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Mining

IN THE

Pacific Northwest

A COMPLETE REVIEW OF THE MINERAL RESOURCES OF WASHINGTON AND BRITISH COLUMBIA .....

WITH MAPS

Edited by L. K. HODGES

THE POST-INTELLIGENCER
SEATTLE, WASH.
1897

PRICE 50 CENTS

Arizona Gold Mining Co.

OFFICERS.

WM. FRANKFURT .....President
N. W. SCANLON .....Vice-President
D. M. SOLLIDAY .....Secretary
FRANK JOBST .....Treasurer

HEAD OFFICE,

601=602 Pioneer Building

SEATTLE, WASHINGTON.

The Arizona Gold Mining Company owns the Arizona and Washington mining claims, on the headwaters of the north fork of the Snoqualmie River, in King County, Washington. They are only one mile from the Brooklyn group on Miller River and the Apex mine on Money Creek, being on the opposite side of the same mountain ridge and are only a mile distant from Miller & Sharp's Mastodon mine.

The Arizona ledge is forty feet wide between walls of granite and the ore is sulphides carrying gold, silver and copper.

The Washington adjoins the Arizona and has a ledge fifty feet wide, carrying ore for twenty feet of its width.

Timber is abundant, a fine millsite can be had on the shore of three small lakes through which a stream flows, furnishing abundant water power.

A limited amount of treasury stock is offered for sale

Write for prospectus and price of stock.

THE Gold Mountain Mining Comp'y

OFFICERS.

WM. FRANKFURT ..... President
G. J. BORGFORD ..... Vice-President
GEO. W. DEVECMON..... Secretary and Treasurer

Head Office 601-2 Pioneer Building, Seattle, Wash.

The Gold Mountain Mining Company's property consists of eight full-sized claims, namely: Grand Central, Bonanza Queen, Paymaster, Crown Point, San Francisco, Red Jacket, Bald Eagle and Happy-Go-Lucky.

All these claims are situated on Money Creek, King County, Washington, within about three miles of the Great Northern Railroad and only fifty-two miles by rail from a smelter. They have large bodies of iron and copper sulphide ore carrying gold, which can be made to pay dividends by a small expenditure for development. Regarding Money Creek the Washington Mining Journal says:

"This district is in the western slope of the Cascade Mountains, in King County, State of Washington, and is easily accessible. Skykomish, on the Great Northern Railway, is the nearest railway station. If there were no other mines in the State of Washington it could still claim distinction as a mining state on the strength of Money Creek alone. The large disclosures of ore in the locality exceed those of Treadwell, in Alaska. The bodies of ore on the Bonanza Queen and Paymaster are believed to be inexhaustible. The Gold Mountain Mining Company is the owner of both claims, and with its new and complete equipment of machinery and a force of competent workmen will record a large output during the present year."

A limited amount of treasury stock for sale.

Write for prospectus and price of stock.

DIRECTORY OF MINING COMPANIES.

Some of the Leading Companies Operating in Washington and British Columbia.

ALKI GOLD MINING CO. (LIMITED)—Capital stock, $750,000; treasury stock, $150,000; office, Tacoma; property, Alki, Trail Creek. Officers: President, James J. Anderson; vice president, John W. Renfroe; secretary, Julius F. Hale; treasurer, Robert G. Hudson.

ALPHA GOLD & COPPER MINING CO.—Capital stock, $1,000,000; treasury stock, $250,000; office, room C, Bailey building, Seattle; property, Alpha group, Index district. Officers: President, T. A. Gamble; vice president, S. R. Haddock; secretary and treasurer, J. H. Irving.

ARIZONA GOLD MINING CO.—Capital stock, $1,500,000; treasury stock, $300,000; office, 601-2 Pioneer building, Seattle; property, Arizona group, Buena Vista district. Officers: President, William Frankfurt; vice president, N. W. Scanlon; secretary, D. M. Solliday; treasurer, Frank Jobst.

BALD EAGLE GOLD MINING CO.—Capital stock, $1,000,000; treasury stock, $400,000; office, Room B, Haller block, Seattle; property, Bald Eagle group of five claims, Colville Reservation. Officers: President, Harwood Morgan; secretary, W. D. Wood; treasurer, W. D. Perkins.

BALLARD GOLD MINING & MILLING CO.—Capital stock, $1,000,000; treasury stock, $200,000; office, Ballard, Wash.; property, Cle-Elum. Officers: President, M. Dow; secretary, F. F. Fisher; treasurer, P. C. Sankey; trustees, Mayor G. G. Startup, W. R. Calderwood, A. Grubb, S. W. Baker, L. S. Hawley, H. T. Hawley, O. Johnson.

BALTIMORE & SEATTLE MINING & REDUCTION CO.—Capital stock, $1,000,000; office, 312 and 313 Occidental block, Seattle, Wash.; property, nine claims in Granite Mountain mining district (unorganized), Miller river, King county, Washington. President, Andrew Blakistone; secretary, D. N. Baxter; treasurer, Herman Chapin; Andrew Hemrich, Andrew Blakistone, D. N. Baxter.

BIG BEAR MINING CO.—Capital stock, $1,000,000; treasury stock, $250,000; office, box 1136, Seattle; property, Big Bear group, Silverton district. Officers: President, A. Kistler; vice president and general manager, Richard Hussey; secretary and treasurer, E. A. Bridgman.

BIG EIGHT GOLD MINING & MILLING CO.—Capital stock, $2,000,000; treasury stock, $600,000; cash in treasury, $1,250; office, 306-7 Fernwell block, Spokane, Wash; property, Big Eight group, Twisp district. Officers: President, I. S. Kaufman; vice president, H. J. Martin; secretary, R. Abernethy; treasurer, W. D. Scott.

BLACK HAWK MINING & CONCENTRATING CO.—Capital stock, $1,000,000; treasury stock, $400,000; office, 52 Hinckley block, Seattle, Wash; property, Black Hawk, Franklin, Le Roi and Josie, Howard creek and Index district. Officers: President, I. Hulme; secretary, L. M. Presnall; treasurer, Fred Furth.

BLACK ROCK GOLD MINING CO.—Capital stock, 1,000,000 shares; treasury stock, 250,000 shares; office, 905 First avenue, Seattle, Wash.; property, The Black Rock mineral claim, Trail Creek district. Officers: President, W. P. Boyd; vice president, O. R. Dahl; secretary, W. Y. L. Rutherford; treasurer, Andrew Chilberg; general manager, A. W. Anderson; consulting engineer, Ernest G. Locke.

BONANZA MINING & SMELTING CO.—Capital stock, $2,000,000; treasury stock, $400,000; office, 35 Sullivan building, Seattle; property, Silver creek. Officers: President, Peter Chiodo; secretary, Charles Lovejoy; treasurer, A. Chilberg.

CASCADE DEVELOPMENT CO.—Capital stock, $1,000,000; treasury stock, $250,000; office, Everett, Wash. Officers: President, F. A. White; vice president and treasurer, W. G. Swalwell; secretary, S. N. Baird. Objects: Furnish capital to develop mines, buy and sell mining properties.

CHELAN GOLD MINING CO.—Capital stock, $1,000,000; treasury stock, 250,000 shares; office, 110 Washington building, Seattle, Wash.; property, Blue Jay and Seattle, Chelan mining district, Okanogan county, Washington. Officers: President, H. F. Norton; secretary, John P. Jacobsen; treasurer, Andrew Chilberg; trustees, H. F. Norton, George F. Raymond, A. Chilberg, N. B. Nelson, Thomas Bowes; superintendent, J. D. McDermott.

CLEOPATRA MINING CO.—Capital stock, $1,000,000; office, 312 and 313 Occidental block, Seattle, Wash.; property, three claims in Granite Mountain mining district (unorganized), Miller river, King county, Washington. President, J. T. Blakistone; secretary, D. N. Baxter; treasurer, R. R. Spencer.

COOK KITCHEN MINING CO. (Tin Mine).—Office, Seattle, Wash. Officers: President, L. Banks; vice president, W. H. Rooks; treasurer, W. B. Hutchinson; secretary, G. I. Case.

CO-OPERATIVE MINING SYNDICATE.—Capital stock, $50,000,000; office, 114 Columbia street, Seattle, Wash. Officers: President, Charles E. Crane; secretary, A. Robinson; treasurer, A. Chilberg; attorney, J. A. Stratton.

DEER TRAIL MINING CO.—Capital stock, $500,000, par value $1 per share; office, Davenport, Wash.; property, Cedar Canyon district. Officers: President, A. W. Turner; treasurer, B. O. Gibson; secretary, E. E. Plough; directors, A. W. Turner, B. O. Gibson, E. E. Plough, D. Child, F. T. McCullough, C. Golden, A. Mobley.

DETROIT-WINDSOR MILL & MINING CO.—Capital stock, 1,000,000 shares of $1 each; treasury stock, 150,000 shares; office, Seattle, Wash.; property, Detroit, Windsor, Detroit No. 2, Windsor No. 2, and Bryan mines near Loomis, Wash. Trustees: President, M. G. Barney; vice president, John Schram; secretary, A. P. Mitten; treasurer, A. M. Brookes; E. W. Pember; A. W. Engle, Mark Bailey, Jr.

ECLIPSE MINING CO.—Capital stock, $1,000,000; treasury stock, $400,000; property, comprising twenty-seven claims in Silverton district. Officers: President, E. C. Ferguson; secretary, D. S. Swerdfiger.

ELLIOTT CREEK GOLD MINING CO.—Capital stock, $1,200,000; treasury stock, $300,000; office, 52 Safe Deposit building, Seattle. Officers: President, H. W. Coffin; secretary and treaeurer, H. C. Paige.

EMPIRE MINING CO.—Capital stock, $1,000,000; office, 501-502 Washington block, Seattle, Wash.; property, near Camp McKinney, Osoyoos division, British Columbia. Officers: President, G. E. Hallock; secretary, W. H. Clark; treasurer, A. E. Nelson.

EUREKA MINING CO.—Capital stock, $100,000; office, Anacortes, Wash.; property, Eureka group, Slate Creek district. Officers: President, Melville Curtis; secretary, E. S. Dodge.

EUREKA MINING & MILLING CO.—Capital stock, $1,000,000; treasury stock, $448,000; office, Everett, Wash.; property, Eureka and Eureka Extension No. 1, Silverton district; president, P. K. Lewis; secretary, Alex. Keay; treasurer, Charles Anderson.

45 CONSOLIDATED MINING CO.—Capital stock, $2,000,000 in $10 shares, fully paid and non-assessable; treasury stock, $750,000; office, Everett, Wash.; property, 45 group, Sultan basin. Officers: President, W. C. Cox; vice president, L. A. Dyer; secretary, Louis Henry Legg; treasurer, Schuyler Duryee; general manager, W. F. Brown.

GOLD BELT MINING CO.—Capital stock, $1,000,000; treasury stock, $300,000; office, 33-34-35 Union block, Seattle; property, Sunset, Keremeos district, British Columbia. Officers: President, G. W. Yancy; secretary, A. B. Ball; treasurer, A. D. Eshelman; attorney, John F. Miller.

GOLD HILL MINING & MILLING CO.—Capital stock, $1,500,000; treasury stock, $500,000; office, Buckley, Wash.; property, King, Cascade, Axe and G. A. R., Summit district. Officers: President, Edw. C. Keith; secretary, Seymour H. Bell; treasurer, Gwin Hicks; vice president, J. B. Current.

GOLD MOUNTAIN MINING CO.—Capital stock, $1,000,000; treasury stock, $200,000; office, 601-2 Pioneer building, Seattle; property, Gold Mountain group, Money Creek district. Officers: President, William Frankfurt; vice president, G. J. Borgford; secretary and treasurer, G. W. Devecmon; superintendent, J. T. Pomercy.

GOLD TUNNEL MINING CO.—Capital stock, $1,000,000; treasury stock, $300,000; office, Seattle Ice Co., Seattle; property, Money creek. Officers: President, Geo. W. Devecmon; secretary, G. C. Mitchell; treasurer, R. C. Connor.

GREAT WESTERN MINING & REDUCTION CO.—Capital stock, $1,000,000; treasury stock, $200,000; office, Ballard, Wash.; property, Stillaguamish, Fortuna, Sixteen to One, Mountain View and Ballard. Officers: President, H. B. Pederson; secretary, William M. Curtiss; treasurer, Lewis Anderson.

HIDDEN TREASURE GOLD MINING & MILLING CO.—Capital stock, $1,000,000; treasury stock, $300,000, non-assessable; office, 114 Yesler way, Seattle; property, Hidden Treasure mine, Squaw Creek district, Washington. Officers: President, James West; secretary, Joseph W. Gregory; treasurer, H. R. Baylis.

HIGHLANDER GOLD & SILVER MINING CO.—Capital stock, $1,000,000; treasury stock, $300,000; office, 412 Bailey block, Seattle; property, Highlander group, Miller river. Officers: President, D. E. Durie; secretary, George Low; treasurer, W. W. Easter.

IDAHO & WOLVERINE MINING CO.—Capital stock, $1,000,000; treasury stock, $250,000; office, Rialto building; property, Idaho and Wolverine, Chelan district. Officers: President, George F. Raymond; secretary, T. Bowes.

IRON MOUNTAIN CONSOLIDATED GOLD & COPPER MINING CO.—

Capital stock, $1,000,000; treasury stock, $250,000; office, 52 Hinckley block, Seattle, Wash.; property, Nest Egg, Iron Cap, Duke, River Side, Ray-Belle-Clyde and War Eagle, Howard Creek and Index district. Officers: President, W. H. Moore; secretary, L. M. Presnall; treasurer, J. R. Griffith.

KASLO MONTEZUMA MINING & MILLING CO.—Capital stock, $1,250,000; treasury stock, $300,000; office, Seattle, Washington; branch office, Kaslo, B. C.; property, Montezuma, Mexico, Vera Cruz, Buena Vista, Slocan mining district. President, C. L. Webb; secretary and treasurer, Maurice McMicken; trustees, C. L. Webb, E. C. Hughes, John B. Allen, Maurice McMicken, L. L. Patrick.

LIVINGSTONE-ANDREWS MINING CO.—Capital stock, $1,000,000; treasury stock, $250,000; office, Seattle, Wash.; property, Our Sisters and Pohakaole, Silverton (Stillaguamish) district. Officers: President, C. Livingstone; secretary and treasurer, W. R. Andrews.

LOG CABIN GOLD MINING CO.—Capital stock, $1,000,000, $1 shares; office, 601 Pioneer building, Seattle; property, Money Creek district. Officers: President and treasurer, Julius Wegert; vice president, Oswald Meyer; secretary, D. M. Solliday; trustees, George V. Gau, M. W. Scanlon, Julius Wegert and Oswald Meyer.

MARIETTA MINING CO.—Capital stock, $1,000,000; treasury stock, $250,000; office, Everett, Wash.; property, Palmer mountain, Okanogan county. Officers: President, F. A. White; vice president, J. S. McIlhany; secretary, E. P. Gardiner; treasurer, W. G. Swalwell; general manager, Charles Hove.

MAYFLOWER NUMBER FOUR GOLD MINING CO.—Capital stock, $1,000,000; office, Seattle, Wash.; property, Murphy creek, British Columbia. Officers: President, J. M. E. Atkinson; secretary and treasurer, F. A. Bell.

MILLER RIVER MINING CO.—Capital, $1,000,000; treasury stock, $300,000; office, 628 Pioneer building. Officers: President, George Fowler; secretary and treasurer, C. A. McKenzie.

MONTEREY GOLD MINING & MILLING CO.—Capital stock, $1,000,000; office, 602 Pioneer block, Seattle; property, Georgie Smith group, Leavenworth district. Officers: President, Samuel Gibson; vice president, Homer W. Olts; secretary, D. M. Solliday; treasure, George L. Hay.

NEW YORK & BALTIMORE MINING CO.—Capital stock, $1,000,000, 200,000 shares; treasury stock, 80,000 shares; office, 515 New York block, Seattle; property, ten claims on Miller river and Money creek. Officers: President, F. D. Van Wagenen; secretary and treasurer, Frank P. Lewis.

OLD GLORY MINING CO.—Capital stock, $1,000,000; treasury stock, 333,333 shares; office, Seattle, Wash.; property, Slocan district, British Columbia, 2½ miles from Slocan City. Officers: President, J. F. McNaught; secretary, Francis A. Bell.

PERRY CREEK MINING CO.—Capital stock, $1,000,000; treasury stock, $250,000; office, 119 Washington building, Seattle, Wash.; property, Eureka, Cosmopolitan, Maybar, Orient, Copper Queen, Copper King, Eventide, Olympian, Ajax, Fanny D., Wooley, Rocky, Skookum, Skookum No. 2 and the J. A. Dorman, Stillaguamish district. Officers: President, Angus W. Young; secretary and treasurer, George T. Reichenbach.

PICKWICK MINING & DEVELOPMENT CO.—Capital stock, $10,000; office, Rialto building, Seattle; property, Pickwick group, Leavenworth district. Officers: President, N. B. Nelson; secretary, Thomas Bowes; treasurer, Andrew Chilberg.

PORTLAND & NORTHWESTERN EXPLORATION & MINING CO.—Capital stock, $250,000; office, 32, 33 and 34 Washington block, Portland, Or.; property, St. Helen's district. Officers: President, F. Abraham; secretary, Alexander Bernstein.

QUADRA MINING CO.—Capital stock, $1,000,000; treasury stock, $400,000; office, Safe Deposit building, Seattle, Wash.; property, Lane, Deadwood No. 1, Deadwood and Western claims, Flat creek, Northport district. Officers: President, W. Strohl; secretary, J. G. Blake; treasurer, J. G. Cotton.

RIVERSIDE GOLD MINING CO.—Capital stock, $1,000,000 treasury stock, $250,000; office, 715 New York block, Seattle, Wash.; property, Dayville, Riverside, East End claims, Squaw Creek mining district. Officers: President, J. G. Cotton; secretary, Stewart E. Smith.

ROSSLAND UNITED GOLD MINING CO.—Capital stock, $1,000,000; treasury stock, $300,000; office, Seattle. Officers: President, T. J. Humes; secretary, Alpheus Byers; treasurer, R. V. Ankeny.

ST. KEVERNE MINING CO.—Capital stock, $1,000,000; treasury stock, $200,000; office, Spokane Hotel, Spokane, Wash.; property, St. Keverne group, Payne mountain, Slocan district, British Columbia. Officers: President, J. D. Farrell; secretary, Sid. Norman; treasurer, Sid Norman; trustees, W. S. Norman, C. G. Reeder and Ben Norman.

SEARCHLIGHT MINING CO.—Capital stock, $1,000,000; treasury stock, $400,000; office, 5 Colonial block, Seattle, Wash.; property, Searchlight No. 1, Searchlight No. 2, Elgin and Trilby claims, Flat creek, Northport district. Officers: President, J. G. Cotton; secretary, George W. Bacon; treasurer, F. M. Jordan.

SILVER CREEK GOLD MINING CO.—Capital stock, $1,000,000, $1 shares; treasury stock, $300,000; office, Everett, Wash.; property, Silver Creek dis-

trict, Snohomish county. President, A. J Westland; secretary, D. C. Johnson; treasurer, J. N. Scott.

SILVER LAKE MINING & SMELTING CO.—Capital stock, $1,000,000; treasury stock, 250,000 shares; office, Seattle, Wash.; property, Monte Cristo and Silver creek. President, Sol G. Simpson; secretary, Francis A. Bell.

SLOCAN-RECIPROCITY MINING CO.—Capital stock, $1,000,000; treasury stock, $200,000; office, Spokane Hotel, Spokane, Wash.; property, Reciprocity and Lillian on Payne mountain, Slocan district, British Columbia. President, J. D. Farrell; secretary and treasurer, Sid Norman; trustees, J. H. Thompson, W. S. Norman and J. A. Whittier.

STANDARD GOLD MINING & MILLING CO.—Capital stock, $1,000,000; treasury stock, $300,000; no personal stock issued; office, 114 Yesler way, Seattle; property, Standard and Louisa, Methow district. President, Douglas Young; secretary, M. D. Clark; treasurer, C. N. Hutchinson, Gen Mang. James West.

SYNDICATE GOLD MINING CO.—Capital stock, $1,000,000; treasury stock, $400,000; office, room B, Haller block, Seattle; property, Syndicate group of five claims, Colville Reservation. President, Harwood Morgan; secretary, W. D. Wood; treasurer, W. D. Perkins.

T. & K. MINING CO.—Capitalization, 1,000,000 shares; treasury fund, 250,000 shares; office, Everett; property, Stillaguamish district, Snohomish county. President, H. L. Keyte; secretary, Jas. A. McLaren; treasurer, J. W. Baihly.

THE CLERMONT GOLD MINING & MILLING CO.—Capital stock, $1,000,000; treasury stock, $200,000 office, Seattle, Washington property, Cle-elum mining district, Kittitas county, Washington. President, O. O. Hamre; secretary, D. M. Solliday; vice president and treasurer, C. F. Karns.

THE COLVILLE GOLD MINING CO.—Capital stock, $1,000,000; treasury stock, $400,000; office, Olympia, Wash. President, T. N. Allen; secretary and treasurer, Oscar S. Bowen.

THE GOLD BAR MINING CO.—Capital stock, $1,000,000; treasury stock, $300,000; office, rooms 23 to 26 Haller building, Seattle; property, Gold Bar, Little Diamond, Homeward Bound, Silver Creek district, Snohomish county, Washington. President, Franklin Bedford, Chicago; secretary, J. W. Crawford, Minneapolis; vice president, J. O. Robinson, Seattle; trustees, Judson C. Hubbard, William E. Smith.

THE HAMILTON GOLD & COPPER MINING CO.—Capital stock, 1,000,000 shares, par value $1 per share; treasury stock, 350,000 shares; office, 217 Columbia street, Seattle; property, at Hamilton, Skagit county, Washington. President, W. P. Stanley; secretary,. F. H. Browning; trustees, W. P. Stanley, Capt. W. Clark, F. H. Browning, John G. Hunter, C. H. Fuller, B. Marshall, C. J. Hessler.

THE IRON HOPE MINING & MILLING CO.—Capital stock, $600,000; treasury stock, $250,000; office, Seattle, Wash.; property, the Iron Hope claims, Trail Creek district, British Columbia. President, Charles G. Scott; secretary, W. T. Scott; treasurer, Salmon Lauridson.

THE LONDON GALENA MINING & MILLING CO.—Capital stock, 2,000,000 shares, par value $1; treasury stock, 750,000 shares; office, 217 Columbia street, Seattle; property, fifteen claims in Cascade district, Skagit county, Washington. President, Capt. W. Clark; secretary, F. H. Browning; trustees, C. D. Chambers, Capt. W. Clark, John Willard, C. H. Fuller, W. C. Keith, C. H. Smith.

THE MARTIN CREEK MINING CO.—Capital stock, $1,000,000; treasury stock, $334,000; office, room 53, Boston block, Seattle; property, seven claims near Silverton, Wash. President, William Frankfurt; secretary and treasurer, H. R. Clise.

THE MONARCH GOLD & SILVER MINING CO.—Capital stock, $1,000,000; treasury stock, $300,000; office, 217 Columbia street; property, Monarch No. 1 and Monarch No. 2, Granite Mountain mining district, Miller river. President, W. M. Wilson; secretary and treasurer, F. H. Browning; trustees, C. E. Hill, B. W. Padley, V. L. Bevington, J. M. Layhue, F. H. Browning.

THE PITTSBURG MINING & OPERATIVE CO.—Capital stock, $250,000; treasury stock, $50; office, room 208 Pioneer building, Seattle, Wash.; property, a placer claim on the Wenatchee river near Peshastin. President, William Keene; secretary, W. W. Radcliffe; treasurer, E. G. Jackson; trustees, William Keene, W. W. Radcliffe, E. J. Jackson and A. G. Jackson.

THE ROBINSON MINING CO.—Capital stock, $600,000; treasury stock, $100,000; office, Seattle, Wash.; property, three claims on Cedar river, King county, Washington. President, E. B. Robinson; secretary and treasurer, E. L. Drew.

THE TENASKET GOLD MINING CO.—Capital stock, $500,000, non-assessable, $1 per share; treasury stock, $230,000; office, room 224 Bailey building, Seattle, Wash.; property, Andruss, Okanogan county; Raymond, Sparling, Curlew district, Stevens county. President, Alfred Raymond; secretary and treasurer, Lawrence Spear; trustees, Alfred Raymond, Lawrence Spear and William P. Watson.

THE TREASURE MINING CO.—Capital stock, $1,000,000; treasury stock, $250,000; office, room 302 Burke building, Seattle; property, Horse Shoe, Treas-

ure Box, Silver Creflek district, Snohomish county, Washington. President, H. R. Clise; secretary and treasurer, E. F. McAuliffe; trustees, H. R. Clise, E. F. McAuliffe, George F. Ward, E. Petronio, F. A. Ausman, C. Ludewig, G. J. Borgford, Wiliam E. Smith.

TIN MINE.—26 government mineral claims, see Cook Kitchen, this directory.

TOBIQUE MINING CO.—Capital stock, $1,000,000; treasury stock, $200,000; office, Colonial block, Seattle, Wash.; property, Monte Cristo district; secretary, F. M. Jordan.

TRAIL CREEK MIDLAND MINING CO.—Capital stock, $1,000,000; treasury stock, $250,000; principal office, Spokane; property, Clara group, Red Top mountain, near Northport. President, George F. Orchard, Tacoma; vice president and general manager, F. J. Monroe; treasurer and trustee, W. H. Murray, Seattle; secretary, P. A. Morgan, Seattle.

TUESDAY GOLD MINING CO.—Capital stock, $1,000,000; treasury stock, $250,000; office, Safe Deposit building, Seattle, Wash.; property, Sunday, Tuesday, Wednesday and Thursday claims, in Squaw creek, Methow district. President, J. G. Blake; secretary, J. G. Cotton; treasurer, J. B. Powles.

TUSCAN GOLD MINING CO.—Capital stock, $1,000,000; treasury stock, $300,000; office, Haller block; property in Trail Creek district, British Columbia. President, Frank A. Pontius; secretary, F. J. Hardy.

UNA MINING & MILLING CO.—Capital stock, $1,200,000; treasury stock, $240,000; office, 619 Pioneer block, Seattle; property, Una group, Bryan group, Santa Fe group, total of 28 claims on Red Mountain in Leavenworth district. President, J. T. Ronald, ex-mayor; vice president, George W. Hall, ex-mayor; secretary, Robert Livesly.

UNION & DOMINION MINING CO.—Capital stock, $500,000; treasury stock, $250,000; office, 619 Pioneer block, Seattle, Wash.; property, Union and Dominion, Negro creek. President, M. R. Galloway; secretary, J. T. Ronald; treasurer, George W. Hall.

VAN ANDA COPPER & GOLD CO.—Capital stock, $5,000,000; treasury stock, $3,000,000; office, 108 La Salle street, Chicago, Ill., 613 Bailey building, Seattle, and Victoria, B. C.; property, Texada Island, British Columbia, 774 acres crown granted land. President, Edward Blewett; secretary, R. D. Hall; treasurer, Harry W. Treat; trustees, Edward Blewett, Hon, C. E. Pooley, Henry Saunders, C. S. Neras, H. W. Treat.

