zinc)

La Sota (Silver Crest, Bromide) (41)

Last Chance
(see Hawkeye-Gray Eagle-Last Chance under copper)

Lead Hill (14)
(see under zinc)

Lead King (7)
(see under lead)

Little Noisy (39)
(see under zinc)

Lloyd (63)
(see under lead)

McCann (47)
(see under copper)

McCullough
(see Alger and McCullough under copper)

Mammoth
(see Morning and Mammoth under lead)

Metaline Contact (29)
(see under zinc)

Metaline Metals (8)
(see under zinc)

Meteor (53)
(see also Alger and McCullough under copper)
Midas
(see Ries under lead)

Morning and Mammoth (25)
(see under lead)

Mount Pisgah (64)
(see under lead)

Mule Deer (42)
(see under lead)

Nelroe (9)
(see under lead)

Nevell (66)
(see under gold)

O. K. (31)

Oriole (30)
(see under zinc)

Pat (21)
(see under lead)

Pend Oreille Mines & Metals Co.
(see under zinc)

Pindle (87)
(see under copper)

Poorman

Prouty (22)

Queen Bess
(see Skippy and Queen Bess under lead)

Rainbow (48)
(see under copper)

Reuther
(see Grandview)

Ries (61)
(see under lead)

Riverview (10)
(see under zinc)

Rocky Creek (41A)


Silver Crest
(see La Sota)

Skippy and Queen Bess (44)
(see under lead)

Slate Creek
(see Whoopie-Galena Hill under zinc)

Snowbird and Stanley (59)
(see under lead)

Snyder
(see Gold Coin-Hardtack)

Stanley
(see Snowbird and Stanley under lead)

Star (Campbell)
(see Campbell under copper)

Star (Independence)
(see Independence)

Sterling (33)
(see under zinc)

Sunrise (65)
(see under gold)

Velvet Lode
(see King Tut under lead)

Washington (27)
(see under lead)

West
(see Blue Jim)

Whoopie-Galena Hill (13)
(see under zinc)

Wolf Creek (35)
(see under lead)

PIERCE COUNTY

Bear Gap
(see Fife under gold under Yakima County)

Blazing Star
(see under gold)

Blue Bell
(see Fife under gold under Yakima County)

Blue Grouse and Sure Thing (2)
(see under gold)

Blue Star
(see under copper)

Boston
(see under gold)

Current (3)
(see under gold)

Fife (4)
(see under gold under Yakima County)

Frater (5)
(see under gold)
Silver Occurrences—Pierce County

King
(see under gold)

Lone Star
(see under copper)

Lorraine
(see under copper)

Manitau
(see Fife under gold under Yakima County)

Nell

New Deal
(see Washington cascade under gold)

Pick Handle
(see Fife under gold under Yakima County)

Silver Creek (6)
(see under gold)

Silver Creek Gold & Lead (1)
(see under gold)

Sure Thing
(see Blue Grouse and Sure Thing under gold)

Tacoma
(see under copper)

Washington Cascade (7)
(see under gold)

SKAGIT COUNTY

Alta (11)
(see under lead)

Anacopper (1)
(see under copper)

Borntite
(see North Coast under gold)

Boston (12)
(see under lead)

British
(see Skagit Queen)

Bunker Hill and Sullivan

Cascade (23)
(see under lead)

Cascade Minerals
(see under lead)

Chicago (13)
(see under lead)

Denver

Dorothy
(see Thunder Creek under lead)

Eldorado (15)

Epoch (24)
(see under lead)

Everett
(see Willis and Everett)

Everett Extension

Fidalgo
(see Stephens under copper)

Fidalgo Island (2)
(see under copper)

Fourth of July (26)

Friend (16)

Grand Republic (27)
(see under lead)

Granite (22)

Great Northern
(see under gold)

Hartford (6)
(see under lead)

Iowa-Olympia

Johnsburg (21)
(see under lead)

Kildare (17)
(see under lead)

Lakeside
(see under lead)

Logan No. 2 (10)

Marine
(see under gold)

Michigan (25)

Midas (18)

North Coast (3)
(see under gold)
Olympia
(see Iowa-Olympia)

Ontario (7)
(see under lead)

Pioneer (28)

Sierra Grande (8)
(see under lead)

Silver Tip (9)
(see under lead)

Skagit Queen (British) (4)

Soldier Boy (19)
(see under gold)

Standard

Stenmo
(see under lead)

Sullivan
(see Bunker Hill and Sullivan)

Thunder Creek (9A)
(see under lead)

Ventura (20)

West Seattle (14)
(see under lead)

Willis and Everett (5)

SKAMANIA COUNTY

Athens
(see under copper)

Bronze Monarch (12)
(see under copper)

Brown and Livingston (15)
(see under gold)

Chicago (8)
(see under copper)

Coe
(see Sweden under copper)

Copper Canyon Mines
(see Yellow Jacket and Hoo Hoo under copper)

Cross Lode

Earl
(see Samson under copper)

Gold Creek
(see Zinc Creek under zinc)

Grizzly Creek (5)
(see under gold)

Hoo Hoo
(see Yellow Jacket and Hoo Hoo under copper)

Independence (2)
(see under copper)

Index (6)
(see under copper)

Kentucky Belle

Last Chance (19)
(see under copper)

Livingston
(see Brown and Livingston under gold)

Martha Washington
(see Bronze Monarch under copper)

Minnie Alice (1)
(see under copper)

Minnie Lee (4)
(see under copper)

Mount Fairy (9)
(see under gold)

Mountain King
(see under copper)

Norway (10)
(see under copper)

Plamondon (17)
(see under gold)

Polar Star (7)
(see under copper)

Primary Gold (16)
(see under gold)

Rainbow (20)
(see under vanadium)

St. Helens
(see Sweden under copper)

Samson (3)
(see under copper)

Sweden (13)
(see under copper)
Silver Occurrences—Skamania County

Yellow Jacket and Hoo Hoo (21)
(see under copper)

Yellow Metals (11)
(see under copper)

Young America (14)
(see under copper)

Zinc Creek (18)
(see under zinc)

SNOHOMISH COUNTY

Ajax (102)
(see under gold)

Ala-Dickson (80)
(see under copper)

Allegany
(see Foggy under copper)

Alta (152)
(see under gold)

Anaconda
(see under copper)

Annie
(see under gold)

Arlington (32)
(see under copper)

Bald Mountain (33)
(see under copper)

Baltimore (70)
(see under gold)

Bangor Creek (44)
(see under copper)

Bear (153)
(see under gold)

Beatrice
(see Sunset and Beatrice under lead)

Beckler River
(see under copper)

Bell and Crown (77)
(see under copper)

Ben Lomond
(see Rainy under gold)

Bergensen
(see Taylor & Nunn under gold)

Big Bear and Butte (30)
(see under gold)

Big Copper (82)
(see under copper)

Big Four (67)
(see under lead)

Big Raymond (127)
(see under gold)

Billy Lee (154)
(see under lead)

Blackman
(see Doris under copper)

Blackstone (155)
(see under copper)

Blomquist (40)
(see under copper)

Blue Bird (2)
(see under gold)

Blue Bird (179)
(see under gold)

Blue Rock (71)
(see under copper)

Bluebell (156)
(see under gold)

Bon Ton (96)
(see under copper)

Bonanza
(see Mineral Center under gold)

Bonanza Queen (45)
(see under copper)

Bornite
(see Bangor Creek under copper)

Broken Ridge (180)
(see under copper)

Brown
(see Doris under copper)

Buckeye (209)
(see under copper)

Buckeye (9)

Bullet (42)
(see under copper)

Bullion King
(see under gold)

Bunker Hill
(see Copper Beile under copper)

Burns (4)
(see under gold)

Butte and Big Bear
(see Big Bear and Butte under gold)

Calumet
(see Glacier Peak under copper)

Calumet (143)
(see under gold)

Caplin-Holbrooke (105)
(see under gold)

Cascade (197)
(see under copper)

Cassidy (103)
(see under gold)

Castle (128)
(see under gold)

Champion (157)
(see under gold)

Charlotte (202)
(see under copper)

Clara Thompson
(see Jaspenson under gold)
Cleveland (46)  
(see under copper)

Cleveland  
(see under lead)

Colts (29)  
(see under copper)

Commonwealth  
(see Jasperson under gold)

Commonwealth  
(see under gold)

Consolidated  
(see under gold)

Cooperative (194)  
(see under copper)

Copper Belle (204)  
(see under copper)

Copper Chief (158)  
(see under copper)

Copper Cliff  
(see under gold)

Copper Independent (47)  
(see under gold)

Copper Prince (48)  
(see under gold)

Copperhead (49)  
(see under copper)

Cornucopia (68)  
(see under gold)

Corona (122)  

Courtney (17)  
(see under copper)

Crown  
(see Bell and Crown under copper)

Crown Point (159)  
(see under lead)

Dahl  
(see Eclipse under gold)

Daisy (123)  
(see under gold)

Damm  
(see under copper)

Darrington  
(see Gold Mountain under copper)

Deerfly (26)  
(see under lead)

Del Campo  
(see under gold)

Delta  
(see under copper)

Deway (181)  
(see under gold)

Diamond Hitch (129)  
(see under copper)

Dominion  
(see under lead)

Doris (144)  
(see under copper)

Dry Creek  
(see under gold)

Eclipse (50)  
(see under gold)

Edison (130)  
(see under gold)

Editor (182)  

El Dorado (97)  
(see under copper)

Elmo  
(see Gold Bar and Elmo under lead)

Emma Moore (106)  
(see under lead)

Emma No. 2  
(see under lead)

Ethel (203)  
(see under copper)

Ethel Consolidated  
(see Ethel under copper)

Etruria  
(see under lead)

Eureka (65)  
(see under copper)

Everett (51)  
(see under copper)

Evergreen (183)  
(see under copper)

Fanny (52)  
(see under gold)

Feldt (10)  

Florence-Rae (198)  
(see under copper)

Florence Rae (Rudebeck-Florence Rae) (147)  
(see under copper)

Foggy (98)  
(see under copper)

Forest Hope (5)  
(see under copper)
Fortunate
(see under gold)

Fortunate (131)
(see under gold)

"45" (Magus) (78)

Four Brothers (160)
(see under lead)

Garfield
(see under lead)

Gettysburg (161)
(see under lead)

Gift
(see under gold)

Glacier Peak (25)
(see under copper)

Glengarry

Glory of the Mountain (72)
(see under gold)

Golconda
(see under lead)

Gold Bar (132)
(see under copper)

Gold Bar and Elmo
(see under lead)

Gold Mountain (8)
(see under copper)

Gold Standard (162)
(see under gold)

Golden Chord (34)
(see under gold)

Golden Cord
(see Justice under gold)

Golden Eagle (151)
(see under molybdenum)

Good Hope (107)
(see under gold)

Granite and Maud (53)
(see under gold)

Gray Eagle (184)
(see under copper)

Gray Mare (Old Gray Mare) (11)
(probably same property as Whitehorse under zinc)
Loc: Sec. 30 (7), or SE1/4 sec. 29, (32-9E). Elev: 1,700 to 1,800 ft. Access: 9 mi. by road from Darrington. Prop: 3 claims: Snow Gulch, Gray Mare Nos. 1 and 2. Owner: W. J. Lee, Seattle, and Mrs. Charles Lawson and Earl Beman, Arlington, Wash. (1940). Ore: Silver, lead, zinc, antimony, gold. Ore min: Galena, silver sulfides, sphalerite. Deposit: Mineralized breccia zones in cherty limestone and calcareous shale. May be considerable low-grade ore. Dev: 50-ft. adit, another short adit, some surface workings. Assays: Assays, probably on handpicked samples, show 15.8 to 245 oz. Ag, 20% to 70% Pb, 1% to 3% Zn, 0.3% to 9.8% Sb, 0.01 oz. Au, 0.34% As. Ref: 58, p. 50. 157. 158.

Great Northern (87)
(see under gold)

Great Scott (124)
(see under copper)

Green Crown (12)
(see under copper)

Grizzly
(see under copper)

Gunn Peak (207)
(see under copper)

Gypsy Queen (163)
(see under lead)

Hammond
(see Keystone under copper)

Hancock (133)
(see under copper)

Hannah (13)
(see under copper)

Hard Pass (148)
(see under copper)

Hecla (35)
(see under copper)

Helena (28)
(see under copper)

Helena and Sadie (149)
(see under copper)

Hiawatha (108)
(see under gold)

Hicks
(see Sultan King under copper)

Hidden Treasure

Highland (24)
(see under copper)

J. J. Hill
(see under gold)

Holbrooke
(see Caplin-Holbrooke under gold)

Homestead
(see Cascade under copper)
**Inventory of Washington Minerals—Part II, Metallic Minerals**

Hoodoo (54)  
(see under copper)

Howard  
(see Cooperative under copper)

Hunter (18)  
(see under copper)

Idaho (164)  
(see under lead)

Imperial (55)  
(see under copper)

Independent  
(see Copper Independent under gold)

Index  
(see Lake Serene under copper)

Index Bornite (205)  
(see under copper)

Index Gold Mines, Inc. (185)  
(see under gold)

Index-Independent  
(see Lake Serene under copper)

Iowa (Mint) (145)  
(see under copper)

Iowa (Washington-Iowa)  
(see Washington-Iowa under copper)

Isabell  
(see Red Cross under copper)

J. B. (109)  
(see under gold)

Jackson  
(see St. Louis and Jackson under copper)

Jasper  
(see under lead)

Jasperson (165)  
(see under gold)

Jesse (19)  
(see under gold)

Jim Dandy (166)  
(see under gold)

Jones (178)  
**Loc:** Center N 1/2 sec. 11, (28-10E), on Elk Cr., about 5 mi. above confluence with N. Fk. Sultan R. **Elev:** 3,000 ft. **Owner:** Abandoned (1943). **Ore:** Reportedly silver-lead. **Dev:** Reportedly a shaft now obliterated by snowslides. **Improv:** Parts of a water wheel, cabin, and hoisting equipment. **Ref:** 23, p. 74.

Jones  
(see Kromona under copper)

Jumbo (134)  
(see under gold)

Junia  
(see under copper)

Justice (110)  
(see under gold)

Justin (6)  
(see under gold)

Kena and Troy  
(see Skrinde under copper)

Keystone (86)  
(see under copper)

Keystone (91)  
(see under gold)

Keywinder (20)  
(see under copper)

Kromona (200)  
(see under copper)

Lake Serene (206)  
(see under copper)

Lakeview Extension (27)  
(see under gold)

Lalla Rookh  
(see Tobique and Lalla Rookh under gold)

Lambert  
(see under copper)

Larson (1)  
(see under lead)

Last Chance (186)  
(see under gold)

Last Hope  
(see under gold)

Le Roy (88)  
**Loc:** N 1/2 sec. 19, (29-11E), Silver Cr. dist. **Access:** 10 mi. E. of Index on Mineral City road. **Owner:** Index Gold Mines, Inc. **Ore:** Silver, lead, platinum, gold. **Ref:** 158.

Lida (135)  
(see under copper)

Lily James (56)  
(see under gold)

Little Chief (81)  
(see under copper)

Little Giant (69)  
(see under gold)

Lockwood (167)  
(see under lead)

Lockwood Pyrite (88)  
(see under iron)

Lost Creek (195)  
(see under copper)

Louise  
(see Mineral Center under gold)

Lulu (57)  
(see under gold)

M and H No. 2 (168)  
(see under gold)

McCombs  
(see Jasperson under gold)

Mackinaw (90)  
(see under copper)

Magus  
(see "45")

Marguerite Mosher  
(see under copper)

Martin Engdahl (169)  
(see under lead)
Silver Occurrences—Snohomish County

Maud
(see Granite and Maud under gold)

Michigan (187)
(see under gold)

Miiki Maru (150)
(see under gold)

Milwaukee (79)
(see under zinc)

Mineral Center (136)
(see under gold)

Mineral Mines (170)
(see under copper)

Minnehaha (111)
(see under gold)

Mint
(see Iowa under copper)

Molly
(see under gold)

Monitor and Sterling (43)
(see under copper)

Monte Cristo (104)
(see under gold)

Morning Star (125)
(see under lead)

Mosher
(see Marguerite Mosher under copper)

Mountain Cedar (84)
(see under copper)

Mountain Goat
(see under lead)

Murdock
(see under lead)

Myrtle C. (7)
(see under copper)

Mystery (Monte Cristo, Pride)
(see Monte Cristo under gold)

Mystery (Mountain Cedar, Paystreak)
(see Mountain Cedar under copper)

National (137)
(see under copper)

Nemo (58)
(see under gold)

Nesta (21)
(see under copper)

Nevada (73)
(see under copper)

New Seattle (36)

New York (59)
(see under copper)

New York-Seattle (126)
(see under copper)

Nickel Bird (60)
(see under copper)

Non Pareil (196)
(see under copper)

North Star
(see Sunrise under gold)

Northwest Consolidated
(see under gold)

Nunn
(see Taylor & Nunn under gold)

O and B (92)
(see under copper)

Occidental (83)
(see under gold)

Old Gray Mare
(see Gray Mare)

Oldfield
(see Sunrise under gold)

Ontario (171)
(see under lead)

Ore Recoveries (61)
(see under copper)

Oro Fino (188)
(see under copper)

Orphan Boy (112)
(see under gold)

P. I. (189)
(see under copper)

P. and L. (93)
(see under gold)

Paystreak
(see Mountain Cedar under copper)

Peabody (113)
(see under gold)

Penn
(see Foggy under copper)

Perm
(see under gold)

Philo (99)
(see under copper)

Pride
(see Monte Cristo under gold)

Pride of Index
(see Lake Serene under copper)

Pullman
(see under lead)

Q. T. (114)
(see under gold)

Queen Anne (22)
(see under gold)

Rainy (94)
(see under gold)

Red Cloud (172)
(see under gold)

Red Cross (201)
(see under copper)

Republican (100)
(see under lead)
Ruby King (173)  
(see under gold)

Rudebeck-Florence Rae  
(see Florence Rae under copper)

Sadie  
(see Helena and Sadie under copper)

St. Louis (174)  
(see under copper)

St. Louis and Jackson (37)  
(see under copper)

Sam Strom (3)  
(see under copper)

Scriber  
(see Kromona under copper)

Seattle  
(see under gold)

Seattle  
(see New York-Seattle under copper)

Seventy Six (115)  
(see under lead)

Shirley (190)  
(see under gold)

Sidney (116)  
(see under gold)

Silver Coin (38)  
(see under gold)

Silver Creek  
(see Broken Ridge under copper)

Silver Horseshoe (66)  
Loc: SW¼ sec. 33, (30-10E). Elev: 4,500 to 4,800 ft. Access:  
A steep trail 1 mi. long from Williamson Cr. to Copper Lk. crosses the property. Prep: 10 claims: Silver Horseshoe Nos. 1 to 10. Owner: Forrest E. Wing and associates, Tacoma, Wash. (1943). Ore: Silver, lead, gold, zinc, copper. Ore min: Galena, sphalerite, chalcopyrite, pyrite, arsenopyrite, pyrrhotite, scheelite, molybdenite. Gangue: Quartz, calcite, gouge. Deposit:  
Mineralized shear zone 2 ft. wide in quartz diorite and mineralized tension fractures extending out from shear zone 5 to 6 ft., some as much as 30 ft. Dev: Open cuts. Assays: Mineralized zone est. to assay 1% to 2% Cu, 4% to 5% Zn, 3% to 4% Pb. Assays show 3.5% to 11.3% Pb, 0.04 to 0.42 oz. Au, and 4.5 to 190.3 oz. Ag. Ref: 23, pp. 47-49.

Silver Lake (117)  
(see under gold)

Silver Queen (118)  
(see under gold)

Silver Slipper (175)  
(see under gold)

Skrinde (191)  
(see under copper)

Sloman  
(see under gold)

Standard  
(see under lead)

Sterling  
(see Monitor and Sterling under copper)

Sultan King (146)  
(see under copper)

Sultan Queen  
(see Sultan King under copper)

Sunday Star  
(see under gold)

Sunrise (85)  
(see under copper)

Sunrise (14)  
(see under gold)

Sunset (199)  
(see under copper)

Sunset (74)  
(see under gold)

Sunset and Beatrice (192)  
(see under lead)

Taylor & Nunn (15)  
(see under gold)

Texas (193)  
(see under lead)

Threadwell  
(see under gold)

Three Sisters (62)  
(see under gold)

Three Star (75)  
(see under gold)

 Tobique and Lalla Bookh (95)  
(see under gold)

Trade Dollar  
(see under lead)

Troy  
(see Skrinde under copper)

Troublesome Pass  

Tum Tum  
(see Taylor & Nunn under gold)

Twentieth Century (119)  
Loc: Sec. 27, (29-11E), Monte Cristo dist. Ore: Silver, gold.

Uncle Sam (208)  
(see under copper)

Undaunted (138)  
(see under gold)

Union (76)  
(see under gold)

Vandalia (176)  
(see under lead)

Victory  
(see under gold)

Virginia (63)  
(see under copper)

Washington-Iowa (139)  
(see under copper)

Wayside (39)  
(see under copper)

Webster  
(see Jasperson under gold)
Weden Creek  
(see Mackinaw under copper)

Westland (177)  
(see under copper)

Whaleback (140)  
(see under gold)

Whistler (101)  
(see under lead)

White Gander (23)  
(see under copper)

White Swan (31)  

Whitehorse (16)  
(see under zinc)

Wilbur Index  
(see Lake Serene under copper)

Wild Rose (141)  
(see under copper)

Wildcat (120)  
(see under gold)

Winnie (142)  
(see under copper)

Winter Coon (64)  
(see under gold)

Zeta (121)  
(see under gold)

**SPOKANE COUNTY**

**Silver Hill (1)**  
(see under tin)

**STEVENS COUNTY**

A and C (117)  
(see under copper)

Abe Lincoln  
(see Comstock under lead)

Acme (158)  
(see under lead)

Acme (F. H. and C.)  
(see F. H. and C. under gold)

Admiral (219)  
(see under copper)

Admiral Consolidated (91)  
(see under zinc)

Advance (82)  
(see under zinc)

Agula (160)  
(see under lead)

**Aichan Bee (Austin, Mineral Hill, H & B) (243)**  

**AI Ki (116)**  
(see under lead)

**Aladdin (139)**  
(see under lead)

**Aladdin (Blue Ridge, Sierra Zinc)**  
(see Sierra Zinc under zinc)

**Alberta (245)**  
(see under copper)

**Alert**  
(see under gold)

**Alice**  
(see under copper)

**Alma (Black Witch) (159)**  

**Amazon (185)**  
(see under copper)

**Anaconda (96)**  
(see under lead)

**Ark (Silver Queen) (155)**  
(see also E. M. C. under lead)


**Austin**  
(see Aichan Bee)

**Avondale-Dome (127)**  
(see under lead)
Bonanza (112)  
(see under lead)
Bonanza Copper (227)  
(see under copper)
Botts (120)  
(see under lead)
Boundary Silver Lead  
(see Lucie under zinc)
Brook (164)  
Ore: Silver. Ref: 158.
Brooks (237)  
Bruce Creek  
(see A and C under copper)
W. J. Bryan  
(see Bechtol under lead)
Buck Mountain  
Buffalo (109)  
Bullion (61)  
(see under lead)
Burrus (138)  
(see under zinc)
Butte (25)  
(see under gold)
Cantaloupe (165)  
Cast Steel (76)  
(see under lead)
Cedar Canyon  
Centennial (42)  
(see under copper)
Center Star (125)  
Charity  
(see F. H. and C. under gold)
Chewelah Consolidated (178)  
(see under lead)
Silver Occurrences—Stevens County

Chewelah Eagle
(see Eagle)

Chewelah Silver
(see Fred B., under lead)

Chewelah Standard (194)
(see under copper)

Chinto (186)
(see under copper)

Chloride (223)
(see under lead)

Chloride Queen (126)
(see under lead)

City View (153)
(see under gold)

Clara (103)
(see under gold)

Cleveland (222)
(see under lead)

Clugston
(see Silver Trail under lead)

Columbia
(see Iroquois under zinc)

Columbia River (149)
(see under copper)

Columbia Tungsten (173)
(see under tungsten)

Colville Queen
(see Chloride Queen under lead)

Comstock (18)
(see under copper)

Comstock (Abe Lincoln) (56)
(see under lead)

Contention
(see Mountain View)

Copper Butte (33)
(see under copper)

Copper King (202)
(see under copper)

Copper King (85)
(see under copper)

Copper Queen (181)
(see under copper)

Copper Queen (187)
(see under copper)

Coyote (68)
(see under lead)

Coyote (Rightside)
(see Rightside under copper)

Coyotte
(see Coyote under lead)

Crow Point (47)

Daisy
(see Daisy-Tempest)

Daisy-Tempest (Silver Mountain) (166)
(includes Daisy and Tempest mines)
(see also Tempest)


Dead Medicine
(see Silver Trail under lead)

Deep Creek (79)
(see under zinc)

Deep Lake
(see Farmer under zinc)

Deer Trail (Providence, Venus) (236)
(see also Legal Tender, Providence, Hoodoo)

Defender (30)
(see under zinc)

Delmonico
(see Jay Dec)

Dora
(see Acme under lead)
Double Eagle (218)  
(see under lead)

Double Standard (57)  
(see under copper)

Douglas  
(see under tungsten)

Douglas Hunter  
(see under gold)

E. M. C. (156)  
(see under lead)

Eagle (Blue Star, Redwood, Chewelah Eagle) (203)  
(see also Redwood)

Loc: Near center N½ sec. 5, (32-41E) and sec. 32, (33-41E).

Prop: 1 patented, 7 unpatented claims, and some deeded land. 
Ore: Silver, lead, copper, zinc, gold, molybdenum. 
Ore min: Galena, tetrahedrite, sphalerite, chalcocpyrite, pyrite, pyrrhotite, cerussite, anglesite, malachite, azurite, molybdenite. 
Gangue: Quartz. 
Deposit: Irregular lenses and replacements in dolomitic limestone near granite contact. Ore bodies from a few in. to 3 or 4 ft. wide and a few ft. to 50 ft. or more long. 
Dev: Main level with more than 3,000 ft. of crosscuts and drifts. Shaft 217 ft. deep. 
Prod: Prior to and during 1909, 1911, 1925. Production to 1925 was $150,000. 

Eagle-Newport  
(see Agulia under lead)

Easter Sunday (53)  
(see under gold)

Easy Money  
(see Magma under zinc)

Echo (123)  
(see under zinc)

Edna (216)  
(see under copper)

Eldorado (102)  
(see under lead)

Eldorado (Magma)  
(see Magma under zinc)

Electric Point (86)  
(see under lead)

Enterprise  
(see under gold)

Enterprise (see Jay Dee)

Esther Hilbert  

Eureka (3)  
(see under gold)

Eureka (Uncle Sam)  
(see Uncle Sam under lead)

Eureka and Orient  
(see Eureka under gold)

Examiner  
(see under gold)

Excelsior  
(see under lead)

Express  
(see St. Paul-Express under copper)

F. H. and C. (6)  
(see under gold)

Faith  
(see F. H. and C. under gold)

Farmer (84)  
(see under zinc)

Finley  
(see under lead)

First Thought (26)  
(see under gold)

Fish (157)  

Fissure (10)  
(see under gold)

Flannigan  
(see Iroquois under zinc)

Fred B. (206)  
(see under lead)

Frisco Standard (108)  
Loc: S½ NW¼ sec. 12, (40-42E), on Jubilee Cr., just S. of international boundary. 
Elev: 3,700 ft. Access: 14 mi. by road from railroad at Boundary. 18 mi. by road from railroad at Metaline Falls. 
Prod: 9 claims, of which 7 are patented: H. R. H., Big Strike, Frisco, Buffalo, Standard, Syndicate, Boulder. 
Owner: Northport Operating Co., Olympia, Wash. (1953—). 
Ore: Silver, lead, copper, zinc, gold. 
Ore min: Galena, tetrahedrite, chalcocpyrite, sphalerite, pyrrargyrite, cerargyrite, bromargyrite, azurite, malachite, stannite. 
Deposit: Quartz veins or lenses up to 7 ft. wide in sheared graphitic schist. Veins occur along the planes of schistoities. One vein varies from a few inches to 6 ft. in width. 
Dev: 1,000 ft. of accessible workings and several caved adits. 
Improv: Cookhouse and cabins (1951). 
Assays: Sample across 5-ft. width in lower adit showed 1.00% Zn, 0.10% Pb, 0.23% Cu, 3.35 oz. Ag. 3 small shipments showed 49.2 to 72.8 oz. Ag, 7% to 18.8% Pb, 2.7% to 4.6% Cu, tr. to 0.01 oz. Au. 

Galena Farm (130)  
(see under lead)

Galena Hill (20)  
(see under lead)

Galena Knob (127A)  
(see under lead)

Galena Ridge  
(see Galena Farm under lead)

Georgie (36)  
(see under copper)

Germania (234)  
(see under tungsten)
Giant Silver
(see Red Cloud under copper)

Gillete
(see Avondale-Dome under lead)

Gladstone (87)
(see under lead)

Globe (24)
(see under copper)

Gold Bar (113)
(see under gold)

Gold Hill
(see under gold)

Gold Ledge (148)
(see under gold)

Gold Reef (147)
(see under gold)

Golden Hope
(see Sunday under gold)

Golden Reef
(see Gold Reef under gold)

Good Enough
(see Sandiego)

Goodenough (177)
Loc: Sec. 7, (33-38E), 4 mi. E. of Daisy, Kettle Falls dist.
Ore: Silver. Ref: 158.

Gorien Zinc
(see under zinc)

Graves (35)
(see under copper)

Gray Eagle
(see Highside under copper)

Great Republic (58)
(see under copper)

Grubstake

Guaranty

H & B
(see Aichan Bee)

Ham (171)
(see under lead)

Hartbauer (94)
(see under lead)

Hartford
(see Krug under copper)

Hazel (Lake View) (99)

Hecla (205)
(see under copper)

Helena Johnson (81)
(see under lead)

Hi Cliff
(see Uncle Sam under lead)

High Grade (Jay Dee)
(see Jay Dee)

High Grade (Turk)
(see Turk under copper)

Highland (106)
(see under lead)

Homebuilder (48)
(see under lead)

Homestake (45A)
(see under gold)

Honest John (212)

Hoodoo (233)
(see also Deer Trail)

Hope
(see F. H. and C. under gold)

Hope and Twin Cabins (46)
(see under copper)

Hubbard (60)
(see under lead)

Hunter
(see Jackson under zinc)

I. O. U. (150)

Ibex (129)
(see under lead)

Imperial Copper (192)
(see under copper)

Indian
(see Eureka under gold)
International (23)  
(see under gold)

Interstate  
(see under gold)

Iron Cap  
(see Ham under lead)

Iron Horse  
(see under gold)

Iron Mask (13)  
(see under zinc)

Iroquois (97)  
(see under zinc)

Jack and Jill  
Loc: Northport dist.  
Owner: Silver Mountain Mining Co.  
Ore: Silver.  
Ref: 104, 6/15/35, p. 27; 7/30/36, p. 25.

Jackson (101)  
(see under zinc)

Jay Dee (Delmonico, Enterprise, High Grade) (190)  
Loc: SW 1/4 sec. 31, (33-41E), 1/4 mi. SW of the United Copper mine.  
Elev: 2,515 ft.  
Access: 4 mi. by road NE. of railroad at Chewelah.  
Prop: 6 unpatented claims.  
Owner: Jay Dee Mining Co. (1935-1941).  
New Dominion Copper Mining & Development Co. (1966).  
High Grade Silver & Copper Mining Co. (1918).  
Enterprise Mining Co. (1922-1932).  
Ore: Silver, lead, copper, zinc.  
Ore min: Galena, tetrahedrite, sphalerite, chrysocolla, malachite, azurite, chalcocite.  
Deposit: Small quartz stringers from less than one inch to several inches wide in limestone.  
Ore minerals sparsely distributed in the quartz.  
Dev: 160-ft. shaft, 100-ft. adit with a 50-ft. winze in the adit.  
Assays: Said to carry high values in Ag.  
Ore shipped said to have netted $2600 per ton.  
Prod: Some hand-sorted ore shipped.  

Jay Gould (199)  
(see also Fred B. under lead)

Loc: Near center E 1/4 sec. 8, (32-41E).  
Elev: 2,700 ft.  
Access: 4 mi. by road E of Chewelah.  
Prop: Includes Fred B. (Chewelah Silver, Nabob) property.  
Owner: O. C. Niles (1941).  
Travelers Mining & Milling Co. (1908).  
Jay Gould Mining Co. (1907-1918).  
New Currency Mining Co. (1918-1922).  
Chewelah Silver Mining Co. (1922-1928).  
Ore: Silver, lead, zinc, copper, gold.  
Ore min: Galena, pyrite, sphalerite, chalcopyrite, some tetrahedrite, bornite, malachite.  
Deposit: Several large quartz veins and numerous small veinlets in argillite near contact with granite and basic dikes.  
Dev: 200-ft. inclined shaft, from which two levels several hundred feet long have been driven.  
Assays: DiKe reported to assay 60° or less Au.  
Ore shipped in 1939 netted $50 Ag.  
Pb.  
Prod: Production to 1920 about $6,200.  
Shipped in 1939.  

Jayhawkers (54)  
(see under copper)

John Day (W. B. Stuart) (189)  
Loc: SE 1/4 sec. 31, (33-41E), on SW spur of Eagle Mtn. just SE. of the United Copper mine, Chewelah dist.  
Ore: Silver, lead, copper.  
Ore min: Argentiferous galena, a little chalco-
pyrite and malachite.  
Deposit: A stockwork of small mineralized quartz veinlets in limestone.  
Dev: 120-ft. shaft from which several hundred feet of drifts have been driven.  
Assays: Values principally in silver.  
Prod: Has produced silver ore.  
Ref: 158.

John Hays (162)  
Loc: Sec. 22, (34-37E), Summit dist.  
Access: Near road.  
Prop: 3 unpatented claims.  
Owner: John Marty, Kettle Falls, Wash. (1941).  
Ore: Said to be silver, gold, copper, lead.  
Deposit: Quartz vein.  
Dev: 100 ft. of adit.  
Ref: 30, p. 65.

Johnny Boy  
(see Moonshine-Johnny Boy)

Juno-Echo (195)  
(see under copper)

Jupiter  
(see Last Chance under lead)

Just Time (105)  
(see under lead)

Katy  
(see Blue Grass under gold)

Kemp Komar  
(see Loon Lake under copper)

Kettle River (Galena Hill)  
(see Galena Hill under lead)

Kettle River (White Elephant)  
(see White Elephant under gold)

Key West  
(see Loon Lake under copper)

Keystone (88)  
(see under iron)

King  
(see Edna under copper)

Koyotte  
(see Rightside under copper)

Krug (175)  
(see under copper)

Lake View  
(see Hazel)

Lakeview  
(see Roosevelt)

Last Chance (80)  
(see under lead)

Lead King (90)  
(see under lead)

Leadville (121)  
(see under lead)

Legal Tender (231)  
(see also Deer Trail)

Loc: Sec. 1, (29-37E), Deer Trail dist.  
Prop: Part of Deer Trail property.  
Ore: Silver, lead.  
Ore min: Argentiferous galena, cerussite, sphalerite, silver sulphide, silver chloride.  
Galnue: Quartz.  
Deposit: Ore occurs in bunches and lenses in quartz veins in a brecciated zone parallel to the bedding of the enclosing argillite.  

Lem (51)  
(see under gold)

Liberty Copper (174)  
(see under copper)
Little Frank (235)
  (see under lead)

Little Gem

Little Giant (7)
  (see under lead)

Lone Star (64)

Longshot (141)
  (see under lead)

Loon Lake Copper (210)
  (see under copper)

Lottie (43)
  (see under copper)

Lucile (98)
  (see under zinc)

Lucky Boy (128)
  (see under lead)

Lucky Boy (Turk)
  (see Turk under copper)

Lucky Charlie (16)
  (see under copper)

Lucky Four (89)
  (see also Electric Point)

Lucky Stone (122)
  (see under lead)

M. and C.
  (see U. S. Copper Gold)

McAdoo (196)
  (see under gold)

McDonald
  (see Keystone under iron)

McKinley (4)
  (see under gold)

McKinley (39)
  (see under lead)

McNally (49)
  (see under copper)

Magma (133)
  (see under zinc)

Maple Leaf
  (see Melrose)

Margarette (1)
  (see under lead)

Maryland
  (see Bonanza Copper under copper)

Melrose (Paragon, Maple Leaf) (92)

Mexico
  (see Queen)

Michigan (27)
  (see under gold)

Michigan Boy (142)
  (see under lead)

Middleport (140)
  (see under zinc)

Mineral Belt (65)
  (see under lead)

Mineral Hill
  (see Aitchon Bee)

Minnehaha (191)
  (see under copper)

Minorca (44)
  (see under copper)

Mint
  (see under copper)

Monahan (226)
  (see under copper)

Monday Morning (135)
  (see under copper)

Montana and Washington (8)
  (see under copper)

Montgomery (201)
  (see under copper)

Moonlite
  (see Morning)

Moonshine-Johnny Boy (239)

Moore (70)
  (see under gold)

Morning (Moonlite) (134)
  (see also Monday Morning under lead)

Inventory of Washington Minerals—Part II, Metallic Minerals

**Assays:** 6 tons produced in 1948 av. 34% Pb, 30% Zn. Ore av. $30 Ag, Pb, Zn, Au. Gold values low. Prod: 1929, 6 tons in 1948. Note: Probably this is the same as the Morning property. Ref: 13, p. 127. 36, p. 89. 46, p. 114. 68, p. 14. 97, 1929, p. 428. 110, 7/48, p. 5. 111.

**Morning Star**
(see under gold)

**Mountain View (Contention) (66)**

**Mountain View Extension (67)**

**Mullen (207)**
(see under lead)

**Myerah (110)**
(see under lead)

**Myrtle**
(see under lead)

**Nabob**
(see Fred B. under lead)

**Nellie S.**
(see Chewelah Standard under copper)

**Nest Egg (32)**
(see under gold)

**Nevada (215)**
(see under lead)

**Newland**
(see Longshot under lead)

**Newport**
(see Aguilla under lead)

**Niles (197)**
(see under lead)

**Noble Four**
(see under copper)

**Norman King**
(see under lead)

**North Monitor (225)**

**Northern Light (74)**
(see under lead)

**Northport**
(see Deep Creek under zinc)

Norway King
(see under lead)

Oakshott (136)
(see under lead)

Old Abe
(see under copper)

Old Dominion (145)
Loc: Near NW. cor. sec. 9, (35-40E). Elev: 2,925 to 3,375 ft. Access: 7½ mi. by road from railroad at Colville. Prop: 10 patented claims, including: Ella, Reeves, Old Dominion, Ophir Boy, Tillie P. Also 700 acres of deeded land, and 4 unpatented claims: Chickamin, Cheechaco, Friday No. 1 and No. 2. Owner: E. B. Gibbs and I. M. Hunley, Colville, Wash. (1949—). Old Dominion Mining & Milling Co. (1892-1918). Dominin Silver-Lead Mining Co. (1918-1925). Ore: Silver, lead, zinc. Ore min: Galena, cerusite, anglesite, sphalerite, secondary silver sulfides, native silver, stephanite, tetrahedrite. Gangue: Quartz, calcite, siderite, dolomite. Deposit: Irregular lenticular ore bodies in limestone 6 in. to 10 ft. wide. Ore has been found at places 2,500 ft. apart. Richest ore was near the surface and has largely been mined out. Dev: About 8 mi. of workings on at least 11 levels. Assays: Shipments from upper workings showed the ore to contain 100 to 400 oz. Ag and 13% to 60% Pb. A 10-ft. width reported to show 98.3 oz. Ag, 12% Pb, 10.4% Zn. Ore contains trace of galium. Pred: More than $625,000 by 1920. One report says about $2,000,000 was produced prior to 1897. $20,000 produced 1924. Produced 1936-1940. Ref: 7, pp. 126-130. 12, pp. 16, 72, 13, p. 118. 36, p. 52. 63, p. 112. 73, pp. 120-123. 97, 1907, 1915, 1921, 1923-1925, 1928, 1929, 1935-1941. 98, 1920-1925. 104, 5/15/34, p. 34. 166, no. 16, 1921, pp. 1-2. 112, pp. 176, 195, 141, pp. 26, 22. 158. 164, pp. 171-173.

O-Lo-Lim (246)
(see under copper)

O'Neal
(see Rightside under copper)

Ora
(see under copper)

Orazada (244)

Orchid (221)

Ore Cache (144)
(see under lead)

Orient Eureka
(see Eureka under gold)

Oro Cache
(see Ore Cache under lead)
Owen
(see Lucile under zinc)

Paragon
(see Melrose)

Payne (189)
(see under copper)

Pedivar

Pedro (40)
(see under gold)

Perry (2)
(see under lead)

Pioneer
(see Longshot under lead)

Plata Fino (240)

Plata Rica (241)

Plug (83)
(see under zinc)

Pomeroy (52)
(see under zinc)

Pop (37)
(see under copper)

Providence (232)
(see also Deer Trail)

Providence (63)
(see under lead)

Quadra
(see under gold)

Queen (Silver Queen, Queen & Seal, Mexico, Silver Basin, Silver Seal) (238)

Queen & Seal
(see Queen)

R. J. (116)
(see under lead)

Rainbow

Ranch View (100)
(see under lead)

Rattler

Reardon Copper
(see Turk under copper)

Red Cloud (230)
(see under copper)

Red Lion (22)
(see under copper)

Red Sheaf (114)
(see under gold)

Red Top (93)
(see under lead)

Redwood (204)
(see also Eagle)

Regina (50)
(see under copper)

Rightside (152)
(see under copper)

Rinchaw
(see Middleport under zinc)

Riverview (71)
(see under lead)

Robena
(see Young America under zinc)

Rockcut (15)
(see under lead)

Rocky Creek
(see Burrus under zinc)
Rocky Lake (161)
(see under molybdenum)

Roosevelt (Lakeview) (104)

Rosebud (163)
(see under lead)

Royal
(see Big Chief under lead)

Royal Gold
(see Hubbard under lead)

St. Crispin (69)
(see under gold)

St. Paul-Express
(see under copper)

Sandiego (Good Enough) (224)

Santa Rita
(see Cleveland under lead)

Saratoga
(see under gold)

Saturday Night-Sunday Morning (242)
(see under lead)

Scandia (78)
(see under zinc)

Schenk
(see Rightside under copper)

Scott (137)
(see under gold)

Seal
(see Queen)

Second Thought (28)
(see under gold)

Security Copper (193)
(see under copper)

Shoemaker (143)
(see under zinc)

Short Wait (62)
(see under lead)

Sierra Zinc (132)
(see under zinc)

Silent Bell
(see Pop under copper)

Silver Basin
(see Queen)

Silver Crest

Silver Crown (75)
(see under lead)

Silver Horde

Silver Key
(see Big Chief under lead)

Silver King
(see under lead)

Silver Mountain
(see Daisy-Tempest)

Silver Queen
(see Queen)

Silver Queen (Ark)
(see Ark)

Silver Seal
(see Queen)

Silver Summit (172)
(see under lead)

Silver Trail (115)
(see under lead)

Silver Wave
(see under lead)

Smoky Bullion
(see A and C under copper)

Snowstorm

Snyder and Baxter

Squire
(see under lead)

Star
(see Just Time under lead)

Steel Galena
(see Ham under lead)

Stemwinder (19)
(see under copper)

Sterrett (73)
(see under lead)

Stockwell
(see Columbia Tungsten under tungsten)

Stonewall-Sunnyside (77)
(see under lead)

W. B. Stuart
(see John Day)

Sugar Loaf
(see Vanasse)

Summit
(see Silver Summit under lead)

Sunday (151)
(see under gold)

Sunday Morning
(see Saturday Night-Sunday Morning under lead)

Sunday Morning Star
(see Sunday under gold)

Sunnyside
(see under gold)
Sunnsyde (Stonewall-Sunnsyde)  
(see Stonewall-Sunnsyde under lead)

Sunset (72)  
(see under lead)

Superior Copper (214)  
(see under copper)

Surprise  
(see Uncle Sam under lead)

Swamp King (9)  
(see under gold)

Syndicate  
(see under copper)

Tempest (168)  
(see also Daisy-Tempest)  
Loc: Sec. 7, (33-38E), Kettle Falls dist.  
Prop: 6 claims:  
Tempest, Master, Crown Point, Great Eastern, Eureka, Wild Rose.  
Owner: Consolidated Silver Mountain Mines Co., Ltd.  
Tempest Consolidated Mines Co. (1924-1926).  
Ore: Silver, gold, copper, zinc.  
Ore min: Sphalerite, chalcoprite, pyrite.  
Gangue: Quartz.  
Deposit: 2 sparsely mineralized veins 4 and 12 ft. wide in quartzite, argillite, and diorite.  
Prod: Has produced.  
104, 6/30/32, p. 18; 7/30/32, p. 19.  
106, 11/17/32.  
129, pp. 140-143.  
164, pp. 229-231.

Tenderfoot (Avondale-Dome)  
(see Avondale-Dome under lead)

Tenderfoot (Big Chief)  
(see Big Chief under lead)

Thomason Queen (180)  
(see under copper)

Three Orphans (17)  
(see under lead)

Titanic (24)  
(see under gold)

Togo (228)  
(see under copper)

Tom Moore (11)  
(see under lead)

Treadwell  
(see Iron Mask under zinc)

Trojan (31)  
(see under gold)

Tungsten King (211)  
(see under tungsten)

Turk (229)  
(see under copper)

Twin Cabins  
(see Hope and Twin Cabins under copper)

U. S. Copper Gold (M. and C.) (200)  
Elev: 2,550 to 2,850 ft.  
Access: 4 mi. by road E. of Chewelah.  
Prop: 2 claims: Expert, Grace.  
Ore: Silver, copper, gold.  
Ore min: Chalcoprite, pyrite, malachite, azurite, limonite.  
Deposit: 4-ft. quartz vein cutting metamorphics.  
Dev: 340-ft. adit, a shorter adit.  
Assays: Carload of ore shipped in 1917 reported to assay 4% Cu. 20 oz. Ag, $2.50 Au.  
Prod: One car in 1917.  
Ref: 7, p. 107.  
30, pp. 37-38.  
33, 1907, p. 517.  
68, p. 17.  
163, p. 161.

Uncle Sam (38)  
(see under copper)

Uncle Sam (Hi Clif) (119)  
(see under lead)

United Copper (188)  
(see under copper)

United Silver Copper  
(see United Copper under copper)

United Treasure (107)  
Loc: Near center sec. 11, (40-42E), on E. side of Fish Cr.,  
1 mi. W. of Frisco Standard property, Russian Cr. area.  
Elev: 3,450 ft.  
Access: 11 mi. E. of railroad at Boundary, by Cedar  
Cr. road.  
Prop: 4 unpatented claims.  
Owner: Singlejack Silver Mining Exploration Co., Wm. and Richard Weaver, Spokane,  
Wash. (1853—).  
Ore: Silver, lead, zinc, copper, gold.  
Ore min: Tetrahedrite, galena, sphalerite, azurite, malachite, pyrite.  
Gangue: Quartz, carbonates.  
Deposit: Irregular vein zone of quartz having a max. width of 4 ft. cuts slates. Thin lamprophyre  
dike above the vein zone.  
Dev: 1,000 ft. of shallow adits and cuts and one 800-ft. adit.  
Assays: Best values in silver.  
2 tons of hand-sorted ore av. 117 oz. Ag per ton.  
Prod: 62 tons in 1917.  
2 tons in 1933, 1935.  
Ref: 30, p. 114.  
73, pp. 104-105.  
97, 1917, 1918, 1926, 1934.  
158, pp. 60-61.  
158, 164, pp. 303-304.

Valley Dew  
(see Titanic under gold)

Valley View (169)  
Loc: Sec. 7, (33-38E), 4 mi. E. of Daisy.  
Ore: Silver.  
Ref: 158.