WHISKEY HILL MINING CO.—Capital stock, $5,000,000; treasury stock, $2,000,000; office, Ellensburg, Wash.; property, twenty claims and tunnel site on Whisky Hill near the Okanogan river. Wanicutt Lake district. President, Charles H. Flummerfelt; secretary, Martin Cameron; treasurer, H. M. Baldwin; trustees, Charles H. Flummerfelt,, William Lewis and Thomas Cody.

WHITE ROCK GOLD MINING CO.—Capital stock, $2,000,000; treasury stock, 300,000 shares; office, 905 First avenue, Seattle, Wash.; property, The Everett, Crescent and Swan, one-eighth interest in Fortuna, 16 to 1, Ballard and Mountain View. President, A. W. Anderson; vice president, F. Wright; secretary, O. R. Dahl; treasurer, A. Grubb.

INDEX TO ADVERTISEMENTS.

WASHINGTON

AND THE SOUTHERN PORTION OF

BRITISH COLUMBIA.

SHOWING

MINING DISTRICTS and LINES OF TRAVEL.

Prepared From the Latest Official Data and Other Sources.

BY

WEBSTER BROWN

CIVIL AND MINING ENGINEER

SEATTLE, WASHINGTON.

MARCH,

1897.

BRITISH COLUMBIA

VANCOUVER ISLAND

LILLOOET DISTRICT

YALE DISTRICT

KAMLOOPS

KOOTENAY DISTRICT

EAST DIVISION

WEST DIVISION

OSOYOOS

OKANOGAN

WASHINGTON

SCALE OF MILES

0 5 10 20 30 40 50

REFERENCE

U. S. LAND OFFICES

County Seats

INTERNATIONAL BOUNDARY

STATE BOUNDARY

COUNTY BOUNDARY

RAILWAYS

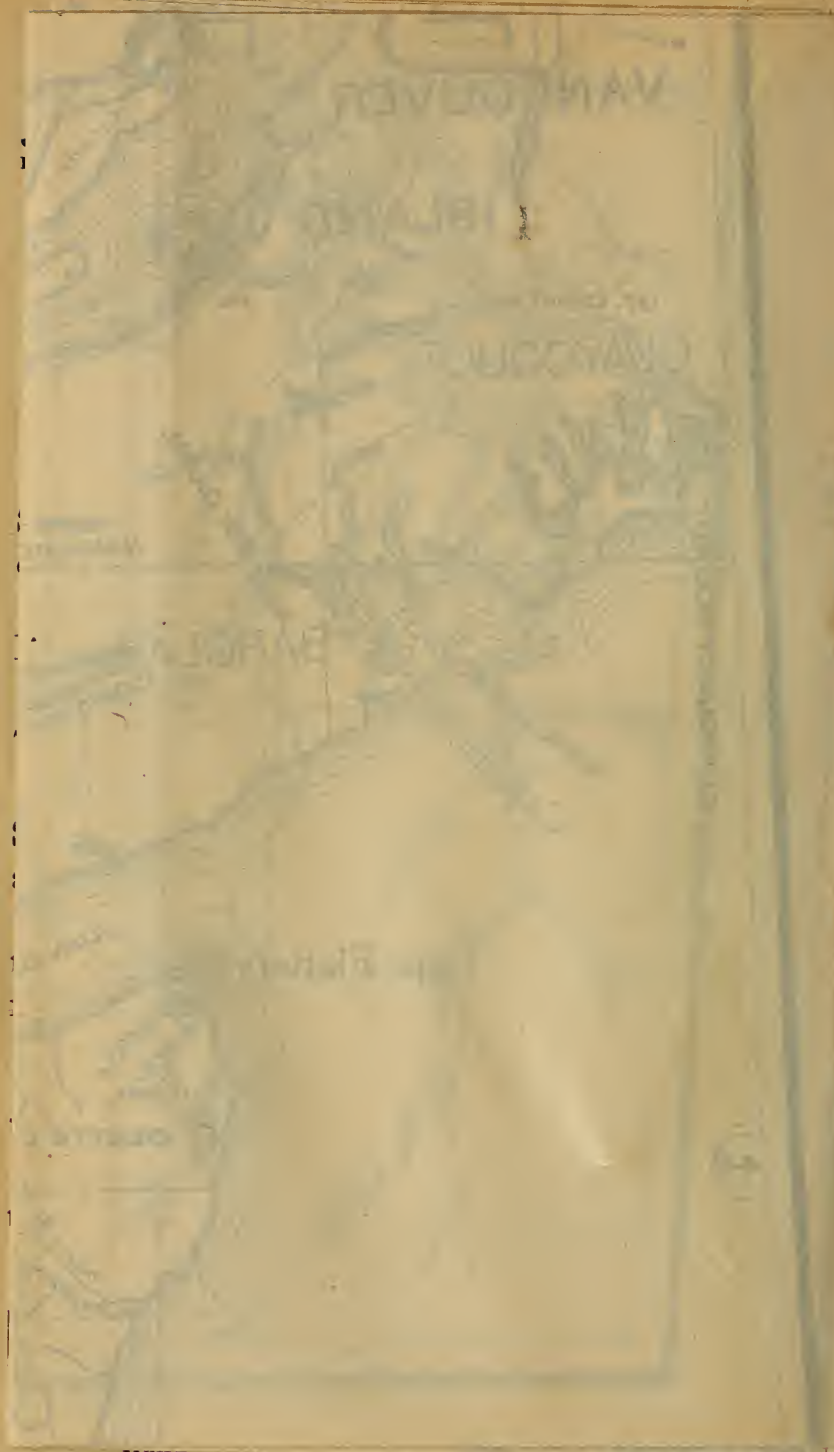
WAGON ROADS

TRAILS

RAILWAYS INDICATED BY INITIALS

Bellingham Bay & British Columbia
Seattle & International
Everett & Monte Cristo
Northern Pacific
Port Townsend Southern
Spokane Falls & Northern
Nelson & Fort Shepherd
Columbia & Western
Red Mountain Railway
Columbia & Kootenay
Canadian Pacific
Central Washington

LONGITUDE WEST FROM GREENWICH



MINING

IN THE

PACIFIC NORTHWEST

A COMPLETE REVIEW OF THE MINERAL RESOURCES OF WASHINGTON AND BRITISH COLUMBIA

WITH MAPS

EDITED BY L. K. HODGES

THE POST-INTELLIGENCER
SEATTLE, WASHINGTON
1897

METROPOLITAN PRINTING AND BINDING CO.

PREFACE.

The enterprise of the Seattle Post-Intelligencer in sending the writer on a tour of the mining districts of the Pacific Northwest called forth such general commendation and the articles published in the course of that tour aroused such wide interest as to suggest the advisability of republishing them in book form. Such a publication was recommended by many readers of the Post-Intelligencer, who desired to have them in convenient form for reference. The canvass for subscriptions abundantly proved that a demand for such a work existed and the present volume is the result.

The purpose has been to give in a succinct form and with moderation of statement a description of each mining district in Washington and in Southern British Columbia, following a general description of each district with a description of each mine and the more important prospects in that district. The original plan was to revise the articles and add to them articles on the more important districts which were not on the writer's itinerary, with a map to illustrate each district. It has been found necessary to enlarge the scope of the work to such an extent that the original matter has been almost entirely rewritten and much more has been added than was at first contemplated. This has required a much longer time than was estimated, but the public would rather endure such delay than be presented with a hastily prepared and glaringly incomplete work. Even now it has been found impossible to do full justice to some districts, without further unduly delaying publication.

It can safely be said that this is the first attempt to describe with any approach to thoroughness the mineral resources of this section and to tell what has been done to develop them. The aim has been to collate information on the subject from the most reliable sources available and to mass the material facts without any exaggeration or verbal flourishes, leaving them generally to tell their own story. How far this aim has been attained, it is for the reader to judge. The articles on the Trail Creek, Slocan, Nelson and Ainsworth Districts are mainly condensed from the recent reports of W. A. Carlyle, Provincial Mineralogist of British Columbia.

An important feature of the work is the maps. By studying the large map in connection with the small district maps, it will be possible to ascertain the route into any district and the location of a mining property in that district. The maps do not profess to show all the claims or to be free from inaccuracies. It would have been impossible to make them so without a survey and a larger expenditure than was warranted. But it can be said without fear of contradiction that this volume contains a more complete set of detailed maps than has yet been published and that the large map contains a mass of valuable information which has never yet reached the public.

Some desire has been expressed that this volume should include the descriptions of the country traversed by the writer in the course of his tour, which formed a part of the articles in the Post-Intelligencer. This was considered beyond the scope of a work designed to deal with mining exclusively and would have unduly increased the bulk of the book. All such matter has therefore been omitted and these pages have been devoted only to the purpose indicated by the title.

For valuable aid in preparing both the reading matter and the maps, the publishers are indebted to the officers of the state of Washington and the Province of British Columbia, to the United States Surveyor General, and to many private individuals. These latter are so numerous and have all taken so deep an interest in the undertaking that it would be impracticable to name

them all and to single out a few would be invidious. The publishers therefore take this means of thanking them, one and all.

We believe that this work will be instrumental in giving the people of the Pacific Northwest a fuller knowledge of the mineral wealth with which nature has blessed them; and will spread such knowledge far and wide. We hope that it will also aid in some degree in promoting the development of that wealth.

THE EDITOR.

JAMES D. HOGE, JR.,
L. K. HODGES,
Publishers and Proprietors.

INTRODUCTORY.

A map of the western portion of the United States, designed to show the mineral belt, would twenty years ago have shown Washington and the adjoining section of British Columbia as a blank. There might have been a few spots, such as the Swauk, Ruby and Sultan placers and the Peshastin mines in Washington, the Cariboo, Rock Creek and Wild Horse placers in British Columbia, but otherwise this whole broad stretch of country would have been regarded as barren, so far as mineral was concerned. During those twenty years the people of the Pacific Northwest have been occupied in filling in that blank. They have not worked continuously, for many circumstances have until late years diverted their attention, but for eight years past they have gradually centered their energies more and more on mining, until now it is their one absorbing interest, to which every other takes a subordinate place. They have proved what has been repeatedly denied, that the mineral belt extends through the whole breadth of Washington and British Columbia, and discovery has been continually pushed northward through Alaska to the confines of the frozen ocean. It is now an established fact, which the most pessimistic skeptic cannot gainsay, that the backbone of the American continent, from the Arctic Ocean to Tierra del Fuego, with all its ribs and spurs, has mineral for its marrow. This mineral is of every kind, precious and base, and in every combination, and it only awaits the application of man's genius and industry to be turned to his uses.

A geological survey of this region as a whole has never been made, at least so far as Washington is concerned, British Columbia being far in advance in this particular. Thus, what is known on the subject in Washington has been learned by a number of individuals, each of whom has studied a particular section as opportunity offered. These sources of information have established that the Cascade Range is mainly built of granite, syenite, diorite and kindred rocks. Among them occur broad belts of gneiss, schist, slate, shale and sandstone and dikes of porphyry and limestone. The same formation extends eastward through the Gold Range and to the western foothills of the Rocky Mountains in the eastern part of Washington and the Selkirk Range in the Kootenai District of British Columbia. The mineral ledges occur, in most instances, in fissures in the granite, syenite, diorite and slate, often cutting through several of these rocks, but are also in contact between two of them, or between one of the granitic rocks and a dike of porphyry or limestone. Towards the east, in the Gold Range, there are numerous areas in which the eruptive rocks have burst through the older formation and in the latter have caused fissures, which have either been filled in with mineral-bearing rock or have been impregnated with mineral along the walls of the cavities thus created. The presence of one of these ledges is generally indicated by a heavy capping of oxidized iron, or magnetic iron, often of great width and thickness.

The ores of this section are almost universally base and of low grade. The exceptions are the silver-lead belt extending from the Slocan District through a strip of Washington east of the Columbia River as far south as the Spokane River, known as the Colville and Cedar Canyon Districts; some ledges on Palmer Mountain which carry high-grade silver ore; the Slate Creek District, where high-grade free milling gold ore has been followed to some depth. Recent development, however, has shown high-grade silver ores in the Silverton, Sultan, Troublesome, Miller River and Gold Creek Districts, the values here being in ruby silver, high grade gray copper and brittle silver, and the Cascades promise yet to give birth to several high-grade camps. There are other isolated instances where the ores are rich enough to be

classed as high-grade, and the cutting of ore chutes at depth in some cases has been followed by such satisfactory increase in value as to justify the hope that, as development proceeds deeper, higher grade ores will be found.

The minerals are in every combination, the most common being iron and copper pyrites, arseno-pyrite, chalcopyrite, pyrrhotite, galena, tetrahedrite or gray copper, zinc blende. The pyritic ores carry gold in some proportion almost invariably, with a few ounces of silver, and often carry so much copper as to make that metal the principal element of value. The galena is usually rich in silver where the ledges are small, the silver value decreasing in inverse ratio to the increased size of the ledge, and the lead value ranges as high as 75 per cent., while such ore also carries a few dollars per ton in gold. Gray copper is a high-grade silver ore, and when associated with iron carries a good gold value, and shows pockets of ruby silver and brittle silver of high value. Silver also occurs in association with copper in some districts, notably about Nelson, British Columbia, and in the form of chlorides, bromides and carbonates. It is also found in equal value with gold in dry ores, southward from the Slocan galena belt. Free gold is often found on the surface, where the ore has been subject to the decomposing influence of the air, and continues in decreasing ratio as the ore bodies are followed down, but with increasing depth the gold is found more and more in iron and copper sulphides. The minerals named are found in every possible combination, sometimes one, at other times another predominating.

It is probable, however, that the developments of the next few years will give copper as high a place among the mineral productions of Washington and British Columbia as it occupies in Montana and Michigan. A study of the large map, in connection with the chapters on the several districts, will show the reader that a great belt of gold-bearing copper ores has been traced from a point on the coast 200 miles northwest of Vancouver, British Columbia, across the Skagit Valley between Hamilton and Marble Mount, across the Stillaguamish east and west of Silverton, through the Sultan Basin and Silver Creek, through the Index Range of mountains, through the Miller River and Money Creek Districts, across the Snoqualmie and Cedar River watersheds. Ores of like nature have also been found further south, along the western slope, as far as the St. Helens District. On the eastern slope like bodies of gold-bearing copper ore have been found in Palmer Mountain, the Methow, Chelan and Cle-Elum Districts. Further east, in the Gold Range, they occur of immense size in the Boundary and Trail Creek Districts of British Columbia and in the Colville Reservation, particularly along the Kettle River and its tributaries. The ores of this belt are copper sulphides in various forms, in which the copper contents rarely fall below 5 per cent. and are commonly over 20 per cent., frequently rising beyond 30 per cent. Bornite is often found in bunches, carrying 40 and 50 per cent. copper, and masses of native copper weighing as much as 1,000 pounds have at times been encountered. These copper ores invariably carry a good gold value and often a few ounces of silver.

The ledges in this region have a gangue of quartz, porphyry, porphyritic quartz, hornblende or modifications of these several rocks, and in the Cascade Mountains are exposed to such a width as to excite even the most phlegmatic miners to wonder. Here the exposures occur along steep mountain-sides, which have been plowed down by the glaciers, or along gulches, of which the beds are the ledges and the walls are the walls of those ledges. Nature has done the surface prospecting in these cases. Further east, in the foothills and in the Gold Range, where the formation is covered with wash, the exposures are not as continuous but are often extremely large, and development has been rewarded by the opening of some ore bodies so large as to tax the credulity of one most willing to believe.

Mining in Washington dates back to the returning tide of miners from the Cariboo District of British Columbia in the early 60's. They worked placers on Rock Creek, north of the boundary, and, traveling southward,

washed gold from the gravel bars of the Peshastin and Swauk Creeks in Eastern Washington, Ruby Creek and the Sultan River west of the Cascades. The first quartz ledge to be discovered, so far as records go, was the Culver, on the Peshastin, where the town of Blewett now stands. This mine, after many vicissitudes, is still being worked and its product is reduced at a twenty-stamp mill. Then mining languished until the early 80's, when the first discoveries of silver ore were made in the Colville district and a few prospectors strayed up the Cle-Elum. The only notable discoveries in the interim were near the sources of the Snoqualmie, where immense croppings of iron ore became known as the Denny and Guye iron mines. The Denny mines have already proved to be copper, and development may yet have the same result on the Guye mines.

It was not until the opening of Chief Moses' Reservation in 1887 that the mining business fairly began in Washington, and in the same year the first discoveries were made in the Boundary and Trail Creek Districts of British Columbia. Development began on the low-grade silver ores of Salmon River and on the gold and silver ores of Palmer Mountain. About the same time prospectors invaded the Cascade Range on all sides and during several succeeding years discoveries were made on the Cascade, Methow, at Monte Cristo, on Silver Creek, Miller River, Money Creek, the Snoqualmie, Summit and other districts. A decided interest in mining had been awakened and it appeared as though the industry had already come to stay.

But the first flock of investors was doomed to failure, mainly through their own fault. They were without experience in mining, for Washington had been mainly populated by farmers, merchants, manufacturers and professional men from the Eastern and Middle Western States, while British Columbia had absorbed a similar population from the British Isles and Eastern Canada. The working people were generally drawn from the same sources. This was not a mining population, for it knew nothing of mining, having always turned its mind into other channels. There was a sprinkling of old miners and prospectors from California, Colorado and other mining states, but the formation was new to them. A few of them flung aside precedent and boldly proclaimed the mineral wealth of the state and the adjoining British territory. But the experts, with their heads filled with California and Colorado precedents, scoffed at them, saying that the ore was too base and low grade to pay for treatment and that the formation was so broken that it would be impossible to follow any ore body from the croppings to any considerable depth. The moneyed men in the cities were absorbed in real estate speculation and readily voiced the unfavorable opinions of the experts, being anxious that outside investments should go into their own schemes and not be diverted into any alluring mining ventures.

Thus the first men to make known the mineral wealth of the Pacific Northwest "caught on" in only a limited degree. They induced some investments among men of means and caused quite a flurry in the Salmon River, Palmer Mountain, Cascade and Silver Creek Districts. But a combination of circumstances forbade success at that time. The surface free gold in the ledges on Palmer Mountain led to the belief that free gold would continue indefinitely, and stamp mills were built without concentrators and managed by unskilled millmen. Wild speculation was practiced in some instances and there were not lacking evidences of fraud in others. The result was failure. As ore changed from free milling to base, a larger percentage of the value was lost in the tailings. Victims of fraud loudly denounced the mines as worthless and others took up the cry and repeated it far and wide. The fall in the price of silver caused a suspension of work in the low-grade silver mines of Salmon River, which had already suffered in the eyes of investors from two abortive attempts at reduction of the ore. Only a few persons held their faith in the Pacific Northwest as a mining region and most of them were bankrupted by the panic or the collapse of their mining ventures. Only in a few places was development continued, notably among which is Monte Cristo. For a few years mining languished with every other industry.

Three districts were notable exceptions. One of these was Slocan, in British Columbia, where the ores, although almost purely silver-lead, were so high in grade that they could be profitably mined under the most adverse condition of the metal market. Another was Monte Cristo, whither the railroad was completed in 1893, the year of the panic, and where development was prosecuted and machinery installed at great expense as though there had been no panic. The third was Trail Creek, where the famous Le Roi and War Eagle mines became regular shippers in 1895 and declared their first dividend in that year.

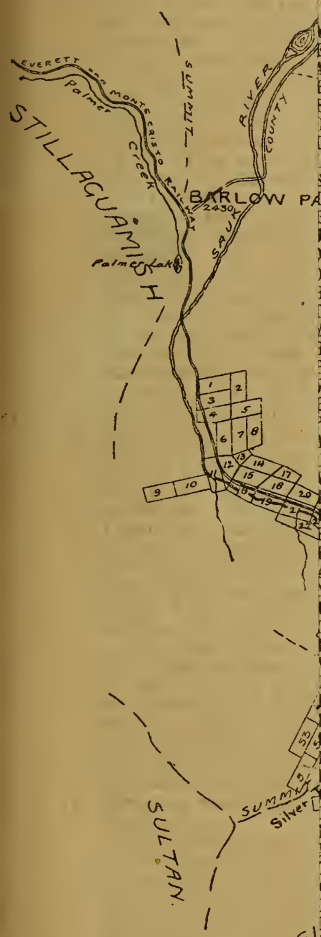
The revival of mining was due mainly to the favorable results attained in Slocan and Trail Creek, which drew attention to a new field of employment for industry and capital. Another cause which contributed largely to this revival was the general stagnation in other lines of business, which had driven thousands out of business or employment and left them stranded in the cities. By a common impulse many of them took to the mountains and became prospectors. They returned to their former homes with good reports of what they had found and obtained means to continue work. Thus a movement was started which caused the renewed operation of properties long neglected, the development of new ones and the extension of discoveries. The opening of dividend-paying mines in the Trail Creek and Slocan Districts and the continued improvement shown by development at Monte Cristo drew the attention of the investing public in this direction. Large investments were made in British Columbia by capitalists from England and Eastern Canada and the stream of investment is now turning to Washington.

The Pacific Northwest can offer what mining investors are particularly seeking at present—immense bodies of low-grade ore. Forty or fifty feet is an ordinary width for one of these ledges and some of them are as wide as 200 feet. In the Cascade Range the advantage is offered of ledges exposed so clearly on the sides of steep and lofty mountains that they can be opened at great depth by tunnels running into the mountain-side. This not only saves the additional cost of sinking, but of hoisting machinery and pumps, for it affords natural drainage. Throughout the whole mineral belt in question, not only in the Cascades, but in the Gold Range, innumerable rapid streams furnish abundant cheap power to operate mining machinery and reduction plants. The presence of such water-power could have been mentioned truthfully as regards nearly every mining property described in this volume, but it would have been a wearisome repetition. This general statement suffices to cover the whole field, and some conception can be formed of the greatness of the advantage by comparison with the low-grade districts of West Australia and South Africa, where no water-power exists.

So also as regards timber. The valleys and foothills west of the Cascade summit are abundantly clothed with fir, cedar, spruce and hemlock. In higher altitudes, where mines are often opened, there is a smaller growth of larch and Alaska cedar, too small for merchantable timber, but large enough for mine timbers and buildings. On the eastern slope the same kinds of timber, of great size, are to be found for some distance from the summit. When the eastern foothills are reached the high ridges and plateaus and the upper benches are densely clothed with pine timber, often of good size. The same conditions extend through the Gold Range in both Washington and British Columbia, except that in many of the valleys and canyons there occurs a large growth of cedar, hemlock and other timber, together with the pine. The mining claim is a rare exception where timber for all purposes cannot be found upon its surface or immediately adjacent.

The climate of the Pacific Northwest is peculiarly agreeable for travel and outdoor work in summer. West of the Cascade summit spring sets in early in middle of June. The summer in that section is not extremely hot and the nights are always cool. No rain falls from June until late in September and the equinoctial storms of that period are usually followed by several weeks of clear, warm, autumn weather. In the mountains little snow falls until

Railways
Wagon Roads
Trails
Tramways



NUMBERED CLAIMS.

Mountaineer.
Ethel.
Annie Laurie.
Bingo.
F. E. Davis.
Otego.
Lady of the Lake.
Lester.
Silver Tip.
Lake View.
Rainbow.
Jennie D.
Orphan Boy.
Old Norwegian.
Remnant Placer.
Tyee.
Mechanic.
Rainy.
Phœnix.
West Seattle.
Pirate.
Pinto.
Mexican.
Oro.
Waverly.
Rainbow.
June.
Eagle's Nest.
Eyrie.
Artisan.
Neptune.
Utopian.
Gothic.
Hydra.
Whistler.
Tuscola.
Eureka.
Pusher.
Philo.
Pica.
Keystone.
Central Fraction.
Rantoul.
Merchant.
Irma.
Thomas.
Clara.
Baltic.
Mystery.
Potomac.

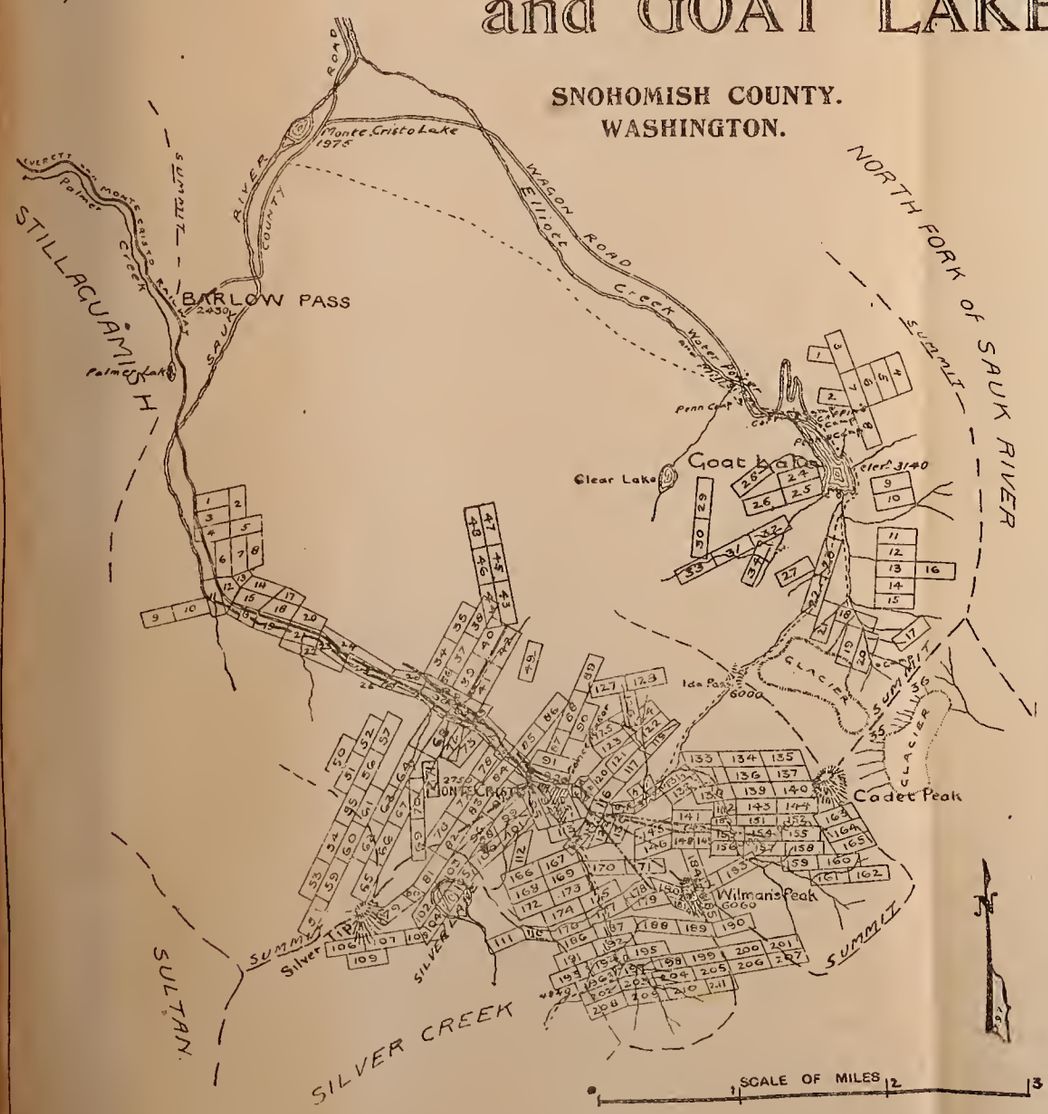
151. Washington.
152. Cadet.
153. Pride of the Woods.
154. Pride of the Mountains.
155. Eighty-nine.
156. L. X. L.
157. Side Line.
158. Ptarmigan.
159. Dora J.
160. Zola B.
161. Ajax.
162. Nero.
163. Galore.
164. Silver Tip.
165. Snowflake.
166. Poodle Dog.
167. Mirror.
168. Alameda.
169. Mountain Maid.
170. Argonant.
171. Typo.
172. Alpha.
173. Omega.
174. Hannah.
175. Rob Roy.
176. Emma Moore.
177. Uncle Sam.
178. Glacier.
179. Hopeful.
180. Comet.
181. Nestor.
182. Monte Cristo.
183. Alicante.
184. American.
185. Ouida.
186. '74.
187. '75.
188. '76.
189. Ranger.
190. Sentinel.
191. Congress.
192. Senate.
193. Summit.
194. Ibex No. 2.
195. Ibex No. 1.
196. Iron Town.
197. Iron Dale.
198. Iron Clad.
199. Ironton.
200. Iron Crown.
201. Iron Knight.
202. Iron Man.
203. Vulcan.
204. Iron Age.
205. Iron Cap.
206. Iron Queen.
207. Iron King.
208. Iron Hat.
209. Iron Mask.
210. Fourth of July.
211. Iron Prince.
a, b, c, etc., Mill Sites.

GOAT LAKE.

1. Great Western.
2. Washington.
3. Lola Montes.
5. Mexican.
6. Navaho.
7. Glory of the Mountains.
8. Sutter.
9. Union.
10. Nevada.
11. Baltimore.
12. Republican.
13. Eldorado.
14. Waterfall.
15. Black Jack.
16. Golden Star.
17. Little Giant.
18. Bon-Ton.
19. Wild Goat.
20. Alamo.
21. San Francisco.
22. Sacramento.
23. Sunset.
24. Blue Rock.
25. Beaver.
26. Great Western.
27. Ida.
28. Three Star.
29. Cornwall No. 2
30. Cornwall.
31. Monticello No. 3
32. Monticello No. 2.
33. Monticello.
34. Teller.
35. Penn Co.
36. Penn Co.

MONTE CRISTO and GOAT LAKE,

SNOHOMISH COUNTY. WASHINGTON.



Webster Brown
CIVIL AND MINING ENGINEER,
SEATTLE WASHINGTON.

INDEX TO NUMBERED CLAIMS.

MONTE CRISTO.

1. Red Gulch.
2. Mosquito
3. Gold Dust.
4. King.
5. Balsam.
6. Hawthorne.
7. Black Bear.
8. Monntain Goar.
9. Fisher.
11. Bannock.
12. Pavonia.
13. Twilight.
14. California.
15. Orient.
16. Occident.
17. Lockwood.
18. Pennsylvania.
19. Aurora.
20. Wyoming.
21. Jones.
22. Pelton.
23. Seattle.
24. Franklin.
25. Prairie.
26. Sunrise.
27. Washington.
28. Emerson.
29. Sylvan.
30. Junction.
31. Seattle.
32. Condor.
33. O. B. Mill Site.
34. Marble.
35. Two R's.
36. Juanita.
37. Keystone No. 2.
38. Last Chance No. 2.
39. Irene.
40. Silver Bell.
41. Red Bluff.
42. Cascade.
43. Chinook.
44. Leroy.
45. Golden Eagle.
46. Walsh.
47. Lieutenant.
48. Captain.
49. Idaho.
50. Maggie
51. Doctor.
52. Murray.
53. Daudy.
54. Monte Carlo.
55. Snrprise.
56. Frank and Bob.
57. Outlet.
58. Wonder.
59. Copper Prince.
60. Bald Mountain.
61. Maud.
62. Milton.
63. Albion.
64. Spokane.
65. Apex.
66. Sunset.
67. King.
68. Mario.
69. Last Chance
70. Nettleton.
71. S. A. M.
72. Silver Rose.
73. Humming Bird.
74. Union.
75. Rattler.
76. Bunco.
77. Olive May.
78. Florence.
79. Cosmopolitan.
80. Juno.
81. Arena.
82. O. & B
83. P. & I.
84. Sauk Lode.
85. F. & M.
86. O. & J.
87. Tobique
88. Talla Rookh
89. Gold Blossom.
90. Sunshine.
91. Cox Placer.
92. Junction Placer No. 1.
93. Junction Placer No. 3.
94. Jnnction Placer No. 2.
95. Blake Placer.
96. Ingress.
97. Egress.
98. Carrie Anderson.
99. Mountaineer.
100. Ethel.
101. Annie Laurie.
102. Bingo.
103. F. E. Davis.
104. Otego.
105. Lady of the Lake.
106. Lester.
107. Silver Tip.
108. Lake View.
109. Rainbow.
110. Jennie D.
111. Orphan Boy.
112. Old Norwegian.
113. Remnant Placer.
114. Tyee.
115. Mechanic.
116. Rainy.
117. Phœnix.
119. West Seattle.
120. Pirate.
121. Pinto.
122. Mexican.
123. Oro.
124. Waverly.
125. Rainbow.
126. June.
127. Eagle's Nest.
128. Eyrie.
129. Artisan.
131. Neptune.
132. Utopian.
133. Gothic.
134. Hydra.
135. Whistler.
136. Tuscola.
137. Eureka.
138. Pusher.
139. Philo.
140. Pica.
141. Keystone.
142. Central Fraction.
143. Rantoul.
144. Merchant.
145. Irma.
146. Thomas.
147. Clara.
148. Baltic.
149. Mystery.
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151. Washington.
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157. Side Line.
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167. Mirror.
168. Alameda.
169. Monntain Maid.
170. Argonant.
171. Typo.
172. Alpha.
173. Omega.
174. Hannah.
175. Rob Roy.
176. Emma Moore.
177. Uncle Sam.
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33. Monticello.
34. Teller.
35. Penn Co.
36. Penn Co.

April, rainstorms grow less frequent until they cease altogether about the December, but from that time forward the snowfall is heavy. The snow has usually disappeared from the mountains by the middle of May, except at great altitudes and in deep gulches where it has piled up in slides. East of the Cascades the air is dry and exhilarating the year around and, though the heat is sometimes intense in summer, it does not produce that feeling of chronic lassitude experienced in the moist atmosphere of the Eastern States. The nights, too, are always cool, permitting of sound sleep, which prepares one to endure severe exertion in extreme heat. Spring sets in during April, the bunchgrass springs up as fast as the snow goes, and this rich food for horses, everywhere found in the open country, makes it a prospector's paradise. There are no thunderstorms or tornadoes west of the Rocky Mountains, so that a man need burrow into the ground only in search of wealth. There are no venomous snakes west of the Cascades, but rattlesnakes abound in some places east of that range. On the other hand, small game and fish can be found almost anywhere and large game is to be had for the hunting.

While many districts are remote from railroads, preparations are on foot for extensions which will largely remedy this defect. The Columbia and Okanogan Valleys form a natural route for the Great Northern to tap the whole of Okanogan County with a branch from Wenatchee, unless the Central Washington should first occupy the field with an extension from Coulee City by way of Waterville and Orondo, as it now contemplates. The Seattle & International is well situated to occupy the Snoqualmie and Cedar River Districts with branches whenever developments hold out prospect of remunerative traffic, and it can also tap the White Horse District by a branch along the north fork of the Stillaguamish. The Seattle & Northern already has the traffic of the Skagit copper belt secured and can be extended up the Skagit and Cascade Rivers at moderate cost. The Great Northern can draw the traffic of the Silver Creek and Index Districts by building a branch up the Skykomish north fork. The fast developing wealth of the Colville Reservation has already induced the Spokane Falls & Northern to survey a line up the Kettle River, which may be partly in United States and partly in British territory. The advantage of having its main line run through the heart of the rich Kootenai District, added to the manifold advantages of having a more direct southern route through the Rocky Mountains and of developing the rich coal fields on that route, has induced the Canadian Pacific to prepare for the construction of a line through the Crow's Nest Pass this season. A line is now under construction from Slocan City, at the foot of Slocan Lake, to Slocan Crossing on the Kootenai River, where it will connect with the Columbia & Kootenai branch of the Canadian Pacific. This will form a link in the connection between the old and new main line. F. August Heinze is now extending the Columbia & Western up the Columbia River from Trail to Robson and has raised funds for a further extension through the Boundary Creek District to Penticton, connecting with the Canadian Pacific steamer on Okanogan Lake.

The first requisite for the development of a mining district is a wagon road. The first prospectors blaze a trail and the next flight of newcomers aids them to cut it out and make it plain and passable. This is as much as they should be expected to do at their own expense. The county should follow up their work by cutting a good horse trail into any new district which gives promise of development, and when that development has assumed important dimensions and holds forth an early prospect of regular production the trail should be transformed into a wagon road. In this manner lines of travel and transportation would be continually improved to keep pace with the progress of development.

The Province of British Columbia has set a good example in this respect, which Washington is only now beginning to imitate. It has built a main trunk road from Penticton through Camp McKinney, Midway, Greenwood, Anaconda and Carson to Grand Forks, a distance of 110 miles, connecting at the latter point with the Kettle River roads to Marcus and Bossburg, on the Spokane Falls & Northern Railroad. It has also built roads in the Kootenai country wherever they would reach a large enough group of claims to warrant the expense. Shorter roads in Boundary Creek have been built in several directions at the private expense of Robert Wood, owner of the town of Greenwood. The State of Washington has made a beginning in this direction by constructing a horse trail from the mouth of the Twisp, over the Twisp and

Cascade Passes to the mouth of the Cascade River, thus connecting the county road systems of Eastern and Western Washington. It has also constructed a road across the Colville Reservation, except for a short gap, which will be closed by an appropriation made at the last session. Appropriations have also been made for a road from Wenatchee up the Columbia River to Ives and for the widening of the trail to a wagon road between the mouth of the Twisp and North Creek, and between Marble Mount and Gilbert's Camp, near the head of the Cascade River, leaving the remainder of the trail to be widened later.

Unlike their earlier, less careful and therefore less successful predecessors, the present investors in mines in the Pacific Northwest are fully alive to the necessity of modern economical processes of reduction, carefully and skillfully managed, for the extraction of the value from the ores. Stamp mills are now seconded by concentrators and slime tables. The employment of a skilled millman is admitted to be one of the conditions of success. The cyanide process has been applied with a large degree of success at one mine and a plant erected last season at another, will be put in operation this year. Experiments are continually made with new processes of reduction, from among which, it is hoped, one will be evolved capable of cheap application on the mine ground. Meanwhile the bulk of the ore produced goes to the smelters at Everett and Tacoma, Wash.; Trail, Nelson and Pilot Bay, B. C. Coke for flux is produced at the Fairhaven and Wilkeson mines, Washington, and at Nanaimo, B. C. Coal in large quantities is produced at Newcastle, Franklin, Black Diamond, Gilman, Renton and Danville, in King county; Wilkeson, Carbonado, Pittsburg, in Pierce county; Roslyn and Cle-Elum, in Kittitas county; Blue Canyon, in Whatcom county; and Fairhaven mine, in Skagit county, Washington; at Nanaimo, Wellington and Comox, B. C. New discoveries have been made on Day Creek, Skagit county; the Skykomish River, King county; Camas Prairie, Kittitas county; on Chumstick Creek, Okanogan county; also on Rock Creek, British Columbia.

It is a trite, but by no means true, saying that mining is a gamble. It is only a gamble when a man unfamiliar with the business buys property he has never seen or of which he does not know the value. It is not a gamble if entered upon on business principles, with a full knowledge of what is being bought, obtained either by personal inspection or through the report of a reliable mining engineer. There is no more reason why a man should buy "a pig in a poke" in the mining business than in any other business. If he does so and finds that he has not bought a pig but some other animal, he must not blame the mining business, but his own unbusinesslike manner of engaging in it.

One result of the great size of the ore bodies in this section of the country has been the necessity of large amounts of capital to carry on the preliminary work of prospecting and make such a showing of mineral as will put the claims in a salable condition. The locators of claims rarely having the necessary capital, this work has been undertaken by development companies, organized for the purpose of thoroughly prospecting claims in exchange for an interest and of then selling them to others, who will further develop them into mines. Such companies have filled a decided gap in the mining community and are operating with marked success in many districts.

That mining is destined to fill a leading place among the industries of Washington and British Columbia must be evident to every observing mind. It has already taken first rank in British Columbia and is fast stepping into that rank in Washington. It must have a decidedly beneficial effect on the general prosperity of both province and state, for it brings with it a number of kindred industries and furnishes a ready cash market for the products of the farmer, stock-raiser and manufacturer of various wares. It tends to diversify industry and thus to prevent undue reliance of a whole community on any single means of support. It requires a healthy, active, open-air life and makes a sturdy, independent, self-reliant race of men and women.

MONTE CRISTO.

The name of this camp has long been on the tongue of every person interested in mining in the Cascade Mountains and every atom of news regarding the camp has been eagerly watched for. The reason is not far to seek. Monte Cristo was the scene of the first mining operations on a large scale by men having ample capital to develop a mine to a paying basis. These mines and the affiliated investments represented an investment of about $3,000,000, which John D. Rockefeller and his business associates had staked on their faith in the mining possibilities of the Cascades. They had done so in the face of adverse opinion from many experts as to the character of the formation and the permanence of the ore bodies. They had found gold and silver-bearing minerals of such a refractory nature that they incurred heavy penalties at the smelter and one man described a particularly troublesome combination of mineral as "concentrated essence of the Inferno." But the Monte Cristo and its allied companies persisted in the face of many difficulties and may now be said to have solved the problem for the whole Cascade mineral belt. By tapping at a depth of 700 feet one of the ore chutes which cropped on the surface, they have proved that the ore bodies are continuous for a great depth and maintain their size and value. They have proved that, in spite of its refractory character, the ore can be mined, concentrated and smelted at a profit, when handled on a large scale. They have proved these valuable facts as pioneers in a new mining field, where new conditions had to be met and new problems solved, and they have persevered in spite of many obstacles and much detraction from pessimists, until they have found the answer, not only for themselves but for all others who enter the same field. They have not published abroad the results attained, for they are in effect close corporations, having no stock to sell and no objects to gain by publicity except to satisfy a natural curiosity on the part of the community as to an enterprise the success of which means much for the mining industry of Washington.

Monte Cristo lies in a basin in which the south fork of the Sauk River rises. Two glaciers form its source, one sloping from Cadet Peak and pouring its drippings in a cascade down Glacier Gulch to form Glacier Creek, the other scoring the side of the lofty ridge south of Wilman's Peak and sending Seventy-six Creek down a gulch to join Glacier Creek in the town of Monte Cristo. Wilmans Peak is a bold, precipitous headland jutting out between Glacier and Seventy-six Gulches, which the ice has carved out to right and left of it. The united stream flows northwest from beneath these peaks to receive the north fork, which rises on the other side of the ridge, and then enter the Skagit, fifty miles north.

The Monte Cristo mines are one of a number of properties which have been acquired by the Rockefeller Syndicate and are being operated in conjunction. At Everett, where the Great Northern main and coast lines unite at the mouth of the Snohomish River on Puget Sound, is the smelter of the Puget Sound Reduction Company. From a junction with the Great Northern at this point the Everett & Monte Cristo Railroad has been built to Snohomish, a distance of eleven and one-half miles. From Snohomish to Hartford, eight and two-tenth miles, trains run at present over the Seattle & International Road, the Everett & Monte Cristo running from the latter station to Monte Cristo, fifty-two and two-tenth miles, making a total distance from Everett junction of seventy-one and nine-tenths miles.

The manner of the discovery of the great mineral ledges of Monte Cristo was not only dramatic, but was itself an evidence of their great size and richness. Prospectors had for several years explored the Silver Creek district, directly over the divide to the south, and had found the mountains everywhere stained with great red streaks, where surface influences had oxidized the iron in the surface ore. Joseph Pearsall pursued his explorations up the east bank of Silver Creek and climbed along and up the steep sides of Hubbart's Peak until he could see over the divide to the mountains forming a jagged amphitheatre around the Sauk Basin. He could look sheer down over 2,000 feet to where the two creeks unite to form the Sauk and where Monte Cristo now stands. But another spectacle riveted his attention; this was a broad, glistening streak on the side of Wilmans Peak, overlooking Seventy-six Gulch. He also saw that all the mountains which shut in the valley beyond were streaked with broad red bands from summit to base. But that glittering streak more fastened his attention and he examined it from the distance with a field glass, and convinced himself that it was galena. He was looking for galena, as were all the prospectors of the Cascades in those days, and waving his arms in delight, he exclaimed: "It is rich as Monte Cristo," and named the mountain after that master of fabulous wealth. This happened on the Fourth of July, 1889, and when he afterwards climbed to the spot and made his first location he named it "Independence of 1776," a name which has become abbreviated to Seventy-six

and is now applied to this claim, the whole ledge and the gulch which exposes it and the creek flowing from it.

Mr. Pearsall went down to Seattle and returned with J. M. Wilmans, who became interested with him in a number of other locations. The thorough exploration of the district and a host of other locations followed. In the year 1890 the claims on Mystery Hill, Cadet Peak, Glacier Gulch, Seventy-six Gulch and Wilmans Peak, with a number extending along the ridges on each side of the canyon, came into the possession of Hon. H. G. Bond, L. S. J. Hunt, H. C. Henry, Edward Blewett, J. M., F. W. and S. C. Wilmans, all of Seattle. In 1891 Mr. Henry and J. M. Wilmans, in returning from the camp, looked for a railroad route and found that the basin could be entered from the Sound by either the north or south fork of the Stillaguamish. Their first choice was the north fork route, but they decided in favor of the south fork, although more difficult and expensive, on account of the many signs of mineral in the vicinity of Silverton. They then had a line surveyed proving this route practicable. In the summer of 1891 five companies were organized, owning the several groups of claims in the basin—the Monte Cristo, Pride of the Mountains, Rainy, Wil[illegible] the fall of that year the controlling interest in the first three companies named was sold to the Rockefeller Syndicate, which in the fololwing year bought all Judge Bond's remaining interest, the Wilmans brothers retaining control of the Wilmans and Golden Cord.

Then began development on a large scale, which has been continued without interruption throughout the period of depression following the boom times during which the discoveries were made. Many exaggerated expectations, formed while the camp was in its embryonic prospect state, have been disappointed, the halo of romance and the visions of great wealth suddenly and easily acquired have vanished into vapory nothingness under the cold, calculating eye of the business man. What remains is this: A great series of ledges of refractory ore of low to medium grade, proved to go down to great depth and to carry such value, that, if skilfully and economically mined and concentrated on the ground, they will pay good profits after the mine is once really a mine—that is, sufficiently opened to regularly produce ore in large quantities. It has been proved that the Cascades are, generally speaking, not a poor man's mining country, but that a judicious investment of large amounts of capital will pay good dividends. Of course, there are instances of mines so favorably located as regards transportation, or having such high grade ore that they can be put on a paying basis by a comparatively small investment, but they are the exception, not the rule.

The Rockefeller Syndicate built the Everett & Monte Cristo Railroad in 1892 and 1893 from Everett to Snohomish along the Snohomish valley, and from Hartford Junction to Monte Cristo along the south fork of the Stillaguamish. A large part of the line runs through a canyon which presented great engineering difficulties in its construction and has been costly to maintain, but the impending development of the Silverton and other adjoining districts will probably make the road a paying investment on its own basis. The smelter at Everett was erected about the same time and has now become a paying institution, treating not only the Monte Cristo concentrates but customs ore from all sides and even from distant Australia.

The Monte Cristo Mining Company has twenty-eight claims, including mill sites and placers in the canyon, the mineral locations being divided among Glacier, Seventy-six and West Seattle Gulches. In Glacier Gulch the ledges run east and west between walls of diorite; in Seventy-six Gulch their course is northeast and southwest between diorite and basalt; and in West Seattle Gulch north and south between diorite walls. The ledge matter is almost always silicious porphyry. The principal development has been done on Mystery Hill on a ledge which runs through the ground of both the Monte Cristo and Pride of the Mountains Mining Companies. The croppings of this ledge are in some places as wide as forty feet, but this is not mineralized throughout, and the dip averages 70 degrees north. The ore bodies range in width from two to fourteen feet and average about four feet.

The Mystery Hill mine of the Monte Cristo Company has three working tunnels 125 feet apart from all of which ore is being stoped. The upper one cuts through Mystery Hill for about 1,000 feet and has developed one long ore chute averaging about four feet wide, which carries arsenical iron, sulphurets of iron, arseno-sulphurets and zinc blende. The second tunnel is a little over 900 feet long and would, if continued, run fifteen feet beneath Glacier Gulch and into Cadet Peak. It cuts the same ore chute as the upper tunnel, 800 feet long and with an inclination to the east.

The longest and deepest tunnel is the third, which runs through Mystery Hill on this ledge for 1,600 feet and cut the same ore chute as the two upper ones, 700 feet below the summit of the hill, thus defining that chute for this depth. This tunnel then turns southward and runs for seventy-five feet as a cross-cut until it intersects a parallel ledge, which it then follows through the Pride of the Mountains ground for 500 feet. It runs for 280 feet through an ore chute three feet wide, carrying galena and a little chalcopyrite, in addition to the other minerals already mentioned, the galena somewhat increasing the average value. All further development by the extension of this tunnel will be carried on in the Pride ground.

The Pride of the Mountains mine has been developed on the ledge to which the long tunnel has cross-cut, but at a point beyond that to which this tunnel has been driven. This is the ledge in the croppings of which Mr. Pearsall saw galena in the distance. It strikes east and west and is nearly flat, and two tunnels have been driven on it, 180 feet apart along its dip. One is 600 feet long and is 200 feet below the surface, while the other is a little over 800 feet long and gains a depth of 380 feet. The ore in this ledge occurs in lenses, which lap each other and are always accompanied by small quantities of waste on one wall. The Pride of the Mountains Company owns fourteen claims in all, mostly in this group.

The Seventy-six Mine of the Monte Cristo Company is on Seventy-six Gulch and consists of two tunnels. The upper one, 130 feet long, starts 150 feet below the summit of a vertical wall and gains a maximum depth of 200 feet, while the other is 100 feet below and is 800 feet long. Both these tunnels show a two and one-half foot ledge, with good indications of approaching the ore-chute cropping above, and prospecting with the diamond drill was started in the lower tunnel in the fall of 1896, but snow prevented anything from being accomplished.

The ore is transported from the Mystery Hill and Pride of the Mountains Mines by two cable bucket tramways, which run to the same discharge terminal. One runs from the lower tunnel of the Pride of the Mountains and over Mystery Hill and is about 6,000 feet long, making a descent of about 1,800 feet. It has a span of 1,200 feet across Glacier Gulch, with a central drop of 600 feet, and its capacity is 230 tons in twenty-four hours. The other tramway is 3,600 feet long and leads from the long tunnel in Mystery Hill, a vertical height of 1,200 feet, to the discharge terminal. The ore is here run through a coarse crusher, then loaded on cars and hauled by horses over a surface tramway to the concentrator, 1,000 feet distant.

The concentrator is what is known as a double section mill and has a capacity of 300 tons in twenty-four hours, or 150 tons for each side. The ore is crushed by rollers and concentrated on Hartz jigs, the fine pulps and slimes passing on to round tables and Frue vanners. The total extraction is about 85 per cent. of the assay value, which is about $8 for the low grade Mystery ore and over $30 for the ore in the Pride ledge. The ratio of concentration is about four and one-half tons into one. The mill is run by a 200 horse-power Corliss engine, which also runs a 100 horse-power generator. The latter furnishes power to a motor at the Mystery Hill Mine, which compresses air for three power drills, while electricity is also generated in the engine room to light the town and the mill. The ore concentrates three tons into one and the mill is producing about 1,200 tons of concentrates a month, with a probable increase during the year.

The Rainy Mining Company has ten claims, three of which are on Cadet Peak and two on a ledge running up the mountain east of the tramway terminal. On a level with the latter, a tunnel runs 800 feet into the mountain, gaining a depth of 400 feet, and a shaft is down ninety feet at the mouth of this tunnel showing twenty-eight inches of well mineralized ore of the same character as that in Mystery Hill.

About 250 men are employed in Mystery Hill and Pride of the Mountains Mines and in the concentrator.

The Wilmans Mining Company has a group of seven claims on a series of ledges cutting through Wilmans Peak from Seventy-six Gulch to Glacier Basin and carrying galena, sulphides and some chlorides of silver. A tunnel has been driven through the mountain several hundred feet below the summit and another, 100 feet below, is in 125 feet. A cable tramway 10,000 feet long stretches from the mouth of the upper tunnel to a point near the concentrator and a large amount of ore is stored in the bins at this point.

The Golden Cord Mining Company has nine claims on the crest of Wilmans Peak and on the sides overlooking the town and the concentrator. A tunnel about 500 feet long has developed an ore body about thirty inches wide, half of which is similar in character and value to the Pride ore, while the remainder is decomposed and carries a higher gold value. This ore is worth $35 to $40 and some of it has been run through the concentrator, but was found to slime so badly that that process is not adapted to it. A cable tramway about 4,800 feet long stretches from this mine to the terminal near the concentrator.

Steps are now being taken towards a resumption of work on the Wilmans and Golden Cord properties, on which nothing has been done since 1895, and the erection of a plant for the chemical extraction of the value is contemplated.

The O. & B. group of four claims is directly across the divide from Silver Lake, 2,000 feet above the Everett & Monte Cristo Railroad, and was bonded and leased by the Packard Mining Company, Cobb & McCrea, John F. Bakeman, Oliver McLean and F. M. Headlee to the O. & B. Mining & Milling Company, which afterwards acquired the interests of Messrs. Cobb & McCrea, Bakeman and Headlee by purchase. The main ledge, on which are three claims, runs up the ridge to Silver Lake, is about eight feet wide and has from six to twenty-four inches of pay ore. The lowest tunnel, sixty feet, is 700 feet below the summit and shows nine inches of $45 ore, the remainder of the ledge carrying $2.75 to $5. The second tunnel, 180 feet above, is 260 feet

long and ran through an ore chute eighteen inches wide and forty-three feet long, with good concentrating ore the rest of its length. At 200 feet an upraise was made seventy-five feet, showing two feet of solid ore. The third tunnel, 110 feet above the second, is 135 feet long and has an average of five inches of solid and four feet of concentrating ore. The fourth claim is on a parallel ledge traced for its full length and showing a foot of $70 ore in a short tunnel. A temporary cable tramway has been built to the railroad, 2,000 feet below, and 200 tons of ore have been shipped, ranging in value from $15 to $35 and averaging $20 gross. The company proposes to erect a permanent tramway and a concentrator.