Van Stone (131)  
(see under zinc)

Vanasse (Sugar Loaf, Victory) (146)  
Loc: S1/4NE1/4 sec. 10, (36-38E), Kettle Falls dist.  
Prop: 240-acre State lease.  
Owner: Luther Vanasse, Colville, Wash. (1951—).  
Ore: Silver, gold, lead, copper, antimony.  
Ore min: Chalcoprite, tetrahedrite, galena, sphalerite, stibnite, bornite, pyrite.  
Deposit: Mineralized quartz veins in arkose and  
quartzite. Veins from 1 to 6 ft. wide. In general, zinc, lead, and  
copper minerals predominate.  
Dev: 9 shafts 7 to 20 ft. deep and one 65 ft. deep.  
Also some bulldozer trenches. Diamond  
drilling.  
Assays: Assays on picked samples as high as 14% Pb,  
6% Cu, $4.00 Au, 140 oz. Ag.  
One 16-in. vein shows about 4% stibnite.  
Ref: 36, p. 57.  
132, p. 145.  
133, p. 41.

Venus  
(see Deer Trail)

Victory  
(see Vanasse)

Viking (21)  
(see under copper)

Vulcan (217)  
(see under copper)

Wahkiagin (170)  
Loc: Sec. 7, (33-38E), Summit dist.  
Owner: Silver Mountain Mining Co. (1918-1924).  
Ore: Silver.  
Ref: 112, p. 203.

War Eagle (45)  
(see under gold)

Washington  
(see Montana and Washington under copper)
Wellington  
(see under lead)

Wells Fargo (220)  
(see under antimony)

Western Molybdenum  
(see Juno-Echo under copper)

White Elephant (5)  
(see under gold)

White Horse (59)  
(see under copper)

Wilkie Lode (183)  
(see under lead)

Windfall (208)  
(see under copper)

Winslow (182)  
(see under lead)

Woohaa  
(see Bechtol under lead)

Young America (111)  
(see under zinc)

WHATCOM COUNTY

Allen Basin (16)  
(see under gold)

Anacortes (12)  
(see under gold)

Azurite (27)  
(see under gold)

B. C. & M. (26)  
(see under gold)

Beck and Short Grub (17)  
(see under gold)

Bismarck (21)  
(see under gold)

Bonita  
(see New Light under gold)

Boundary Gold  
(see Lone Jack under gold)

Brooks-Willis  
(see Lone Jack under gold)

Chain Lakes (4)  
(see under zinc)

Chancellor (14)  
(see under gold)

Crown Point (13)  
(see under gold)

Eureka  
(see New Light under gold)

Evergreen (7)  
(see under gold)

Galena  
(see Veronias under gold)

Gargett (6)  
(see under gold)

Glacier  
(see Midas under copper)

Gold Hill (Northern Cascade, Peterson) (28)  

Gold Run  
(see under gold)

Golden Arrow  
(see Tacoma under gold)

Great Excelsior (3)  
(see under gold)

Indiana  
(see Chancellor under gold)

Lambert  
(see Lone Jack under gold)

Lestrud  
(see Tooter-Lestrud)

Lincoln  
(see Great Excelsior under gold)

Lone Jack (8)  
(see under gold)

Mammoth (18)  
(see under gold)

Midas (1)  
(see under copper)

Monica  
(see New Light under gold)

Morley B. (25)  
(see under gold)

Morovitz  
(see under gold)

Mount Baker  
(see Lone Jack under gold)

New Light (19)  
(see under gold)

Nineteen-nine (15)  
(see under gold)

North American (20)  
(see under gold)

Northern Cascade  
(see Gold Hill)

Peterson  
(see Gold Hill)

Post-Lambert  
(see Lone Jack under gold)

President  
(see Great Excelsior under gold)
Rockefeller
   (see under gold)
Saginaw (9)
   (see under gold)
Shanghai (22)
   (see under gold)
Short Grub
   (see Beck and Short Grub under gold)
Silver Creek (11)
   (see under molybdenum)
Silver Tip (10)
   (see under copper)
Slate Creek
   (see New Light under gold)
Tooker-Lestrud (2)
   Baker highway about 1 mi. E. of the Excelsior power house.
   Preps: 9 claims: Waldo Nos. 1 and 2, Partridge, Victory, Liberty
   Bell, Elhine, Robert Lee, Pay Day, Lucky Adrians. Owner:
   Vernon Lestrud and Ray Tooker, Bellingham, Wash. (1944).
   Ore: Silver. Ore min: Pyrite, marcasite. Deposit: A zone of
   oxidized pyrite 10 to 25 ft. or more wide. The pyrite zone is in
   schistose volcanic rocks and sediments. Assays: Spectrographic
   analysis showed 2.9 oz. Ag. Ref: 158.
Tyler
   (see Veradell under gold)
Velvet
   (see North American under gold)
Veradell (24)
   (see under gold)
Verona (5)
   (see under gold)
Whistler (23)
   (see under gold)
White Swan
   (see under gold)
Willis
   (see Lone Jack under gold)
Yellow Aster
   (see under nickel)

YAKIMA COUNTY

Bear Gap
   (see Fife under gold)
Blue Bell
   (see Fife under gold)
Chinook (8)
   (see under copper)
Comstock (1)
   (see under gold)
Copper Mining Co. (11)
   (see under copper)
Crown Point
   (see under gold)
Damfino (2)
   (see under gold)
Dry Spring (3)
   (see under gold)
Elizabeth Gold Hill (7)
   (see under gold)
Eva
   (see under gold)
Fife (4)
   (see under gold)
Gold Hill (5)
   (see under gold)
Highland (9)
   (see under gold)
Lolette (6)
   (see under gold)
Manitou
   (see Fife under gold)
New Find (12)
   (see under copper)
Pickhandle
   (see Fife under gold)
Richmond (10)
   (see under lead)

SODIUM

Properties—Sodium is a silver-white metal which is
lustrous when freshly cut but rapidly darkens in air. It
is lighter in weight than water, ductile, malleable, and
at room temperatures is nearly as soft as wax but is fairly
hard and brittle at -20° C. The metal is a good con-
ductor of heat and electricity, being exceeded in these
properties only by silver, copper, gold, and possibly potas-
sium. Weight for weight, it is three times as conductive
as copper. Sodium is univalent, and its chemical prop-
erties are similar to those of potassium. Except for the
silicates, almost all sodium salts are soluble in water.
The metal is very reactive, oxidizing rapidly in air, and
decomposing water with explosive violence; thus it must
be kept in an oxygen-free environment, usually in kero-
sene. Other properties are shown in the table on page 12.

Uses—The softness and chemical activity of sodium
make it unlikely that the metal will have much value
for the structural and mechanical uses characteristic of
ordinary metals; however, the metal does have some
important chemical uses. Formerly it was used as a
reducing agent in producing aluminum and magnesium,
and it has been considered for use in producing titanium.
It now has important use as a reducing agent in making
tetraethyl lead, vat-dye indigo, and in other organic
syntheses. The metal has minor uses in sodium-vapor
lamps, as a scavenger, to desulfurize petroleum, to dehy-
drater ether, and as an amalgam with mercury in platinum
mining to recover platinum, which does not amalgamate
with mercury alone. The metal has a low melting point,
and the liquid can be used as a heat-transfer medium
in power plants. Very minor use has been made of so-
dium alloys, but sodium salts have a great many very
important industrial uses.
Production— Metallic sodium production in the United States rose from some 5,000 tons in 1929 to an estimated 8,000 to 10,000 tons in 1945. In 1950 there were two producing plants, one in Delaware and one in New York City. Washington has had a very small production of sodium salts, and in 1945 approximately 20,000 pounds of sodium metal was produced at the plant at Mead which was originally built for the production of magnesium.

Prices—In the 1880's, when sodium metal was used in the production of aluminum, it sold at about $3.40 per pound, but later the price dropped considerably, and during World War I it was about 30 cents per pound. The price had dropped to 26½ cents by 1921 and to 15 cents by 1929. The 1945 price was 15 cents per pound, in drums, in carload lots, and the average price for 1951 was 16½ cents, which also was the price quoted in June 1885.

Ore minerals and geology—Sodium makes up more than 2.8 percent of the earth's crust, mostly in the form of silicates, in which it is not economically available for extraction. The solids dissolved in sea water are about two-thirds sodium chloride. Common soluble sodium minerals are halides, carbonates, and sulfates. Most sodium compounds and probably all sodium metal are made from common or rock salt, which is sodium chloride, NaCl, containing 39.4 percent sodium. Halite (the mineral name for common salt) in Washington occurs only as a mineral curiosity in infinitesimal quantity at Sulphate Lake, Grant County. Sodium carbonate and sulfate minerals found in the state are mirabilite, Na₂SO₄·10H₂O; thenardite, Na₂SO₄; trona, Na₂CO₃·NaHCO₃·2H₂O; and natron, Na₂CO₃·10H₂O. These are soluble salts which have accumulated by evaporation of closed-basin lakes. Some salt waters have been encountered in deep wells in the state, but none of the brines have been concentrated enough to appear to have value as a source of sodium compounds.

Occurrences

Occurrences of sodium carbonate and sodium sulphate minerals are described under saline compounds in Part I of this report.

Strontium

Properties—Strontium is a hard silver-white metal which quickly becomes yellow on exposure to air. It is photoelectric and reacts readily with oxygen and water. Strontium, barium, and calcium make up the group of metals known as the alkaline-earth metals. They and their compounds are very much alike chemically and physically. Strontium is always bivalent. Its salts give a brilliant crimson color to a flame. Other properties are shown in the table on page 12.

Uses—About the only use of strontium metal is in blue-green-sensitive photoelectric cells and in alloys with barium, aluminum, and magnesium which are used as "getters" to remove residual gases from evacuated electronic tubes. Strontium compounds are used for red signal flares, fireworks, and tracer bullets. Other uses are in medicines, iridescent glass, sugar refining, pigments, as a filler, and as a substitute for barite as a weighting agent in oil-well drilling mud. Strontianite has been used for desulfurizing and dephosphorizing steel.

Production—In 1950 there were reported only two domestic producers of the metal. These were in Cleveland, Ohio, and Syracuse, New York. The Alverson strontianite-celestite deposit in western Skagit County has had intermittent small production, but no strontium metal has ever been produced in this state.

Prices—Strontium metal sold at from $15 to $30 per pound from 1943 to 1945. In 1949 and 1950 strontium was quoted at $10 per pound in 500-pound lots for cast billets and $11 per pound for extruded rods. In 1951 prices quoted were from $7.50 to $35 per pound, probably depending upon purity.

Ore minerals and geology—Although at least ten strontium minerals are known, the only two which are ores of the element are the sulfate, celestite, SrSO₄, containing 56.4 percent SrO, and the carbonate, strontianite, SrCO₃, containing 70.2 percent SrO. Celestite occurs as a gangue mineral in hydrothermal veins, as disseminated replacement deposits in limestone, as sedimentary beds, and as a chemical precipitate which may or may not be associated with saline minerals. Strontianite occurs as a secondary alteration product of celestite and as veins and nodules in limestone, marl, and shale.

Occurrences

Occurrences in Washington of strontianite and celestite, the ore minerals of strontium, are described under miscellaneous nonmetallic minerals in Part I of this report.

Tantalum

See columbium (niobium) and tantalum on page 44.
Tellurium is a semi-metallic member of the sulfur group of elements, and like the other members of the group it is allotropic, occurring in a crystalline and an amorphous form. The amorphous form is as dark gray to brown lustrous powder, and the other form is as silver-white lustrous brittle metallic crystals. In its chemical reactions it is similar generally to sulfur and selenium. Other properties are shown in the table on page 12.

Uses—Tellurium may be substituted for selenium in many applications. Its chief use is in rubber goods, to increase tensile strength and resistance to heat and abrasion. In metallurgy it is used to improve the machining qualities of certain steels; to harden, strengthen, and add acid-resistance to lead and lead alloys; as a substitute for chromium, to produce wear-resistant surfaces on cast iron; to make special alloys of marked electrical resistance; and in making thermocouples. Added to copper and copper alloys, tellurium improves machinability without inducing hot-shortness. It is used to remove cobalt from zinc solutions prior to electrolytic deposition of zinc, and a tellurium reagent is used to produce a black finish on silverware. Tellurium is used in staining glass and china, and has restricted use in toning photographic prints and in electrical rectifiers. Of historical interest are past uses as crystal detectors in radios and as diethyl telluride in high-octane gasoline, the latter use now being taken over by tetraethyl lead.

Production—The United States output comes from four plants in Maryland, New Jersey, and Indiana. It is a by-product of lead smelting, and, with selenium, is recovered in electrolytic refining of copper. United States production of tellurium during the period 1940 to 1950 varied greatly from year to year but averaged about 100,000 pounds per year. Tellurium is not produced in Washington.

Prices—From 1920 to 1936 the price of tellurium remained at $2 per pound or a little more, and since that time it has remained practically steady at $1.75 per pound.

Ore minerals and geology—Most tellurium occurs as impurities in other ores, especially in chalcopyrite copper ores, but it has been found associated with selenium in sulfatatic deposits. Tellurium occurs sparsely in the free state associated with gold and silver, but it is usually combined with gold, silver, lead, bismuth, nickel, and copper as tellurides. It is one of the few elements that combine with gold. Secondary tellurium minerals are the oxide and a few rare tellurates or tellurites. Some of the better known tellurides are sylvanite, (Au,Ag)Te₂, containing 58 to 62 percent tellurium; petzite, (Au,Ag)Te₂, containing 32 to 35 percent tellurium; calaverite, Au₄Te₄, containing 56 to 68 percent tellurium; and tetradytite, Bi₂Te₄, containing 39 to 49 percent tellurium.

The map showing the numbered tellurium occurrences is plate 18, on page 47 in volume 2.

**FERRY COUNTY**

- Ada
  (see Laura S. under lead)
- Grandview (3)
  (see under lead)
- Knob Hill (1)
  (see under gold)
- Laura S. (4)
  (see under lead)
- Morning Glory (2)
  (see under gold)
- Old Gold
  (see Morning Glory under gold)

**KANOGAN COUNTY**

- Bellevue (2)
  (see under gold)
- Calumet (1)
  (see under gold)
- Wolverine (3)
  (see under gold)

**TEVENS COUNTY**

- Beecher (1)
  (see under gold)

**WHATCOM COUNTY**

- Anacortes (5)
  (see under gold)
- Bonita
  (see New Light under gold)
- Boundary Gold
  (see Lone Jack under gold)
- Brooks-Willis
  (see Lone Jack under gold)
- Eureka
  (see New Light under gold)
- Great Excelsior (1)
  (see under gold)
- Lambert
  (see Lone Jack under gold)
- Lincoln
  (see Great Excelsior under gold)
- Lone Jack (2)
  (see under gold)
- Lone Star (3)
  (see under gold)
- Mammoth (6)
  (see under gold)
- Monica
  (see New Light under gold)
- Mount Baker
  (see Lone Jack under gold)
New Light (7)  
(see under gold)

Ninety-nine (8)  
(see under gold)

Post-Lambert  
(see Lone Jack under gold)

President  
(see Great Excelsior under gold)

Slate Creek  
(see New Light under gold)

Tacoma (9)  
(see under gold)

Terra Alta (4)  
(see under gold)

Willis  
(see Lone Jack under gold)

**THORIUM**

Properties—Thorium is a soft heavy gray metal which is malleable and difficultly fusible. It is strongly radioactive, emitting alpha, beta, and gamma rays. It is very resistant to chemical action and in many respects resembles platinum, but its chemical compounds are analogous to those of zirconium. Other properties are given in the table on page 12.

Uses—Formerly, and even yet, the greatest use of thorium was for treating gas-light mantles to improve their light-giving quality. An important present use for thorium is for electron-emissive elements in radio tubes. Thorium is alloyed with tungsten for use in electric-light filaments. It is used in high-temperature refractories, in polishing compounds, as X-ray targets, as a catalyst, and in medicine. It has limited use in optical glass. Alloyed with magnesium it adds strength, and to resistance-heating alloys it adds longer life. Thorium is a radioactive metal which is a potential source of nuclear energy.

Production—In 1950 a few tens of thousands of pounds of thorium compounds were produced in the United States, mostly by two plants, one in Illinois and the other in New Jersey. Thorium metal production was negligible. The production of thorium compounds was as a byproduct of the recovery of cerium and other rare earths from monazite—just the reverse of the situation some years ago, when there was little demand for cerium but thorium was used in much larger quantities in gas-mantle manufacture.

Prices—Thorium metal prices are seldom quoted, but the 1951 price varied between $159 and $318 per pound. Thorium nitrate was quoted in 1950 at $3.50 per pound, at which price it has been since the latter part of 1947, before which it was $2.00. In 1950 thorium oxide, 97 percent ThO₃, was $5.00 per pound, and 99 percent ThO₂ was $10.00 per pound. In 1955 the Atomic Energy Commission was offering about $4.00 per pound for ThO₃ in material concentrated to 50 percent ThO₂ and was buying mechanical concentrates of thorium minerals (other than monazite) containing 10 percent or more ThO₂. Quotations on monazite sand, 8 percent minimum ThO₃, dropped from a high of $252 per ton in 1920 to a low of $50 in 1933 and then rose to $60 and remained there through 1946. Increased interest in thorium and restriction of foreign supplies initiated a price rise in 1947 which had brought the price to $340 per ton by 1950.

Ore minerals—The principal ore mineral of thorium is monazite, the rare earth phosphate (Ce,La,Di)PO₄, which almost always contains some thorium, probably as a silicate. The thorium content commonly is from 3 to 10 percent, but as much as 26 percent has been reported. Monazite is found in Washington, and another thorium-bearing mineral which has been reported in the state is allanite (orthite), a complex silicate of aluminum, iron, calcium, and rare earth, which contains up to 3.5 percent ThO₂. Seventy or more minerals contain thorium in small to large percentages. These minerals are silicates, oxides, phosphates, fluosilicates, titanates, and columbo-tantalates. Of these, the silicates are most numerous.

Geology—Monazite is widely but sparsely distributed in granites, gneisses, and pegmatites. The mineral is almost always disseminated and rarely makes up more than a very small fraction of 1 percent of the host rock. The only common type of concentration is in placer stream gravels and beach sands.

**OCCURRENCES**

**GRAYS HARBOR COUNTY**

Moclips Placer (1)  
(see under cerium)

**DOUGLAS COUNTY**

Columbia River Placer  
(see under gold, placer)

**FERRY COUNTY**

Sherman Creek Pass (2)  
(see under uranium)

Wilmont Bar Placer (1)  
(see under gold, placer)

**KING COUNTY**

Seattle Placer  
(see under gold, placer)

Snoqualmie  
Loc: Within the area of the Snoqualmie folio, near Snoqualmie Pass, in eastern King County. Ore: Thorium, cerium, uranium (?). Deposit: A little allanite occurs as an accessory mineral in the Snoqualmie granodiorite. Ref: 146, p. 8.
OKANOGAN COUNTY

Happy Hill (1)
(see under uranium)

PEND OREILLE COUNTY

Dry Canyon (1)
Loc: In Dry Canyon, which is 2 to 3 mi. E. of Pend Oreille R.
The canyon is 10 mi. long, and its N. end is 3 mi. E. of Ione.

Properties—Tin is a very soft, very malleable, ductile metal having only slight tenacity and exhibiting an attractive lustrous silver-white color. It is easily fusible and alloys readily with other metals. It is corrosion resistant and at ordinary temperatures is only very slightly acted upon by air or water. Tin has three crystalline forms. The ordinary form is unstable below 18° C., and at lower temperatures it crumbles to a gray powder. This change is known as the “tin disease” or “tin plague.” Other properties are shown in the table on page 12.

Uses—In 1950 the largest use for tin was in tin plate, which accounted for 34 percent of the total. Other important uses were in solder (27 percent), bronze and brass (20 percent), and hambitt (6 percent), followed in decreasing order of importance by tinning, type metal, chemicals, miscellaneous alloys, collapsible tubes and foil, bar tin, terneplate, and pipe and tubing.

Production—In the United States, production of tin is negligible, amounting to only a small fraction of 1 percent of the consumption. Most of this production comes from Alaska, although a little recovery is made from the traces of tin which are found in the Climax molybdenum ore. A Government-owned smelter has been operating at Texas City, Texas, since 1941, but prior to that time there were no smelting facilities in the United States. Although tin is known to occur in a few places in Washington, to date there has been no production. However, 150 tons of ore estimated to carry 6 percent tin were mined but not shipped in 1907 from the Silver Hill property a few miles south of Spokane.

Prices—Tin prices have fluctuated over a wide range in the past 60 years, from a low average annual price of 13.7 cents per pound in 1897 to a high of $1.28 in 1951. During the war years, 1941 to November 1946, the price was held by Government order at 52 cents. The price continued to be Government-regulated for some time thereafter but rose by steps to $1.03 by September 1949. Twelve decreases brought the price down to 74.12 cents per pound by February 1950, but a year later the price was up to an all-time high of $1.82, only to drop back to $1.03 by August of the same year, and rise again to $1.21½ by January 1952, where it remained for more than a year. The 1954 price averaged about 90 cents, and the price in June 1955 was $1.16½ cents per pound.

Ore minerals—Tin very rarely occurs native. There are only two important ore minerals of tin, and these by far the more important is the oxide, cassiterite, SnO₂, containing 78.6 percent tin. The other is the copper-iron-tin sulfide, stannite, Cu₂S·FeS·SnS₃, containing 27.5 percent tin. At least nine other tin minerals are known, but only one of these—the lead-tin sulfide, teallite, PbSnS₃—is found in sufficient quantity, and then rarely, to be mined as tin ore.

Geology—All primary tin deposits are genetically related to siliceous igneous rocks such as granites or pegmatites. Tin occurs rarely in contact metamorphic deposits, but most primary tin deposits are pegmatites or hydrothermal or pneumatolitic veins which have formed under high temperature and pressure at great depths. Tin minerals are commonly associated with tungsten and molybdenum, and gangue minerals are quartz, fluorite, tourmaline, or muscovite. Because cassiterite is resistant to alteration and has high specific gravity it is readily concentrated in placer deposits, and about 75 percent of the world’s tin production is from such deposits. Tin placers commonly carry 0.4 to 5 pounds of tin per cubic yard, and lode deposits usually run from 1 to 8 percent tin. The sulfide vein deposits in Bolivia carry 1 to 2 percent tin.

Occurrences

The map showing the numbered tin occurrences is plate 21, on page 55 in volume 2.

CHELAN COUNTY

Blewett (3)

Chelan Butte (1)

Monitor (2)
Loc: Sec. 23, (23-19E), near Monitor. Ore: Tin. Deposit: Tin is reported in an andesite dike, but the occurrence is doubtful. Ref: 111.

Peshastin Creek

CLALLAM COUNTY

Bright Angel (1)
(see under manganese)
KING COUNTY

Bear Basin (2)
(see under silver)

Skykomish (1)

KITSAP COUNTY

Chico (Cook-Kitchen) (1)

Cook-Kitchen
(see Chico)

Kitchen
(see Chico)

OKANOGAN COUNTY

Omak (1)
Loc: Just N. of American Graphite claims, which are in sec. 27, (34-29E). Ore: Tin reported. Assays: High percentage reported. Ref: 158.

PEND OREILLE COUNTY

Blueside (1)

SNOHOMISH COUNTY

Hoodoo (1)
(see under copper)

Ore Recoveries
(see Hoodoo under copper)

Snohomish Placer (2)

SPOKANE COUNTY

Silver Hill (1)

STEVENS COUNTY

Dumbolton (3)
(see under gold)

Frisco Standard (1)
(see under silver)

Loon Lake
(see Tungsten Products under tungsten)

Tungsten Products (4)
(see under tungsten)

Young America (2)
(see under zinc)

WALLA WALLA COUNTY

Mill Creek Placer
Loc: At Mill Cr., 12 mi. E. of Walla Walla. Ore: Tin reported. Deposit: This reported occurrence is most doubtful. Ref: 105, 5/07, p. 584.