On the extension of the O. & B. ledge down the mountain is the P. & I., on which the P. & I. Mining Company is at work. The ledge ranges from two to six feet between granite walls and shows from five to twenty-four inches of pay ore carrying sulphurets and assaying $8.80 to $21 gold and 16 to 38 ounces silver. A tunnel is in 112 feet near the lower end of the claim and will be extended 100 feet this year. A tramway will be built 1,350 feet to the railroad, making a descent of 980 feet vertically.

Directly opposite the O. & B. and within 1,500 feet of the concentrator and railroad are the Tobique and Lalla Rookh, owned by Jasper Compton and others, on a fissure ledge twelve to fifteen feet between syenite walls. The ledge has been defined by two fifteen-foot tunnels, the lower one of which has tapped an ore chute carrying sixteen inches of solid iron pyrites with some galena, which assays $8 to $30 gold and 6 to 40 ounces silver. Another tunnel has been run forty feet to tap this chute and to be used as a working tunnel and shows chlorides, which are gradually giving place to iron pyrites. This tunnel will be continued this year.

On the extension of the Foggy ledge across the divide to Monte Cristo is the Whistler group of four claims, owned by the Packard Mining Company, Bell & Austin and the Lillis estate. The ledge is four to twenty feet wide and has an eighteen-inch pay streak of sulphurets, gray copper and galena, assaying $25 to $45 gold and silver. Tunnels twenty and thirty feet long and an open cut, at intervals of 100 feet, have made this showing.

The Philo group of three claims, 100 feet south of the Whistler group, is owned by George Evans, Charles F. Jackson, H. F. Jackson, the Packard Mining Company, Joseph Barrett and — Trombly. Tunnels twenty and forty feet long show fifteen inches of pay ore carrying arsenical iron and copper sulphides and two feet of concentrating ore.

The Keystone group of four claims adjoins the Mystery Mine and is owned by the Packard Mining Company, A. W. Hawks, A. D. Austin and the Lillis estate. A thirty-foot tunnel and a twenty-foot open cut show a pay streak, ten to eighteen inches, of galena, iron and copper sulphides, assaying $20 to $24 gold and silver. The ledge crops four to twenty feet wide in the gulch and shows twenty-four inches of galena in an ore chute 300 feet long. A cross-cut is in forty feet and will tap this ore chute at a depth of 100 feet in ninety feet more. A parallel ledge shows six to thirty-six inches of similar ore in a sixty-foot tunnel.

In the Seventy-six Basin, adjoining the Golden Cord, are the Argonaut and Typo, on a ledge which crops seventy to seventy-five feet wide along the creek and has arsenical iron disseminated through its whole width. This is believed to be all concentrating ore carrying $8 to $12 gold.

On a ledge parallel with the O. & B. are the Ethel and Annie Laurie, owned by F. A. Bass, M. T. J. Cummings and the Dempsey estate, on a ledge which shows in an open cut eight feet of iron pyrites carrying $5 to $21 gold. A tunnel is in sixty feet for the ore chute and a cross-cut has been driven twenty feet towards the hanging wall.

On the east slope of the ridge dividing the Sauk, Sultan and Stillaguamish water-sheds, overlooking Crater Lake, two and one-half miles from Monte Cristo, is the Del Campo group of three claims, owned by the Del Campo Gold & Copper Mining Company. Two claims are on a ledge which is exposed for 2,000 feet and crops ten to thirty feet wide, carrying chalcopyrite, which assays on the surface $44.86 gold and silver, 13.8 per cent. copper; 34 per cent. copper and $6 gold. The other claim is on a parallel ledge cropping 50 to 100 feet wide and carrying similar ore with more silica. A twenty-five foot tunnel and several open cuts have shown up each ledge. One mile of cable tramway would take this ore to the railroad.

GOAT LAKE.

Though a part of the organized district of Monte Cristo, this is practically a separate district set apart by the formation of the country. It is the extension eastward of the Monte Cristo mineral belt, traced through the ridge dividing the south from the north fork of the Sauk and the latter from Goat Lake. The latter body of water, less than a mile long, empties through Elliott Creek into the south fork of the Sauk, and the mountains at its head and on each side are veined with mineral.

The district is easily accessible from Seattle. Taking the Great Northern train or a steamer to Everett, thirty-three miles, one goes thence by the Everett & Monte Cristo Railroad to Barlow Pass, sixty-two miles, and thence by a good road to the foot of the lake, eight miles. From there a trail runs along the shore and a road through the bottom land at the head to the Penn Camp on the cliff above. The distance to the Everett smelter is sixty-two miles and to the Tacoma smelter 136 miles from Barlow Pass.

The formation of the country is syenite, granite and schist, with dikes of quartz, porphyry and slate. The principal ledges cut the schist, quartz, porphyry and granite in a general easterly and westerly direction. The ledges vary from a clear white quartz, sparsely mineralized, to a very dark quartz, strongly mineralized and very auriferous. They carry a fine grained arsenical iron of a good gold value, together with gray copper, galena and in some cases chalcopyrite. In some cases gold, and in some silver, predominates. Part of the ores are high grade and will pay to haul to the railroad and ship to the smelter, and the remainder will be concentrating. Discoveries began in August, 1891, with the location of the Foggy and parallel ledges on the divide between Goat Lake and the Sauk's north fork and continued along the mountains on both sides of the lake.

Development is being pushed most vigorously on the Foggy group of about forty claims, owned by the Penn Mining Company. The Foggy edge cuts the mountain from the east edge of the Monte Cristo basin easterly and has been traced over 5,000 feet, showing five feet of solid ore similar in character and value to the Pride ore at Monte Cristo, with feeders three and four feet wide running into it at acute angles. The Foggy was proved to be a true fissure vein by a number of open cuts and shafts, after which a crosscut was run 200 feet intersecting it from 200 to 250 feet below the lowest cropping and running along it for about 100 feet each way, the total length of the tunnel at that point being about 400 feet. Parallel with this ledge on the south is another about six feet wide with a three-foot paystreak of ore similar to the Foggy, on which are two claims. Others of about seven feet and three and one-half or four feet cut across the head of the basin, while in Sauk basin below the Foggy are a number of others. Having thus proved the permanence of the main ledge, the company last spring built a road up Elliott Creek to the foot of the lake and repaired the county road down the Sauk, took in a donkey engine to haul supplies up the cliff to the site selected for a permanent camp, 1,100 feet above the lake, and installed an air compressor and two power drills. A crosscut tunnel was then started from the Goat Lake basin to crosscut the series of ledges at greater depth, and is now in about 200 feet, having tapped the first ledge at a depth of 200 feet. It will cut the Foggy 800 feet deep and possibly others at greater depth and will be used as a working tunnel. A survey has been made for a tramway down the lake to the falls at its mouth, where the company owns a millsite, and a telephone line has been stretched over this route, which is two miles long. An electric plant will be erected at the falls, which have a fall of 350 feet in 700, and a concentrator placed there to treat the ore. A survey has also been made for a branch railroad six miles long from Barlow Pass on the Everett & Monte Cristo Railroad to the millsite. When the tunnel has cut the ledges, as is expected by next fall, the question of constructing this road will be decided and work will in that event begin the following spring.

The Nevada and El Dorado, on two parallel ledges on the east side of the lake, near its head, are being developed by the Elliott Creek Gold Mining Company, which has a millsite on the level tract at the head of the lake, well protected from snow slides. The Nevada ledge crops three feet wide between slate walls 1,200 feet from the lake shore and has been tapped by a 60-foot tunnel, which ran through highly mineralized quartz and slate and has continued for ten feet across the ledge, without striking the opposite wall. Of this width three feet is high grade and the balance concentrating ore. The El Dorado ledge runs parallel, higher up the mountain, and shows five feet of sulphuret ore in the croppings. A tunnel runs fifteen feet on a two-inch streak in the porphyry gangue and shows it to steadily widen. The croppings assayed $6.61 to $7.85 gold, $1.73 to $2.56 silver, while an assay from a depth of four feet gave $13.60 gold, $7.20 silver, 21.20 per cent copper.

Two assays from a foot deeper gave $17.36 gold, $2.77 silver and $21.50 gold, $4.80 silver respectively, while from a depth of eight feet in an open cut the ore assayed $27.28 gold, $1.34 silver. Judging from the width and continuity of the ledges and the correspondence of the exposures on opposite sides of the mountain, it is reasonable to conclude that these ledges run clear through the ridge and can be tapped by tunneling at great depth.

One of the best-looking and widest ledges crops out directly under the granite cliffs a few hundred feet above the north shore of the lake, and on this and its spurs the Goat Lake Mining Company has the Glory of the Mountains group of seven claims. The ledge appears to have been broken over by slide rock, but in a tunnel, driven forty feet across, it appears to be straightening up from a pitch of forty-five degrees, and shows twenty feet of ore divided by a horse of porphyry. The ledge matter is porphyritic quartz and is pretty evenly impregnated with white iron and sulphides. A sample taken across eight feet of ore assayed $21.50 gold, $4.80 silver, and another from twelve feet further in gave $27.60 gold, $1.80 silver. The company is driving a cross-cut from the shore of the lake which is expected to tap the ledge in 360 feet at a depth of 800 feet, and is now in ninety feet. Three of the claims are on the main ledge and four are on spurs running east and west up the mountain from the lake shore, while the Navajo group of three claims, all of which have good surface showings, are on a parallel ledge further up the mountain and would be developed by the Glory of the Mountains crosscut.

From this point up the lake, running up the mountain parallel with the Glory, is a series of ledges extending to the basin wall. The first of these is the Lily of the West, owned by Dr. McCulloch, J. W. Coffin, Miss H. K. Coffin and E. G. English. The ledge crops out eighteen inches wide, with a foot of mineral arsenic beside it, and pitches into the mountain. A cross-cut to tap it is in thirty-five feet. The same parties have the Hunter on a small streak of ore, running into the Lily, and parallel with it J. W. Coffin has the Union on a ledge carrying arsenical iron and iron sulphides, which crops out eighteen inches to four feet wide. A crosscut is being run to tap it in forty feet.

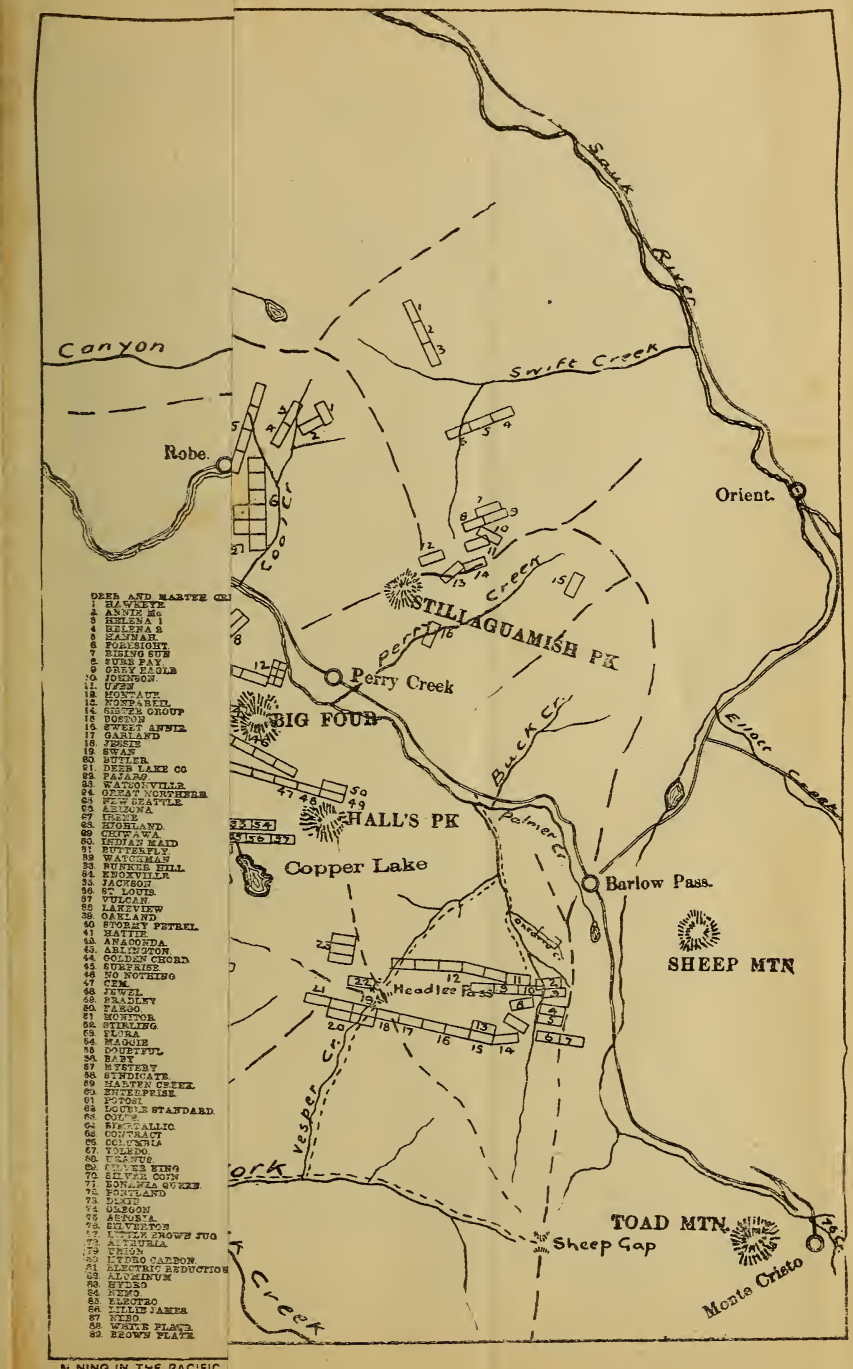
The Blue Rock group of four claims, owned by Messrs. Coffin and sons, is on two parallel ledges running up from the lake. One of these crops five feet wide between granite walls and shows three and one-half feet of arsenical iron ore carrying gold, silver and copper in a ten-foot shaft, as well as in a thirty-five foot tunnel. The other ledge, 100 feet above the lake, is six feet wide where it has been stripped and crops five to twenty feet wide higher up the mountain.

Between the Nevada and El Dorado J. W. Coffin has the Baltimore on a ledge from three to five feet wide, with six to eighteen inches of pay ore, carrying iron sulphides rich in galena. Assays from the croppings show about $6 gold, $3 silver. On a similar ledge, with a cropping of about four feet of sulphide ore, Mr. Coffin and his sons have the Republican. Above the El Dorado Mr. Coffin and C. M. Mackintosh have the Waterfall on a five-foot ledge showing from eighteen inches to four feet of pay ore, and the Black Jack on a parallel ledge, similar in size and character. Above this, in the rim of the basin, H. W. and C. B. Coffin have the Brooklyn, showing twelve to fourteen inches of ore, on which they are driving a tunnel. Under the rocky promontory in the center of the basin is the Little Giant, owned by J. W. Coffin, E. G. English and Dr. McCulloch. The ledge is eight feet wide, with a pay streak ranging from eighteen inches to its full width, carrying sulphide ore. A cross-cut is in thirty feet, and will tap the ledge in about 150 feet more.

Running up the center of the basin to the south of the Penn camp is the Bon Ton group of five claims, on as many parallel ledges, owned by J. W. Coffin, E. G. English, Dr. McCulloch and C. M. Mackintosh. The main ledge is from ten to twelve feet wide, with four to eight feet of chalcopyrite, peacock copper and iron sulphides. It crops out for 650 feet, and has broken over on the surface, but appears to straighten up and to be running into the Little Giant. Assays have shown $16 to $27 gold and silver, and the other ledges in the group carry similar ore. On the south side of the basin, running up under the great glacier, C. B. and H. W. Coffin have the San Francisco on a ledge about the same width as the Bon Ton, and are driving a tunnel on it below the glacier. To the south of this Dr. McCulloch, H. W. Coffin, E. G. English and C. M. Mackintosh have the Sunset on a ledge carrying three feet of iron pyrites and arsenical iron, which assays $32 to $33 gold and silver. A cross-cut tunnel to tap it in 350 feet has been driven twenty-two feet. The Sacramento, owned by C. B. and H. W. Coffin, is an extension on the Sunset up the mountain. Further down towards the foot of the lake the same parties have the Three Star on a ledge eight to twelve feet wide, with three to seven feet of pure hard white quartz, largely crystallized and carrying iron sulphides. A tunnel has been started on this ledge.

Messrs. Coffin and sons have three mill sites extending from the outlet of the lake 900 feet down the falls, in which there is ample water for power.

The Gift claim, located by two prospectors of the fair sex, Miss Coffin and Miss Goodspeed, is on the divide between the lake and the north fork of the


Canyon
Robe.
Swift Creek
Orient.
STILLAGUAMISH PK
Perry Creek
BIG FOUR
HALL'S PK
Copper Lake
Barlow Pass.
SHEEP MTN
Headlee Pass
TOAD MTN.
Sheep Gap
Monte Cristo
Elliott Creek
Palmer Cr.
Vesper Cr.
Buck Cr.
DEER AND MARTEE CR
1 RAWLEY
2 ANNIE Mc
3 HELENA
4 BELEFAR
5 EANNAH
6 FORESIGHT
7 RISING SUN
8 SURE PAY
9 GREY EAGLE
10 JOHNSON
11 UTEM
12 MONTANE
13 MONTANEL
14 SISTER GROUP
15 BOSTON
16 SWEET ANNIE
17 GARLAND
18 JESSIE
19 SWAN
20 BUTLER
21 DEER LAKE CO
22 PAVANE
23 WATSONVILLE
24 GREAT NORTHERN
25 NEW SEATTLE
26 ARIZONA
27 IRENE
28 STORLAND
29 CHIWAWA
30 INDIAN MAID
31 BUTTERFLY
32 WATCHMAN
33 BUNKER HILL
34 KNOXVILLE
35 JACKSON
36 ST. LOUIS
37 VULCAN
38 LAKEVIEW
39 OAKLAND
40 STOREY PETREL
41 HATTIE
42 ANACONDA
43 ARLINGTON
44 GOLDEN CHORD
45 SURPRISE
46 NO NOTHING
47 CEM
48 JEWEL
49 BRADLEY
50 PARGO
51 MONITOR
52 STIRLING
53 FLORA
54 MAGGIE
55 DOUBTFUL
56 BART
57 MYSTERY
58 SYNDICATE
59 MARTEN CREEK
60 ENTERPRISE
61 POTOSI
62 BOTTLE STANDARD
63 COLFAX
64 BIMETALLIC
65 CONTRACT
66 COLUMBIA
67 TOLEDO
68 URANUS
69 SILVER KING
70 SILVER COIN
71 BONANZA QUEEN
72 PORTLAND
73 OLIVE
74 OREGON
75 ARTURIA
76 SILVERTON
77 LITTLE KNOWN JUG
78 ALTURIA
79 UNION
80 LYDIO CARBON
81 ELECTRIC REDUCTION
82 ALUMINUM
83 HYDRO
84 XENO
85 ELECTRO
86 LILLIS JAMES
87 NERO
88 WHITE PLAINS
89 BROWN PLAIN
MINING IN THE PACIFIC


SILVERTON,
SNOHOMISH COUNTY,
WASHINGTON.
Canyon Creek
Robe.
South Fork
Everett
Sellaquamish
Gold Basin
Monte Cristo
Railway
Wisconsin Cr
Boardman Cr
Gordon Creek
Deer Lake
Clear Creek
South Fork
Swift Creek
Orient.
LONG MTN.
Silverton
Marcella
Cooper Cr
Perry Creek
STILLAGUAMISH PK
BIG FOUR
Marble Pass
Bender Cr
BELL & CROWN PK.
Black Jack Cr
HALL'S PK
Copper Lake
Barlow Pass.
SHEEP MTN
Buck Cr
Palmer Cr
Elliott Creek
Vesper Cr
North Fork
Middle Fork
Sultan River
South Fork
Elk Creek
Sheep Gap
TOAD MTN.
Monte Cristo
MT. PILCHUCK
Railways
Wagon Roads.
Trails
Summit Lines
SCALE OF MILES
0 1 2 3 4
Webster Brown
CIVIL AND MINING ENGINEER
SEATTLE, WASH.
DEER AND MARTEN CREEK
1 HAWKEYE
2 ANNIE Mc
3 HELENA 1
4 HELENA 2
5 HANNAH
6 FOREMOST
7 RISING SUN
8 WISE BOY
9 GREY EAGLE
10 JOHNSON
11 UTE
12 MONTAUK
13 MONPAREIL
14 SIXTEEN GROUP
15 DORTON
16 SWEET ANNIE
17 OAKLAND
18 TESTS
19 SWAN
20 BUTLER
21 DEER LAKE CO
22 PASADO
23 WATSONVILLE
24 GREAT NORTHERN
25 W. S. SEATTLE
26 ARIZONA
27 IRENE
28 HIGHLAND
29 CHEWAKA
30 INDIAN MAID
31 BUTTERFLY
32 WATCHMAN
33 BUNKER HILL
34 KNOXVILLE
35 JACKSON
36 ST. LOUIS
37 VULCAN
38 LAKEVIEW
39 OAKLAND
40 STORMY PETREL
41 HATTIE
42 ANACONDA
43 ARLINGTON
44 GOLDEN CHORD
45 SURPRISE
46 NO NOTHING
47 GEM.
48 JEWEL
49 BRADLEY
50 PARGO
51 MONITOR
52 STERLING
53 FLORA
54 MAGUIE
55 DOUBTFUL
56 BABY
57 MYSTERY
58 STANDGATE
59 MALTEN CREEK
60 ENTERPRISE
61 POTOSI
62 DOUBLE STANDARD
63 COPCO
64 RIP-SAW
65 CONTRACT
66 CONTENTS
67 TALEPO
68 CLIMAX
69 GOLDEN KING
70 SILVER COIN
71 BONANZA QUEEN
72 FOURLAND
73 DIXIE
74 OREGON
75 ARIZONA
76 SILVERTON
77 LITTLE BROWN JUG
78 CALIFORNIA
79 UNION
80 NITRO-GARDOX
81 ELECTRIC REDUCTION
82 ALUMINUM
83 RETRO
84 RENO
85 ELKOTRO
86 WILLIE JAMES
87 NEBO
88 WHITE PLAINS
89 BROWN PLATE
PERRY CREEK.
1 DORMAN
2 SEURUM 1
3 SEURUM 2
4 WOOLLEY
5 FANNY D
6 BOOKY
7 EVENTIDE
8 COPPER QUEEN
9 COPPER KING
10 ORIENT
11 HAYMAR
12 OLYMPIAN
13 EUREKA
14 COSMOPOLITE
15 FOURTH OF JULY
16 AJAX
COAL CREEK.
1 HONEY CART
2 GOLD FLOCK
3 PUEBLO
4 LEGION
5 RHODES GROUP
6 PLACERS
LONG MOUNTAIN
1 BELTVIEW
2 JONER
3 JACKSON 2
4 LINCOLN
5 BRICE TOP
6 LONE JACK
7 BATTLE AX
8 DEUCE OF CLUBS
9 DEUCE OF DIAMONDS
10 DEUCH OF HEARTS
11 DEUCE OF SPADES
12 ACE OF CLUBS
13 ACE OF DIAMONDS
14 ACE OF HEARTS
15 ACE OF SPADES
17 JUMP OFF
18 IDLE
18 ST CLOUD
20 ST CHARLES
21 COPPER CENT
22 COPPER HEAD
23 BULL DOG
24 BULL PUP
GORDON CREEK.
1 QUEEN ESTHER
2 BALD EAGLE
3 WAR
4 BULLET
5 HOPE.
WESTERN GROUP
1 PHOENIX
2 B. A. M.
3 CULTUS
4 POCAHONTAS
5 AMERICAN GIRL
6 BUNTS
7 BIG BEAR
8 FREE GOLD
9 RAINIER
10 FERDINAND
South of River
1 DOUBLE STANDARD
2 SHYLOCK
3 PRODUCER
4 ANACORTES
5 DAISY
6 MARYSVILLE
7 PEACOCK
8 WHITE ROCK
9 LAKEVIEW
10 TENDERFOOT
11 HOODOO
12 MORRISON
13 PEERY
14 GEYSER
15 TATLO
16 FIRST CHANCE
17 CLEVELAND
18 COON
19 BRASS WIRE
20 INDEPENDENT.
21 CYNTHIA ROWE
22 VIOLET
23 FANNY
24 LEE.
25 FLYING DUTCHMAN
26 ANGELIA
27 LULU
28 GRANITE.
29 MAUD S
30 NEW YORK
31 SILVER BODE.
32 MAMIE
33 PENNSYLVANIA
34 CALIFORNIA
35 ECLIPSE
36 HEAD HOUSER
37 SUMMIT
38 BLACK ROCK
39 ENTERPRISE
40 SAILOR BOY
41 RAINBOW
42 WAR HORSE
43 SIDE LINE
44 CLEAR WATER
45 45 GROUP
46 LIVINGSTONE GROUP
47 BIG FOUR
48 LYNNWOOD.
49 10 TO 1
50 MARY L
51 BELL & CROWN GROUP
52 GOLD STANDARD
53 BI-METALLIC
54 RED HEAD
55 JONES
56 COPENTOPIA
57 ALCHEMIST
58 LITTLE CHIEF GROUP
59 CHASE GROUP
Head of River
1 JANUARY
2 BOOMERANG
3 GRANITE
4 MIAMA
5 BRUNSWICK
6 ALADAMA
7 ALL EIGHT
8 GREYHOUND.
9 T. & K.
10 TUSTLER
11 LIBERTY BELL
12 ELDRIDGE GROUP
13 SNOWFLAKE
14 DIPPER
15 RED CLOUD
16 X. & M.
17 UTERO
18 TENDERFOOT
19 EARNURITE
20 SNOHOMISH
21 HAWKEYE
22 TIMBER LINE
23 A. W. RAINEY GROUP.

Sauk, and has eight feet of solid quartz, mineralized from wall to wall with iron sulphides carrying gold and silver. A tunnel has been driven fifteen feet on one wall, from which the ledge will be cross-cut.

SILVERTON.

This district has the advantages of proximity to a railroad and smelter and of being so compact that a circle drawn seven miles around Silverton, its center, would enclose all the principal properties, while the majority are within an inner circle having a radius of four miles. With great bodies of mineral, and having these facilities for cheap mining, transportation and smelting, the district has sprung into the front rank among those of the Cascade Range. Large investments have been made there by men with ample capital to develop their property, and the year 1897 may be expected to see it proven a permanent, producing camp.

To reach this camp from Seattle one can go by the Great Northern train or by steamer to Everett, thirty-three miles, and thence by the Everett & Monte Cristo Railroad to Silverton, fifty miles; or from Seattle by the Seattle & International Railroad to Hartford Junction, forty-three miles, and thence by the Everett & Monte Cristo Railroad to Silverton, thirty-three miles. From Silverton a good wagon road runs up Deer Creek to the Clear Creek divide, four and one-half miles, and another road runs half a mile to the mouth of Silver Gulch. Trails branch out from the railroad and from these wagon roads to the various mines, and one has been made over the Marble Pass to the Forty-five Mine, on the Sultan side, a distance of four and one-half miles. The distance to the Everett smelter is fifty-four miles and to the Tacoma smelter 128 miles.

The mineral ledges of this district are contained in a belt of granite about twelve miles wide, which runs a little east of north and west of south and cuts across the south fork of the Stillaguamish from a line crossing five miles above Silverton to another crossing seven miles below. It has been traced from the north fork of the river and includes the heads of both forks at White Horse Mountain, which stands at the upper end of the ridge between the forks. Cutting across the south fork valley, it has been found to extend across the Sultan Valley and across Silver Creek, where it shows two miles above the mouth. It runs on across both forks of the Skykomish to the head of Miller River. It is cut off on the northeast by a coal formation, which has been traced from the Stillaguamish south fork to the Skykomish south fork, where explorations of good coal prospects a short distance above the town of Skykomish have been carried on for several years. Southwest of this granite is a slate belt, of which the contact is not traceable, the formation being much covered, but slate is found above the canyon of the Sultan River and is believed to be the source of the placer gold of that stream. In true fissures following the same course as this granite belt, but of course with many cross ledges and stringers, runs a series of quartz ledges, some of which attain enormous width, fifty and sixty feet being quite common and 180 feet being the defined width of one ledge. The quartz is mineralized with chalcopyrite, pyrrhotite, iron pyrites and arsenical iron, all extremely rich in copper and carrying gold and silver, while in some instances galena is found mixed with the other minerals. The ore rarely carries less than 10 per cent. copper and 20 to 25 per cent. is more common, while rich streaks of black oxide run up to 45 per cent., and bornite, which carries 50 to 60 per cent. copper, has been found in pockets. The gold and silver values are alone sufficient to make such large ore bodies so conveniently located pay well, though copper will in many instances prove to be the principal value. Nickel and cobalt occur in some ledges, and near the head of Clear Creek is a deposit of asbestos of great surface width.

Mineral discoveries in this region date from the summer of 1891, when the Hoodoo ledge of pyritic ore on the right-hand side of Hoodoo Gulch was located by Abe Gordon and Fred Harrington. Within a few days William and James Hanset found a great ledge carrying arsenical iron and galena on Silver Gulch, and on this they located the Independent. The same fall George Hall and W. M. Moleque discovered the Anacortes ledge in Anacortes Gulch. Then the great Bonanza Queen ledge, on Long Mountain, was found by J. F. Bender, Z. W. Lockwood and J. O. Marsh.

The camp was first named Independence, after one of the early discoveries, but on August 26, 1891, the Stillaguamish Mining District was organized at a miners' meeting and the name Silverton was adopted. In the following winter a townsite was established by the late Charles McKenzie, Parker McKenzie, J. B. Carrothers, William Whitten and John F. Birney. They cut a pack-trail to Hartford in November, 1891, and within a year the great Helena ledges on the divide between Deer and Clear Creeks had been discovered by Louis Lundlin, John Jackson and Thomas Johnson, and the Perry Creek claims had been located by Theodore Lohr. During the same year the wagon road had been constructed and the railroad was graded almost

to Barlow Pass, eight miles to the southeast. In the years 1893 and 1894 there was a lull, due to the panic, but in 1895 activity in prospecting was renewed by the discoverey of an extension of the mineral belt over Long Mountain from Deer Creek to Martin Creek by A. D. Sperry, William Matsdorp, A. Iverson and George O. Mosher, and in the fall of 1895 this was followed by further discoveries near the head of that creek by John McClellan. The last notable discovery was that of the asbestos deposit on the divide from which Deer, Marten and Clear Creeks all spring, this being made in July, 1896, by R. C. Myers and Louis Callihan.

The Hoodoo group of seven mineral claims and six millsites is now owned by the Stillaguamish and Sultan Mining Company, composed principally of English, Scotch and Welsh capitalists. The main ledge runs through the Morrison, Hoodoo, Tenderfoot and Lakeview claims, and is fully twenty feet wide, between walls of conglomerate and slate, being one of the best-defined fissure veins in the district. The ore carries iron and copper pyrites and pyrrhotite, with some bell metal, and is contained in a lime quartz gangue. There are two well-defined ore bodies, one eighteen inches to twelve feet wide and 300 feet long, and the other twenty inches to twelve feet wide and 200 feet long, showing 500 feet further up the mountain. The main tunnel has been driven 420 feet on the Hoodoo ledge, showing two to eight feet of solid ore, and will be continued 350 feet to get under the highest cropping, where a depth of 510 feet will be attained early in May. About 200 feet of tunneling has been done on a stringer and to prospect the ledge at other points. This ore will concentrate 3½ into 1, making concentrates worth $83 a ton, this value being divided in the proportion of 43 per cent. gold, 31 per cent. silver, 25 per cent. copper. On the Peacock a four-foot ledge is shown up by a number of open cuts, and is traceable for 400 feet, while the Tenderfoot cross-ledge shows equal width in open cuts. The mine is reached by three-quarters of a mile of wagon road from the railroad, and by seventy feet of exterior rock cut protected by snowsheds. It is equipped with two power drills operated by steam, but at present it is found to be cheaper to mine by hand.

The Independent group of three claims, recently incorporated, has a ledge cropping to a width of sixty feet in the bed of a gorge running towards the mouth of Silver Gulch, which has been traced across the Stillaguamish River to Long Mountain and across the head of Anacortes Gulch through the Hoodoo into Sultan Basin. The ledge carries arsenical iron all through and contains ten feet of high grade ore and some streaks of galena. Assays of the pay streak range from $17 to $140 gold and average between $70 and $80, only 3 to 4 per cent. of the total value being silver. A tunnel has been driven 156 feet on the ledge at the west end of the Independent claim and shows thirty-eight inches of solid ore in the face. Another tunnel 100 feet higher has been driven 100 feet on the ore chute, through which a cross-cut is now being made, and a recent rockslide has uncovered a large body of high grade ore.

Adjoining this group is the Cleveland group of four claims, a three-quarters interest in which has been bonded by Thomas Wilson and S. A. Hartman to Van B. De Lashmutt, E. E. Crookham and others, of Portland, for $50,000, and is being developed by them. The Violet is the east extension of the Independent ledge and is crossed by the Cleveland ledge, running north and south, which crops in a gorge between fifty and sixty feet wide, with at least three feet of chalcopyrite showing. The American and Geyser cross the Violet in a northeast and southwest course, and, like it, carry arsenical iron and galena. A tunnel has been run seventy-two feet, cross-cutting the Violet ledge at its intersection with the Cleveland, and will be continued on the hanging wall of the latter, which it is intended to develop. It cut a number of small streaks of ore all through the Violet and shows two wide pay streaks on the Cleveland. Some prospect holes on the Cleveland croppings have shown wide bodies of fine copper and iron pyrites, of which assays average $29 gold, silver and copper, and have shown up two to three feet of crystallized lime in the ledge, which may also assay and would probably be taken at a premium at the smelter.

The Everett group of three claims, owned by the White Rock Gold Mining Company, together with a one-eighth interest in four parallel adjoining claims and two millsites at the mouth of Deer Creek, is on the extension of the Independent ledge over to Anacortes Gulch. There is a well-defined ledge of mineralized rock seventy-two feet wide, in which are three distinct mineral veins from six to fourteen inches wide, carrying copper and iron sulphides and gray copper. The surface ore assays $11 to $12 gold and silver. Tunneling on the ledge will begin as soon as the weather permits.

The Anacortes Nos. 1, 2 and 3, owned by George Hall, M. L. Moleque and Dr. Longstreet, of New York, are on a ledge parallel with the Independence on the north. Tunnels have been driven 120 and 26 feet, showing thirty inches of pay ore carrying arsenical iron and some steel galena.

On the extension of the Cleveland Joseph Crane, William Hanset, Charles Willison and Peter Johnson have the Summer Coon.

On Silver Gulch are also the Granite and Maud, owned by J. B. Vannetter, C. L. Clemans, S. W. Munger and A. W. Hawks, on two ledges three and four

feet wide. The Granite shows eight inches of white iron and galena, assaying $43 gold and silver in a forty-foot tunnel and thirty-foot shaft.

On a four-foot ledge of solid arsenical iron ore which crosses the Summer Coon S. W. Munger, J. B. Vannetter, A. W. Hawks and C. L. Clemans have the New York, on which they have run a tunnel about twenty feet, showing ore which runs from $15 to $17 in gold, silver and copper. The extension of the Summer Coon ledge also crosses this claim.

On a spur of the mountain south of Silver Gulch Jasper Compton, J. B. Vannetter, William M. Kittell and A. W. Hawks have the Fanny, on a twenty-foot ledge carrying a twenty-two-inch pay streak of ore similar to that of the Forty-five Mine, on the Sultan side of the divide. This is shown up by an open cut thirty feet long, extended by thirty feet of tunnel. Assays range from $12 to $46 gold, silver and copper.

Across the gulch from the Granite is the Lula, owned by J. E. Bogardus, of Sidney. A tunnel has been driven forty feet on the ledge and at its mouth a shaft is down thirty feet, showing eight inches of white iron and galena, assaying $43 gold and silver.

The Big Four group of seven claims has recently been incorporated by the Big Four Mountain Mining Company, which is preparing for the season's operations. The ledge is twelve to fifteen feet wide between syenite hanging and granite foot wall, and runs through the summit to the Sultan side, where the Forty-five group is on the extension. The gangue is blue slate and the pay streak, thirty inches wide, carries galena, antimonial silver and arsenical iron, averaging about $50 in value, and the remainder of the ledge is concentrating ore. This is shown in a tunnel 100 feet long, with a depth of 150 to 200 feet, on the Pehakaole. A number of open cuts on the other claims show concentrating ore.

The Forty-five ledge is believed to extend almost to the railroad, through the Granite Mountain group, owned by the Granite Mountain Gold Mining Company. It extends down a canyon on Marble Mountain and the croppings show sixteen to forty feet of decomposed porphyry, carrying chalcopyrite and iron sulphides, assaying $6.40 to $12, across their whole width. A tunnel will be driven on the ledge 100 feet.

On Marble Mountain, which forms the Sultan Divide at the head of the east fork of Bender Creek, D. C. and W. R. Brawley and W. J. Dean, of Seattle, and W. W. Rhodes and Lou Myers have the Bell and Crown group of seventeen claims, and have cut a trail to them, two and one-half miles, from the railroad, and will begin opening up the ore bodies this spring. Three claims are on the main ledge, which crops at least thirty feet, and at one point eighty feet, wide between walls of porphyry and shale, the ledge matter being quartz, though a large part of the ore is mingled with the shale. The ore is copper pyrites, carrying gold and silver, and the width of pay ore is about twelve feet, chiefly on the hanging wall, though the whole ledge is well enough mineralized to pay for concentration. The lowest assay was 10½ per cent. copper and $8 gold and silver, and the total value has run up to over $30. On a cross ledge twelve feet wide, showing six feet of solid ore, are two claims, and on another eighteen feet wide, showing three feet of ore, is another claim, while two more each have about two feet of ore. Another claim has three feet of ore carrying copper, galena and zinc, which assays $12 to $40 on the surface.

The Eclipse group of twenty-seven claims on the south side of the river will be developed this season by the Eclipse Mining Company. Three claims are on the extension of the Independent ledge, which shows a streak of arsenical iron rich in gold. Another ledge covered by three claims runs twelve to fourteen feet wide up Marble Gulch to the Sultan Divide, and carries gold, silver and copper. The Little Giant ledge, on which are three claims, runs north and south across the latter one and crops sixty feet wide, containing bodies of sulphide ore which assay well in gold, silver and copper. Three claims are on an east and west ledge crossing this one. The company has two claims on Long Mountain showing five feet of copper sulphides in the croppings, which assay $23 gold, silver and copper, and is running a cross-cut to tap this ledge.

The greatest showing on the north side of the river is on the Helena group, on the divide between Deer and Clear Creeks, owned by the Deer Creek Gold and Copper Mining Company. The crest of the mountain is a line of jagged cliffs, below which the granite is exposed for several hundred feet down its side. The cliffs and the mountain side below them are stained a bright red with the oxidized iron and copper, and here a series of ledges was discovered in 1894 by Louis Lundlin, Thomas Johnson and John Jackson. This group is composed of six claims, making an area 4,500 feet long and 1,200 feet wide. On Helena No. 1 are four distinct ledges, which have been traced to a width ranging from twelve to fifty feet right through the mountain, and on the Helena No. 2 there is a single ledge 180 feet wide, clearly traceable through the mountain. All carry chalcopyrite with gold and silver, and in the 180-foot ledge are many large pay streaks, one of them twenty feet, as shown in a cross-cut. The main tunnel, 720 feet below the summit, is in 124 feet, with drifts sixty feet to the right and seventy-two feet to the left. The latter cuts a twenty-two foot ledge with an eight-foot pay streak. These drifts run into

parallel ledges, shown up by tunnels 150 and 100 feet long at a point 100 feet higher. A tunnel has been started on the main ledge 1,000 feet below the main tunnel and will be pushed ahead to tap the ore body at depth. About 160 tons of ore from near the surface have been shipped to the Everett smelter, the first 100 tons returning $19 to $32 gross. A wagon road has been made up Deer Creek to the foot of the divide, where ore will be loaded from a chute extending to the mine 1,500 feet above.

The same company owns the St. Louis and Jackson on a ledge which is cut by Deer Creek, and have run a tunnel 127 feet, from which a winze has been sunk to another tunnel 104 feet long. Both of these tunnels are in solid ore, with pay streaks from eighteen to thirty-six inches, an assay of which runs $20 gold, $23 silver and 30 per cent. copper. A cross-cut has been started 250 feet below, which will tap the ledge in 300 feet. This work is being done by three power drills, with an air compressor run by water power from a Pelton wheel at a fall 175 feet high. This plant will be transferred to the deep tunnel on the Helena group when the St. Louis ledge has been tapped.

On the extension of the Helena ledges across the divide between Clear and Martin Creeks the Three Sisters Mining Company has the Three Sisters group of four claims, on which five men are driving a tunnel. At twenty feet this showed eighteen feet of ore.

The Glengarry Mining Company has the Glengarry group of nine claims parallel with the Three Sisters group, and is tunneling from the Martin Creek side. It shows a forty-five-inch pay streak of gray copper ore, an average sample of which assayed $4.20 gold, $140.70 silver.

The Helena Extension group of five claims, owned by the Helena Extension Mining Company, is on the Helena series of ledges and is being developed.

The Hannah group of eight claims, owned by E. C. Hughes and Maurice McMicken, of Seattle, is parallel with the Helena on the same series of ledges. There is a surface showing of ore eighteen feet wide, and a forty-foot tunnel on the hanging wall shows ore all through, assaying $7 to $10, mostly copper. This tunnel is being extended 100 feet and shows constant improvement in the ore, and two prospect holes higher on the ledge have shown ore worth $21 and $23 respectively.

The Nonpareil Mining Company has begun development on its two claims, on which the supposed southwest extension of one of the Helena ledges crops eight to twelve feet wide.

One of the most important recent deals was the bonding to Dennis Ryan, of St. Paul, of the Bonanza Queen group of ten claims by J. F. Bender, Z. W. Lockwood and A. Sutherland. The main ledge, on which are four claims, crops out sixty feet wide in a gulch running down Long Mountain to Deer Creek, its course being from southeast to northwest. It can be seen cutting across a lateral gulch into the mountain towards the north fork of the Stillaguamish, its course being clearly traceable wherever the rock is exposed. A tunnel has been run forty-two feet and a cross-cut from it eleven feet towards the wall is all in ore, which carries chalcopyrite assaying 26 per cent. copper and upwards, besides gold and silver, arsenical iron running $27 gold and 16 ounces silver, and black oxide of copper which assays as high as 44 per cent. copper. Another tunnel has been run fifty-five feet at a point 250 feet lower and showed ore until it was run to one side into softer material, with the intention of cross-cutting into the ore again. Three thousand feet northwest of the upper tunnel another tunnel has been driven sixty feet in ore. In the ledge is a streak of about six feet of crystallized lime, carrying mineral, and with the richest streaks on each side, which would be taken by smelters for flux at a premium. On the Oregon parallel ledge on the east are four claims of the same group. It is nearly sixty feet wide, with several good pay streaks of similar ore, and has been well exposed by a slide which occurred last spring above the camp. A tunnel has been run twenty feet, showing veins of chalcopyrite, black oxide and galena. The galena assays $60 gold, and surface ore taken above the tunnel assayed $27 gold, 16 ounces silver and 26 per cent. copper. On a cross ledge of white quartz fourteen feet wide the same owners have another claim, on which a thirty-foot tunnel shows two feet of solid white iron ore, with some copper, assaying 11 ounces gold. There are several other good streaks beside that in the tunnel. On another cross ledge twelve feet between walls is the tenth claim, in which a thirty-foot tunnel shows a wide streak of white iron rather less in value. Mr. Ryan has established camp and ordered machinery, ready for vigorous development, and is meanwhile running a cross-cut by manual labor.

On extensions of the Bonanza Queen and Oregon ledges D. K. Sutherland, J. D. Sutherland and C. E. Anderson have four claims, which they have bonded for $50,000 for one year from December 1, 1896, to R. B. Symington, of San Francisco, representing an English company. A tunnel run thirty-one feet on a soft streak in the Stockton, from which a cross-cut will be made, and shorter tunnels on the other claims, show ore bodies equal in size and value to those of the Bonanza Queen group.

On Long Mountain D. C. and W. R. Brawley, W. J. Dean, W. W. Rhodes and Lou Myers have the Copperhead group of nineteen claims, on a series of seventeen ledges and stringers. The principal ledge is the Four Aces, on which are four claims and which is twenty-two feet wide, with a pay streak showing on the surface which in one place is two inches and widens in places

to five feet. The ore is copper pyrites, running lower in copper but higher in gold than the group owned by the same parties across the river, assays ranging from $10 to $40 for all values. The Copperhead ledge, on which there are four claims, shows four feet of the same kind of ore, and the Idle shows two to six feet of ore carrying white iron, with gold and silver, but little copper. The best ore in the group is on the Sunbeam stringer, which is eight to ten inches wide and assays $50 to $70, including 10 per cent. copper.

On the Four Aces ledge George Hodgins and A. W. Hawks, of Snohomish, have the Mayflower and Louise, on which they have begun work.

On the west end of Long Mountain R. C. Myers and A. D. Sperry have the Dry Creek group of four claims on a nine-foot ledge capped with serpentine, in which there is a twenty-four-inch pay streak of arsenical iron assaying $2 to $7 gold and silver and a small percentage of copper. Rich float similar to this ledge was found in the gulch below it and assayed $400 gold and silver.

On the extension of the Oregon ledge C. H. Packard, A. W. Hawks and D. C. Johnson, of Everett, have the Nemo group of five claims on three spurs, all running into the Oregon ledge. They have run a tunnel 175 feet on one spur, which is white quartz carrying arsenical iron and copper pyrites, their purpose being to strike the ore body which crops out 200 feet above and to cross-cut the Oregon ledge. The tunnel shows about three feet of ore in spots, assays of which run from $8 to $15 gold, with very little silver and some copper. The tunnel is almost at the foot of the mountain, within 150 yards of the railroad, so that operations will be very cheap.

On one of these spurs J. H. James has the Lily James and has traced the ledge from the footwall to a width of twenty feet. The whole width is more or less mineralized and there are streaks of white iron assaying $7 gold and silver and upwards. A tunnel has been run eighty feet on the footwall, but the ledge has not yet been cross-cut.

Half a mile from the wagon road, on the right fork of Deer Creek, is the Colts group of four claims, owned by Bert Horton and David McRae, on a ledge ten feet between walls, with three feet of rich ore, and the remainder concentrating. Near the summit are two tunnels, fourteen and sixteen feet, on the ledge, and 3,000 feet below the summit a cross-cut is in fifty-five feet and will strike the ledge at a depth of 100 feet in ten or fifteen feet more. The ore is chalcopyrite, assaying 26 per cent. copper, 18½ ounces silver, $3.40 gold. A trail has been cut from the road and development is in progress.

On the mountains overlooking Deer Lake the Deer Lake Mining Company has a group of ten claims. The Wildcat, Otillie and Granite are on a ledge which runs across the divide to Marten Creek. The ledge is four feet wide, carrying chalcopyrite clear across. A tunnel is in sixty feet on the Wildcat and another the same length on the other claims. On the mountain southwest of the lake they have the Lakeview on a six-foot ledge, shown up by a forty-foot tunnel. On the Cameron and Homestake, which run across the head of the lake, they have a body of quartzite seventy to ninety feet wide, carrying white iron, and are running a cross-cut. They are also cross-cutting a ledge of black sulphurets eighteen to twenty inches wide on the Highland, which is above the Homestake.

On Clear Creek, beyond the Helena group, is the Grizzly group of four claims, owned by the Clear Creek Mining Company. They have two ledges, twenty-five and six feet wide, carrying high-grade copper ore, including chalcopyrite, black oxide and bornite. Assays show from 25 to 45 per cent. copper, and the value in gold, silver and copper is about $50. In the smaller ledge a twenty-four inch pay streak is being shown up by a shaft eighteen feet deep and tunnel, on which work is now in progress, and the larger ledge shows several good streaks. This company intends to extend the Deer Creek road over the divide to the property, and is erecting buildings and continuing the shaft.

Extending across Clear Creek, just below this group, is the Asbestos group of six claims, located in a double line of three each by R. C. Myers and Louis Callihan last summer. Against a granite wall running northeast and southwest is a great dike of talcic asbestos, varying from 30 to 150 feet wide, which stands up seventy-five feet above the rock on each side. This material is used to give body to paper and specimens examined by skilled men at the Lowell paper mill are pronounced superior to that brought from New York by that company. On the surface this material is of a greenish tinge, but deeper down is expected to be pure white, like the New York product. Against this dike is a body of mineral apparently carrying nickel and cobalt, about 500 feet wide, and throughout its width are large pockets of very tough fibrous asbestos. The wall of this deposit is a serpentine dike 150 to 400 feet wide, in contact with a hard black flinty slate.

A series of four or five parallel ledges of white quartz carrying chalcopyrite and some galena has been traced from Marten Creek across the mountain to Deer Creek. The principal ledge is the Arlington, which shows up seventy feet wide on the Arlington claim and has been traced four miles across Deer Creek, showing more or less mineral throughout. The Arlington and three other claims on the same ledge have been bought by the Marten Creek Gold and Copper Mining Company, which has bonded a majority of its stock to Captain C. H. Thompson and others, of Spokane, on condition that they continue development until May 1. A twenty-foot tunnel is all in

sulphide ore assaying $12.60 gold, $6.20 silver and 35 per cent. copper, and another tunnel, 1,000 feet below, is sixty feet in decomposed rock, with 150 feet further to drive before striking the solid formation. The same company has a claim on another ledge four or five feet wide, in which a twenty-foot open cut shows streaks of ore aggregating twenty inches, and assaying $11 gold and 27 per cent. copper. The Climax and Knoxville, on the east of Deer Creek, owned by Hugh Kennedy and others, and the Bunker Hill, further to the east, owned by Charles Sperry and John McCartney, are also believed to be on extensions of this ledge.

On a six-foot ledge parallel with the Arlington Joseph Crane and Thomas Wilson have the Baby Lode and its extension, on which they have run a short tunnel.

On the west extension of this ledge is the Doubtful, which, with the White Swan, on a parallel ledge, has been bonded by the Cascade Development Company. A fifty-foot tunnel is being run on the White Swan, which is said to have assayed 200 ounces silver on the surface.

A recent rich discovery near the head of Marten Creek is the New Seattle ledge, on which the original claim has been bonded by A. D. Sperry and F. F. Randolph to Captain C. H. Thompson, of Spokane, who is tunneling on it. It is seven feet wide, running northeast and southwest, and carrying antimonial silver and gray copper in a five-foot pay streak, assays of which average 350 ounces of silver and $5.60 gold. A test car load shipment will be made shortly.

On the southwest extension are the four Consolidated claims, owned by A. D. Sperry, R. C. Myers and Louis Callihan.

The Bald Mountain Mining Company is developing the two Golden Chord claims on the Arlington ledge and the Lakeview extension on the New Seattle ledge. On the former a fifteen-foot tunnel has shown a large body of sulphides and some galena, the croppings of which carry $7 to $9 gold, silver and copper, but the solid formation has not been reached. On the Lakeview extension a forty-foot open cut and tunnel is entering the solid formation, the croppings assaying $8.46 gold, silver and copper.

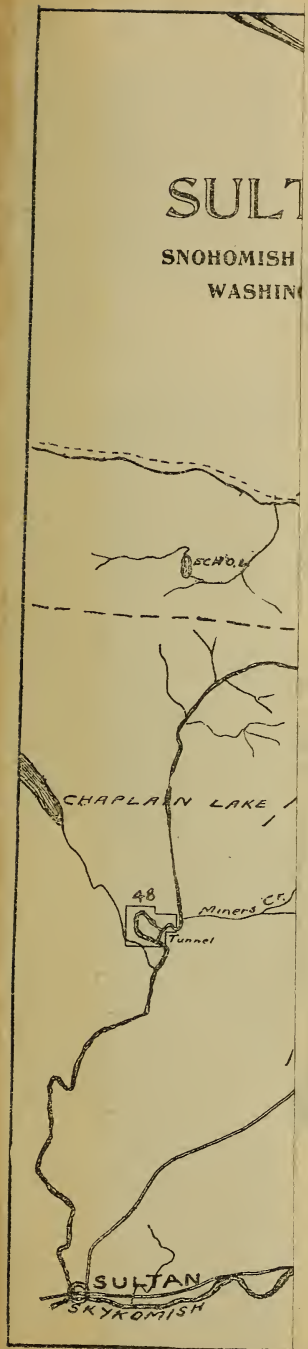
Parallel with the St. Louis ledge, on Marten Creek, are the Monitor and Sterling, owned by the Monitor and Sterling Mining Company. This ledge is six feet wide, with gangue similar to the New Seattle, mineralized the whole width, with thirty inches of ore carrying gray copper and copper pyrites. This is shown in a twenty-foot tunnel, which will be immediately extended fifty feet, giving a depth of 100 feet.