TITANIUM

Properties—Titanium is a lustrous silver-white metal which has a combination of properties giving it great potential value. It is light in weight, corrosion resistant, strong, and heat resistant. It is only 56 percent as heavy as steel and only 60 percent heavier than aluminum; it is as resistant to corrosion as stainless steel; its tensile strength and hardness approach that of steel; and its melting point is 300°F higher than that of iron. Titanium is unique among the common engineering metals in its complete immunity from deleterious effects of salt water and marine atmosphere. It has the greatest resistance to shock of any known metal, retains its strength at high temperatures, has low coefficient of expansion at high temperatures, is tough and strong, but is ductile only when very pure and free of oxygen. At ordinary temperatures it is hard and brittle but when hot it is malleable. Liquid titanium reacts with almost everything with which it comes into contact. It forms alloys with aluminum, chromium, cobalt, copper, iron, lead, nickel, tin, and other metals. Other properties are shown in the table on page 12.

Uses—Prior to 1950 about 99 percent of the titanium ore produced went into the manufacture of titanium dioxide, used extensively for white pigments, and the remainder was used in welding rod coatings, ceramics, titanium carbides, and titanium alloys. The metal's desirable characteristics have stimulated great interest, especially in the aircraft industry, where it is being used
as sheet in jet engine shells and in various structural parts. Titanium is used in certain high-strength aluminum and magnesium alloys, in some steel alloys, and with copper and iron in titanium bronze. It is expected that with decreased production costs, higher purity metal, and improved fabricating techniques the metal will have very greatly expanded uses in the near future.

Production—The production of titanium metal is still in its infancy but is expanding rapidly and is expected to increase one-hundred-fold or more within the next few years. In 1946 less than 100 pounds of the metal was made; the following year less than 1,000 pounds was made; and it was not until 1948 that titanium metal was produced commercially. Production amounted to 30 tons in 1949 and was 55.0 tons in 1961, 1,100 tons in 1952, 2,241 tons in 1953, and 5,300 tons in 1954. The only production in the western part of the United States has been at a plant at Henderson, Nevada.

Prices—Some of the first commercially produced titanium metal sold for as high as $7.00 per pound in 1948, but the price dropped to $5 the same year and remained at that figure through 1953. In June 1955 the price was $3.50 per pound for titanium containing a maximum of 0.5 percent iron. This price corresponds to that of aluminum 60 years ago or magnesium 45 years ago, and if improved production methods can be developed so that titanium prices can be brought down to a competitive level, demand for the metal may be expected to expand tremendously. Ilimenite titanium ore, containing 56 to 59 percent TiO₂, sold for $14 to $16 per gross ton, f.o.b. Atlantic seaboard, in 1950 and had risen to $18 and $20 by 1953. Rutile ore, containing 94 percent or more of TiO₂, sold as low as 3.12 to 4.10 cents per pound in 1950 but was at 5 to 6 cents in 1953.

Ore Minerals—More than 60 minerals contain titanium, but about 97 percent of the titanium ore mined is the iron titanate, ilmenite, FeTiO₃, which contains 31.6 percent titanium. The other 3 percent mined is the oxide, rutile, TiO₂, containing 60.6 percent titanium, although some of the ore marketed as rutile actually is a crystal modification, brookite, or more rarely another modification, octahedrite (anatase). Similarly, some ore called ilmenite probably is a closely allied mineral, arizonite. Furthermore, much ilmenite is partially altered to leucoxene. Other minerals which occasionally occur in quantities large enough to be mined are the calcium titanate, perovskite, CaTiO₃, containing 58.9 percent titanium, and the calcium titanate-silicate, titanite (sphene), CaTiSiO₄, containing 40.8 percent titanium. Magnetite is often titaniferous, containing from 3 to 15 percent titanium, but in these instances the result usually is that the magnetite is too high in titanium to be acceptable as iron ore and too low in titanium to be usable as a source of that metal.

Geology—Titanium is the ninth most abundant element in the earth’s crust and is the fourth most abundant metallic element suitable for engineering uses, being exceeded only by aluminum, iron, and magnesium. It is present in almost all igneous rocks and in sedimentary and residual rocks derived from them. Most of the world’s large primary deposits of titanium are associated with basic igneous rocks, such as anorthosite, gabbro, and pyroxenite, but some are found in other rocks, such as syenite and metamorphic rocks. Minor occurrences are found in quartz veins. A large part of the titanium mined is in black sands in beach placers derived from primary deposits and from accessory titanium minerals in igneous, metamorphic, and sedimentary rocks. Accessory titanium minerals are sometimes concentrated also in residual clays or laterites derived from other rocks. Titanium has been reported in most, if not all, of these types of deposits in Washington, but to date none has been proven to be commercial.

Occurrences

The map showing the numbered titanium occurrences is plate 21, on page 55 in volume 2.

ASOTIN COUNTY

Clarkston Placer (1)
(see under gold, placer)

Snake River Placer
(see under gold, placer)

CHelan COUNTY

First Creek (1)

CLALLAM COUNTY

Cedar Creek Placer (3)
(see under gold, placer)

Lovelace Placer
(see Shi Shi Beach Placer under gold, placer)

Shi Shi Beach Placer (1)
(see under gold, placer)

CLARK COUNTY

Brush Prairie Placer (1)
(see under gold, placer)

Camas Placer (2)

DOUGLAS COUNTY

Columbia River Placer
(see under gold, placer)

FERRY COUNTY

Wilmont Bar Placer (2)
(see under gold, placer)
Wilmont Creek (1)

GARFIELD COUNTY
Pomeroy Placer
(see under gold, placer)

GRAYS HARBOR COUNTY
Damons Point Placer (1)

Dennis
(see Elma under gold)

Elma (2)
(see under iron)

KING COUNTY
Northwestern Realty
(see Rainy under gold)

Rainy (1)
(see under gold)

Western States Copper
(see Rainy under gold)

KITTITAS COUNTY
Big Z
(see Zerwekh under gold)

Zerwekh (1)
(see under gold)

LEWIS COUNTY
Winlock Placer (1)

OKANOGAN COUNTY
Crouse Placer (3)
(see under gold, placer)

Fuller (2)
(see under iron)

Lone Pine
(see Fuller under iron)

Pateros
(see Fuller under iron)

Similkameen Falls Placer (1)
(see under gold, placer)

Strawberry Creek Placer
(see Crouse Placer under gold, placer)

PACIFIC COUNTY
Beards Hollow Placer (1)
(see under platinum)

Fort Canby Placer (2)
(see under gold, placer)

McGowan Placer (4)
(see under iron)

Sand Island Placer (3)
(see under gold, placer)

SNOHOMISH COUNTY
Pilchuck Creek (1)
(see under iron)

SPOKANE COUNTY
Excelsior (1)

STEVENS COUNTY
Marcus Placer (1)
(see under gold, placer)

TUNGSTEN
Properties—Tungsten is a light-gray to brownish-black metal in its powdered form but is brilliant white when fused. No other element is known to have a lower vapor pressure or higher tensile strength, and only carbon has a higher melting point. Tungsten is one of the heaviest of metals, its density being almost twice that of lead. It is very hard, ductile, strong, and elastic. It conducts heat fairly well, is very stable in acids, and is resistant to chemical action. In artificial compounds it shows valences of 2, 3, 4, 5, and 6, but in its only important natural minerals it has a valence of 6. Other properties are shown in the table on page 12.

Uses—About 90 percent of the tungsten consumption is in ferroalloys, mostly high-speed tool steel; 5 percent goes into tungsten carbide; and the remainder, into non-
ferrous alloys, unalloyed tungsten metal, and chemicals. The pure metal is used in electric lamp filaments, for which use no satisfactory substitute is known. It is also used for plating special laboratory equipment, for contact points in electrical apparatus, and as a catalyst in certain industrial chemical reactions. The metal's greatest value lies in its property of imparting increased hardness, toughness, elasticity, and tensile strength to steel, but perhaps its most remarkable property is that of making steel retain its hardness when hot, even at red heat. Of the many nonferrous tungsten alloys the most important is stellite, a cobalt-chromium-tungsten alloy that is used to face cutting tools. Tungsten carbide also is used to face cutting tools, it being the hardest artificial material in common use, having a hardness of 9.8 (Moh's scale) as compared with 10 for diamond. Small amounts of tungsten are used in chemicals to flameproof and waterproof fabrics, in dyes, and in other applications.

Production—In most years, imports of tungsten ore into the United States are greater than domestic production, and imports generally have exceeded production in a ratio of about two to one. The first tungsten mined in Washington was from the Germania mine in southern Stevens County in 1904, and some ore was produced in the state each year thereafter through 1918. After a period of inactivity, production began again in 1930 and has been almost continuous through 1955. Production in this state has never been large, and the maximum was 303 short tons of 60-percent WO₃ concentrate in 1938. Total production from 1900 through 1950 has been 1,326 short tons of 60 percent WO₃, the most uniform percentage of the United States total and causes Washington to rank seventh in output among the states. Many occurrences of tungsten minerals are known in 14 of the 39 counties in Washington, but most of the occurrences are in the northeastern counties, Okanogan, Ferry, and Stevens. A few properties have recorded production, but the most constant and largest output has been from the Germania mine and adjacent properties.

Prices—Tungsten ore prices are based on the short-ton unit of 20 pounds. The prices have fluctuated greatly in the past half century, rising from an annual average price of $5.71 per unit in 1906 to $33.98 by 1916, dropping to a record low of $2.25 by 1925, rising irregularly to $13.13 by 1929, and dropping to $9.20 by 1932. The average yearly price rose again to $23.44 by 1940 and stayed near this level until April 1951, when the Federal Government set its purchase price at $63 per unit. Tungsten metal sold at $1.50 per pound in 1933; in 1948 metal of 98.8 percent purity was quoted at $2,90 per pound, and 99.9 percent, at $4.50. In March 1953 tungsten metals of the same purity were priced at $5.85 and $7.75, and the prices in June 1955 were $4.39 and $4.65, respectively.

Ore minerals—Tungsten does not occur uncombined in nature, and is found in relatively few minerals. Of the sixteen or so known tungsten-bearing minerals only four are of commercial importance, and three of these are members of a single isomorphous series. This series consists of the tungstates of iron and manganese, in which the manganese tungstate, huebnerite, MnWO₄, containing 76.6 percent WO₃, is one end member and the iron tungstate, ferberite, FeWO₄, containing 76.3 percent WO₃, is the other. Intermediate members are known as wolframate, (Mn,Fe)WO₄, and contain from 76.3 to 76.6 percent WO₃. The other tungsten ore mineral is the calcium tungstate, scheelite, CaWO₄, containing 80.6 percent WO₃. The brilliant blue-white fluorescence of scheelite under ultraviolet light is an aid in prospecting for this otherwise rather inconspicuous mineral. Buyers' tolerances of impurities in tungsten ores are variable, but penalties are generally charged for more than 1.6 percent tin, 0.2 percent arsenic, 0.1 percent copper, 0.05 percent phosphorus, 0.05 percent antimony, 0.4 percent bismuth, and 1.0 percent sulfur. Most ore mined in the United States contains 0.4 to 2.5 percent WO₃.

Geology—Tungsten occurs in veins, replacements, segregations, and contact-metamorphic deposits within or near the margins of siliceous igneous rocks such as granites and pegmatites. It is commonly associated with tin or molybdenum, with pyrite and chalcopyrite, and less frequently with sphalerite and galena. Common associates in contact-metamorphic deposits are copper minerals, molybdenite, magnetite, garnet, epidote, and diopside. The tungsten minerals, because of their high specific gravity, tend to concentrate readily in placer deposits, generally close to their primary source.

### Occurrences

The map showing the numbered tungsten occurrences is plate 22, on page 57 in volume 2.

**ASOTIN COUNTY**

**Joseph Creek (1)**

Loc: On Joseph Cr. near its confluence with Grande Ronde


Ore: Tungsten. Ref: 158.

**CHELAN COUNTY**

**Blewett (4)**

(see under tin)

**Blewett Tungsten (3)**

Loc: Sec. 1, (22-17E), Blewett dist. Access: About 0.2 mi. up Cuiver Gulch road from Blewett Pass highway. Ore:


**Holden (1)**

(see under copper)

**Howe Sound**

(see Holden under copper)

**Irene**

(see Holden under copper)

**Red Mountain (2)**

(see under copper)

**Royal**

(see Red Mountain under copper)
FERRY COUNTY

Addison (3)
(see under copper)

Apex
(see Big Chief under lead)

Big Chief (6)
(see under lead)

Chief
(see Big Chief under lead)

Faithful Surprise
(see Morning Star under gold)

Friedlander (10)

Gwin (5)
(see under silver)

Hall Creek
(see Gwin under silver)

Kelly Camp (3)

Laurier
(see Talisman under copper)

Lucile Dreyfus
(see Morning Star under gold)

Mineral Hill
(see Morning Star under gold)

Morning Star (1)
(see under gold)

Orion (7)
(see under silver)

Pacific Mutual
(see Addison under copper)

Silver Leaf (8)
(see under silver)

Surprise (4)

Talisman (2)
(see under copper)

Virginia
(see Morning Star under gold)

KING COUNTY

Devils Canyon (1)
(see under molybdenum)

Jack Pot (2)
(see under zinc)

KITSAP COUNTY

Chico (1)
(see under tin)

Cook-Kitchen
(see Chico under tin)

Kitchen
(see Chico under tin)

KITTITAS COUNTY

Big Dome (1)
(see under copper)

LEWIS COUNTY

Eagle Peak (1)
(see under copper)

LINCOLN COUNTY

Crystal
(see under lead)

OKANOGAN COUNTY

Adams
(see Moncosilgo under copper)

Antimony Queen (5)
(see under antimony)

Auberton
(see Windiate-Auberton)

Bi-Metallic (33)
(see under molybdenum)

Border Lord (2)

Boundary
(see Wolframite)

Buck Mountain (Buckhorn) (42)
Buckhorn
(see Buck Mountain)

Buckhorn
(see Magnetic under copper)

Bunker Hill
(see Silver King under lead)

Caaba
(see Kaaba under lead)

Campbell
(see Holden-Campbell under gold)

Chelan (15)
(see under gold)

Copper Queen (29)
(see under copper)

Copper World Extension (34)
(see under copper)

Corson (44)
(see under molybdenum)

Crystal Butte (32)
(see under iron)

Dixie Queen
(see Antimony Queen under antimony)

Doris Barbara (12)
(see also Holden-Campbell under gold)


Dutch John (Sherwood, Lodge, Texas Creek) (6)


Ferris R. Ford
(see Wolframite)

Fluorspar
(see Tonasket under copper)

49th Parallel (23)
(see under copper)

Four Metals (21)
(see under lead)

Golden Chariot (24)
(see under copper)

Golden Eagle (16)


Grant
(see Roosevelt under iron)

Grubscher
(see Gubser under lead)

Gubser (38)
(see under lead)

Hargrove
(see Silver King under lead)

Hatfield
(see Wolframite)

Highland (8)
(see under gold)

Highland Light
(see Highland under gold)

Holden-Campbell (13)
(see under gold)

Homestake (9)
(see also Methow under gold)


Homestake, long adit (7)
(see also Methow under gold)


Hunter (10)
(see under gold)

Iron Mask
(see Copper World Extension under copper)

Kaaba (22)
(see under lead)

Kaaba-Texas
(see Kaaba under lead)

Lady of the Lake (40)
(see under silver)

Lodge
(see Dutch John)

London
(see Methow under gold)

Lone Star (37)
(see under lead)

MacLean
(see Roosevelt under iron)

Magnetic (30)
(see under iron)

Methow (11)
(see under gold)

Milwaukee (7A)

Loc: N¼SE¼ sec. 7, (30-23E), on E. side of Methow R. Elev: 100 ft. above river. Ore: Tungsten, copper. Ore min:

Mineralite (17)  
(see also Methow under gold)  

Minnie (4)  
(see under gold)

Moncosilgo (26)  
(see under copper)

Monse (43)  

Montgomery  
(see Tonasket under copper)

Neutral  
(see Magnetic under iron)

New Deal  
(see Antimony Queen under antimony)

New London  
(see Methow under gold)

O. K. (25)  
(see under copper)

Okanogan (14)  
(see under gold)

Paymaster (18)  
(see under gold)

Pennington  
(see Chelan under gold)

Rainbow (28)  

Reedy  
(see Antimony Queen under antimony)

Roosevelt (19)  
(see under gold)

Roosevelt (Grant) (31)  
(see under iron)

Sheep Track (1)  

Sherwood  
(see Dutch John)

Silver King (39)  
(see under lead)

Silver Seal  
(see Antimony Queen under antimony)

Silver Tip  
(see Starr under molybdenum)

Star  
(see Lone Star under lead)

Starr (35)  
(see under molybdenum)

Strawberry Lake (27)  
(see under iron)

Teddy Roosevelt  
(see Roosevelt under iron)

Texas Creek  
(see Dutch John)

Tonasket (36)  
(see under copper)

Twin Pine (45)  
(see under zinc)

Washington (20)  
(see under gold)

Windianite-Auberton (41)  

Wolframite (Hatfield, Ferris R. Ford, Boundary) (3)  

PEND OREILLE COUNTY

Hardrock Thomas (4)  
(see under copper)
Tungsten Occurrences—Pend Oreille County

Little Noisy (1)
(see under zinc)

Nevell (5)
(see under gold)

Scheelite Queen (3)

Stagger Inn (2)
Loc: In road cut 1½ mi. NW. of the Stagger Inn Forest Service Guard Station on the Nordman-Metaline Falls road. Owner: L. E. Hines, Spokane, Wash. (1943). Ore: Tungsten. Ore min: Scheelite. Gangue: Wollastonite or tremolite. Deposit: A narrow stringer of scheelite in boulders presumably derived from a road cut which exposes a limy layer in an argillaceous sedimentary series about 1,000 ft. from the closest granite outcrops. Only the barest trace of scheelite was found in the road cut itself. Ref: 158.

PIERCE COUNTY
Golden Rule (1)
(see under zinc)

SNOHOMISH COUNTY
Armament (13)
(see under copper)
Blackman
(see Doris under copper)
Brown
(see Doris under copper)
Calumet
(see Glacier Peak under copper)
Chatman
(see Jerry Chatman under copper)
Copper Belle
(see under copper)
Doris (8)
(see under copper)
Eldred (5)
(see under copper)
Florence Rae (7)
(see under copper)
"45" (2)
(see under silver)
Glacier Peak (1)
(see under copper)
Golden Eagle (11)
(see under molybdenum)
Hustler (6)
(see under copper)
Iowa (9)
(see under copper)
Jackson
(see St. Louis and Jackson under copper)
Jerry Chatman (10)
(see under copper)

Jones
(see Kromona under copper)
Kromona (12)
(see under copper)
Magus
(see "45" under silver)
Marvel (14)
(see under copper)
Mint
(see Iowa under copper)
St. Louis and Jackson (2)
(see under copper)
Scriber
(see Kromona under copper)
Silver Horseshoe (4)
(see under silver)
Wayside
(see Armament under copper)

SPOKANE COUNTY
Silver Hill (1)
(see under tin)

STEVENS COUNTY
Anderson
(see Becker-Anderson-Kirkwood)
Becker-Anderson-Kirkwood (25)
Assays: One sample showed 0.65% WO₃. Ref: 158.

Big Iron (1)
(see under iron)

Black Horse
(see Columbia Tungsten)

Blue Grouse (new) (18)

Blue Grouse (old) (19)

Boundary Silver Lead
(see Lucile under zinc)

Columbia Tungsten (Black Horse, Stockwell) (13)

Daisy
(see Daisy-Tempest under silver)

Daisy-Tempest (12)
(see under silver)

Douglas

Easy Money
(see Magma under zinc)

Eldorado
(see Magma under zinc)

Gaber (17)

Germania (26)
(see also Roselle)

Germania Consolidated (Keeth, Industrial Tungsten, Norton) (27)
(see also Green)

Green (Industrial Tungsten?) (28)
(see also Germania Consolidated)

Harper
(see Fritchard and Harper under gold)

Harrison (20)

Heritage (4)
(see under zinc)

Industrial Tungsten
(see Green, Germania Consolidated)

Juno-Echo (16)
(see under copper)

Jupiter (21)
Keeth
(see Germania Consolidated)

Kirkwood
(see Becker-Anderson-Kirkwood)

Lafayette

Little Mountain (31)

Longshot (10)
(see under lead)

Loon Lake
(see Tungsten Products)

Lucile (2)
(see under zinc)

McMillan (11)

Magma (6)
(see under zinc)

Mineral Ridge (7)

Newland
(see Longshot under lead)

Norton
(see Germania Consolidated)

Owen
(see Lucile under zinc)

Pioneer
(see Longshot under lead)

Pritchard and Harper (8)
(see under gold)

Read (9)
(see under iron)

Red Top (3)
(see under lead)

Roselle (29)
(see also Germania)

S. L. (22)

Sand Creek (30)

Silver Mountain
(see Daisy-Depstem under silver)

Stockwell
(see Columbia Tungsten)

Superior Copper (15)
(see under copper)

Tempest
(see Daisy-Depstem under silver)

Tile Creek (5)
(see under antimony)

Tungsten King (23)

Tungsten Products "west end" (Loon Lake) (24)

Washington Metals (14)
URANIUM

Properties—Uranium is a metal that is hard but ductile and malleable. It is very heavy (2½ times as heavy as steel) and is capable of taking a high polish. The polished metal, however, rather quickly oxidizes to a black surface. In powder form uranium is black and pyrophoric, catching on fire spontaneously upon exposure to air. In its chemical behavior it is most closely related to chromium. Other properties are given in the table on page 12. Uranium is radioactive, and the isotope U₂³⁵ (present in natural uranium to the extent of about 0.7 percent), is fissionable—properties of utmost importance. Uranium radiates alpha rays, and in its atomic disintegration produces a series of elements including helium, radium, actinium, and lead, which emit alpha, beta, and gamma rays. Pound for pound, fissionable uranium has more than two and a half million times the heat-producing energy of coal.

Uses—By far the most important use of uranium is as a source of nuclear energy, which is utilized in the atomic bombs, and which is being developed for use in power plants for various military and industrial applications. Nonenergy uses of uranium in recent years have been largely in the chemical industries, including use as catalysts and in analytical reagents. Next in importance has been its use in ceramics—in glass for a coloring agent and to regulate the coefficient of thermal expansion of the glass. It has been used in motion picture film manufacture, in electrical equipment, and luminous paint, and it has been alloyed with steel for special uses.

Production—During the years 1945 through 1950 the United States consumption of uranium for nonenergy purposes varied between 1½ and 2½ tons per year. The amount used in the atomic energy program has not been announced. Prior to World War II most of our uranium was imported, but domestic sources now produce large quantities. Data on production and imports and exports are not disclosed. Every producer of uranium ore must be licensed by the U. S. Atomic Energy Commission, and the ore must be sold either directly to the Commission or to a buyer licensed by it.

Prices—Uranium salts prices have not changed greatly in the past few years. Sodium uranate sold at $1.25 per pound in 1936, $1.75 in 1939, and $1.65 from 1942 to 1948. Uranium metal prices have risen considerably, however, being quoted at $7.00 per pound in 1943, $20.00 per pound in 1946, and $30.00 per pound for high-purity metal in 1950. The Atomic Energy Commission’s domestic uranium program provides for: (1) A guaranteed minimum price, effective through March 31, 1962, of $3.50 per pound f.o.b. shipping point, for uranium oxide (U₂O₅) contained in domestic ores or mechanical concentrates assaying at least 10 percent U₂O₅. This price does not apply to the carnitite-type and roscoelite-type ores of the Colorado Plateau. (2) Guaranteed minimum prices, effective through March 31, 1962, for the carnitite-type and roscoelite-type ores of the Colorado Plateau area, varying from $1.50 per pound of U₂O₅ in ores containing 0.10 percent U₂O₅ to $3.50 per pound of U₂O₅ in ores containing 0.20 percent or more U₂O₅. (3) A bonus of $10,000, effective until April 11, 1958, for the discovery of a new deposit and the production therefrom of the first 20 short tons of uranium ore or mechanical concentrate assaying 20 percent or more U₂O₅. (4) The Commission will pay an additional graduated bonus of up to $35,000, depending upon the quantity and
rade of ore, for initial production and delivery of acceptable uranium ore from new and certain existing mining properties. For new properties this bonus payment will be made on each pound of uranium oxide up to and including the first 10,000 pounds.