On the divide between Perry Creek and Falls Creek and extending down both of those streams is the Eureka group of fifteen claims and three mill-sites, owned by the Perry Creek Mining Company, distant from one to six miles from the railroad. One ledge is over 100 feet wide and has croppings of copper pyrites assaying 9 to 15 per cent. copper, 4 to 38 ounces silver and $1 gold, on which a 100-foot tunnel is being driven. Another claim is on a large body of ore shown by a small tunnel and assaying 9 per cent. copper, 4 ounces silver and a trace of gold. A tunnel has been started on another well-defined ledge of concentrating ore twelve feet wide extending through two claims. A ten-foot tunnel is on a ledge of chalcopyrite fifty-four inches between walls, assaying 19 to 26 per cent. copper, 5 to 7 ounces silver and a trace of gold. A tunnel has been started on two ledges four feet each, showing good bodies of chalcopyrite, the croppings of which assay 14 to 30 per cent. copper, 10 to 25 ounces silver and a trace of gold. A ledge extending through three claims has sixteen feet of concentrating ore carrying fine-grained steel galena and copper pyrites and averaging 4 per cent. copper, $3 gold and silver and 3 per cent. lead. A tunnel has penetrated seventy feet, showing continued improvement, and is being extended. Three other claims are on a large ledge, of which the croppings show a good-sized pay streak of concentrating ore, carrying galena, sulphides and gray copper, which will be struck at a depth of eighty-five feet by a twenty-foot tunnel when it has been driven ten feet further.

Extending from the head of the west fork of Coal Creek down to the railroad is the Double Eagle group of four quartz and eight placer claims, owned by the Double Eagle Mining Company. The quartz claims are on a ledge of free milling ore varying from fifteen to forty feet in width, assays of which range all the way from $1 to $20 and average about $8. The placers are on several small tributaries of Coal Creek which wash the ledge.

The Butte and Big Bear, owned by the Big Bear Mining Company, on the divide between Clear and Canyon Creeks, four miles by trail from the railroad, have a ledge 100 feet wide between walls, running a little north of west and south of east. It contains a number of streaks of peacock copper, carrying gold and silver, ranging in width from four to thirty inches, from the surface of one of which twenty assays averaged $9 gold, $7 silver. Tunnels have been run fifty feet on the widest and twenty-five feet on the four-inch streak, and the latter has widened to ten inches. This cross-cut will be extended to tap the ledge, which will be defined by drifting. A cross-cut will then be run from the Canyon Creek side of the divide to tap the ledge at depth.

On a ledge running up the mountain at the mouth of Gordon Creek, from


SULT
SNOHOMISH
WASHIN
SCH'D. L.
CHAPLAIN LAKE
48
Miners Cr.
Tunnel
SULTAN
SKYKOMISH


SULTAN
SNOHOMISH COUNTY,
WASHINGTON.
South Fork of STILLAGUAMISH RIVER
EVERETT
Monte Cristo Railway
Silverton.
Marble Creek
Bell and Crown Pt.
Marble Pt.
BIG FOUR MTN.
Boardman Creek
Black Jack Cr.
Sauk River
to Scott Lake
HALL'S PK
Barlow Pass.
Copper Lake.
Meadlee Pass
Vesper Creek
North Fork
Pilchuck River
Summit
Low Divide
Sultan River
Kennedy
Wilson
Monte Cristo.
Sheep Cap
Elk Creek
Hard Pass
Mineral City.
Chaplain Lake
South Fork
Olney Creek
Miners Cr.
Shaw
Tunnel
Wallace L.
Wallace River
Salmon Creek
Silver Creek
Skykomish River
Galena
North Fork
Sultan
Skykomish River
Wallace
1 45 GNOME
2 GOLD STANDARD
3 BIMETALLIC
4 RED HEAD
5 JONES
6 CORNUCOPIA
7 ALCHYMIST
8 STEPTO
9 SILVER PEAK
10 PEELES GLACIER
11 CEDAR.
12 HEMLOCK
13 LITTLE CHIEF
14 SUMMIT
15 OPTION
16 GRANITE MTN GROUP.
17 COLUMBUS.
18 BIG COPPER.
19 A. W. HAWES GROUP
20 TIMBERLINE
21 MARGUERITE
22 L. & M
23 T. & K.
24 MOHAWK.
25 LILA REED
26 ADELAIDE
27 SADIE
28 LUCY.
29 MINNIE.
30 LOUENA.
31 ASCO.
32 OLD JIM
33 HAZEL.
34 SULTAN.
35 HARD PASS
36 SADIE.
37 HELENA
38 HEPNER
39 KELLY
40 KILLIE.
41 BLACK DIAMOND
42 CHASE GROUP
43 POTO
44 HAYDEN GROUP
45 SUNNY SOUTH
46 JIM HILL.
47 GREAT NORTHERN
48 HORSESHOE.
49 VICKNEY GROUP.
50 HIDDEN TREASURE.
51 LAST CHANCE
ELK CREEK
1 STANLEY GROUP
3 MINT
3 760.
4 PELICAN
5 HOMESTAKE
6 Belcher
7 Dwarf
8 Giant
Railways.
Wagon Roads.
Trails
Summit Lines.
SCALE OF MILES.
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N
CIVIL AND MINING ENGINEER,
SEATTLE, WASH.

a point only 150 feet from the railroad, the Gordon Creek Gold Mining Company has the Wad, Bullet and Hope. The ledge is twelve to fourteen feet wide between walls of syenite and serpentine and is traceable for 4,500 feet. The surface ore is sulphides and arsenical iron and assays from $2 to $39 gold and copper. The company has driven a tunnel thirty-five feet on the hanging wall from the base of the mountain, which has ore in the face assaying $15 gold and silver all the way across.

The estimated cost of mining the wider ledges in this district is $1 a ton, hauling to the railroad four or five miles $2, railroad freight $2, smelting $6, a total cost of $11. Concentration will reduce all of these costs except mining in a degree varying with the ratio in which the ore will concentrate, and the only additional cost would be about $1 a ton for concentration.

THE SULTAN.

This district had until six years ago the reputation of being one of the paying placer districts of the Cascade Range, but during that period the placers have dwarfed beside the developments of quartz near the headwaters of the several forks and their tributaries.

The route to the mineral belt from Seattle is by the Great Northern Railroad to Sultan, fifty-five miles; thence by wagon road six miles to Happy Valley, and the rest of the distance by horse trail. The main trail runs to the head of the north fork, a total distance of twenty-three miles from Sultan, while other trails branch off up the middle fork and up Elk Creek, the same distance from Sultan in each case, while another trail branches off to the east fork of Olney Creek, a total distance from Sultan of sixteen miles. Another road runs along the left bank of the main stream for seven miles and a trail continues up the river to the forks. The distance by the Great Northern from Sultan to the nearest smelter, at Everett, is only twenty-two miles, and to the Tacoma smelter ninety-six miles, and thus the extension of the road would settle the transportation problem for the present, or until production has made such progress as to furnish traffic for a railroad.

The characteristic ores of this district are like those of the Stillaguamish District, of which belt this is the southward extension, rich mainly in copper, but carrying gold and silver, with nickel and cobalt in places. But side by side with the greatest copper deposit at the head of the north fork is a ledge of high-grade gold and silver ore. The formation in this section of the district is granite, like that of the Stillaguamish side of the divide, but the ledges bearing gold and silver across the basin are in a blue slate gangue between walls of talcose schist. In the middle fork basin the formation is porphyritic syenite, which forms a contact with the granite and diorite of Silver Creek, and the ledges are in true fissures in the syenite, carrying copper pyrites and gold.

Until the year 1896 the most active work on the north fork basin had been done by the Stillaguamish and Sultan Mining Company on the Little Chief group of eight mineral claims, with two millsites in the valley below. Six of these claims, two of which are patented, are on a ledge of great width, which runs up the side of Little Chief Mountain and over its summit, almost to Copper Lake, which is drained by Copper Creek. The outcrop is one of the greatest in the Cascades, being a cliff of chalcopyrite about 300 feet high and 120 feet wide and showing for 500 feet along the length of the ledge, at a point 1,000 feet up Little Chief Mountain in Boulder Canyon, up which the deposit has been traced for 700 or 800 feet. The lower level, which is designed for a main working tunnel, as its location avoids the Phelps Glacier and all danger of snowslides, has been driven 290 feet, of which the last seventy-nine feet are in ore. It has been turned thirty-four feet to the left and again forty-seven feet to the right, across a number of stringers. The upper level, 265 feet above, runs into the ledge at right angles thirty-five feet, turns forty-five feet to the left, making a cross-cut to the north wall and then follows it for forty-six feet. Another cross-cut runs forty-four feet to the right. All this tunneling is in ore. The ore body has also been located 120 feet further into the mountain by 1,200 feet of diamond drill holes. On the south wall, at a point 200 feet higher, another drift has been run twenty feet, also in very high-grade ore, proving the ore body to be at least 123 feet wide. The ore is copper pyrites, averaging about $12 in gold, silver and copper, at some points running much higher in copper and at certain points carrying nickel and cobalt, the ledge matter being slate mixed in places with quartz. The Stepto and Silver Peak are on a parallel ledge to the north, which shows eight feet wide in an open cut on the latter claim and has eighteen inches of solid ore in a forty-foot tunnel on the former.

The company has made preparations to develop the property on a large scale. It has 2,000 horse-power in Copper Creek, which has a fall of 1,000 feet below the foot of Copper Lake, and has made a rock cut in which to lay a pipe line leading to the millsites below. A survey has also been made for a railroad twenty-six miles long from Sultan, on the Great Northern Railroad,

to the foot of Little Chief Mountain. This road would not only carry the traffic of the Little Chief, but that of the middle fork, Elk Basin and Olney Creek mines, and would develop the splendid body of timber in the Sultan Basin.

The first mine to ship ore from this district was the rich Forty-five, on the opposite side of the north fork basin, now owned by the Forty-five Consolidated Mining Company. The group consists of eighteen claims, four of which are on the Deupree ledge, running parallel with the divide, besides forty acres for tramway terminals in the Sultan Valley and forty acres for the same purpose in the Stillaguamish Valley. Development has been vigorously prosecuted since the organization of the company in April, 1896, and has shown the property to be one of great value. The principal ledge extends for over a mile through six claims and runs east and west between walls of talcose schist, the gangue being blue slate, quartz and talc. On the Deupree Brothers, 1,800 feet above the camp, it crops out eighteen feet wide in a gorge with walls about fifty feet high, formed by the wearing down of the ore by a small stream pouring through it and deeply stained with iron leached out of the ore. The slide rock in the gorge is nearly all ore, and, if there were a wagon road to Sultan, a car load could easily be picked up on the surface rich enough to ship at a profit. From here this ledge has been traced over the surface for 1,500 feet, and a tunnel run on the hanging wall for fifty feet is in ore, the intention being to cross-cut from it. On the adjoining claim a tunnel has been run 163 feet in the hanging wall, with a cross-cut to the footwall. This shows on the hanging wall an eighteen-inch streak of solid ore carrying white iron, copper sulphurets and galena, which runs about $30 gold and silver. On the footwall is thirty to forty inches of decomposed quartz and talc, which is good concentrating ore, averaging about $8 gold and silver, and is so soft that it can be very cheaply mined with pick and shovel.

The development of the Forty-five was begun in the spring of 1896, where the ore crops ten inches wide about 400 feet below the summit. A tunnel was driven 140 feet on the ledge, with a cross-cut of thirty-five feet, showing two pay streaks which aggregate fourteen inches at the narrowest and six feet at the widest point. The gangue is mainly dark blue slate, veined with quartz and considerable talc, and carries galena, white iron and gray copper. At the face of the cross-cut a shaft was sunk twenty feet in order to get the workings deep enough below the water which flows over the ledge in the gulch. A cross-cut was then run to the ledge, which was followed, widening and improving in quality, with showings of ruby silver. The ledge carries three grades of ore, running about $100, $30 and $8 respectively, in gold, silver and lead. The first car load of high-grade ore comprised fourteen tons, and returned 135.8 ounces of silver, .76 of an ounce of gold, and 1½ per cent. of lead, paying $1,222.85 over freight and treatment. The second car load returned about $109 a ton. The ore is carried down the mountain by a temporary tramway of hempen rope 2,000 feet long, but surveys have been made for permanent tramways from both the Forty-five and Deupree Brothers to the millsite, and also across the range to the Everett & Monte Cristo Railroad near Silverton, over a route 13,000 feet long. A cross-cut 232 feet long tapped the Forty-five ledge 175 feet below the present tunnel, showing six to eight inches of high-grade ore on the hanging wall, which assayed $31.30 gold and 102 ounces silver. At 214 feet this tunnel struck a stringer of gray copper and galena ten to fourteen inches wide, carrying $154 gold and silver.

Preparations have also been made to erect a concentrator for reduction of the low grade ore at the proposed tramway terminus. The company worked twelve men throughout the winter on the cross-cut, has left $10,000 worth of ore on the dump ready for concentration and has spent $19,000 on the property so far.

A thousand feet below the outlet of Copper Lake is the Cornucopia group of four claims on two ledges of ore similar to that of the Forty-five mine, owned by Peter L. Trout and others. One of these ledges crosses the Forty-five and shows eighteen to thirty inches of ore in a thirty-foot tunnel, carrying galena and sulphurets, while a surface cut above showed five feet of galena, with a little lead carbonate. An assay from the surface showed $10.33 gold, $1.40 silver, while as the tunnel progressed assays first of $28.90 gold and $9.60 silver, then of $68 for both values were obtained. White iron then came in on the hanging wall and ran $10.30 gold, $2.50 silver. The other ledge is three to four feet wide, assaying $4.13 gold, $10.40 silver; $4.13 gold, $26.10 silver, 36 per cent. lead; then $70, all values. Only surface work has been done on this ledge.

A blow-out of ore similar to the Little Chief has been discovered towards the summit of Hall's Peak and on it R. M. Burnet, John Erickson and others have located the Columbus group of four claims and have run a short tunnel. On the south side of the same peak a similar blow-out, capped with copper and iron, beneath which the principal values are copper and cobalt, with a little gold and silver, was discovered last summer. On this George W. Anderson, of Granite, has located the Big Copper Nos. 1 and 2; H. J. Andrus, of Machias, the Big Copper Nos. 3 and 4, and W. H. Ward, of Snohomish, the Big Copper Nos. 5 and 6, but no work has yet been done to define the extent of the deposit.

Prospecting on the middle fork dates back to about the year 1889, but most locations were abandoned on account of their inaccessibility. Among the few claims which have been held up to the present time by the original locators are the Sultan Nos. 1 and 2, owned by E. R. Krueger, William Biggers and A. W. Hawks. They are on a ledge on Sheep Gap Mountain, which crops out eighteen feet wide, carrying copper pyrites and gray copper. A tunnel has been run forty feet, in ore all the way, with ore also on both sides. Assays show 27 per cent. copper, $23 gold, $6 silver, and it is estimated that the ore will concentrate 5 into 1. On what is believed to be an extension of this ledge up the mountain Robert and William R. Biggers have the Hard Pass, on which they have run a tunnel ten feet, showing good ore of the same kind. On the divide between the middle fork of the Sultan and Elk Creek W. R. Biggers and Ben James in August, 1896, discovered a small outcrop of copper pyrites in a slide to be a five-foot ledge carrying three feet eight inches of copper pyrites, with a little black oxide of copper, there being an inch of talc gougue on each wall. An average sample assayed $6.65 gold, 1½ ounces silver, 16 per cent. copper.

On the same divide R. A. Vaughn and D. E. Taylor in January, 1895, relocated the Helena and Sadie on two abandoned claims having three parallel ledges running nearly east and west between walls of porphyritic syenite. Two of the ledges are thirty inches wide, with an eighteen-inch pay streak, and the third is six feet wide, with a forty-inch pay streak, all of copper pyrites carrying gold and silver. The large vein crops out for 120 feet and is traceable for 2,000 feet, and the middle one crops out for 300 feet. Assays have shown $8 to $10 gold, 16 to 20 per cent. copper. Adits have been run on the several ledges eight to eleven feet.

The Great Northern group of three claims, which is being developed by M. Sheehan, W. D. Simpson and J. H. Wilson under a bond from Thomas Lockwood and C. D. Brownfield, is on a great contact ledge running up the mountain from the bank of Sultan River, ten miles from Sultan and three miles by trail beyond the end of the road. The ledge is in a contact between a bastard granite footwall and porphyry and slate hanging wall, and gradually widens from sixty feet close to the river to seventy feet at the top of the ridge, at 3,300 feet greater elevation, its course being north by east and south by west. The whole width of ledge matter appears to be well mineralized throughout with fine-grained pyrites of iron and copper, as shown in a tunnel running 150 feet on the footwall, giving a depth of eighty feet, and another forty-seven feet on the hanging wall, both tunnels being in ore all the way, and in a sixteen-foot shaft. Assays have ranged from $6 to $87 gold, silver and copper, and an average of six different assays was $32 gold, $1.76 silver, $3.45 copper. The footwall tunnel is being driven thirty feet further and the ledge will then be cross-cut.

The placer mines of the Sultan extend upward from the Horseshoe Bend, which is six miles by road and trail from Sultan City. This form of mining dates back nearly thirty years to 1868, when Thomas Lockwood and James Harris took out as much as $30 a day. They were followed by Chinamen, who worked with rocker and cradle. Tradition has it that two sailors took $6,000 in one season from the Sailors' Bar, and that Lawrence Hanson, of Everett, cleaned up $1,200 in one summer. Several parties of men are still working and average about $1.50 a day per man.

The largest enterprise of this kind has been carried on during the year 1896 by the Horseshoe Bend Mining Company on 157 acres of patented ground, half-encircled by the bend in the river from which the company takes its name. Here is the clearest evidence of the nature of the gold-bearing deposit. In the hollow of the bend is a bar 50 to 150 high, and similar bars extend along the banks for some distance up the river. In making this bend the stream enters a box canyon formed by a deep fissure in the bedrock and is here apparently fathomless. The explanation of this canyon appears to be that some natural convulsion split the rock and opened this new channel and that the river then left the higher bed now forming the bars and swept its way down through the fissure. The high bar in the hollow of the bend is composed of cement gravel, boulders and sand, with streaks of blue clay, all characteristic of river wash.

In the quite reasonable belief that the deep hole in the box canyon had formed a depository for great quantities of gold washed from the gravel, the first owners of this property, the Sultan River Mining Company, in 1889 and 1890 cut a tunnel seven feet wide and 800 feet long across the bend and turned the river into it for the purpose of emptying and working the present channel, the work costing $40,000. Soon after the river had been turned into it the tunnel was choked with boulders and driftwood by a great flood and the work was abandoned until it was taken up again in the spring of 1896 by the new company. The latter has made one and one-half miles of ditch and flume from Marsh Creek, with a fall of 100 feet and a possible fall of 700 feet, laid 600 feet of eight-inch pipe and installed a hydraulic giant, fitted for nozzles ranging from one and one-half to four inches in diameter, which washes the dirt into a thirty-foot sluice box over five pole and one Hungarian riffles. The boulders are removed by a derrick and the debris is discharged into the tunnel, into which two-thirds of the river has been turned by the clearing of

its course. At the point where work is in progress the dirt is being washed down to bedrock, which is from eight to eighteen feet below the surface. The whole depth pays from 25 to 40 cents a yard, but the best dirt is two feet of blue clay near the surface and some streaks of cement gravel. The gold is found in rough pieces ranging from 25 cents to $1 each, sometimes with pieces of quartz attached, and at times bits of native silver and copper ranging in size from a pinhead to a kernel of wheat are found. The old company took out $1,200 during a temporary suspension of work on the tunnel. The present company intends to turn the whole stream into the tunnel by damming the present channel, and to pump out the canyon and work the dirt in its bed, a gasoline engine and centrifugal pump having been already provided for this purpose.

Four miles up Wallace River, which flows into the Skykomish four miles above Sultan, J. F. Wash and Charles Myers have the Gold Bar and Elmo on a ledge sixteen or seventeen feet wide, running across the river. There is a two-foot streak of galena ore on each wall, assaying $44 to $102 silver and lead, with a little gold, but a twenty-seven foot tunnel shows copper pyrites coming in.

At present the mines of the north fork of the Sultan find their outlet to transportation by trails over Marble Pass to Silverton, about four and one-half miles. The nature of the country, however, makes the Sultan Valley their natural outlet and the extension of the wagon road would open this route, while a railroad is by no means a remote possibility.

SILVER CREEK.

Though among the first discovered, one of the richest as regards the size and value of its ore bodies, and one of the most accessible, this has hitherto been among the most backward districts in the Cascade Range. This fact is due to a variety of causes. It was discovered at a time when attention was centered on real estate and men who had property of that kind for sale went out of their way to discourage the diversion of capital into mining ventures. At that time little was known of the character of the mineral belt of the Cascade Mountains, and mining engineers scoffed at the ores of this region as low grade and refractory, and declared that the formation was so broken that it was impossible to trace the ore bodies to any depth. The attention of prospectors was at that time centered on silver-lead and free milling gold ores, so that they passed by the ledges of sulphide ore heavily capped with oxidized iron, which they found towards the mouth of the creek, and went on nearer its source, where they found galena. Thus it was that the creek received the misnomer "Silver," and, when the fall in the price of silver caused depression in mining for that metal, the camp was almost deserted and many of the earlier locations were abandoned. Later discoveries and developments have proved that it is not a silver, but a gold and copper camp, and that the formerly despised iron caps cover ledges as rich as those which carry silver. This discovery is due mainly to the riches unearthed from beneath similar iron caps across the boundary. The mining world has now formed a true estimate of the character and value of the ores and development has been resumed with such vigor that the camp will this year have renewed life.

As a glance at the map will show, this district is the extension of the mineral belt southward from Monte Cristo, where the greatest development in the Cascade Range has been done. It is reached from Seattle by the Great Northern Railroad train to Index, seventy-one miles, thence by the county road up the Skykomish north fork to Galena, at the mouth of Silver Creek, a distance of nine miles. From that point a horse trail leads up the creek to Silver Lake, on the Monte Cristo Divide, a distance of seven miles, with branch trails to the different properties along the route. The county commissioners have begun the extension of the road from Galena to Mineral City, four miles above the mouth of the creek, and will probably complete it this year. The distance from Index to the nearest smelter, at Everett, is only thirty-eight miles, and to the Tacoma smelter 112 miles.

The country rock of this district is mainly granite, which crops out above Index and in several places in the creek beds of the Silver Creek Basin, where the surrounding mountains are mostly composed of syenite and diorite. Silver Tip Mountain is mostly composed of diorite, cut by dikes of porphyry which often reach a width of 200 feet, and this rock extends down the creek about to Mineral City. The granite extends onward under the glaciers of Monte Cristo and crops out again in the Goat Lake District. The granite is alternated with strata of slate on the lower part of the course of Silver Creek. This formation is cut by mineral ledges in true fissures, which run a little south of east and north of west, and by a series of cross ledges of later date running east of north and west of south and intersecting the older ledges. Near the head of the creek the ore is copper and iron sulphides carrying gold and silver, but as the mineral belt is followed down the creek silver-bearing

galena appears, as in the Morning Star, and in the Vandalia and Lockwood groups. Silver and lead predominate in this form, gold and copper taking second place. Within half a mile below the Vandalia, however, the character of the mineral again changes, and in the Michigan group, the Anaconda and Oro Fino, gold and copper take first place and lead and silver are the lower values. The ledges generally contain pay streaks of high enough value to be profitably shipped to the smelter if the wagon road were extended to Silver Lake, and in almost every instance the whole ledge is well enough mineralized to pay for concentration.

The first mineral location of which there is any record was the Norwegian, made in 1874 by Hans Hansen, who carved the name and date on a tree, showing that the claim ran up the mountain on the left bank from a point 500 feet above the forks of the creek. Shortly afterward a man named Johnson discovered a cropping of iron pyrites on the bank of the creek and, mistaking it for gold, located the Anna. He then carried the news to Snohomish, causing a stampede among the loggers all along his route, and induced E. C. Ferguson, Theron Ferguson, Lot Wilbur and W. M. Whitfield to spend $2,000 or $3,000 on building an arrastre on the present site of Mineral City. They produced a piece of amalgam about the size of a goose egg, which was stolen by one of their employes, and they abandoned the experiment.

Prospecting really began in 1882, when the late Elisha H. Hubbart cut a trail to Galena, relocated the Anna, with the Trade Dollar on the extension and the Morning Star on a parallel ledge to the north. Discoveries then followed one another in rapid succession, until in 1890 there was quite a boom, and the towns of Mineral City and Galena were established, a trail having been meanwhile cut through. It was during the four succeeding years that the road was cut from Index to Galena, partly by the county and partly by the miners.

The group on the divide between Silver Creek and Monte Cristo, adjoining the most southerly claims in the latter district, is the Silver Lake, composed of six claims, with a millsite in Monte Cristo, owned by the Silver Lake Mining and Smelting Company. A ledge cutting through Silver Tip Mountain towards the lake is three to four and one-half feet and is covered by three claims. A tunnel 150 feet on the ledge shows it to carry sulphurets the full width, assays running $2 to $14 and proving the ore to be good for concentration. A parallel ledge covered by two claims shows three feet of ore where it is cut by the creek and is opened by a tunnel 101 feet long at a point 300 feet higher, where assays of $10 to $43 gold and silver have been obtained, while the upper claim shows a large body of ore assaying from $1 to $20. A cross ledge shows eighteen inches of ore at the croppings and from two to twelve inches in a 160-foot tunnel, a fifty-foot cross-cut also tapping the ore. Assays have ranged from $16 to $140 gold, silver and lead. A parallel ledge cropping four to six feet will be tapped by a cross-cut now being run. Five tons of high-grade ore are on the dump ready for shipment.

The largest group in the district and the one showing the most development is owned by the Silver Queen Mining and Smelting Company. It is really two groups, one adjoining the Silver Lake group on the Monte Cristo Divide, and the other on Lockwood Gulch near the mouth of the creek. The principal ledge in the former group is the Orphan Boy, cutting through the divide and across Silver Creek, which is covered by four patented claims. A tunnel running 200 feet into the dividing ridge, where the ledge is six to thirty feet wide, shows eighteen inches of ore in the face. Thirty-five samples taken when the ledge was first struck gave assays averaging $26.12, largely in gold. As work progressed, assays showed $97.05, then $179.75, and later $130 for all values, but assays generally run from $40 to $60, and average about $45, from a pay streak of eighteen to twenty-four inches. A second tunnel started about 125 feet lower struck the ledge in 150 feet and has penetrated 286 feet, being expected to strike the ore chute shown in the upper tunnel in twenty-five feet more. The first samples gave $20.80 and $72.40, nearly all silver. A thirty-two foot tunnel on the Monte Cristo side of the ridge shows the ledge about six feet wide, another on the opposite mountain, across the creek, is in twenty-three feet, showing twenty inches of ore in 100 feet of ledge matter, with indications of a blow-out, and a cross-cut on the same side of the creek is in 121 feet, but has not yet tapped the ledge. The Zeta, unpatented, is on three parallel ledges on the Monte Cristo side, all carrying iron pyrites, with some copper in bornite and variegated copper. A fifteen-foot tunnel on the upper ledge shows eight to twenty-four inches of ore, while open cuts show three to five feet of ore in the middle vein and three to eighteen inches in the lowest one. Assays from near the surface on the middle vein gave $5.16 gold, $11.90 silver, and $6.25 gold, $3.99 silver, respectively. The Q. T., on a parallel ledge, further down the creek, is owned jointly by the Silver Queen and O. & B. Companies, and half of it has been patented. A ten-foot open cut with eight-foot face shows a wide ledge with a six-inch pay streak of pyrites and zinc, which assayed near the surface $36 gold, $3.35 silver. A twenty-five foot tunnel has been run on a small stringer running into the ledge. These claims lie well for development, for a 1,000-foot tunnel would cross-cut the Orphan Boy and Zeta ledges at a depth of 900 to 1,100 feet and the ore could be trammed from it to the railroad at Monte Cristo.