Ore minerals—More than 100 uranium-bearing minerals are known. In some cases the uranium is the principal constituent, but in others it is only a minor part of the mineral. The more important primary minerals are the oxides, pitchblende (50 to 80 percent UO₂) and uraninite (85 to 90 percent U₃O₈). Some of the more common secondary uranium minerals are the potassium uraninite, carnotite (50 to 55 percent UO₂); the calcium uranium phosphate, autunite (60 percent UO₂); the copper uranium phosphate, torbernite (60 percent UO₂); the calcite uranium vanadate, tuyauminitic (48 to 55 percent UO₂); and the calcium uranium silicate, uranophane 65 percent UO₂). In general, uranium occurs combined with oxides, phosphates, sulfates, arsenates, carbonates, vanadates, silicates, and hydrocarbons. Uranium minerals that have been found in Washington include uraninite, pitchblende, brannerite, autunite, torbernite, uranophane, sonazite, and allanite. The latter two minerals are primarily thorium bearing but sometimes contain uranium. Other uranium minerals reported in Washington are euxenite, fergusonite, samarskite, euxenite, and pyrochlore.

Geology—Uranium ore deposits occur in a great variety of rocks of igneous, metamorphic, and sedimentary origin. Primary deposits in hydrothermal veins appear to favor felsic intrusive rocks and arenaceous metasediments as host rocks. Within the veins, associated minerals contain, in decreasing order of abundance, iron, copper, obalt, lead, silver, nickel, and bismuth. Of these, perhaps cobalt, nickel, and bismuth are most indicative. Pegmatites commonly contain uranium minerals but almost never in commercial quantities. The potassium-rich pegmatites, or zones in them, have been indicated as most favorable for the occurrence of uranium minerals. The secondary uranium-mineral occurrences, as low-grade disseminations in the sedimentary rocks—sandstone, shale, and limestone, are currently producing large tonnages of ore in the United States. A very large part of the domestic production comes from sedimentary-type deposits of this kind, largely from the Colorado Plateau in the “four corners” region of Colorado, Utah, Arizona, and New Mexico.

Although fairly large areas in Washington are underlain by Mesozoic and Tertiary continental sedimentary rocks, and some of these areas are being prospected, no sedimentary-type deposits in which uranium commonly occurs have yet been found here. All the verified occurrences of uranium in Washington are either in granite or in metamorphic rocks intruded by granite. Uraninite and secondary uranium minerals have been found in pegmatite dikes in this state but not in commercial quantities. The more promising uranium deposits in Washington have been found (1) in and near the contact of granite and rock the granite intrudes, (2) in shear zones cutting these rock types, and (3) as secondary minerals in zones between the fractures, decomposed, and disintegrated granite and metamorphic rocks adjacent to contacts and shear zones. In other words, primary uranium mineralization may be expected to occur under much the same conditions as does copper, gold, silver, lead, zinc, molybdenum, and other ore mineralization.

Recent developments—Uranium prospecting and exploration in Washington expanded very rapidly during the first few months of 1955, especially in Stevens and Spokane Counties. This activity was the direct result of the discovery of substantial quantities of uranium ore at the Midnite Mines property on the Spokane Indian Reservation in southern Stevens County. Many large and small mining companies and thousands of individuals staked claims on open Federal land or obtained mineral leases on State and private lands north of the Reservation throughout Stevens County. Similar exploration activity in the vicinity of Mount Spokane was triggered by the announcement of the discovery of good-grade autunite mineralization on the Dahl farm near Elk in northern Spokane County. Exploration has been active in the whole northern part of counties westward from the Idaho boundary to the western flanks of the Cascade Mountains and in the Cascades about as far south as Mount Rainier. Locations showing radioactivity are known or have been reported in at least 10 counties in this general region, and this area includes all the authenticated uranium occurrences in Washington; however, because of the tremendous interest in uranium prospecting, there probably is no county in the state in which some prospecting has not been done. To date (April 1956) only two uranium properties in Washington have shipped ore—the mine originally operated by Midnite Mines, Inc., and the Daybreak Uranium, Inc. mine on the Dahl farm.

Occurrences

Howe Sound
(see Holden under copper)

Irene
(see Holden under copper)

Keefer Brothers (2)
(see under molybdenum)

Peshastin
Ore: Uranium, but the occurrence has not been authenticated.
Ore min: “Probably a silicate.” Deposit: 5-ft. ledge. Ref: 105, 10/18/97, p. 359.

HELLEN COUNTY
Holden
(1)
(see under copper)
Safety Harbor Creek (4)

Winesap Canyon (3)

FERRY COUNTY

Box Canyon (5)

Hurrell (8)

Lucky Leslie (1)
Loc: Near center W¼NW¼ sec. 23, (38-34E), on N. side of Mt. Leona. Elev: 5,950 ft. Access: 1½ mi. by trail to N. Fk. St. Peters Cr. road, by which it is 7½ mi. to railroad at Malo. Prop: Lucky Leslie No. 2 and several other unpatented claims. Owner: Wm. Alexander and Chas. Biderback, Sweet Home, Oreg. (1855). Ore: Uranium. Deposit: Uraninite and uranophane in irregular pegmatite lens 25 ft. long and up to 5 ft. thick along a shear zone that is parallel to schistosity in biotite schist and quartzite. Dev: Shallow open cut. Assays: Radiometric tests on samples from open cut show 0.35% to 1.40% UO₂ equivalent. Ref: 158.

Lucky 21 (2)
Loc: Near center NW¼NE¼ sec. 15, (38-34E), E. of Malo, on St. Peters Cr. Elev: 3,750 ft. Access: 7 mi. by road to railroad at Malo. Prop: 10 unpatented claims, including Lucky 21. Owner: Bert Edwards, Doug Elmes, Malo, Wash., and William B. Kleinhaus, Republic, Wash. (1955). Ore: Uranium. Deposit: Uraninite and uranophane in narrow pegmatitic lenses in quartzite and schist. Dev: Open cuts. Assays: 0.235% UO₂ reported. Note: Since the original 8 claims were staked, 30 or more claims were staked nearby in a few days by various people. Ref: 158.

Nancy Creek (6)
Loc: SW¼NW¼ sec. 29, (37-37E), near Nancy Cr. Access: 2½ mi. by road to railroad. Prop: 8 claims and 120 acres deeded land. Owner: Patrick Sullivan and Darrell Newland, Colville, Wash., hold lease and have subleased to Day Mines Inc., Wallace, Idaho (1955—). Ore: Uranium. Deposit: Uraninite and uranophane in pegmatitic lenses in gneiss. Assays: 0.31% to 1.45% UO₂ reported. Note: Since the original discovery in this area dozens of claims were staked within a short time. Ref: 158.

Oregonian (3)

Section 36 (7)
Loc: Sec. 36, (37-37E), near head of Nancy Cr. Access: About 8 mi. by road to railroad. Owner: Leases on 320 acres of State land held by R. C. Mulligan, R. J. Pulley, M. F. Fowler, and T. Jones, Okanogan, Wash. (1955). Ore: Uranium. Deposit: Pegmatitic granite in gneiss contains uranophane, autunite, and a little heavy black uranium mineral that probably is uraninite; also hylaitite, garnet, and apatite. Assays: Samples reported to run as high as 0.51% UO₂. Ref: 158.

Sherman Creek Pass (4)
Loc: Vicinity of Sherman Creek Pass, Columbia Mtn., and Sherman Fk., 17 mi. E. of Republic. Elev: 4,000 to 7,000 ft. Access: About 16 mi. by road to railroad at Republic. Prop: 29 or more claims. Owner: Sherman Creek Uranium Mines, Inc., Burt Fowler, A. J. Lane, R. R. Embody, Republic, Wash. (1954—). Ore: Uranium. Ore min: Monazite, autunite. Deposit: Weak radioactivity is sporadically distributed over large area near contact of granite with gneiss and schist, and local areas show considerable radioactivity. At least part of the radioactivity is concentrated in biotite-rich pegmatitic segregations, and here the radioactivity is due to the presence of monazite. Small amount of autunite has been reported along joints in talus blocks. Dev: Open cuts, diatomite drill holes. Assays: “Surface samples indicated up to 0.14% UO₂.” Note: Since the original discovery hundreds of claims have been staked in this area. Ref: 158.

Sunset Mines (9)

GRANT COUNTY

Grand Coulee (1)

Peterson

KING COUNTY

Rainy (1)
(see under gold)

Snoqualmie (see under thorium)

Western States Copper (see Rainy under gold)

KITTITAS COUNTY

Big Dome (1)
(see under copper)

LEWIS COUNTY

Eagle Peak (1)
(see under copper)
LINCOLN COUNTY

Egyp
(see Pitney Butte under molybdenum)

Germania Consolidated
Loc: 17 mi. N. of Davenport. Prop: 1,600 acres leased by

Pinney Butte
(see under molybdenum)

Spokane Molybdenum
(see Pinney Butte under molybdenum)

OKANOGAN COUNTY

Aeneas (3)

American Strategic Minerals (5)

Bi-Metallic (2)
(see under molybdenum)

Happy Hill (4)

Lost Lake (1)

Sanpoil (6)

PEND OREILLE COUNTY

Bella May (new adit) (3)
(see under zinc)

Clark
(see Josephine under zinc)

Dry Canyon (6)
(see under thorium)

Golden Anchor (7A)

Grandview mine (2)
(see under zinc)

Highnoon Uranium (8)
(see also Rocky Ridge and West)

Josephine (1)
(see under zinc)

Kimball Mines (9)

Metaline Mining and Leasing Co. (4)
(see under zinc)

Pend Oreille Mines & Metals Co.
(see Josephine under zinc)

Ponsness (10)

Rocky Ridge (6A)

Ruby (7)

Sacheen Lake (5)
Loc: Probably sec. 30 (or possibly sec. 29 or 31), (31-44E), on top of hill just E. of Sacheen Lk. Owner: Forrest Corwin, E. 1624 Liberty Ave., Spokane, Wash. (1939). Ore: Uranium (?). Deposit: A sample of pegmatitic granite composed of quartz, orthoclase, and a very little magnetite showed slight radioactivity in one very restricted area of the specimen. Ref: 158.

South Skookum Lake

Stagger Inn (11)

Starlight Uranium (8A)
West (5A)

PIERCE COUNTY

Rushing River (1)

SKAMANIA COUNTY

Rainbow (1)
  (see under vanadium)

SNOHOMISH COUNTY

Broken Ridge (5A)
  (see under copper)

Keller (5)

Kromona (4)
  (see under copper)

Mackinaw (1)
  (see under copper)

Molly (2)

Silver Creek
  (see Broken Ridge under copper)

Sultan (3)

Weden Creek
  (see Mackinaw under copper)

SPOKANE COUNTY

Affiliated Mines (20)

Anaconda Uranium (21)

Carbon (16)

Columbia Enterprises (7)

Curtin (18)

Dahl (Daybreak) (1)
  Loc: E½NE¼ sec. 11, (28-44E), about 18 mi. NE. of Spokane, in Mt. Spokane area. Elev: 2,800 ft. Access: 8 mi. by road to railroad at Elk and about 30 mi. to railroad at Spokane. Prop: 80 acres of deeded land. Owner: Alfred L. Dahl, Elk, Wash., leasing to Daybreak Uranium Inc., Spokane, Wash. (1955—). Ore: Uranium. Deposit: Meta-autunite occurs as veinlets and fillings of closely spaced joints in decomposed granite. 5 ore bodies in an area 250 ft. by 900 ft., being worked by open pit. Dev: 7 diamond drill holes (July 1955) show ore to depth of at least 100 ft. 46,300 tons proven ore reserves reported. Assays: Channel samples across 35-ft. width showed 0.35% to 0.80% UO₂. First 10 carloads shipped avg. 0.55% UO₂. Prod: Production began Aug. 1955. Total of 5,196 tons through Sept. 1956 avg. 0.3346% UO₂. Also 7 carloads from nearby Huffman lease in Sept. 1956.

Dahl Uranium Mine, Inc. (5)
  (see also under Stevens County)

Dawn Uranium & Oil (8)
  (see also Curtin, Smith)

Daybreak (see Dahl and see Bair, Lowley under Stevens County)

Elk Uranium (2)
  Loc: 1 mi. E. of Dahl property, and other places in Spokane and Stevens Counties. Prop: Mineral rights on several thousand

Fish Lake (14)
Loc: E1/4SE1/4 sec. 32 and W1/4SW1/4 sec. 33, (24-42E), just N. of Fish Lk. Access: Paved highway crosses deposit, and railroad is within a few hundred ft. Prop: Deeded land. Ore: Uranium. Ore min: Secondary minerals. Deposit: Small irregular masses and veinlets of pegmatite near contact of granite with older metamorphic rocks. Although slight radioactivity may be detected in many places over an area of several thousand sq. ft., no concentrations of ore grade are known. Ref: 158.

Graham (15)

Kit Carson Uranium (3)

Miner (6)

Morning Sun Uranium (4)

Painted Desert (12)
(see also under Stevens County)

Schaefer (13)

Section 32 (9)

Section 21 (10)

Smith (17)

Stapleton (12A)

Thompson (19)

Tungsten Uranium Mines (11)
(see also Germania under tungsten, Stevens County)

STEVENS COUNTY

A A (1)

Arden (4)

Bair (14)

Big Smoke Uranium (18)
contact with granite. Uraninite and gummite in coal in seam 8 ft. wide at depth of 14 ft. A second vein is 12 in. wide and is 30 ft. N. of the first. Dev: Bulldozer pit 12 ft. deep. Assays: Chemical assay of soil from 3-ft. depth showed 0.28% UO₂. A 2-ft. vein showed 0.50% UO₂ equivalent, but chemical assay showed 1.30% UO₂. Prod: A few carloads shipped in 1956. Ref: 158.

Boyd (11)

Calispell Peak
(see Cannon)

Cannon (Calispell Peak, Railway Dike) (5)

Crawford
(see Indian Chief Uranium)

Dahl Uranium Mine, Inc. (12)
(see also under Spokane County)
Loc: Sec. 13, (28-37E), near Midnite mine. Owner: Dahl Uranium Mine, Inc., Spokane, Wash. (1955—). Ore: Uranium. Deposit: Autunite near contact of granite with argillite. Dev: Several drill holes as much as 75 ft. deep showed weak radioactivity. One hole showed ore from the 128-ft. to 140-ft. depth. Assays: 0.20% to 0.70% UO₂ equivalent from 128-ft. to 134-ft. depth in one hole. Ref: 158.

Germania (8)
(see under tungsten)

Germania Consolidated (8A)
(see under tungsten)

Indian Chief Uranium (Crawford) (7)

Lowley (17)

Lucky Charm Uranium (10)

Midnite (9)
Loc: Secs. 1 and 12, (28-37E), on bluffs of Lookout Mtn., 10 mi. NW. of Wellpinit. Elev: 2,600 to 3,400 ft. Access: 33 mi. by road to railroad at Springdale or Reardin. Prop: 570-acre lease from Spokane Indian Agency. Owner: Midnite Mines, Inc., Clair Wyneecop, Pres., Wellpinit, Wash. (1955—) leasing to Dawn Mining Co., 503 Public Service Bldg., Portland, Oreg. (1955—). Ore: Uranium. Ore min: Autunite, uranophane, gummite, torbernite, uraninite, liebigite, phosphuranylite. Gangue: Altered rock. Deposit: Radioactivity traced more than 1 mi. N. and S. Uranium mineralization is in shear zones and at near intrusive contact of Loon Lake granite and Deer Trail argillite in a contact zone which is 100 to 200 ft. wide. Ore bodies, ranging up to several hundred ft. in length and 30 or more ft. in width, are richest at the center and grade outward to assay walls. Autunite and uranophane are the principal ore minerals, but uraninite was found with pyrite at a depth of 150 ft. in one core hole. Mineralization is strongest along joints in argillite but extends down into granite also. Est. 700,000 tons ore reserves reported in 1956. Dev: 13 diamond drill holes drilled by A.E.C. and 28,476 ft. of diamond drill holes drilled by Dawn Mining Co. Numerous bulldozer trenches, 540 ft. of adit workings (1955). Assays: One representative sample ran 0.48% UO₂ and others ran as high as 0.86% UO₂. Av. of 709 tons shipped was 0.285% UO₂. Prod: 100 tons of ore in 1954, 669 tons through Feb. 1955. 94 carloads of ore prior to end of Jan. 1956. Ref: 153-A. 158.

Northwest Uranium (15)
Loc: On Spokane Indian Reservation, southern Stevens County, 3 mi. S. of Midnite mine. Owner: Northwest Uranium Mines, Inc., Wallace, Idaho (1955—). Ore: Uranium. Ore min: Autunite. Deposit: Secondary uranium minerals in faults and lignite beds in flat-lying Tertiary claystone, sandstone, and conglomerate beds overlying granite. Dev: Trenches in an area 1,000 ft. by 600 ft. Assays: Sample across 20-ft. stratigraphic thickness of beds shows 0.13% UO₂. Selected samples from lignite show as high as 1.15% UO₂ and av. 0.648%. A fault-breccia zone 3 ft. wide assays 0.237% UO₂. Chemical analysis of three 50-lb. samples showed: (1) bentonitic clay and carbonaceous material—0.427% UO₂, (2) arkose—7.16% UO₂, (3) conglomerate—0.128% UO₂. Radiometric analysis of these same samples showed only about half the above indicated values. Ref: 158.

O'Toole Mountain (3)

Painted Desert (2A)
(see also under Spokane County)
Loc: Near Orient. Prop: 6 claims and options on 195 acres of land. Owner: Painted Desert Uranium and Oil Co., Spokane,
Railway Dike
(see Cannon)

Section 13 (16)

Snowshoe (6)

Square Deal (13)

U & W Uranium (2)

YAKIMA COUNTY

Bumping Lake (1)
Loc: In the valley of Deep Cr., near the mouth of Copper Cr., on the road to Copper City, 5 mi. S. of Bumping Lk. dam. Access: 5 mi. by gravel road and 11 mi. by paved road from Chinook Pass highway. 53 mi. by road from railroad at Naches. Prop: 6 unpatented claims, including El Khobbar No. 1. Owner: Tom Hendrix, Yakima, Wash. (1954—). Ore: Uranium. Deposit: Strong radioactivity in soil and gravel around a mineral spring which emerges from granite near contact with andesite. Also some autunite along joints in granite. Dev: Open pits. Assays: 0.88% U3O8 by wet analysis and 0.38% U3O8 by radiometric test on surficial soil. Note: Within a few days of the announcement of this original discovery more than 80 claims were staked by various people in an area about 2½ mi. square in this vicinity. Ref: 158.

Chinook Pass (2)

VANADIUM

Properties—Vanadium is a brilliant silver-white metal that is soft, corrosion resistant, and malleable and ductile enough to be drawn into wire. It is not affected by air or water at ordinary temperatures. Chemically it may be either acid or base forming. Its valences are 2, 3, 4, and 5, the last being the most stable. Other properties are shown in the table on page 12.

Uses—In 1950 about 90 percent of the vanadium consumption was as ferrovanadium, which was used in the manufacture of tool steels, other special steels, and in wear-resisting cast irons. Small amounts of ferrovanadium were used in welding-rod coatings, in magnets, and as a deoxidizer. In the same year ductile vanadium, 98.8 percent pure, was made available, but no commercial use has yet been made of the unalloyed metal, except as targets in X-ray apparatus. A few nonferrous alloys have been developed, the most important of which are of vanadium with copper and with aluminum. Both of these alloys are strong and corrosion resistant. Very small additions (0.1 to 0.2 percent) of vanadium to steel bring about great increases in strength, elastic limit, hardness, and shock resistance. Vanadium chemicals have some uses as catalysts in making sulfuric acid and various organic compounds, and other vanadium compounds are used in glass, ceramic glazes, as driers in paints and inks, and in laboratory research.

Production—United States production of vanadium in ores and concentrates dropped from over 5½ million pounds in 1943 to a little more than 2 million pounds in 1947, and since that date production figures have been restricted for security reasons. The few principal United States consumers of vanadium have their own sources of ore, and it would be difficult for an outsider to bring a new deposit into profitable operation. Vanadium minerals have been reported in seven counties in Washington, but only the occurrences in Skamania County have been verified, and none of these has had any production.

Prices—The quoted price for V2O5 contained in vanadium ores remained at 27½ cents per pound f.o.b. mines for a period of 26 years, from early 1925 to early 1951; thereafter the quotation was raised to 31 cents per pound, where it remained at least through most of 1955. Although the price of contained vanadium in ferrovanadium alloy has fluctuated somewhat, it also has had a remarkably small long-range variation, selling at $3.15 to $3.50 in 1930 and $3.00 to $3.20 in 1953.

Ore minerals—Vanadium is widely spread in minute quantities, occurring in most rocks in amounts varying between a trace and a few hundredths of 1 percent. Some petroleum and many coals contain very small percentages of the element, and the oxide may be recovered from the ashes of these organic materials. Vanadium occurs in more than 60 minerals, but only 5 of these are primary. The minerals of principal economic interest are the sulfide, patronite, VSb, containing 19.5 percent vanadium; the vanadium mica, roscoelite, H₂K(Mg,Fe)₂(Al,V)₂(SiO₄)₂, containing from 20 to 29 percent V₂O₅; and the vanadates, vanadinite, 3Pb₂V₂O₇·PbCl₂, containing 19.4 percent V₂O₅, descliozite, 4(Ph,Zn)O·(V₂O₅)·H₂O, and carnotite, K₂O·2UO₂·3V₂O₅·3H₂O, containing about 20 percent V₂O₅.

Geology—Vanadium has been recovered commercially from phosphate rock, iron ore, chrome ore, magnetite beach sands, bauxite, petroleum and coal ashes, and asphalite. In addition, many lead, zinc, and copper deposits contain a little vanadium, and, especially in dry regions
where the soluble salts are not carried away immediately in solution, it concentrates in the oxidized parts of the veins as vanadinite, desclaozite, and related minerals. The world's largest known reserves are in the form of patroinite in asphaltilite in Peru, but in the United States the largest reserves are in small irregular deposits in soft fine-grained sandstone, between the grains of which are roscoelite, carnottite, and similar vanadium minerals. These deposits are in an extensive area in western and southwestern Colorado and portions of the adjoining states. The only authenticated vanadium occurrences in Washington are in the oxidized zone of copper deposits.

**Occurrences**

The map showing the numbered vanadium occurrences is plate 23, on page 59 in volume 2.

**Chelan County**

Dryden


**Clark County**

Sunset Falls (1)


**Kittitas County**

Big Z

(see Zerwekh under gold)

Zerwekh (1)

(see under gold)

**Skagit County**

Scott (1)


**Skamania County**

Last Chance (2)

(see under copper)

Rainbow (3)


**Skamania (1)**

(see under copper)

**Snohomish County**

Clara Thompson

(see Jasperson under gold)

Commonwealth

(see Jasperson under gold)

Good Hope (2)

(see under gold)

**Index**


Jasperson (3)

(see under gold)

McCombs

(see Jasperson under gold)

Wayside (1)

(see under copper)

Webster

(see Jasperson under gold)

**Whatcom County**

Smith (1)


**Zinc**

Uses—The galvanizing industry has long been the largest consumer of zinc, accounting for more than 45 percent of the 1950 consumption. Galvanizing is the placing of a thin coating of zinc, usually on iron or steel sheet, wire, tubes, pipe, fittings, and other shapes. Zinc-base alloys for die castings used nearly 30 percent of the available zinc in 1950, followed by brass (14 percent) for sheet, strip, plate, rod, wire, tubes, castings, and other copper-base products. Rolled zinc accounted for about 7 percent of the consumption; zinc oxide, 2 percent; and 1 percent, for other uses such as wet batteries, deslivering of lead, in light-metal alloys, and chemicals. Zinc oxide and other chemicals are used as pigments, as a filler in rubber, in glass manufacture, in medicines, and in many other minor uses.
Production—Zinc is mined in ten western states, seven central states, and four eastern states, but is smelted or refined in only four states. In the west there are custom zinc smelters in Idaho at Kellogg, in Montana at Anaconda and Butte, and in British Columbia at Trail. Zinc output in the Tri-State district has dropped from 55 percent of the total United States production in 1926 to only 13 percent in 1950, and western production has had a corresponding increase to 59 percent in 1950.