The Lockwood group has two patented claims on a ledge ranging from six to seventy-five feet, on which a ninety-foot tunnel shows a pay streak of sulphides and galena as wide as thirty inches, but narrowing at the face to four inches, of which assays range from $27.60 to $97.03. A large body of ore is exposed on the surface about 100 feet ahead of the face of the tunnel. Two ten-foot tunnels are each on twelve inches of ore, assaying $23.88. Two claims on the Wild West ledge have a short tunnel showing ten inches of ore on the hanging wall and a talc gouge on the footwall. The Little Lee shows a ten-inch streak of ore and two feet of soft ledge matter, well mineralized, in a thirty-foot tunnel. The company intends to resume operations in the early spring.

On the Zeta ledge J. C. Hubbart and Dr. T. M. Young, of Seattle, and John A. Brue, of Everett, have the Silver Lake, in which eight surface cuts show several seams of mineral from fifteen to twenty inches wide in a slightly mineralized dike of porphyry eighty feet wide.

The Dutchman, owned by A. P. Michaud and William Booth, has a ledge which crops out four or five feet wide on Silver Tip Mountain, with a good pay streak shown up in a twenty-foot tunnel. Messrs. Booth and Michaud, with Edward Elwell, of Snohomish, also own the Wildcat, on a ledge of six and one-half feet of concentrating ore, on which a tunnel has been run forty feet, and which assays $10 gold, $1.87 silver throughout.

The Minnehaha, owned by John Campbell, of Port Blakeley, has a ledge cropping fifteen feet wide on the left side of the lower of two falls having a combined height of over 300 feet. The water pours over the iron-stained wall and has washed out the ledge to form its channel. A sixty-foot tunnel is mineralized across its whole face and has a pay streak of six to twenty-four inches, assaying $20 to $65 gold, besides silver. Another pay streak is traceable on the surface outside of the tunnel.

The Hiawatha, owned by H. C. Niles and Frank Evans, of Snohomish, is on the cropping at the other side of the falls, where the ledge shows up equally well in a forty-foot tunnel.

The Morning Star group of five claims, owned by E. D. Spurr and J. A. Maxwell, and bonded to A. F. Burleigh, has one of the best ledges on the creek, which is covered by three claims, with two others on cross ledges. The main ledge is apparently an extension of the Seventy-six ledge of the Monte Cristo District, and runs east northeast and west southwest across the creek, which cuts it and shows it eighteen feet wide. Tunnels have been run on it forty feet on one side and 100 feet on the other, showing a pay streak of over six feet the whole length, carrying galena, copper and iron pyrites which assay $40 to $60, mainly in silver. A tunnel has been run twenty-five feet on the west extension and another twenty feet on the east extension. On the second east extension the ledge crops fourteen to twenty-four inches of solid ore, assaying $40 to $60, shown in a twenty-foot tunnel. The Minnehaha ledge dips into this claim from the west, while another cross ledge eighteen to twenty-five inches wide and carrying sulphurets and arsenical iron worth $24 dips into the first east extension.

On a three and one-half foot ledge parallel with the Morning Star on the north John Wallace, J. A. Cathcart, H. C. Ewing and M. A. Green have the Cora M., in which a twenty-foot tunnel shows eighteen inches of pay ore, assaying $12 gold.

The Hope, south of the east fork of the creek on Hubbart's Peak, is owned by the Hope Mining and Milling Company, and has a ledge twenty-five to thirty feet wide, in which a 100-foot tunnel on the footwall shows five feet of iron and copper sulphides, assaying $5 to $42. A cross-cut has been run eighteen feet from the tunnel towards the hanging wall and another cross-cut of seventy feet taps the ledge fifty feet below.

A valuable group of twelve claims on Edison Gulch, which runs down the side of Silver Tip Mountain, three-quarters of a mile from Mineral City, is the Edison group, owned by the Bonanza Mining and Smelting Company. Running through the Louise and two adjoining claims in an east and west course is a ledge ten or twelve feet wide, in which two feet of pay ore are shown in several tunnels aggregating eighty feet, the average value being $30 to $40 and the highest assay $130 gold. Parallel with this, further up the mountain, is the Edison ledge, covered by three claims, which is 125 feet wide and contains three streaks of ore three to six feet each, shown by tunnels aggregating 200 feet in length. The longest is sixty-eight feet and is being extended 100 feet further. These streaks show a little free gold in the oxidized iron on the surface and carry sulphides and arsenical iron, assays of which average $57 gold, 6 per cent. copper and a little silver. A porphyry dike 1,000 feet wide runs diagonally across both the Edison and Louise ledges and contains an ore body 150 feet wide, which has been exposed in a cliff 500 feet high by the sliding of the hanging wall in the gulch. Three cuts have been made across this dike, the deepest being twenty feet, and all are in ore, with no sign of the footwall. The ore is iron and copper pyrites carrying gold and a trace of silver, assays having ranged from $2.50 to $132. A cross-cut is in thirty-five feet at the base of this ore body to run through it into the Edison ledge, which it will strike at a depth of 800 to 1,000 feet when it has gone 450 feet further. A contract has been let to run it 500 feet. Lower down the gulch is the White Rose, on an east and west contact ledge five or six feet wide,

on which an eighty-five foot tunnel showed an eighteen-inch pay streak of copper pyrites assaying $12 to $20 gold and copper, with a trace of silver. A parallel ledge north of the Edison is four feet wide and carries eighteen inches of ore assaying from $10 to $90. A blow-out forty to fifty feet wide still further north makes a good surface showing of pyrites, while on the south is a parallel ledge two or three feet wide similar to the Louise. A cross ledge seven to nine feet wide runs diagonally through two of the Edison string of claims and two others, then splits into two parts, which run parallel 150 feet apart to the summit of Silver Tip. The undivided ledge is shown by a twenty-five foot tunnel, ore from the face assaying $7.40 gold, as against $2 on the surface. In its course the predominant mineral changes from iron pyrites to copper pyrites, sometimes assaying 25 per cent. copper, with pockets of native copper, and carrying about $18 gold, the ore being similar to that of Trail Creek. The company has a millsite on the creek.

The Big Raymond group of four claims, owned by James C. Spurr and J. A. Maxwell, adjoins the Edison group. Three claims are on the Big Raymond ledge, which runs east northeast and west southwest and averages fifty feet in width, and though it is broken on the surface the mineralized streaks of quartz and spar which run through it appear to be running together and at depth will probably lead to a solid ore body. Several tunnels have been run, aggregating 550 feet, and the deepest, sixty feet, was in ore all the way, which assays $2 to $50, while all the ledge matter is mineralized. One of the tunnels, thirty-five feet long, showed ore assaying $4 to $56, while another of the same length shows some galena. The fourth claim of the group is on the Morning Star ledge, which crops twenty feet wide and is opened by a thirty-foot tunnel.

The Jumbo, owned by Edward L. Ensel and Edward McDade, is on the southwest extension of the Big Raymond, and has a tunnel 140 feet showing ore all across the face, of which assays have ranged from $6 to $140. A cross-cut is in sixty feet and will tap the ledge in forty feet more.

The northeast extension of the Edison is the Lida, owned by W. J. Riley and A. Vermurier, on which a fifteen-foot shaft shows good ore. On a twenty-foot ledge joining the Edison on the northwest W. J. Riley and E. Seroni have the Castle and an extension, where a thirty-foot tunnel shows four feet of ore assaying $25 gold, besides silver. The Whaleback, on a southeast extension of the Edison ledge, owned by W. J. Riley and Peter Chiodo, has fifteen feet of concentrating ore assaying from $4 to $10.

The Mineral Mountain Mining and Milling Company has the Undaunted group of four claims on Mineral Mountain, which rises to the west of the creek, and has projected a main tunnel to cut all the thirteen ledges which vein this peak. On one claim it has two ledges, one five or six feet wide, with six to thirty-six inches of iron sulphuret ore shown in a thirty-five foot tunnel, assays ranging from $18 to $65 gold. The other ledge is fifteen inches wide, with four or five inches of ore, running $30 to $70 gold and silver. On another claim is an eight-foot ledge in which are small seams of pyritic ore assaying $12 gold. On the Gold Standard is a ledge varying in width from twelve to forty feet, on which an open cut and tunnel fifteen feet deep show seams of pay ore aggregating nowhere less than three feet and assaying $12 to $45 gold, besides silver, copper, nickel and cobalt, for which it was not assayed. On the Jessie are three ledges ranging from eighteen inches to six feet, of which the two smaller ones are undeveloped, but the larger one has eighteen to thirty-six inches of pay ore showing in open cuts and assaying $12 to $40 gold. This company is arranging to begin development in the spring, with a view to shipping ore before August, and intends to patent its property.

On the extension of the Gold Standard Oliver Bisner has the Hancock, where the ledge shows fifteen to thirty feet wide, with seams of pay ore aggregating eighteen to thirty-six inches and carrying iron and copper sulphides, with some nickel and cobalt, shown in a forty-foot tunnel.

The Gold Eagle group of three claims on Silver Tip Mountain, owned by W. J. Caplin, William Hacker and Stephen Holbrook, of Tacoma, is on a ledge showing fine-grained white iron sulphides, copper sulphides and gray copper, averaging $12 to $15 gold across the ledge, and showing the full width of a tunnel 175 feet long. Parallel with the Gold Eagle on the northeast is the Last Chance, owned by W. J. Caplin, on a ledge thirty feet wide, in which streaks of copper and iron sulphides four to twenty-four inches wide, assaying $14 gold, are shown in a twenty-foot open cross-cut.

The Remonille group of three claims is on a ledge running up Hubbart's Peak and is owned by Peter Chiodo and W. J. Caplin. It is shown three feet wide in a twenty-five foot tunnel and widens on the middle claim to ten feet, assays running about $10 gold. On the Marengo James Peccolo, A. Peccolo and Peter Hartle have a large ledge of pyrites cut by Silver Creek, and the same parties, with Z. T. Holden, have the Delcho on the extension up the mountain. On the Combination, running down to Silver Creek, Messrs. Riley and Holden, of Seattle, and Hall, of Chicago, have a twenty-four inch ledge with twelve inches of pay ore.

Among the discoveries of 1896 in this vicinity is the St. Louis group of four claims by C. S. Gleason, W. W. Glazier, W. F. Babcock and A. S. Gibbs. They are on a ledge ranging from five to fifteen feet wide running through

the granite near the bed of the main creek and up the mountain across St. Louis Gulch and the head of Hancock to the summit of the divide between Hancock and Molybdenum Gulches. As it cuts through both the granite of the creek bed and the syenite of the mountain, it is evidently a true fissure vein of great strength. As it is undeveloped only surface assays have been obtained. A pay streak eight to twelve inches on one wall yields $4.13 gold, $3.61 silver, $5.65 copper, and a two-inch streak lies against the other wall, besides five feet of concentrating ore. J. C. Hubbart and C. S. Gleason have the Blackstone on a ledge eleven feet wide, which cuts across Hancock Gulch and probably runs into the St. Louis ledge, surface assays showing 4 ounces silver, 9.9 per cent. copper.

The Jasperson, Bullion King and Sigma, which have been relocated by Joseph Carignan, A. P. Michaud and J. O. Robinson, are on a ledge in many places as wide as thirty feet, which cuts clean through the mountain and can be traced from the west fork of Silver Creek over the Sultan and Stillaguamish divides. The pay streak carries iron and copper pyrites, carbonates of copper and galena, assaying from $12 to $138 in gold and silver, with some copper. A tunnel has been run 175 feet to cut under an outcrop of ore six to eight feet wide where the ledge attains a width of thirty feet, but when in seventy-five feet ran off the pay streak, leaving it to the north.

On the same ledge is the Gold Bar group of three claims, owned by the Gold Bar Mining Company, which will begin development this spring.

The National, now owned by E. G. Krueger, has another strong ledge, which cuts through to the Sultan Divide. The ledge is really a dike of porphyry fully seventy-five feet wide, all slightly mineralized, with a pay streak of talc carrying iron and copper pyrites and carbonates of copper three to three and one-half feet wide. assays of which average about $35 gold and silver. The talc along the footwall assays $18 gold and silver, and the richer streaks one to three inches wide run $300 and more. A cross-cut has been run fifty-six feet from the cropping to the pay streak on the footwall, and a tunnel was then run 185 feet on the pay streak, showing ore all the way. Above this tunnel three distinct veins of ore can be traced, coming togther in the dike.

On the extension of the National down to the west fork of Silver Creek is the Diamond Hitch, owned by E. G. Krueger, Jasper Compton and H. A. Noble, of Seattle. A tunnel has been run forty-five feet on a three or four inch stringer to the ledge.

On extensions of the National ledge J. O. Robinson has the Miike Maru and J. J. Hill. He has run two tunnels, twenty and fifty feet, showing fourteen to forty-eight inches of iron and copper pyrites, which assay $17 gold, 4 ounces silver, 3 per cent. copper.

On a four-foot ledge parallel with the Jim Hill the Treasure Mining Company has the Treasure Box and Horseshoe, on which a sixteen-foot tunnel shows eight inches of ore assaying $17 to $27 gold, besides considerable copper.

On a ledge parallel with the National, which crops out eight to ten feet wide and carries iron pyrites, George Probst, of Seattle, has the Ellen and Alki, on which he has driven a cross-cut tunnel sixty feet, and expects to tap the ledge in another twenty feet.

The Webster, relocation of the old Trade Dollar, and its extension are owned by Messrs. Krueger, Compton and Noble. The ledge has not been defined, but a tunnel eighty feet on the footwall shows twenty-three inches of ore carrying steel galena and gold, which assays $45 gold, $8 silver, besides lead. The pay streak pinched out for a few feet, but has since come in again as wide as ever. On the extension of the Webster ledge W. E. Smith, of Seattle, has the Gipsy Queen, on which there is a twenty-foot tunnel.

On the extension of the Anna ledge Joseph Carignan has the Lucky Joe, with six to twelve inches of pay ore carrying about $30 gold. On the west side of the creek A. J. Maxwell and James Spurr have the Ben Butler on a twelve to fifteen foot ledge, with pay streaks aggregating twelve to thirty inches, on which they have a tunnel sixty feet. On the same ledge H. H. Lewis and W. E. Ledgerwood, of Seattle, have patented the Emma Bess, running up Hancock Gulch, on which there are two tunnels twenty-five and thirty feet.

On Straight-up Gulch is a series of ledges three to twelve feet wide, on which the principal group is the Crown Point of sixteen claims owned by E. J. Loyhed and Floyd Clark, of Seattle, and John Stretch, of Munroe. On the Crawford claim they have driven a tunnel sixty feet on a twelve-foot ledge of pyritic ore carrying some galena. On the west side of the creek, opposite Straight-up Gulch, is the Red Cloud group of three claims, owned by the Red Cloud Mining Company. All the claims are on a ledge four to six feet wide, with a pay streak of pyrites three to nine inches and a vein of lead carbonates. A tunnel has been driven sixty feet on the Red Cloud. L. L. Johnson has the Jim Dandy group of six claims on a series of ledges cutting across Straight-up Gulch. One ledge is twenty-two feet wide, with an eight-inch pay streak of copper and iron pyrites, assaying as high as $80 in gold and silver, shown in two tunnels, one of them forty feet long. The other ledges are of less width and carry the same kind of ore, except that one has a two-foot pay streak of arsenical iron, assaying $16 to $40 gold, besides silver, and in another copper pyrites predominates.

Running up from the east bank of Silver Creek is the Bluff group of five claims, held by A. P. Michaud and A. W. Hawks. One has a four-foot ledge with a two-inch pay streak carrying gold and copper. Another twenty feet wide has a four-inch pay streak of white iron ore, shown in a twenty-foot tunnel. The whole ledge is mineralized and gave an average assay of $7.50 gold, besides some copper. The remaining claim is on a parallel ledge to the south, of which the croppings run well in copper and carry galena, and a short tunnel shows ore the full width. On the west side of the creek A. P. Michaud and Eugene Chevrette have the M. & H. No. 2 and an extension on the Bluff ledge, with pay streaks eighteen inches on the footwall and fourteen inches on the hanging wall, assaying $24 gold, besides silver and copper. They also have the Last Dollar on the west extension of another of the Bluff ledges, the ten-inch pay streak assaying $18 gold and 7 per cent. copper.

Below this group, on the west side of the creek, is the Billy Lee group of five claims, owned by the Silver Creek, Snohomish and Port Gardner Mining Company. Two claims are on a ledge about nine feet wide, with a sixteen-inch pay streak of iron pyrites showing in a 150-foot tunnel, assays of which have ranged all the way from $10 to $210. The other three claims are on parallel ledges.

On another ledge parallel with these and as wide as forty feet Job Fields has the Ruby King, on which he has driven a tunnel sixty feet and a cross-cut twenty feet, all in white iron and copper ore, which averages $30 gold. Mr. Fields, with others, has an eight-foot ledge with a twenty-four inch pay streak of similar ore on the Silver Slipper, which has been tapped by a forty-foot tunnel. Assays of the pay streak run as high as $80 gold. Messrs. Northrup and Patricks, of Snohomish, have the Gold Boy on a ledge sixteen feet wide, on which a twenty-foot tunnel shows two feet of pay ore averaging $16 gold. On the west extension of this ledge John McGloyne and others have the Jamboree, on which a twenty-foot tunnel and a shaft twenty feet deep show four feet of pay ore.

The Vandalia group on Cascade Gulch, consisting of five claims, is one of the few groups in which silver is the chief value. The claims are on a series of ledges cut by the gulch, where the outcrops show plainly. The Vandalia ledge is twenty feet wide on the face of the mountain and is all slightly mineralized, with a pay streak ranging from six to eighteen inches and occasionally widening to three feet, carrying galena, carbonates and sulphurets which assay $40 in gold, silver and lead. A mill test gave $27 for all values over freight and treatment. A shaft has been sunk seventy-five feet on the ledge and from it two levels have been run, eighty and ninety feet, to the open air on the side of the gulch. Another tunnel was run forty-five feet to tap the ledge and then runs along it for 220 feet more. At a point 100 feet deeper a cross-cut tunnel has been run 355 feet, tapping the first ledge at a depth of 700 feet and showing it two to three feet wide. When extended 100 feet further it will tap the next ledge at a depth of 1,250 feet, and the others at greater depth ranging up to 3,000 feet. There are 100 tons of ore on the dump, 200 tons having been washed down the creek by a flood in 1894, and it is estimated that there are 19,500 tons in sight averaging $20 over freight and treatment. The owners are F. L. Leslie, Edward Blewett, F. A. McDonald and H. A. Noble.

On a ledge about twenty feet wide opposite the Lockwood Gulch A. P. Michaud and A. W. Hawks have the Texas group of five claims, extending across the creek. On the east end there are a twenty-foot tunnel and a thirty-foot open cut showing a four-foot pay streak carrying white iron and running high in gold. On another claim an open cut forty feet along the ledge shows six or seven ore veins about two inches wide, which assay from $46 to $363 gold and a trace of silver, and ten inches of talc which averages $20 gold.

On the east side of the creek are the Beatrice and Sunset, owned by M. A. Green, H. T. Hannon and R. M. Crawford, on which is a twenty-foot ledge showing in a sixty-foot tunnel from three to six feet of decomposed quartz, which carries galena and lead carbonates and assays as high as $80 gold and silver. Mr. Crawford's interest has been bonded by his partners.

On Moore's Gulch William Johns and L. C. Morse have the Mayflower and two extensions on a ledge about twenty feet wide, on which a thirty-foot tunnel shows a pay streak of eight to thirty-six inches of decomposed pyrites assaying $12 gold.

The Michigan group of three claims on Michigan Gulch is owned by the Michigan Gulch Mining Company. Two claims are on a ledge about three feet wide, with two to fifteen inches of pyrites and zinc ore assaying about $70 gold, and the other is on a cross ledge two to three feet wide, with three inches of pay ore assaying about $40 gold. The cross ledge is shown up by a seventy-foot tunnel, which cross-cuts the main ledge.

On the mountain above Michigan Gulch F. L. Leslie and J. C. Hubbart have the Anaconda, on which there are four parallel and one cross veins varying in width from three to thirty feet, with ore bodies from eighteen inches on the smaller to fifteen feet on the wider ledges, shown by a twenty-foot tunnel on the largest ledge and open cuts on the others. The ore would concentrate anywhere from 3 into 1 up to 6 into 1 and the concentrates would, it is estimated, carry about $42 gold.

On the east bank of the creek, a mile above Galena, Ezra McLaughlin and A. D. Austin have the Ironclad group of four claims on a ledge of concentrating ore about twenty feet wide, on which an eighty-foot tunnel shows a small pay streak of white iron running about $60 in gold. On a parallel ledge about eight feet they have the McKinley, on which a forty-foot tunnel shows a ten-inch pay streak of decomposed quartz carrying pyrites.

A mile up the west bank of the creek the Silver Creek Gold Mining Company has the Westland group of five claims on three ledges of sulphide ore. One of these, eight to twelve feet wide between syenite and granite walls, is exposed for 900 feet, and in a forty-seven foot tunnel shows three and one-half feet of pay ore averaging $20 gold, silver and copper. Another crops twenty to thirty feet wide between granite walls, and in a ten-foot shaft shows concentrating ore carrying $5 to $25 gold, reducing eight or ten tons into one. The third ledge is exposed four feet wide for 300 feet, and in a fifteen-foot tunnel shows arsenical iron assaying $18 to $36 gold.

The Oro Fino group of five claims, immediately adjoining Galena City, has a ledge seven feet wide covered by three claims, on which an eighty-foot tunnel shows four feet of copper pyrites containing masses of native copper and giving an average assay of $56 gold and copper, the copper ranging from 18 to 25 per cent. On the other claims a thirty-five foot tunnel and fifteen-foot shaft show three feet of similar ore.

The Evergreen, owned by the Silver Creek Gold and Copper Mining Company, is on a ledge sixteen to twenty feet wide running down to the creek from the east, 2,000 feet above Galena. The first work was a thirty-foot tunnel, which showed up three feet of solid iron pyrites and chalcopyrite, assaying $25 to $30. A cross-cut tunnel was then run seventy-five feet below and tapped the ledge in twenty-five feet. It has been continued seventy-five feet along the ledge and ran through a body of solid ore two to four feet wide, the mineral being chalcopyrite carrying gold and averaging about $30. On the footwall is another body of ore carrying about $24 gold. The copper value ranges from 3 to 27 per cent. and the gold from $5 to $65; besides a few ounces of silver.

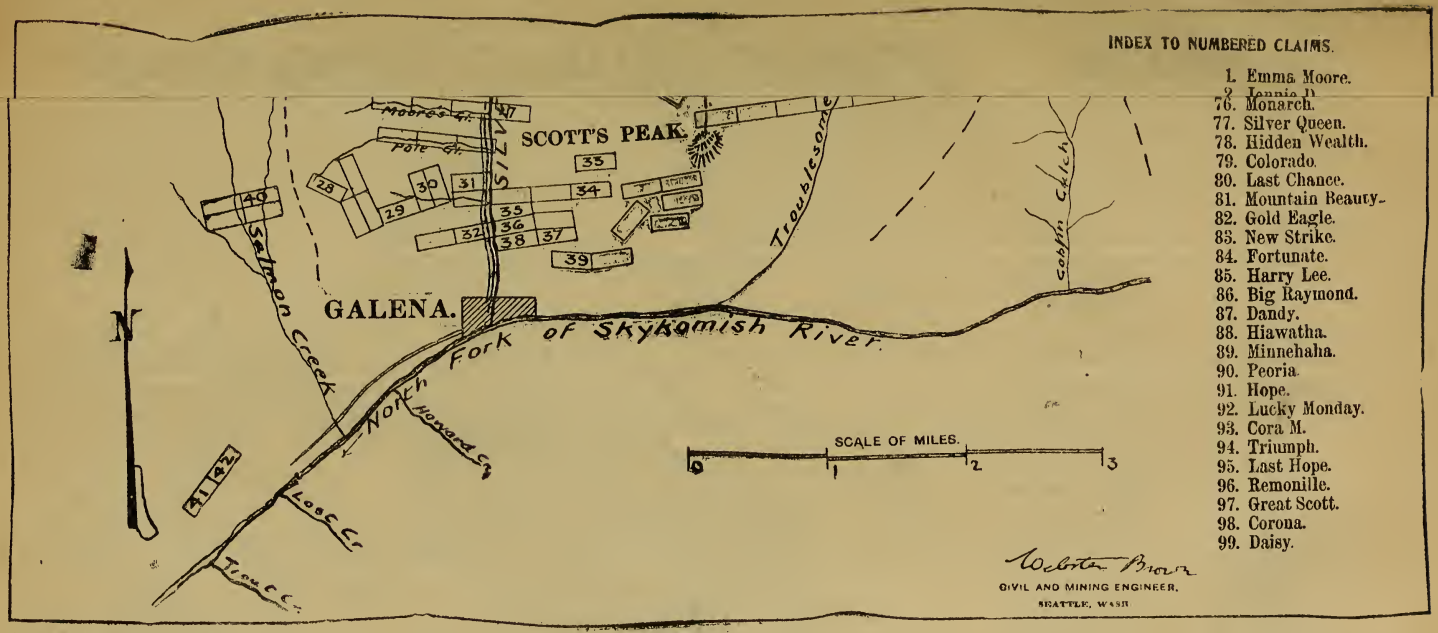
On the P.-I., which is on the east bank half a mile above Galena, J. J. Sheehan, of Seattle, and Frank McCall, of Stanwood, have a four-foot ledge in which several surface cuts have shown two feet of copper sulphides and galena, assaying on an average $32 copper, $26 silver. On the Gray Eagle, below the P.-I., Messrs. Sheehan, McCall and Ezra McLaughlin have a ledge of the same kind of ore, which they will strike by extending a thirty-foot cross-cut twenty feet further. At the head of Pole Gulch, on the west bank, J. J. Sheehan, John Wallace, M. A. Green and Claud Morris have the Editor on a twenty-four inch ledge of pay ore carrying galena throughout, as shown by surface cuts, assays running about $35 silver.

The same mineral belt extends across the divide on the east into the canyon of Troublesome Creek, which enters the North Skykomish two miles above Silver Creek, the late J. C. Lillis having made the first discovery. The formation there also is granite, with some slate in the basin at the head, and the ledges cut it in an east and west course, with some cross ledges. The ore is generally in white quartz and runs higher in silver than most of that on Silver Creek.