Zinc occurrences have been reported in 18 of Washington's 39 counties, but production has been mainly from Okanogan, Ferry, Stevens, Pend Oreille, and Chelan counties, the last 3 counties having accounted for almost all the Washington production in recent years. Among the zinc mines in the United States, the Pend Oreille mine in Pend Oreille County ranked 35th in production in 1949, the Holden mine in Chelan County was 50th, and the Grandview mine in Pend Oreille County was 58th. The following year the Grandview became the leading producer in Washington and ranked 25th nationally. In 1952 the state’s leading zinc producers in order of output were the Pend Oreille, Grandview, Deep Creek, and Holden mines. The Van Stone mine in Stevens County began production late that year and was one of the leading producers in 1953. Among the zinc districts in the United States in 1950, the Metalline district ranked 14th in output, the Lake Chelan district, 28th; and the Northport, 33rd.

The first recorded production of zinc in Washington was from the Oriole mine in the Metalline district in 1911. There appears to have been no further production until 1915, but since that time output has been continuous (except for 1919) to the present. Total production in the state through 1952 has been 228,091 short tons of metal, valued at $49,243,324, which is 22.7 percent of the total value of all metals produced in the state during the same period. The record annual output was in 1953, when 32,890 short tons, valued at $7,170,020, was produced. This was more than triple the zinc output in the state 4 years earlier.

Prices—Zinc prices have fluctuated widely both over long-term and short-term periods, and market quotations change frequently. The annual average price from 1900 through 1914 was between 4 and 5 cents per pound but jumped to 14 cents in 1915 and dropped back to 4½ cents by 1921. It had risen to nearly 8 cents by 1924 but dropped to an all-time low of about 3 cents in 1932. This annual average price rose to 6½ cents by 1937 but dropped to 4½ cents the following year and climbed again by 1942 to 8½ cents, where it remained through the war years until 1946. After Government controls were lifted the annual average price rose to 18.2 cents per pound by 1951, only to drop back again to 16.6 cents the following year and to 11.1 cents in 1953. Early in 1954 the price was 9.25 cents, but by June 1955 it was back up to 12.75 cents. The 1949 high quotation of 17½ cents and low of 9 cents illustrate the extreme fluctuations even in “normal” times, as do the 1952 prices, which included a low of 12½ cents and an all-time high of 19½ cents.

Ore minerals—There are no authenticated occurrences of native zinc, but the element has been reported in almost 150 minerals in the Franklin Furnace district of New Jersey, alone. However, only 6 minerals are common sources of the metal, and by far the most important of these is the sulfide, sphalerite, ZnS, containing 67.0 percent zinc. The others are the carbonate, smithsonite, ZnCO₃, containing 52.0 percent zinc; the hydrous silicate, hemimorphite (calamine), (ZnOH)₂SiO₃, containing 54.2 percent zinc; the oxide, zincite, ZnO, containing 80.3 percent zinc; the silicate, willemite, Zn₄SiO₅, containing 58.5 percent zinc; and the ferrite, franklinite, (Fe₂(Zn,Mn)₂)O₄-, containing from 15 to 20 percent zinc. Of these minerals, the last three are important ore minerals in few, if any deposits other than those in the unique Franklin Furnace district. Of the ore minerals, only sphalerite and smithsonite have been reported in Washington, but the comparatively rare zinc basic carbonate, hydrozincite, 2ZnCO₃·3Zn(OH)₂, occurs in the Covada district and in a few other places in the state.

Geology—Most ores of zinc are ores of lead also, although there are a few straight zinc ores and a few large copper-zinc deposits. In Washington most of the zinc comes from zinc-lead deposits, but the Holden mine produces copper-zinc ore with appreciable values in gold and very low values in silver, and in many smaller deposits zinc is associated with a variety of other minerals in complex ores. Zinc may occur as open-space fillings or replacements in veins, and as residual deposits of oxidized zinc minerals. It may also occur as massive replacement deposits of irregular shape, in which the ore minerals are disseminated in limestone or dolomite and are sometimes accompanied by pyrite and frequently by chert or other forms of low-temperature silica minerals. The disseminated replacements in some districts are near the contact of carbonate rocks with granitic rocks, but in other important zinc districts the igneous sources of the hydrothermal solutions presumably responsible for the metalization are far removed or not exposed at all.

The grade of ore mined varies from a low of about 2 percent combined lead and zinc to a high of 8 percent or more. In 1949 the recovery from western states ore averaged 4.66 percent zinc and 3.20 percent lead, whereas the recovery from the generally larger and less complex ore deposits in the Tri-State district averaged only 1.66 percent zinc and 0.69 percent lead. The 1952 production from one large mine in the Metalline district in Washington averaged 2.29 percent zinc and 1.39 percent lead.
The maps showing the numbered zinc occurrences are plates 24, 25, and 26, on pages 61, 63, and 65 in volume 2.

CHelan COUNTY

Billy Jack (1)
(see under lead)

Bismarck (13)

Black Warrior (5)
(see under copper)

Cascade Consolidated (6)
(see under silver)

Clagstone (2)
(see under lead)

Doubtful (7)
(see under lead)

Ellen
(see Van Epps under antimony)

Galena (8)
(see under lead)

Holden (16)
(see under copper)

Horseshoe Basin (9)
(see under lead)

Howe Sound
(see Holden under copper)

Irene
(see Holden under copper)

Keefer Brothers (17)
(see under molybdenum)

King Solomon (12)
(see under copper)

King Solomon (Van Epps)
(see Van Epps under antimony)

Kingman
(see Galena under lead)

Logan (4)
(see under lead)

Orphan Boy (14)
(see under silver)

Panama No. 2 (10)
(see under lead)

Red Mountain (18)
(see under copper)

Royal
(see Red Mountain under copper)

Silver Jack (3)
(see under lead)

Silver Trail (15)
(see under copper)

Snook and Ellen
(see Van Epps under antimony)

Spokane Boy and Girl (11)
(see under copper)

Tiger
(see Galena under lead)

Van Epps (19)
(see under antimony)

CLALLAM COUNTY

Angeles Star (Winter, Gregory-Savage) (1)

Gregory-Savage
(see Angeles Star)

Savage
(see Angeles Star)

Winter
(see Angeles Star)

CLARK COUNTY

Silver Star (1)
(see under copper)

COWLITZ COUNTY

Green Mountain (1)
(see under gold)

FERRY COUNTY

Abe Lincoln (54)
(see under copper)

Addie B (56)
(see under copper)

Addison (61)
(see under copper)

Advance (28)
(see under silver)

American Granby
(see under copper)

Apex
(see Big Chief under lead)

Apollo
(see California under gold)

Big Chief (29)
(see under lead)

Big Lake (9)
(see under lead)
Black Hawk (30)  (see under lead)

Blevins  (see Meadow Creek under copper)

Blue Mountain  (see Jennie under gold)

Cabin  (see Advance under silver)

California (7)  (see under gold)

Chief  (see Big Chief under lead)

Chief Barnaby (8)  (see under silver)

Cold Spring (12)  (see under lead)

Comstock (1)  (see under copper)

Consolidated Mines and Smelting Co., Ltd.  (see under copper)

Copper Prince  (see under silver)

Cougar (64)  (see under copper)

Cuba  (see Big Lake under lead)

Curlew  (see under lead)

Dan Patch (13)  (see under silver)

Dill (17)  (see under lead)

Drummond (31)  (see under lead)

Gold Twenty (10)  (see under gold)

Golden Cord (62)  (see under silver)

Goldsmith (11)  (see under lead)

Great Northern (52)  (see under silver)

Great Scott (14)  (see under lead)

Henneway (49)  (see under lead)

Humboldt (65)  (see under copper)

Illinois (68)  (see under copper)

Iron Creek  (see Shamrock under nickel)

J. H. E. (15)  (see under lead)

Jennie (5)  (see under gold)

Jumper (67)  (see under copper)

Kentucky Bell (32)  (see under lead)

Keystone (18)  (see under silver)

King Richard  (see Meadow Creek under copper)

La Fleur  (see Comstock under copper)

Lancaster (2)  (see under copper)

Laurier  (see Talisman under copper)

Legal Tender (33)  (see under lead)

Lone Pine (34)  (see under lead)

Longstreet (35)  (see under silver)

McJunkin (48)  (see under silver)

Meadow Creek (55)  (see under silver)

Meteor (19)  (see under silver)

Mono (53)

Loc: Near center S 1/2 sec. 13, (30-32E), Keller dist. Ore: Zinc, silver, lead. Ore min: Sphalerite, galena, pyrite. Gangue: Granite: Deposit: Shear zone in granite 5 ft. or more wide. Outcrop is a heavy gossan beneath which are bunches of pyrite as large as 3 ft. in dia. Also veinlets up to 2 in. wide of solid sulfides. Dev: 30-ft. adit. Assays: Sample from one of veinlets assayed 23.7% Zn, 1.4% Pb, 5.4 oz Ag. Ref: 46, p. 144. 122, p. 127.

Montana (20)  (see under silver)

New York (21)  (see under lead)

Nez Perce (42)  (see under lead)

North Star (57)  (see under lead)

Ophir (58)  (see under lead)

Oregon  (see Illinois under copper)

Pacific Mutual  (see Addison under copper)

Panama (3)  (see under gold)

Patterson  (see Jennie under gold)

Paulsen (43)  (see under lead)

Plymouth Rock (39)  (see under lead)
Polepick (68)
(see under copper)

Poor Man’s Hope (63)
(see under lead)

Prescott (22)
(see under lead)

Rattlesnake (44)
(see under lead)

Ren Rice (16)
(see under lead)

Renner Lake (6)
Ref: 97, 1925, p. 588.

Robert E. Lee (36)
(see under antimony)

Romulus (23)
(see under lead)

Rover Bonanza (59)
(see under silver)

Royal Ann (37)
(see under lead)

San Poil Monitor
(see Meadow Creek under copper)

Several (24)
(see under lead)

Shamrock (50)
(see under nickel)

Silver Bell (45)
(see under lead)

Silver Leaf (46)
(see under silver)

Silver Plume (40)
(see under lead)

Silver Queen (41)
(see under lead)

Silver Spar (38)
(see under lead)

Stotesbury (51)

Stray Dog (25)
(see under silver)

Summit (60)

Talisman (4)
(see under copper)

Vernie (26)
(see under lead)

Walla Walla
(see under copper)

White Rose (27)
(see under lead)

Yellowstone (47)
(see under lead)

KING COUNTY

Aces Up (18)
(see under silver)

Anderson (3)
(see under iron)

Baring
(see Anderson under iron)

Bear Basin (10)
(see under silver)

Cleopatra (11)
(see under silver)

Coney Basin (13)
(see under gold)

Copper Plate
(see Seattle-Cascade under silver)

Dawson (14)
(see under lead)

Dutch Miller (21)
(see under copper)

Goat Mountain (20)
(see under lead)

Guye (22)
(see under iron)

Jack Pot (19)
Loc: SW¼ sec. 27 and 9½ sec. 28, (25-10E), on W. side of Cougar Cr. Elev: 4,740 ft. Access: Trail from Lennox Cr. and 28 mi. by road to railroad at North Bend. Prop: 8 unpatented claims and a millsite. Owner: Robert Prufer, North Bend, Wash. (1947——). Ore: Zinc, lead, gold, silver, copper, tungsten. Ore min: Scheelite, pyrite, chalcopyrite, sphalerite. Gangue: Quartz, tourmaline. Deposit: Discontinuous aligned mineralized fractures. Best showing is a lenticular vein 2 ft. wide at top of a cliff and 10 ft. wide 50 ft. lower. Assays: 7 samples av. 0.03 oz. Au, 0.37 oz. Ag, 5.67% Zn, 0.89% Pb. Ref: 11-A, pp. 204-207. 158.

King and Kinney (15)
(see under copper)

Kinney
(see King and Kinney under copper)

Langer (7A)

Last Chance (8)
(see under gold)

Lennox (7)
(see under gold)
Zinc Occurrences—King County

Mohawk (4)  
(see under lead)

Mona  
(see Mono under copper)

Mono (9)  
(see under copper)

Mt. Logan  
(see Guye under iron)

Mount Phelps (5)  

Philippi Lake (6)  
(see under lead)

Ryland  

Salmon Creek (1)  
(see under gold)

Seattle-Cascade (16)  
(see under silver)

Silver Dollar and Copper Plate  
(see Seattle-Cascade under silver)

Silver Star (12)  
(see under silver)

Sockless Jerry  
(see Last Chance under gold)

Summit  
(see Guye under iron)

Three S Gulch (17)  

Treasury Lead (2)  
(see under lead)

Triple S  
(see Seattle-Cascade under silver)

KITTITAS COUNTY

Camp Creek (2)  
(see under silver)

Esther and Louisa (1)  
(see under silver)

LEWIS COUNTY

Eagle Peak (1)  
(see under copper)

Mineral Creek (2)  

LINCOLN COUNTY

Crystal (1)  
(see under lead)

Fouress (Pitney Butte) (2)  
Loc: SW¼NW¼ sec. 32, (28-37E), in steep valley on NW side of Pitney Butte. Elev: 1,900 ft. Access: Road, 20 mi. to Davenport. Prop: 5 claims: Lost Stake, Valley, Silver Butte, Hill Top, Lakeview. Owner: Fouress Mines, Inc., Olympia, Wash. (1950—). Ore: Silver, zinc, lead, gold, copper. Ore min: Sphalerite, ruby silver, native silver. Deposit: A discontinuous quartz vein 1 to 4 ft. wide and traceable for 100 ft. is enclosed in granite. Vein shows mineralization for about 40 ft. Dev: 500-ft. adit, three 100-ft. shafts. Assays: Typical analysis said to be 7% Zn, 1% Pb, 0.6% Cu, 1% Sb, 0.05% As, 0.57 oz. Ag, 0.04 oz. Au. Ref: 133, p. 33. 158.

Pitney Butte  
(see Fouress)

Valley View (3)  

MASON COUNTY

Black and White (1)  
(see under copper)

OKANOGAN COUNTY

Alder (14)  
(see under gold)

American Flag (8)  
(see under gold)

American Flag (66)  
(see under copper)

Anchor (87)  
(see under silver)

Anna (84)  
(see under silver)

Antimony Queen (16)  
(see under antimony)

Apache (88)  
(see under silver)

Apex (60)  
(see under copper)

Arizona  
(see Horn Silver under silver)
Arlington (56)
(see under silver)

Atkins (67)
(see under lead)

Ben Harrison
(see Apex under copper)

Billy Goat (1)
(see under copper)

Boundary
(see Wolframite under tungsten)

Bunker Hill
(see Silver King under lead)

Butcher Boy (62)
(see under gold)

Caaba
(see Kaaba under lead)

Cabin (89)
(see under lead)

California (21)
(see under copper)

Carr (2)
(see under copper)

Castle Creek (68)
(see under lead)

Catherine (22)
(see under silver)

Central (Trinidad) (39)
(see under silver)

Central (American Flag)
(see American Flag under gold)

Chief Sunshine (40)
(see under silver)

Cliff (69)

Climax (6)
(see under copper)

Continental
(see Mazama Queen under gold)

Controller (92)
(see under copper)

Copper King (42)
(see under lead)

Copper World Extension (34)
(see under copper)

Cornwall (4)
(see under lead)

Crystal Butte (64)
(see under gold)

Daisy (5)
(see under gold)

Dixie Queen
(see Antimony Queen under antimony)

Double Eagle
(see Dry Bone under lead)

Dry Bone
(see under lead)

Duke of Windsor
(see Dry Bone under lead)

Esther (43)
(see under lead)

Eureka (80)

Evening (68)
(see under silver)

Ferris R. Ford
(see Wolframite under tungsten)

First Thought (53)
(see under silver)

Four Metals (23)
(see under lead)

Gold Crown
(see Spokane under gold)

Gold Hill (37)
(see under gold)

Golden Zone (20)
(see under gold)

Gould & Curry (90)
(see under lead)

Great Metals
(see Anchor under silver)

Great Western (81)
(see under lead)

Grubscher
(see Gubser under lead)

Gubser (44)
(see under lead)

Hanks (3)
(see under copper)

Hargrove
(see Silver King under lead)

Hatfield
(see Wolframite under tungsten)

Hercules (77)
(see under lead)

Hiawatha (33)
(see under gold)

Hidden Treasure (Highland) (17)
(see under gold)

Highland (18)
(see under gold)

Highland Light
(see Highland under gold)

Horn Silver (29)
(see under silver)
Zinc Occurrences—Okanogan County

Hudnut (Hudnut) (85)

Independent (78)
(see under lead)

Iron Cap and Snow Cap (9)
(see under gold)

Iron Dike (76)

Iron Mask
(see Copper World Extension under copper)

Josie
(see Hiawatha under gold)

Jupiter
(see Tip Top under copper)

Kaaba (24)
(see under lead)

Kaaba-Texas
(see Kaaba under lead)

Key (45)
(see under silver)

Kimberly (32)
(see under lead)

Lady of the Lake (51)
(see under silver)

Last Chance (54)
(see under lead)

Little Chopaka (25)
(see under lead)

Lone Star (41)
(see under lead)

McGrath (26)

Malott (59)
(see under copper)

Maquae
(see under gold)

Mazama Queen (7)
(see under gold)

Mid Range (10)
(see under gold)

Mineral Hill (46)
(see under silver)

Minnie (15)
(see under gold)

Modoc (82)
(see under copper)

Mohawk
Loc: 5 mi. NW. of Nespelem. Ore: Zinc, silver, chromium. Assays: 4 samples showed: tr. to 8.4 oz. Ag, 4.4% to 14.5% Zn. One sample showed: 40.2% Fe, 2.8% Cr. Ref: 158.

Monitor (47)
(see under lead)

Mother Lode
(see Crystal Butte under gold)

Mountain Boy (70)
(see under lead)

Nevada (55)
(see under silver)

New Deal
(see Antimony Queen under antimony)

Okanogan Free Gold (31)
(see under gold)

Owentangy (61)
(see under gold)

Oriental & Central
(see American Flag under gold)

Owasco
(see Okanogan Free Gold under gold)

Peacock (52)
(see under silver)

Pinnacle (35)
(see under gold)

Poorman (71)

Pyrrargyrite
(see Ruby under silver)

Ramore (79)
(see under lead)

Rattlesnake (13)
(see under gold)

Rebecca (94)
(see under copper)

Red Bird (93)
(see under copper)

Reedy
(see Antimony Queen under antimony)

Rich Bar (30)
(see under copper)

Ruby (28)
(see under silver)

Salmon River (48)
(see under silver)
Security (36)
(see under copper)

Seven Devils
(see Mineral Hill under silver)

Sharp & Balthus (72)

Sherman (58)
(see under lead)

Silver King (49)
(see under lead)

Silver Mountain (28)
(see under silver)

Silver Seal
(see Antimony Queen under antimony)

Silver Star
(see Silver Mountain under silver)

Six Eagles
(see Little Chopaka under lead)

Snow Cap
(see Iron Cap and Snow Cap under gold)

Snowshoe (73)
(see under lead)

Sonny Boy (57)
(see under silver)

Spokane (11)
(see under gold)

Standard
(see Sherman under lead)

Star
(see Lone Star under lead)

Summit (74)
(see under lead)

Summit (27)
(see under silver)

Sunshine
(see Hidden Treasure under gold)

Sunshine Chief
(see Chief Sunshine under silver)

Tip Top (91)
(see under copper)

Tomlinson
(see under copper)

Tough Nut (50)
(see under silver)

Triangle
(see Hidden Treasure under gold)

Trinidad
(see Central under silver)

Twin Pine (83)

Twisp View (12)
(see under gold)

Wasco (75)
(see under silver)

Washington Consolidated
(see Mineral Hill under silver)

West King
(see under silver)

Whitestone (65)
(see under gold)

Wolfmanite (19)
(see under tungsten)

Yakima (63)
(see under copper)

PEND OREILLE COUNTY

Ace Ten Spot (78)

Ackerlund (99)
(see under copper)

D. Aldrich
(see Lead King under lead)

American Zinc, Lead and Smelting Co.
(see Grandview mine, Dumont, Lead Hill)

Auburn (31)
(see under lead)

Bailey-Hanson
(see Red Top under lead)

Barefoot (95)
(see under silver)

Bead Lake (100)
(see under lead)

Beatty (27)
(see under lead)

Bella May (new adit) (86)
(see also Metaline Mining & Leasing Co.)

Berkin
(see Wolf Creek under lead)

Blue Bucket (Kroll) (87)
(see also Metaline Mining & Leasing Co.)

Blue Jim (93)
(see under silver)

Bluebird
(see Dumont)

Bob Tail and Four Flush (72)

Boundary (6)
(see under lead)

Bromide
(see La Sota under silver)

Bunker Hill
(see Lead Hill)

Buzzell
(see Lucky Strike)

Caribou (1)
(see under lead)

Cedar Creek (92)

Clark
(see Josephine)

Cliff (20)

Coffin (90)

Columbia Lead & Zinc Mining Co. (21)
(see also Hoage)
Loc: Secs. 15, 22, and 27, (40-43E), Metaline dist. Elev: 2,700 ft. Access: About 10 mi. N. of railroad at Metaline Falls by way of Z Canyon road. Prop: Includes 7 Hoage claims, 19 other unpatented claims, and 2 patented claims. Owner: Columbia Lead & Zinc Mining Co., Spokane, Wash. (1952—). Ore: Zinc, lead. Ore min: sphalerite, galena, pyrite. Gangue: Dolomite, coarse calcite. Deposit: Ore minerals disseminated in silicified dolomite. Mineralized outcrops exposed in several places along the strike for 1,200 ft. One ore body, 51 ft. long, 7 to 15 ft. wide, reported to assay 4% to 23% Pb, Zn. Dev: 2 adits total 225 ft., also numerous open cuts. One adit has a stope 15 ft. long and 7 ft. high which does not extend to the limits of the ore. Improv: Compressor, drills, track, cars, tools (1952). Assays: Composite of many samples of the 30 tons of stockpiled hand-sorted ore showed 4.15% Pb, 11.1% Zn. Prod: No shipments, but 30 tons of hand-sorted ore were piled at the mine portal in 1945, and 200 tons of lower grade ore were stockpiled in 1951. Ref: 133, p. 32, 158.

Comstock (101)
(see under lead)

Corzine (91)
(see under lead)

Diamond Eagle (75)

Diamond R. (77)
(see under lead)

Dreadnought-Emily
(see Hoage)
Dumont (Bluebird) (22)


Eagle (42)


Emily

(see Hoage)

Eureka (40)


Fairview-Hoosier (76)


Flusay

(see Flusay-Hoopala under lead)

Flusay-Hoopala (30)

(see under lead)

Flying Squirrel

(see Giant-Flying Squirrel)

Four Flush

(see Bob Tail and Four Flush)

Galena Hill

(see Whoopee-Galena Hill)

Gardner (3)

(see also Tom Cat)


General MacArthur (102)

(see under lead)

Georgia Rose-Texas Slim (18)


Giant-Flying Squirrel (22)


Gilt Top (33)


Glass

(see General MacArthur under lead)

Gold Hill (64)

(see under lead)

Grandview mine (68)

(see also Grandview Mines, Inc.)


Grandview Mines, Inc.

(see also Red Top, Hidden Treasure, Mohawk under lead, and Grandview mine under zinc)


Hanley (4)


Hansen (105) (see under gold)

Hanson (see Red Top under lead)

Hemlock (52) (see under lead)

Hidden Treasure (62) (see under lead)

Hoage (Dreadnought-Emily) (23)


Hoosier (see Fairview-Hoosier)

Huffman (see Mule Deer under lead)

Ira Troyer (see Troyer under lead)

Iron Cap (51) (see under lead)

Jenny Dee-Snowshoe (50) (see under lead)

Jim Creek (89) (see under lead)

Jordan (see under lead)

Josephine (Clark) (69) (see also Pend Oreille Mines & Metals Co., and see Sullivan, Hertense under lead)


King Tut (58) (see under lead)

Kroll (see Blue Bucket)

Kurlew (59) (see under lead)

Lakeview (12)


La Sota (Silver Crest, Bromide) (96) (see under silver)

La Sota (Troyer) (see Troyer under lead)

Last Chance (36) (see under lead)

Last Chance (55) (see under lead)

Lead Hill (Bunker Hill) (63)

Compressor and shop building, three 100-ton ore bins, access roads (1922). **Assays**: Assays on shipments showed 62.05% Pb, 3.6 oz. Ag; but, as a whole, zinc predominates over lead in the ratio of more than 2 to 1. **Prod**: Small carload of hand-picked galena shipped in 1937. Milled 1,230 tons in 1951, 9,570 tons in 1952. Ref: 29, p. 33. 71. 97. 1938, p. 459; 1951, p. 1615. 29, 11/27/34. 104, 11/15/34, p. 27. 105, 2/5/31; 3/19/31; 4/10/31; 6/16/32. 113, 10/34, p. 14. 128, p. 63. 158.

**Lead Hill Extension (46)**


**Lead King (25)**

(see under lead)

**Lead Metal (65)**

(see under iron)

**Lead Queen (8)**

(see under lead)

**Little Noisy (94)**

Loc: NE ¼ SW ¼ sec. 17, (36-44E), on N. side of Noisy Cr., about 1 mi. above its mouth. **Elev**: 3,500 ft. **Access**: 13 mi. from Ione on the Sullivan Lk. road and 1½ mi. by trail up Noisy Cr. Canyon. **Prop**: 6 unpatented claims. **Owner**: I. E. Boswick and A. Krantz, Ione, Wash. (1851). **Ore**: Zinc, lead, silver, gold, copper. **Ore min**: Sphalerite, galena, chalcopyrite, molybdenite, pyrrhotite, scheelite, pyrite. **Gangue**: Quartz, carbonate, tourmaline. **Deposit**: Quartz vein 1 to 4 ft. thick and at least 460 ft. long in metamorphic rocks and granite, also mineralized dolomite. **Dev**: 3 adits, one 230 ft., one 80 ft., and one 90 ft. (esved). A 30-ft. shaft, and an open cut. **Assays**: 0.25% scheelite. Said to run $1.50 Au. Av. of all values is $25 per ton. One sample showed 10.5% Pb, 14.8% Zn, 5.05 oz. Ag, 0.93 oz. Au. Ref: 29, p. 62. 37, pp. 54-55. 46, p. 35. 68, p. 12. 138, p. 65. 158.

**Lloyd (103)**

(see under lead)

**Lookout (35)**

(see under lead)

**Lucky Boy (57)**

(see under lead)

**Lucky Boy Rex (34)**

Loc: Sec. 25, (40-43E) and sec. 30, (40-44E), Metaline dist. **Access**: Road. **Prop**: 7 unpatented claims. **Owner**: Dumont brothers, Metaline Falls, Wash. (1941—). **Ore**: Zinc, lead. **Deposit**: Replacement deposit of silicified limestone has been traced on the surface for a length of 200 ft. and a width of 6 to 80 ft. **Dev**: 210 ft. of adits, numerous open cuts. Ref: 29, pp. 47-48. 104, 7/19/36, p. 26. 133, p. 30. 158.

**Lucky Strike (Buzzell) (37)**


**M M (13)**

(see under lead)

**Mack (55)**

(see under lead)

**Mammouth**

(see Morning and Mammouth under lead)

**May Thomas**

(see under lead)

**Maybeso (54)**

(see under lead)

**Metaline Contact (73)**

(see also Metaline Mining & Leasing Co.)


**Metaline Falls (79)**

(see under lead)

**Metaline Metals (66)**

(see also Pend Oreille Mines & Metals Co.)

Loc: Secs. 2, 10, 11, and 15, (39-43E) and sec. 35, (40-42E), Metaline dist. **Access**: 6 mi. from Metaline Falls by road. **Prop**: 3 patented and 39 unpatented claims. **Owner**: Pend Oreille Mines & Metals Co. (1949). **Ore**: Zinc, lead, silver. **Deposit**: Replacement of silicified limestone. **Dev**: 400-ft. shaft with 2 levels; total about 1,000 ft. of workings. Some diamond drilling. **Assays**: Av. ore runs 4.5% Zn, 1.0% Pb, tr. Ag. Ref: 29, p. 84.

**Metaline Mining & Leasing Co. (81)**

(see also Bella May, Blue Bucket, Riverview, Metaline Contact, Sterling under zinc, and Red Top, Diamond R., Hidden Treasure under lead)


**Mockingbird (29)**

(see under lead)

**Morning and Mammouth (67)**

(see under lead)

**Mount Pisgah (104)**

(see under lead)

**Mountain Goat (5)**

(see under lead)
Mule Deer (98)  
(see under lead)

O. K. (84)  
(see under silver)

Ore Hill (83)  
Loc: Secs. 23 and 24, (39-43E), Metaline dist.  
Access: Near road.  
Prop: 10 unpatented claims.  
Owner: Abandoned (1941).  
Ore: Zinc, lead.  
Deposit: Slight mineralization of limestone.  
Dev: Open cuts and stripping.  
Ref: 29, p. 43.

Oriole (74)  
Loc: SE. cor. sec. 19, (39-43E), on N. slope of Linton Mtn.,  
Metaline dist.  
Elev: 3,000 ft.  
Access: ½ mi. from old Metaline on Linton Cr. road.  
Prop: 7 claims and 1 fraction.  
Owner: Arthur Betchart and E. O. Dressel, Jr., Metaline Falls, Wash. (1935—).  
Oriole Mining & Milling Co. 1907).  
Metaline Oriole Mining Co. (1911-1924).  
Metaline Minerals Co. (1922-1924).  
Frank Schultz (1935).  
W. L. Schultz, Metaline, Wash. (1942).  
Ore: Zinc, lead, silver, copper, gold.  
Ore min: Sphalerite, galena, tetrahedrite, chalcocyprite, pyrite, malachite, azurite, smithsonite, cerussite, bornite.  
Gangue: Quartz, calcite, dolomite.  
Deposit: Quartz lenses up to 3 ft. wide and 20 ft. long along a gouge breccia seam in dolomite.  
Dev: 2,000 ft. of workings, mostly in 3 adits.  
Assays: Smaller returns on coreload of picked ore: 42.1 oz. Ag, 21.8% Zn, 15.3% Pb.  
Red: 1,12% Cu.  
Pred: 2,000 tons up to 1942.  
1911, 1912, 1925, 1926, 1925.  
Ref: 5, p. 195-196.  
7, pp. 46-47.  
29, p. 36.  
73, pp. 67-69.  
97, 1912, 1917, 1926.  
98, 1922, p. 1655; 1923, p. 1823.  
112, p. 190.  
114, no. 5, 1909, p. 56.  
116, no. 8, 1907, p. 14.  
128, pp. 76-77.  
129, pp. 87-88.  
141, p. 46.  
158.

Pacnor Mines  
Loc: Russian Cr. area.  
Prop: 47 claims.  
Ore: Zinc, lead.  
Ref: 158.

Pay Day (16)  
Loc: Secs. 15 and 22, (40-43E), Metaline dist.  
Access: ¼ mi. from road.  
Prop: 1 unpatented claim.  
Owner: Jack Dandellon, Metaline, Wash. (1941).  
Ore: Zinc, lead.  
Deposit: Replacement in silicified limestone has been traced on the surface for about 150 ft. in length and 10 ft. in width.  
Dev: 15-ft. shaft, open cut.  
Ref: 29, p. 44.

Pearson (82)  
Loc: Sec. 33, (39-43E), Metaline dist.  
Access: Road.  
Prop: 80 acres of deeded land used for farming.  
Ore: Zinc, lead.  
Dev: None.  
Assays: Traces of lead and zinc.  
Ref: 29, p. 44.

Peevewee (15)  
Loc: Sec. 15, (40-43E), Metaline dist.  
Access: 300 yd. from road.  
Prop: 3 unpatented claims.  
Owner: Jim Ehle, Metaline, Wash. (1941).  
Ore: Zinc, lead.  
Deposit: Replacement of limestone.  
Dev: 40 ft. of tunnel, open cuts.  
Ref: 29, p. 45.

Pend Oreille Iron, Lead, and Zinc (14)  
Loc: Sec. 6, (40-44E), Metaline dist.  
Prop: 20 unpatented claims.  
Owner: Abandoned (1941).  
Ore: Zinc, lead.  
Deposit: Small showings of zinc and lead.  
Dev: Open cuts.  
Ref: 29, pp. 61-62.

Pend Oreille Mines & Metals Co. (70)  
(see also Josephine, Metaline Metals, Torrential-Sphinx, Yellowhead under zinc, and Flussey-Hoapals, Washington, Metaline Falls, Riverside, Z Canyon under lead)

Loc: Metaline dist.  
Access: Road.  
Prop: Several hundred acres of deeded property, many claims, including Josephine mine.  
Also own controlling interest in Reeves MacDonald Mines, Ltd.  
Owner: Pend Oreille Mines & Metals Co., Spokane, Wash. (1934—).  
Ore: Zinc, lead, silver, cadmium.  
Ore min: Sphalerite, galena, pyrite, marcasite, smithsonite, cerussite, unidentified uranium mineral.  
Gangue: Dolomite, jasperoid, calcite.  
Deposit: Replacement ore bodies of irregular shape and grade are near top of Metaline limestone, below black slate.  
Known ore bodies are 5,000 ft. long, as much as 700 ft. wide, and up to 100 ft. thick (1941).  
Uranium mineralization is not commercial.  
It is apparently not related to the zinc-lead mineralization.  
It occurs (1) in a small zone of the Josephine dolomite, (2) in black carbonaceous beds 0.05 to 0.2 ft. thick, and (3) as a "skin" on a fault.  
Gallium and germanium have been detected spectrographically in ore from the Chiechahominy claim.  
Dev: More than a mile of underground workings.  
Improv: 750-ton flotation mill and 2,400-ton flotation mill, power plant, apartment house, complete camp (1954).  
Assays: Ore as mined was 5% to 7% Zn and 0.5% to 2% Pb in 1941.  
Ore produced in 1948 av. 6.87% Zn, 3.57% Pb.  
1951 production av. 1.11% Pb, 2.37% Zn.  
Pred: 1927-1955, 3,111 tons valued at $9,76 per ton in 1915 from Clark property.  
123,751 tons of ore in 1948.  
186,955 tons in 1949.  
186,197 tons of ore in 1950 yielded 9,850,731 lb. Zn, 6,336,653 lb. Pb, 16,000 oz. Ag, 30,000 lb. Cu.  
273,580 tons of ore in 1951 yielded 12,950,584 lb. Zn, 6,045,914 lb. Pb, 16,014 oz. Ag.  
43, 7/52, pp. 90-93.  
83, 97, 1957-1952.  
110, 7/48, p. 5.  
133, p. 38.  
156.  
172.

Pine Cone-Z Canyon (19)  
Loc: Secs. 22 and 23, (40-43E), Metaline dist.  
Access: ¼ mi. from road.  
Prop: 15 unpatented claims.  
Owner: Messrs. Pfeiffer and Dandelson, Metaline, Wash. (1941).  
Ore: Zinc, lead.  
Deposit: Replacement deposit in limestone.  
Dev: Open cuts.  
Ref: 29, p. 45.

Red Crown (38)  
(see under lead)

Red Top (61)  
(see under lead)

Riverview (28)  
(see also Metaline Mining & Leasing Co.)

Loc: Secs. 26 and 35, (40-43E), Metaline dist.  
Access: 1 mi. from road.  
Prop: 5 unpatented claims.  
Owner: Metaline Mining & Leasing Co. (1949).  
Ore: Zinc, lead, silver.  
Deposit: Replacement deposit in silicified limestone.  
Zone shows only slight mineralization where exposed.  
Dev: 80 ft. of adits, numerous open cuts.  
Ref: 29, p. 44.  
46, p. 29.  
65, p. 13.

Robert E. Lee (39)  
(see under lead)

Rocky Creek (97)  
(see under silver)

Saddle (17)  
Access: 1¼ mi. from road.  
Prop: Group of claims.  
Owner: Maude Lindstrom, Spokane, Wash. (1941).  
Ore: Zinc, lead, iron.  
Deposit: Replacement deposit in silicified limestone exposed on the surface for about 300 ft. along the strike.  
Dev: 10-ft. adit, numerous open cuts and trenches.  
Ref: 29, p. 61.

Salmon (56)  
(see under silver)

Scandinavian  
(see Lead Queen under lead)

Silver Crescent (9)  
(see under lead)
Silver Crest
(see La Sota under silver)

Silverado
(see Z Canyon under lead)

Slate Creek (47)
(see Whoopie-Galena Hill)

Snowshoe
(see Jenny Dee-Snowshoe under lead)

Sphinx
(see Torrential-Sphinx)

Star (41)
(see under lead)

Star (43)
(see under lead)

Sterling (88)
(see also Mettile Mining & Leasing Co.)


Sullivan (71)
(see under lead)

Sunshine (49)
(see under lead)

Tamarack (60)
(see under lead)

Texas Slim
(see Georgia Rose-Texas Slim)

Tom Cat (2)
(see also Gardner)

Loc: Center S. line sec. 3, (40-43E), Metatile dist. Elev: 2,000 ft. Access: 1/4 mi. E. of road 1 mile. N. of Z Canyon. Prop: 1 patented claim: Tom Cat (part of Gardner property). Owner: E. O. Dressel, Metatile Falls, Wash. (1937-1941). Ore: Zinc, lead. Ore min: Sphalerite, galena. Gangue: Dolomite. Deposit: Disseminations in dolomite and silicified carbonate rock. Dev: 26-ft. vertical shaft, 14-ft. drift, 2 open cuts, 3 diamond drill holes. Assays: 3 diamond drill holes showed 6 ore intersections 4 to 6 ft. thick which showed nil to 15.3 Pb, 0.4% to 1.8% Zn, the av. being 3.2% Pb, 0.8% Zn. 6 channel samples av. 1.1% Pb, 1.3% Zn. Ref: 19. 128, p. 74.

Torrell
(see under lead)

Torrential-Sphinx (10)
(see also Pend Oreille Mines & Metals Co.)


Troyer (La Sota, Ira Troyer) (45)
(see under lead)

Twin Lakes (24)
(see under lead)

Uncas (44)

Velvet
(see under lead)

Velvet Lode
(see King Tut under lead)

Washington (80)
(see under lead)

Washington Rock
(see under lead)

West
(see Blue Jim under silver)

Whoopie-Galena Hill (Slate Creek) (48)

Wolf Creek (85)
(see under lead)

Woodpecker (26)

Yellowhead
(see also Pend Oreille Mines & Metals Co.)


Z Canyon (Pine Cone-Z Canyon)
(see Pine Cone-Z Canyon)

Z Canyon (Silverado) (11)
(see under lead)

Z Canyon Mutual (7)

PIERCE COUNTY

Golden Rule (1)
Zinc Occurrences—Pierce County

chite. **Deposit**: Black hard siliceous vein 18 in. wide in coarse granodiorite. **Dev**: 45-ft. adit. **Ref**: 158.

**Silver Creek (3)**  
(see under gold)

**Silver Creek Gold & Lead (2)**  
(see under gold)

**SKAGIT COUNTY**

**Alta (8)**  
(see under lead)

**Boston (9)**  
(see under lead)

**British**  
(see Skagit Queen under silver)

**Cerrico**  
(see under lead)

**Chicago (10)**  
(see under lead)

**Cliff (14)**  

**Dorothy**  
(see Thunder Creek under lead)

**Eldorado (12)**  
(see under silver)

**Everett Extension**  
(see under silver)

**Friend (15)**  
(see under silver)

**Great Northern**  
(see under gold)

**Iowa-Olympia**  
(see under silver)

**Johnsburg (13)**  
(see under lead)

**Kildare (16)**  
(see under lead)

**Lakeside**  
(see under lead)

**Logan No. 2 (3)**  
(see under silver)

**Midas (17)**  
(see under silver)

**Olympia**  
(see Iowa-Olympia under silver)

**Pioneer (19)**  
(see under silver)

**Protection (5)**  
(see under lead)

**Silver Tip (6)**  
(see under lead)

**Skagit Queen (2)**  
(see under silver)

**Soldier Boy (18)**  
(see under gold)

**Stenno (4)**  
(see under lead)

**Stephens (1)**  
(see under copper)

**Thunder Creek (7)**  
(see under lead)

**West Seattle (11)**  
(see under lead)

**SKAMANIA COUNTY**

**Athens**  
(see under copper)

**Bumble Bee**  
(see under copper)

**Chicago (4)**  
(see under copper)

**Coe**  
(see Sweden under copper)

**Commonwealth (3)**  
(see under copper)

**Golconda (2)**  
(see under gold)

**Gold Creek**  
(see Zinc Creek)

**Last Chance (7)**  
(see under copper)

**St. Helens**  
(see Sweden under copper)

**Snowflake (1)**  
(see under lead)

**Sweden (5)**  
(see under copper)

**Zinc Creek (Gold Creek) (6)**  
**Loc**: SW¼NE¼ and NW¼SE¼ sec. 13, (3-5E), on a tributary of Washougal R. **Elev**: 1,450 ft. **Access**: 13 mi. by road and 1½ mi. by trail from Cape Horn. **Prop**: State land. **Owner**: Leased by G. A. John, and Axel Bloomquist and Fred McKay, Vancouver, Wash. (1952—). E. G. Judd and Leslie E. Judd, Vancouver, Wash. (1947). **Ore**: Zinc. **Ore min**: Sphalerite, some galena and chalcopyrite. **Gangue**: Quartz, calcite, breccia, siderite. **Deposit**: Shear zone in volcanic rocks cemented by mineralized quartz and calcite. Zone av. 1 to 3 ft. but is 10 ft. wide at one place. **Dev**: 120-ft. drift, shaft, and surface exposures. **Assays**: Zn content of vein est. to be 5%. Au and Ag reported in assays. **Ref**: 158.

**SNOHOMISH COUNTY**

**Ala-Dickson (17)**  
(see under copper)

**Alleghany**  
(see Foggy under copper)

**Blackman**  
(see Doris under copper)

**Bonanza**  
(see Mineral Center under gold)

**Broken Ridge (36)**  
(see under copper)

**Brown**  
(see Doris under copper)
Calumet (28)
(see under gold)

Calumet (41)
(see under copper)

Calumet (Glacier Peak)
(see Glacier Peak under copper)

Clara Thompson
(see Jasperon under gold)

Commonwealth
(see Jasperon under gold)

Cooperative (40)
(see under copper)

Darrington
(see Gold Mountain under copper)

Doris (29)
(see under copper)

Edison
(see Mineral Center under gold)

Feldt (2)
(see under silver)

Florence Rae (31)
(see under copper)

Foggy (23)
(see under copper)

"45" (13)
(see under silver)

Glacier Peak (9)
(see under copper)

Gold Mountain (8)
(see under copper)

Good Hope (25)
(see under gold)

Gray Mare (3)
(see under silver)

Howard
(see Cooperative under copper)

Index Gold Mines, Inc. (37)
(see under gold)

Iowa (30)
(see under copper)

Iowa
(see Washington-Iowa under copper)

Jasperon (32)
(see under gold)

Kazian (38)
(see under copper)

Larson (1)
(see under lead)

Lockwood Pyrite (19)
(see under iron)

Louise
(see Mineral Center under gold)

McCombs
(see Jasperon under gold)

Magus
(see "45" under silver)

Martin Engdahl (33)
(see under lead)

Marvel (42)
(see under copper)

Michigan (39)
(see under gold)

Milwaukee (14)

Mineral Center (20)
(see under gold)

Mineral Mines (34)
(see under copper)

Mint
(see Iowa under copper)

Monte Cristo (24)
(see under gold)

Mountain Cedar (18)
(see under copper)

Mystery (Monte Cristo, Pride)
(see Monte Cristo under gold)

Mystery (Mountain Cedar, Paystreak)
(see Mountain Cedar under copper)

Nesta (6)
(see under copper)

North Star
(see Sunrise under gold)

O and B (22)
(see under copper)

Old Gray Mare
(see Gray Mare under silver)

Oldfield
(see Sunrise under gold)

Palmer
(see under nickel)

Paystreak
(see Mountain Cedar under copper)

Peabody (26)
(see under gold)

Penn
(see Foggy under copper)

Perm
(see under gold)

Pride
(see Monte Cristo under gold)

Queen Anne (7)
(see under gold)

Rustler (16)
(see under copper)
S. M. P. (35)


Silver Coin (12)

(see under gold)

Silver Creek

(see Broken Ridge under copper)

Silver Horseshoe (15)

(see under silver)

Silver Queen (27)

(see under gold)

Sunrise (4)

(see under gold)

Threadwell

(see under gold)

Washington-Iowa (21)

(see under copper)

Wayside (10)

(see under copper)

Webster

(see Jasperson under gold)

Whitehorse (5)

(probably same property as Gray Mare under silver)

Loe: Near N. 1/4 cor. sec. 30, (33-9E) and vicinity, on Whitehorse Mtn., Darrington dist. Access: Road. Prop: Large group of claims. Owner: Mr. Larsen. Ore: Zinc, lead, copper, silver, gold. Ore min: Sphalerite, galena, chalcocyprite. Deposit: Mineralized fractures in limestone and doreite. Mineralization very sparse. Dev: 5 short adits. Assays: As high as 60% Pb, 3% Zn, 25 oz. Ag are reported. Obviously these assays were on handpicked samples. Ref: 104, 5/30/33, p. 18; 10/15/33, p. 18; 2/28/37, p. 28. 158.

Yankee Boy (11)

(see under copper)

STEVENS COUNTY

A and C (85)

(see under copper)

Abe Lincoln

(see Comstock under lead)

Acme (100)

(see under lead)

Admiral Consolidated (51)


Advance (40)


Aichan Bee (126)

(see under silver)

Aladdin (Blue Ridge, Sierra Zinc)

(see Sierra Zinc)

Aladdin (92)

(see under lead)

Alma (101)

(see under silver)

Anaconda (56)

(see under lead)

A. Anderson (50)


Anderson (49)


Ark (99)

(see under silver)

Austin

(see Aichan Bee under silver)

Avondale-Dome (77)

(see under lead)

Banner

(see Chinto under copper)

Bear Mountain (104)

(see under lead)

Big Chief (79)

(see under lead)

Black Canyon

(see under lead)

Black Horse

(see Columbia Tungsten under tungsten)
Black Rock (Washington Black Rock, Gorien Zinc) (35)


Black Witch (see Alma under silver)

Bliss (see Galena Hill under lead)

Blue Ridge (see Sierra Zinc)

Blue Star (see Eagle under silver)

Bonanza (72) (see under lead)

Boundary Silver Lead (see Lucile)

Brooks (123) (see under silver)

Bruce Creek (see A and C under copper)

Buffalo (68) (see under silver)

Bullion (24) (see under lead)

Burrus (Rocky Creek) (91)


Carbo (45)


Chewelah Eagle (see Eagle under silver)

Chinto (106) (see under copper)

Chloride Queen (78) (see under lead)


Cleveland (118) (see under lead)

Clugston (see Silver Trail under lead)

Columbia (see Iroquois)

Columbia Tungsten (115) (see under tungsten)

Colville Queen (see Chloride Queen under lead)

Comstock (Abe Lincoln) (12) (see under lead)

Contention (see Mountain View under silver)

Copper King (55) (see under lead)

Copper King (85) (see under lead)

Coyote (19) (see under lead)

Coyote (see Coyote under lead)

Daisy (see Daisy-Tempest under silver)

Daisy-Tempest (102) (see under silver)

Dead Medicine (see Silver Trail under lead)

Deep Creek (Gorien Zinc, Northport) (38)


Deep Lake
(see Farmer)

Deer Trail (121)
(see under silver)

Defender (7)

Dora
(see Acme under lead)

Double Standard (14)
(see under copper)

Eagle (108)
(see under silver)

Easter Sunday (9)
(see under gold)

Easy Money
(see Magma)

Echo (80)

Eldorado
(see Magma)

Electric Point (46)
(see under lead)

Emerald
(see under lead)

Empire (36)

Eureka (2)
(see under gold)

Eureka (Uncle Sam)
(see Uncle Sam under lead)

Eureka and Orient
(see Eureka under gold)

Evergreen (69)
(see under lead)

Farmer (Deep Lake) (42)

Flannigan
(see Iroquois)

Flat Creek (11)

Frisco Standard (67)
(see under silver)

Galena Hill (6)
(see under lead)

Gillete
(see Avondale-Dome under lead)

Gladstone (47)
(see under lead)

Globe (8)
(see under copper)

Gold Bar (73)
(see under gold)

Gorien Zinc
(see Black Rock, Deep Creek, New England)
Note: In 1919 John Gorien was Treasurer of the Northport Mining Co., and this company owned or controlled 280 acres of mineral land on both sides of Deep Cr. Valley, probably including all of the properties described separately in this report under the names of Deep Creek (Northport, Gorien), New England (Stone), Black Rock (Washington Black Rock, Gorien Zinc), and probably including others also.

Great Republic (15)
(see under copper)

Great Western (33)
(see under lead)

Grubstake
(see under silver)

H & B
(see Aichan Bee under silver)

Haribauer (54)
(see under lead)

Hartford
(see Krug under copper)
Hecla (109)
(see under copper)

Helena Johnson (37)
(see under lead)

Heritage (25)

Hi Cliff
(see Uncle Sam under lead)

Highland (63)
(see under lead)

Hoodoo (122)
(see under silver)

Hubbard (23)
(see under lead)

Hunter
(see Jackson)

Indian
(see Eureka under gold)

Iron Mask (Treadwell) (3)

Iroquois (Flannigan, Columbia) (57)

Jackson (Hunter) (60)

Jay Dee (107)
(see under silver)

Jay Gould (110)
(see under silver)

Joe Creek (95)
Loc: NW¼NW¼ sec. 4 and SW¼SW¼ sec. 5, (36-40E), Mill Cr. area. Owner: Joe Creek Mining Co., Colville, Wash. (1952—). Ore: Zinc, lead. Ref: 133, p. 35.

Jupiter
(see Last Chance under lead)

Just Time (62)
(see under lead)

Keough (64)
(see under lead)

Kettle River
(see Galena Hill under lead)

King Tut
(see under lead)

Krug (113)
(see under copper)

Lakeview
(see Roosevelt under silver)

Last Chance (34)
(see under lead)

Lead King (48)
(see under lead)

Little Frank (120)
(see under lead)

Lone Star (20)
(see under silver)

Longshot (94)
(see under lead)

Lucile (Owen, Boundary Silver Lead) (58)

Lucky Charlie (5)
(see under copper)
Lucky Stone (76)
(see under lead)

Magna (Easy Money, Eldorado) (88)

Maki (44)
(see under lead)

Maple Leaf
(see Melrose under silver)

Melrose (52)
(see under silver)

Mexico
(see Queen under silver)

Michigan Boy (96)
(see under lead)

Middleport (Rinchaw) (93)

Mineral Hill
(see Aichan Bee under silver)

Moonlite
(see Morning under silver)

Morning (89)
(see under silver)

Mountain View (21)
(see under silver)

Mullen (112)
(see under lead)

Myeerah (66)
(see under lead)

Neglected (81)
(see under lead)

Nevada (114)
(see under lead)

New England (Stone) (31)

Newland
(see Longshot under lead)

North Monitor (119)
(see under silver)

Northern Light (28)
(see under lead)

Northport
(see Deep Creek)

Northwest

Oakshott (90)
(see under lead)

Occidental (32)

Old Dominion (98)
(see under silver)

O-Lo-Lim (128)
(see under copper)

Olympia (70)
(see under lead)

Orazada (127)
(see under silver)

Orchid (117)
(see under silver)

Orient Eureka
(see Eureka under gold)

Owen
(see Lucile)

Paragon
(see Melrose under silver)

Payne (111)
(see under copper)

Perry (1)
(see under lead)
Pioneer
(see Longshot under lead)

Plug (41)
Loc: Secs. 28 and 33, (39-41E), just W. of Farmer property. Access: 14 mi. by road from railroad at Northport. Prop: 160 acres of deeded land. Owner: Grandview Mines, Inc., Spokane, Wash. (1952——). Mrs. Helen Johnson, Northport, Wash. (1941-1945). Ore: Zinc, lead, silver. Deposit: Replacement zone in limestone near granite contact is about 12 ft. wide and has been traced on the surface for 1,000 ft. Dev: 15-ft. shaft, 130-ft. adit. Assays: Said to contain as much as 22% Zn, 2% Pb. Samples from unspecified widths show 0.1% to 0.2% Pb, 0.3% to 8.9% Zn. Ref: 30, p. 90, 46, p. 62. 157, 158.

Pomeroy (10)

Providence (22)
(see under lead)

Providence (Deer Trail)
(see Deer Trail under silver)

Queen (124)
(see under silver)

Queen and Seal
(see Queen under silver)

Ranch View (59)
(see under lead)

Red Sheaf (75)
(see under gold)

Red Top (53)
(see under lead)

Redwood
(see Eagle under silver)

Rinchaw
(see Middleport)

Riverview (16)
(see under lead)

Robena
(see Young America)

Rockcut (4)
(see under lead)

Rocky Creek
(see Burrus)

Roosevelt (61)
(see under silver)

Royal
(see Big Chief under lead)

Royal Gold
(see Hubbard under lead)

Santa Rita
(see Cleveland under lead)

Saturday Night-Sunday Morning (125)
(see under lead)

Scandia (39)

Seal
(see Queen under silver)

Shoemaker (97)

Short Wait (26)
(see under lead)

Sierra Zinc (Aladdin, Blue Ridge) (87)
Loc: Secs. 19, 20, 29, and 30, (36-41E), on W. side of Deep Cr. 4 mi. N. of Aladdin. Elev: 2,000 ft. Access: ½ mi. W. of the Aladdin-Deep Lk. highway by road. 17 mi. from railroad at Northport. Prop: 7 claims: Troublesome, Mistake, In Place, Original (or Skookum), Rite, Champion, Protect. Owner: Goldfield Consolidated Mines Co., San Francisco, Calif. (1949——). Aladdin Mining Co. (1908-1933). Blue Ridge Mining Co. (1910-1940). Sierra Zinc Co. (1940-1944). Ore: Zinc, lead, silver, gold. Ore min: Sphalerite, galena, chalcopyrite, pyrite, molybdenite, smithsonite. Gangue: Dolomite, limestone. Deposit: Present ore consists of sphalerite and galena disseminated in limestone. Also on the property are quartz veins which carry minor amounts of chalcopyrite, sphalerite, galena, pyrite, and molybdenite. The main ore body mined prior to 1944 measured 300 ft. along the strike, 200 ft. down dip, and 4 to 12 ft. thick. 3 smaller ore bodies were mined. The ore occurred in marble close to a low-dipping fault and/or an igneous sill. Dev: 6 adits total 8,450 ft. of workings and 470 ft. of shaft. Diamond drill holes. Principal workings are on 4 levels. The upper 2 levels are connected to the lower 2 by a 260-ft. 30° inclined shaft. Improv: 300-ton flotation mill (1954). Assays: A carload of conc. ran 6.7 oz. Ag, 0.14 oz. Au, 21.8% Zn, 11% Pb. 12,123 tons produced in 1942 av. 1.59% Pb, 7.36% Zn. Av. of 0.67% Pb, 5.43% Zn, 0.01 oz. Ag, 0.01 oz. Au per ton were recovered from 1941-1944 production. Prod: 1909, 1924, 1925, 1941-1944 (100,000 tons). 1950-1952. Ref: 30, pp. 109-110, 46, pp. 40-42, 63, p. 111. 73, pp. 109-111. 97, 1925, p. 561; 1926, p. 470. 98, 1922-1926. 166, 1/5/33. 168, 1/42.
Silver Basin
(see Queen under silver)

Silver Crown (29)
(see under lead)

Silver Key
(see Big Chief under lead)

Silver Mountain
(see Daisy-Tempest under silver)

Silver Queen (Ark)
(see Ark under silver)

Silver Queen (Queen)
(see Queen under silver)

Silver Seal
(see Queen under silver)

Silver Trail (84)
(see under lead)

Smoky Bullion
(see A and C under copper)

Star
(see Just Time under lead)

Sterrett (18)
(see under lead)

Stockwell
(see Columbia Tungsten under tungsten)

Stone
(see New England)

Stonewall-Sunnyside (30)
(see under lead)

Sugar Loaf
(see Vanasse under silver)

Sunday Morning
(see Saturday Night-Sunday Morning under lead)

Sunnyside
(see Stonewall-Sunnyside under lead)

Sunset (17)
(see under lead)

Surprise
(see Uncle Sam under lead)

Tempest (103)
(see under silver)

Tenderfoot (Avondale-Dome)
(see Avondale-Dome under lead)

Tenderfoot (Big Chief)
(see Big Chief under lead)

Treadwell
(see Iron Mask)

Uncle Sam (82)
(see under lead)

United Treasure (65)
(see under silver)

Van Stone (85)


Vanasse (74)
(see under silver)

Venus
(see Deer Trail under silver)

Victory
(see Vanasse under silver)

Wall Street (27)
(see under copper)

Washington Black Rock
(see Black Rock)

Wells Fargo (116)
(see under antimony)

White Horse (13)
(see under copper)

Winslow (105)
(see under lead)

Young (43)
(see under lead)

Young America (Robena) (71)


WHATCOM COUNTY

Allen Basin (6)
(see under gold)

Azurite (11)
(see under gold)

Baltimore (7)
(see under gold)

Chain Lakes (4)

Chancellor (8)
(see under gold)

Evergreen (2)
(see under gold)

Galena
(see Verona under gold)

Gargett (1)
(see under gold)

Gold Hill (12)
(see under silver)

Golden Arrow
(see Tacoma under gold)

Great Excelsior (3)
(see under gold)

Indiana
(see Chancellor under gold)

Lincoln
(see Great Excelsior under gold)

Mammoth (9)
(see under gold)

Northern Cascade
(see Gold Hill under silver)

Peterson
(see Gold Hill under silver)

President
(see Great Excelsior under gold)

Tacoma (10)
(see under gold)

Verona (5)
(see under gold)

YAKIMA COUNTY

Black Jack (Green, Deep Creek) (4)

Chinook (2)
(see under copper)

Deep Creek
(see Black Jack)

Gold Hill (1)
(see under gold)

Green
(see Black Jack)

Richmond (3)
(see under lead)

ZIRCONIUM

Properties—Because zirconium metal is difficult to prepare in a state of high purity, there is much confusion concerning its physical and chemical properties, many of the earlier data having been determined from impure metal. In the sponge form it is a bluish-black powder, but the fused metal is steel gray to lustrous silver white, resembling freshly broken cast iron. In many respects it resembles titanium, and also it is similar to hafnium. It is moderately hard, ductile, malleable, and strong. Zirconium is one of the most corrosion resistant of metals, resisting most acids, even when concentrated and hot, as well as hot concentrated caustic solutions. The metal is about five-sixths as heavy as iron, and its tensile properties are similar to those of mild steel. At high temperatures it has a great affinity for gases such as oxygen, nitrogen, hydrogen, and carbon dioxide. Unlike most metals, it has a very low absorption for neutrons and therefore does not slow down atomic fission. Other properties are shown in the table on page 12.

Uses—The current chief use of zirconium metal is in atomic-power devices, where it is employed as a structural material. It has also been used as a “getter” in the production of electronic tubes, for lamp filaments, as a deoxidizer and scavenger in steel manufacture, in ammunition primers, blasting caps, rayon spinnerets, electrodes, photo-flash bulbs, flares, and welding rods for spot welding. It has proven useful in surgery for suture wires, bone pins, and plates, as tissue grows directly to it without deterioration. Zirconium is alloyed with iron and with nickel to increase its hardness, with tungsten to increase its ductility, with copper to increase its strength, and with aluminum and magnesium to improve certain of their
physical qualities. Zirconium oxide is used in refractories, being one of the most refractory oxides known. The oxide and other compounds are used in leather tanning, dyeing, ceramics, and pigments. Perfect crystals of the silicate, zircon, are valuable as gems.

**Production**—Very small amounts of zirconium have been produced in the United States for many years, but until 1952 the only substantial producer of the pure ductile metal was the United States Bureau of Mines, whose plant in 1953 was producing at the rate of 100,000 pounds per year, the entire output going to the Atomic Energy Commission. Although zircon occurs in black sands rather commonly in Washington, there has as yet been no production.

**Prices**—Zirconium metal powder was quoted in 1955 at $10 per pound, which is not greatly different from the price 25 years earlier, but some of the purer ductile zirconium metal when first produced in this country sold for as much as $650 per pound. The ore, zircon concentrate, 65 percent ZrO₂, was quoted in 1955 at $48 per ton delivered at Atlantic seacoast, which also was about the same as the price 25 years earlier.

**Ore minerals**—Zirconium is estimated to constitute 0.02 to 0.03 percent of the earth’s crust and is more abundant than copper, lead, zinc, and silver combined. It is a constant and almost inseparable companion of hafnium. Although zirconium is a constituent of a number of minerals, only two are abundant enough to be ores. These are the silicate, zircon, ZrSiO₄, containing 67.2 percent ZrO₂, and the oxide, baddeleyite, ZrO₂, containing 74.0 percent zirconium. Both minerals generally carry up to 4 percent hafnium.

**Geology**—Zircon is a common accessory constituent of many granitic, volcanic, and metamorphic rocks and of sedimentary rocks and sands derived from them. Black sands of beach and river placers frequently are zirconium bearing. Common associated minerals are magnetite, ilmenite, monazite, and other heavy metallic and nonmetallic minerals. Baddeleyite occurs in pegmatites and placers derived from them.

**Occurrences**

**DOUGLAS COUNTY**

**Columbia River Placer**
(see under gold, placer)

**FERRY COUNTY**

**Wilmont Bar Placer** (1)
(see under gold, placer)

**GARFIELD COUNTY**

**Pomeroy Placer**
(see under gold, placer)

**GRAYS HARBOR COUNTY**

**Damons Point Placer** (1)
(see under titanium)

**PACIFIC COUNTY**

**Beards Hollow Placer** (1)
(see under platinum)

**McGowan Placer** (2)
(see under iron)

**ORE UNKNOWN**

In the literature there are many mine and claim descriptions that fail to mention the ore present in the deposit. In some instances this was because no ore was found, and in others failure to mention the ore was merely an oversight. Probably most prospects in this category are of little or no consequence, but, in order to make the record complete, they are listed and briefly described in the following pages.

**Occurrences**

**CHelan County**

**Adolph** (1)

**Bagley** (29)
Chelan Consolidated Copper

Chelan Falls (19)

Christy (2)

Clinton

Comet

Copper King

Diamond Drill (20)

East Side
(see Mayflower and East Side)

Eureka (24)

Gertie (3)

Gibson (12)

Gilman (25)

Granite (13)

Happy Thought (14)

Iron Cap (15)

Iron Cross (16)

Kingman (4)

Lady of the Lake (5)

Last Chance (26)

Leavenworth

Lucky Dick

Mattie Jane (17)

Mayflower and East Side (10)

Silver Bell (11)

State

Stoner (23)

Sunnyside (6)

Sunrise (27)

Tibbie (28)

Viola (7)

Water Fall (8)

White Cap (9)
FERRY COUNTY

Anonymous (5)

Bonanza Fraction (27)

Bottle (4)

Bummer (28)

Buster (20)

Churchill (3)

Cuba (2)

Evening Star (1)

Golden Zone (29)

Goldsmith (12)

Iron Age (30)

Iron Rod (6)

Ironside (26)

Josie (8)

Kirkpatrick (13)

Last Chance (17)

Liberty Bell (21)

Lincoln (31)

Lookout (14)

Lost Lode (9)

Maple (10)

Meekland (18)

Mohawk (11)

Mountain View (15)

Raspberry (22)

Rising Sun (19)

Salina (7)

Seattle (23)

Stemwinder (24)

Tomboy (16)

Tyler (25)

Wells (32)

GRAY'S HARBOR COUNTY

Damons Point (1)

KING COUNTY

Ascherfeld (Jones, Sunday Creek) (7)

Belle

Black Jack (15)

Black Prince

Clara K. (11)

Commonwealth (17)
Copper Bell (14)
Loe: NW¼ sec. 36, (24-8E), Snoqualmie dist. Ore: Unknown. Deposit: Vein along contact between granite and gneiss, with 4 cross veins 1 to 4 ft. wide. Ref: 63, p. 42.

Double Stamp (2)

Galena Star

Hardy
(see Milton-Hardy)

Jones
(see Ascherfeld)

Jumbo (12)

McKinley (3)

Markley (4)

Milton-Hardy (8)

Mina (5)

Orphan Girl (1)

Portland (13)

Red Butte (9)

Spider (6)

Sunday Creek
(see Ascherfeld)

Tornado (10)

United Cascade Mining Co. (16)

KITTITAS COUNTY

Bald Eagle

Billy Goat (1)

Black Bear

Copper Prince

Cottontail

Davis

Eureka

Glover

Green Bear

Ione Fraction

Little New York
(see Phoenix and Little New York)

Lucky Boy (2)

Madeleine

Merrick (3)

Mountain Sprite

Once There

Phoenix and Little New York (4)

Rainbow

Red Jacket (5)

Robert E. Lee

Silver Belle No. 2

Silver Dump

Silver King

Tacoma
Taft (6)

Wolf (7)

LEWIS COUNTY

Peterson (1)

MASSA COUNTY

Darcy (Keller) (1)

Keller
(see Darky)

OKANOGAN COUNTY

Alyna

Americanetta

Ashton (8)

Aurora (Deer Creek, Lucky Strike) (21)

Banner

Beggars's Choice (11)

Ben Everett

Bonanza

Bonanza Chief (1)

Bonanza King

Boomer

Buckhorn (13)

Cape Nome (23)

Central

Clayton (4)

Conconully Copper

Deer Creek
(see Aurora)

Deerfly (15)

Dewey (18)

Dundee

Echo Gulch (6)

Glory

Golden King

Granite

Gussie Everett

Haggerty

Humboldt

Ida May
Indiana

Kaywash (5)
  Loc: Sec. 8 (?), (35-20E), on SW. side of Methow Valley
  about 11 mi. NW. of Winthrop. Owner: Abandoned (1946).
  Ore: Unknown. Ref: 158.

Keno (14)
  Deposit: Several strong quartz veins near contact of granite
  with schist, quartzite, greenstone, and some limestone. Dev:

Keystone (19)
  Loc: NW 1/4 sec. 35, (40-30E), Myers Cr. dist. Owner: Inter-
  state Mining Corp., Columbus, Ohio (1903). Ore: Unknown.
  Ref: 100, 1903, p. 102.

Kismet (1)

La Plata

Lucky Dog

Lucky Jim (7)
  Loc: Sec. 16, (35-20E), on SW. side of Methow Valley.
  Access: About 10 mi. NW. of Winthrop. Prop: 8 patented
  claims. Owner: L. G. Halloway, Winthrop, Wash. (1946). Ore:
  Unknown. Dev: 1 adit 750 to 800 ft. long, 2 shorter adits, and
  1 shaft is reported. Ref: 158.

Lucky Strike
  (see Aurora)

Lucky Sunday (3)
  Loc: SW 1/4 sec. 16, (36-20E), on Montana Cr. trail. Access:
  About 1 mi. from the Goat Cr. road. Ore: Unknown. Deposit:

J. M. Lundy

Marvel

Mayflower

Missing Link

Modoc Chief

Monte Oro

Mount Bay

Mountain Lily
  Loc: Near head of South Cr., in Gilbert area. Access: 4 to 8
  mi. from Twisp R. road. Owner: Abandoned (1946). Ore: Un-
  known. Ref: 158.

Mug
Thompson

U. S. Treasure (15)

Union

Weymayer (2)

Wheel of Fortune

Wide West

Yellow Jacket

PEND OREILLE COUNTY
Bettencourt

Bonnie Blue Belle

Brown (9)

Emerald (4)

Joscie (2)

Log Cabin (7)

Malden (5)

Opal

Pine Hill (1)

Rectangle

Storm (8)

Wall Street (6)

Wide West (3)

PIERCE COUNTY
Apex (1)

Big Load

Clipper

Little Gem

Summit

Vermont

SKAGIT COUNTY
Baltimore

Black Stallion (1)

Buffalo

Cincinnati

Hartlay (2)

Helena Butte

Homestake

Jumbo

King Solomon

Logan
Montreal

New York

SKAMANIA COUNTY
Big Blue (5)

Blue Bird

Bonanza (1)

Box Canyon

Chicago and Golden Crown (6)

Copper King

Denmark (3)

Dixie

Golden Crown
(see Chicago and Golden Crown)

Hercules (2)

Tennessee (4)

Washington

Williams (7)

SNOHOMISH COUNTY
Alki and Ellen (22)

Arkansas Traveler (23)

Baby Lode (4)

Beeman

Bengal (15)

Beta (9)

Black Diamond

Black Hawk (5)

Blackjack
(see Waterfall and Blackjack)

Boulder (10)

Buncombe (30)

Bunker Hill (3)

Butte (24)

Cariboo

Cedar (11)

Central Fraction

Clara (16)
Climax

Climax and Knoxville

Columbus (12)

Columbus (33)

Combination (29)

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Dena

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    (see Alki and Ellen)

Emma

Even Up

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Forty-Seven

Frater

G. H. and L.

Galena Copper

Glacier

Great Republic

Gustafson

Homestake

Hunter

Hydra

Ingersoll

Justice

Knoxville
    (see Climax and Knoxville)

Laborum

Lone Jack

Louise
    (see Mayflower and Louise)

Lucky Chance

Mammoth

Marine (25)

Mayflower and Louise

Moss Rose
Navajo

Nibus

Noaday

Non Pareil (2)

Old Missouri (26)

Pauline (20)

Phoenix (21)

Pinnacle

Pomona

Port Gardner

Ranger

Russia

Sacramento (14)

San Francisco (17)

Saturday

Scotch Lassie Jean (27)

Seventy-Four

Shamrock Copper

Silver Shield

Stockton

Stratus

Summer Coon (8)

Superior

Thistle

Three Sisters (7)

Trident

Tuscoluma

Uncle Sam

Washington

Waterfall and Blackjack (18)

Welcome Home (13)

West Seattle

Wildcat (28)

Witcher (1)

STEVENS COUNTY

Alberta
Alice Mae (11)

Big Bear

Bromide Mountain

Brown Bear (19)

Buck Canyon (14)

Bulldog

Butte
(see Chief and Butte)

Butte and Washington

C & A

Calumet and Hecla (12)

Carr

Chicamun

Chief and Butte (4)

Coffin

Commonwealth

Culits

Dandy

David Harum (5)

Drake

Edwin Seaman (15)

Effie R.

Fool's Luck

Fraction

Hartbauer (9)

Hecla
(see Calumet and Hecla)

Iron Chief

Last Chance

Lion

Log Cabin (6)

Lost Boy

Lucky Bill

Lucky Red

Lucky Strike (10)

Mammoth

Minnehaha

Monohan (7)
Old National

Princess Pat (2)

Prudential

Ranger

San Jose

Santiago

Skookum (16)

Strobeck (13)

Tenderfoot (1)

Treadwell (2)

Uncle Sam (17)

Union (8)

Velvet

Washington (18)

Washington (Butte and Washington)
(see Butte and Washington)

Wizard

WHATCOM COUNTY

Blue Hen

Chandelar (2)

Clear Water

Copper Mountain

Mill Creek

Miller
(see Newton and Miller)

Mountain Top

Newton and Miller (1)

Swift Creek

YAKIMA COUNTY

Bob's Mine (1)

Ivanhoe

Welcome
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## PROPERTY INDEX

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