The principal group is the Daisy of ten claims, owned by Hon. H. G. Struve, Hon. John B. Allen, E. C. Hughes, Maurice McMicken, of Seattle, and Hon. John C. Denney, of Snohomish. Five claims are on a ledge ranging from four to twelve feet wide between granite walls, which have been stripped for about 3,000 feet by snowslides. On the surface there is about twenty-four inches of galena and arsenical iron ore exposed, of which eight inches is on each wall, and a fifteen-foot shaft and a fifty-foot tunnel show from two to three feet of ore on the footwall, with the possibility of other streaks when the ledge is cross-cut to the hanging wall. Assays range from $7 to $70 gold and as high as $60 silver, the average being at least $20 for both values. Two claims are on an eight-foot cross ledge running into the main ledge from the west, in which an eighteen-inch pay streak carries 90 to 168 ounces silver and $8 gold, while the other claims are on small spurs.

The Corona group of two claims is on a flat ledge half way up the mountain, near the head of the middle fork, and is owned by A. C. Lincoln, A. L. Walters and L. B. Parsons, all of Seattle. On the surface it had a pay streak carrying gold and bromide of silver, one specimen of which assayed 5,000 ounces silver, while the lowest assay was $60 silver, and the gold value ran as high as $22. In a sixty-five foot tunnel the ledge has widened to six feet and the pay streak to three feet, but the value is not as high as near the surface.

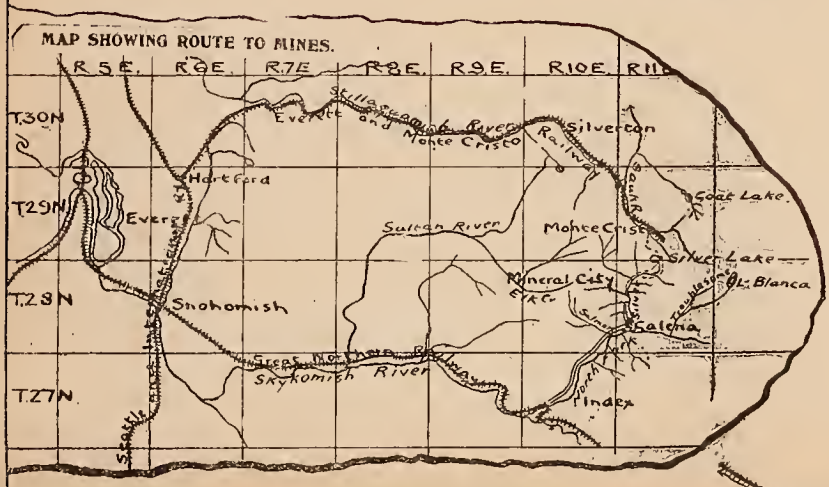
On the west side of the basin, one and one-half miles above the Daisy group, is the Great Scott group of seven claims, owned by J. N. Scott, William Bennison and A. W. Hawks, of Everett. Three claims are on a ledge capped with iron, twenty to forty feet wide, between granite and slate walls. It has several streaks, three to eighteen inches wide, of arsenical iron and sulphides, assays of which run from $8 to $56 gold, a little silver and 2 to 3 per cent. copper. A cross-cut has been run twenty feet into the ledge and will go through it in ten feet more. On another ledge about five feet wide, with eight to ten inches of iron sulphurets, are two more claims, and on a ten-foot ledge carrying sulphurets throughout are the two other claims.

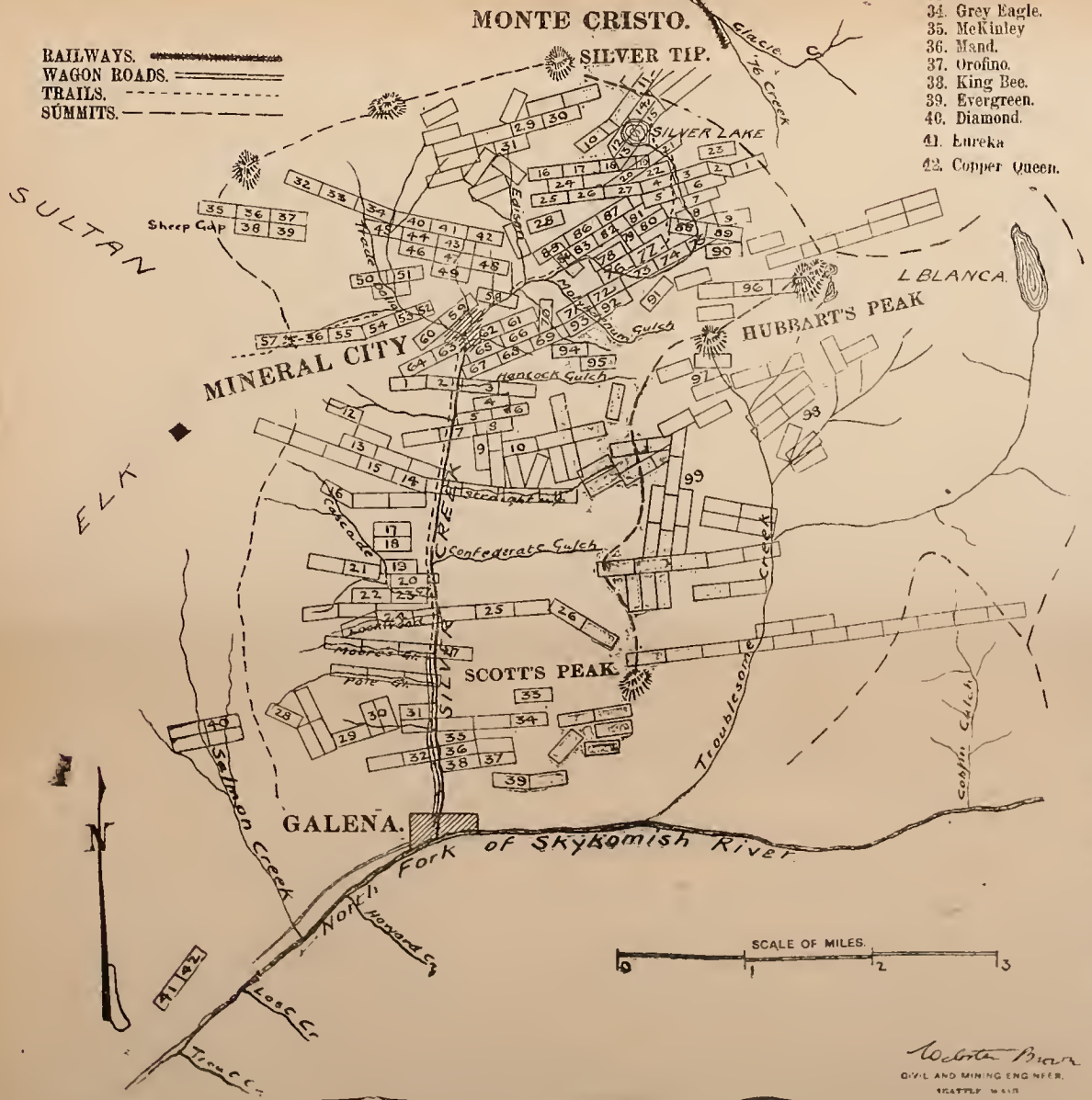

INDEX TO NUMBERED CLAIMS.
1. Emma Moore.
2. Lennie D.
76. Monarch.
77. Silver Queen.
78. Hidden Wealth.
79. Colorado.
80. Last Chance.
81. Mountain Beauty.
82. Gold Eagle.
83. New Strike.
84. Fortunate.
85. Harry Lee.
86. Big Raymond.
87. Dandy.
88. Hiawatha.
89. Minnehaha.
90. Peoria.
91. Hope.
92. Lucky Monday.
93. Cora M.
94. Triumph.
95. Last Hope.
96. Remonille.
97. Great Scott.
98. Corona.
99. Daisy.
SCOTT'S PEAK.
GALENA.
Moore's Cr.
Pete Cr.
Silver
Salmon Creek
North Fork of Skykomish River
Howard Cr.
Loose Cr.
Trout Cr.
Troublesome
Coffin Crick
N
SCALE OF MILES.
0
1
2
3
CIVIL AND MINING ENGINEER,
SEATTLE, WASH.

SILVER CREEK

SNOHOMISH COUNTY.

WASHINGTON.





Webster Bros.
CIVIL AND MINING ENGINEERS.
SEATTLE, WASH.

INDEX TO NUMBERED CLAIMS.

South of Mineral City.

1. Red Cloud.
2. Cleveland.
3. Portland
4. St. Paul.
5. Bluff
6. Reward.
7. A. P. A.
8. Sunshine.
9. Crown Point.
10. Crawford.
11. Jim Dandy.
12. Silver Slipper.
13. Badger.
14. Billy Lee.
15. Ellen.
16. Ruby King.
17. Era.
18. Transfer.
19. Vandallia.
20. Blue Bird.
21. Idaho.
22. Gretchen.
23. Warwick.
24. Lockwood Group.
25. Texas.
26. Sunset.
27. Mayflower.
28. Editor.
29. Anaconda.
30. Michigan.
31. Nest Egg.
32. Olympia.
33. P.-I.
34. Grey Eagle.
35. McKinley
36. Maud.
37. Orofino.
38. King Bee.
39. Evergreen.
40. Diamond.
41. Eureka
42. Copper Queen.

1. Emma Moore.
2. Jennie D.
3. Orphan Boy
4. Stockton.
5. Dutchman.
6. Q. T.
7. Wildcat.
8. Little Lee.
9. Wild Welshman.
10. Cosmopolitan.
11. O. & B.
12. Bingo.
13. F. E. Davis
14. Otsego.
15. Lady of the Lake.
16. Lester.
17. Silver Tip.
18. Lakeview.
19. Edith
20. Edna.
21. Siver Lake.
22. Mascotte.
23. Zeta.
24. Rainbow.
25. Boston.
26. Lillie G.
27. Hettie.
28. Jumbo.
29. Edison.
30. Lida.
31. Louise.
32. Homeward Bound.
33. Gold Bar.
34. Little Diamond.
35. Billy Goat.
36. Jim Hill.
37. Mike Marn.
38. Horseshoe.
39. Treasure Box.
40. Jasperson.
41. C. R. & M.
42. Sigma.
43. Jessie.
44. National.
45. Diamond Hitch.
46. Barney Barnato.
47. Gold Standard.
48. Hancock.
49. White Pine
50. Alki.
51. Ella.
52. Gypsy Queen.
53. Daniel Webster.
54. Alice.
55. Katie.
56. Hard Pan.
57. Sultan.
58. Grace
59. Anna.
60. Lucky Joe.
61. Hubbart.
62. Emma Beos.
63. Ben Butler.
64. Ashland.
65. Josie.
66. Blue Jay.
67. Canton.
68. St. Louis.
69. White House.
70. Blackstone.
71. Queen.
72. Lucky Boy
73. Morning Star.
74. Nettie K.
75. Job.
76. Monarch.
77. Silver Queen.
78. Hidden Wealth.
79. Colorado
80. Last Chance.
81. Mountain Beauty.
82. Gold Eagle.
83. New Strike.
84. Fortunate.
85. Harry Lee.
86. Big Raymond.
87. Dandy.
88. Hiawatha.
89. Minnehaha.
90. Peoria
91. Hope.
92. Lucky Monday.
93. Cora M.
94. Triumph.
95. Last Hope.
96. Remonille.
97. Great Scott.
98. Corona.
99. Daisy

The same mineral belt has also been traced across the Silver Creek Divide to Salmon Creek on the west. On Dominion Gulch, running into Salmon Creek from the east, is the Dominion group of seven claims, owned by J. J. Sheehan, A. D. Austin and A. P. Michaud. Four of these are on a ledge three feet wide and carrying galena ore, which runs northwest and southeast, and the three others are on a parallel ledge of the same size and carrying similar ore.

The great need of this district is railroad transportation, for which the route is not difficult, and there is some prospect that a road may be constructed in the next two years. A survey was made in the fall of 1896 by a syndicate interested in the district for a narrow gauge line from Index to Galena, a distance of nine miles, and to the Troublesome, two miles beyond, following the valley of the North Skykomish as closely as possible. The only engineering difficulties would be two blue clay cuts and some cribbing along a river bar half a mile long, the only rock work being on a hill near Galena, and the timber along the right of way being ample for construction. Such a road would also tap the rich copper belt in the Index Range across the river and would so stimulate development that it should soon have a lucrative traffic.

INDEX.

In grouping the unorganized mining country of the Cascade Range into districts, that section lying in the lofty spur of which Mount Index is the most westerly peak and the two forks of the Skykomish River are the northern and southern boundaries, is naturally set off by itself. The eastern boundary remains undetermined, though later discoveries will probably carry it along the main divide of the range. The district is compact, possesses the same general characteristics and is easily accessible. Leaving Seattle on the Great Northern train and going to Index, seventy-one miles, one goes by road five miles up the north fork, crosses by a cable ferry worked by hand, and travels by trail four miles up Trout Creek; or goes two miles further up the south bank and up Lost Creek; or proceeds along the road nine miles to Galena and there crosses by ferry and goes by trail four miles to the head of Howard Creek. These are the routes to the properties on the north side of the range. In order to reach Eagle Creek, one leaves the train at Salmon Station, seventy-seven miles from Seattle, crosses the south fork and goes by trail eight miles, almost to the head of the creek. In going up Beckler River, one leaves the train at Skykomish, eighty-five miles from Seattle, and goes three miles by wagon road and eleven miles by trail, crossing both the south fork of the Skykomish and Beckler River. Index Station is only thirty-eight miles from the smelter at Everett and 109 miles from that at Tacoma.

The formation of this district is metamorphic granite diked with fine-grained trap and conglomerate, and overlaid with magnesian limestone and metamorphic slates. Extending along the backbone of the range from Mount Index along the course of Trout Creek is a geologic fold, where a belt of diorite has been thrust through the metamorphic formation of schist, slate rock and quartzite and has formed a line of lofty peaks. A series of mineralized ledges cuts this formation in a northwest and southeast course with a number of cross ledges running north and south, generally of great size and strength, traceable through the mountains from one creek to another. In the primary rocks, apparently in contact with lime and slate, are ledges carrying iron sulphides, chalcopyrite, copper in the form of bornite, gray copper and some red and black oxide of copper, while in true fissures, also in the primary rocks, are ledges carrying free gold. The copper-bearing ledges are generally capped with iron, like those of the belt of pyritic ores in British Columbia and the Colville Reservation, and on Trout Creek copper is found in association with specular iron. The iron capping led some of the early discoverers to imagine that they had found large deposits of iron ore and for lack of thorough prospecting this error prevailed until last year, as it did on Money Creek and on the Skagit. The true nature of these ores has now been made plain and development has been undertaken with commendable vigor on several properties.

Howard Creek rises in Howard Lake and flows generally northward from the Index range into the north fork, in a course of about four miles. Immediately below the lake it cuts a system of parallel ledges, on which the Co-operative Mining Syndicate has the Howard group of eleven claims. One of these is porphyritic quartz carrying sixteen feet of clean solid iron sulphide ore, which assays $7 to $120 gold. A sixteen-foot tunnel is in ore all the way. On the same string of claims is a parallel ledge carrying eight feet of the same kind of ore. A lower parallel ledge, forty feet between walls, is well mineralized with iron and copper sulphides, gray copper, galena and zinc and has been traced for over four miles. It is intended to run a cross-cut this year which will give a depth of 100 feet on this ledge and 400 feet on the sixteen-foot ledge.

The Copper group of four claims is on a ledge of black quartz 100 feet wide, identical in formation with the Silver King at Nelson, B. C., and the Coney in New Mexico. It shows streaks of bornite widening at frequent intervals into large bodies, which carry about 30 per cent. copper and some gold and silver, twenty-four inches of solid bornite taken from one point having carried $147 in all values. This group, together with the Howard group, has been bonded by the Co-operative Mining Syndicate for $15,000, with the condition that development is to be prosecuted continuously.

The Black Hawk group of four claims, owned by the Black Hawk Mining and Concentrating Co., runs down the west slope of Iron Mountain to the creek, one and one-half miles above its mouth, on two parallel ledges capped with iron and carrying gold-bearing iron and copper pyrites. One is eighteen to twenty feet wide and has an eighteen-inch pay streak in the center, shown in a ten-foot cut. This cut is to be extended by a 200-foot tunnel, for which a contract has been let to W. F. Chadbourne, and after the completion of which patents will be secured. The second ledge is seven to eight feet wide and has six to eight inches of pay ore. Shipments will begin as soon as the road is repaired.

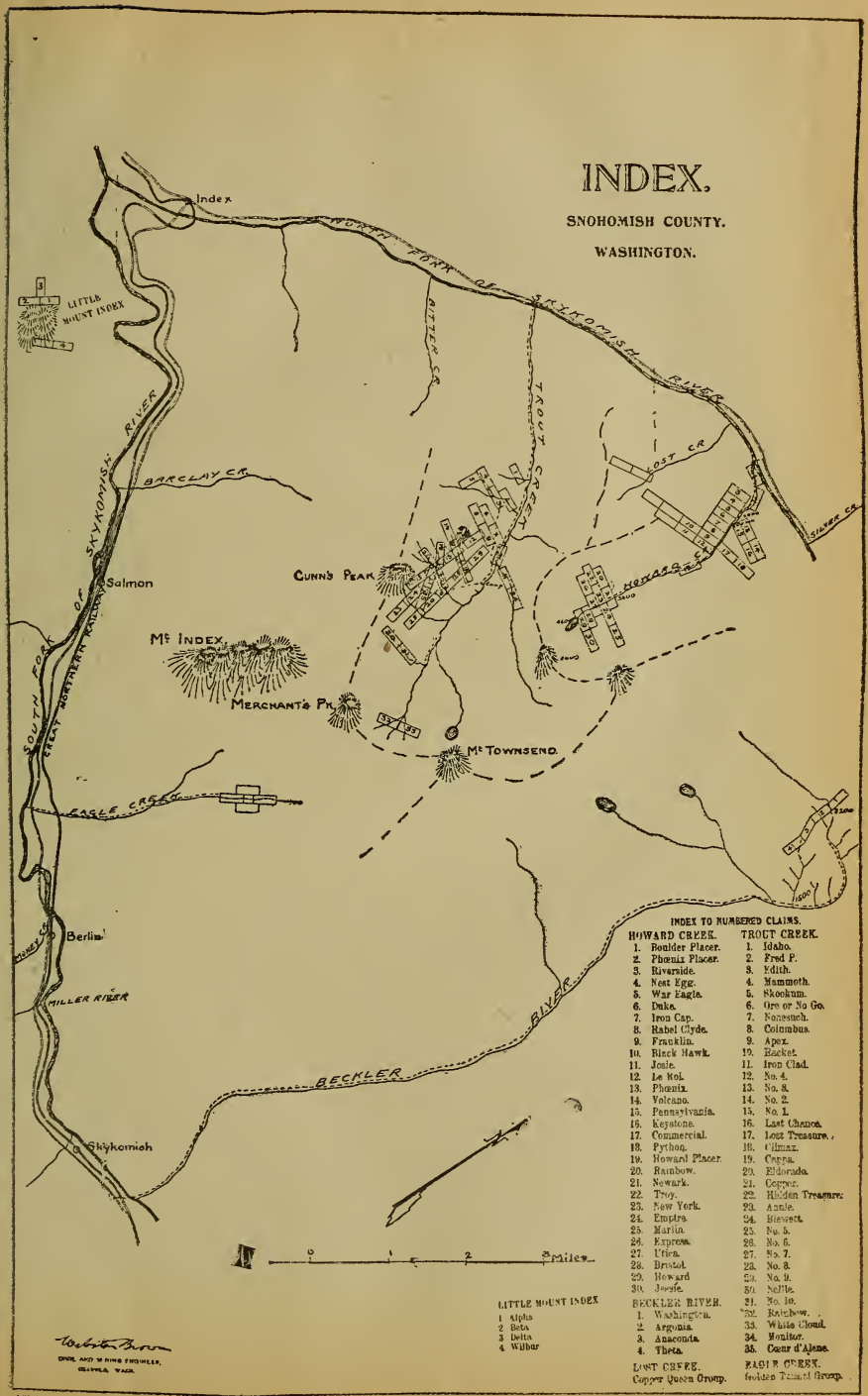
The Iron Mountain group of six claims, owned by the Iron Mountain Consolidated Gold and Copper Mining Company, is on a supposed extension of the Copper group ledge within a mile of the west bank of the North Skykomish River. There is a series of six well-defined ledges with several stringers which have been traced four miles east and west. They range from four to ten feet in width and carry ore similar to that of the Black Hawk group, though one shows free gold on the surface. Open cuts have been made ten feet deep on each ledge, and a contract has been let to W. F. Chadbourne for 150 feet of tunnel, most of it to be on one ledge, with the intention of securing patents immediately. A tramway will be built to the road and shipping begin as soon as the latter can be repaired.

Across the creek from the Iron Mountain group is the Commercial group of two claims, owned by J. A. Cathcart, H. C. Ewing, M. A. Green and John Wallace on a ledge of iron and copper pyrites and chalcopyrite four feet between walls, which has been traced about 600 feet on the surface, where it assays $15 to $20 gold and copper.

On the west side of Iron Mountain, sloping down to Lost Creek, the Lost Creek Mining Company has three claims on a ledge which follows the same course as the Iron Mountain group. The locations were made in 1893 by Peter Rucker, who mistook the deposits for iron ore in consequence of the iron capping, and sold them to N. Rudebeck as such. Their true character was discovered in 1896, when they were acquired by the company. The ledge is shown by a fair amount of surface work to be twenty feet wide and carries copper pyrites, a mill test of which showed 16 8-10 per cent. copper. The ore makes 43 per cent. concentrates, which assayed 26 per cent. copper. This sample was taken from the foot of the bluff, into which a fifty-foot tunnel is being run. The same company has two claims on the right bank of the north Skykomish, four and one-half miles from Index, on a similar ledge four feet wide.

In a basin within a mile of the head of the west fork of Trout Creek and on the mountains on its left bank is the Copper group of twenty-six claims, owned by Col. Benjamin R. Townsend and Andrew Merchant. Running diagonally across the valley below the basin, including Merchant's peak and showing at the base of Headquarters peak, is the belt of sedimentary rock in which occurs the geologic fold already mentioned. In the schistose formation is a series of contact ledges running north and south and in the diorite occur a series of east and west ledges, which are in true fissures. The two principal groups of claims are on the contact, the ore bodies in which are rich in chalcopyrite and carry gold and silver.

The group lying in or near Copper Gulch, which scores the face of the ridge between Quartzite and Headquarters Peaks, is composed of five claims. The main ledge belongs to the north and south series, though its course is northwest and southeast, and is about 100 feet wide, crossing the gulch near its head. The north end of the ore body occurs along the contact. It outcrops in the gulch, where the twin falls unite upon it, and on one side shows up a rich ore body five or six feet wide at a point 300 feet above the bed of the gulch, where it assays over 20 per cent. copper. Adjoining this rich body is a large body of lower grade ore. On the other side of the gulch is a cliff of ore nearly 250 feet high, and in the bed and in the slide at the foot of the gulch are boulders of chalcopyrite which have been broken from the ore body and which alone are worth many thousands of dollars. This ore body has assayed from 10 to 30 per cent. copper, and on it are located three claims. Running up the Copper Gulch from its mouth is another body of chalcopyrite ore of undefined width, with a spur twelve feet wide, running into it at an acute angle, which has been shown up by a thirty-foot tunnel. Running across the Blewett Gulch on Quartzite Peak, and showing up on each side and in the bottom, is an ore body at least fifteen feet wide, which is probably on the same contact with that in Copper Gulch and on which are two claims. This ore body is all chalcopyrite, very rich in copper and carrying silver and gold. An east and west ledge in a true fissure in diorite runs up Lost Treasure Gulch, on the side of Headquarters Peak, and is cov-


INDEX.
SNOHOMISH COUNTY.
WASHINGTON.
Index
NORTH FORK OF SKYKOMISH RIVER
LITTLE MOUNT INDEX
BITTER CR.
TROUT CREEK
LOST CR.
SILVER CR.
HOWARD CR.
SKYKOMISH RIVER
BARCLAY CR.
Salmon
CUNN'S PEAK
Mt INDEX.
MERCHANT'S PK.
Mt TOWNSEND.
SOUTH FORK OF SKYKOMISH RIVER
GREAT NORTHERN RAILWAY
EAGLE CREEK
Berlin
MILLER RIVER
BECKLER RIVER
Skykomish
0 1 2 3 Miles
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HOWARD CREEK.
1. Boulder Placer.
2. Phoenix Placer.
3. Riverside.
4. Nest Egg.
5. War Eagle.
6. Duke.
7. Iron Cap.
8. Rabel Clyde.
9. Franklin.
10. Black Hawk.
11. Josie.
12. Le Roi.
13. Phoenix.
14. Volcano.
15. Pennsylvania.
16. Keystone.
17. Commercial.
18. Python.
19. Howard Placer.
20. Rainbow.
21. Newark.
22. Troy.
23. New York.
24. Empire.
25. Marlin.
26. Express.
27. Utica.
28. Bristol.
29. Howard
30. Jessie.
BECKLER RIVER.
1. Washington.
2. Argonia.
3. Anaconda.
4. Theta.
LOST CREEK.
Copper Queen Group.
TROUT CREEK.
1. Idaho.
2. Fred P.
3. Edith.
4. Mammoth.
5. Skookum.
6. Ore or No Go.
7. Nonesuch.
8. Columbus.
9. Apex.
10. Racket.
11. Iron Clad.
12. No. 4.
13. No. 8.
14. No. 2.
15. No. 1.
16. Last Chance.
17. Lost Treasure.
18. Climax.
19. Copper.
20. Eldorado.
21. Copper.
22. Hidden Treasure.
23. Annie.
24. Bleyert.
25. No. 5.
26. No. 6.
27. No. 7.
28. No. 8.
29. No. 9.
30. Nellie.
31. No. 10.
32. Rainbow.
33. White Cloud.
34. Monitor.
35. Coeur d'Alene.
EAGLE CREEK.
Golden Tunnel Group.
LITTLE MOUNT INDEX
1 Alpha
2 Beta
3 Delta
4 Wilbur
DIVE AND MINING ENGINEER,
SEATTLE, WASH.
MINING IN THE PACIFIC NORTHWEST.

ered by three claims. The ledge is ten to twelve feet wide at the surface, and a tunnel has been run on it forty-five feet in chalcopyrite and iron pyrites ore, assaying 6 to 15 per cent. copper and four to sixteen ounces silver. An outcrop of another ledge twelve or thirteen feet wide has recently been found parallel with it.

Further down the creek are three claims on two east and west ledges of specular iron, carrying silver and copper, fifteen feet and twenty to thirty feet wide. On these two ledges tunnels have been run fifty and seventy feet. A parallel ledge of the same kind of ore crops out to a width of at least fifteen feet, assays showing 7 to 8 per cent. copper. Another parallel ledge of great width and in some places cropping out to a width of forty feet, is shown up by a good deal of surface work. A fourth parallel, fourteen feet wide, carrying iron pyrites, is covered by two claims and is shown up by a fifty-foot tunnel. The other claims cover ledges of less size and value, as well as the water power of the north fork of the creek, which has a fall of 250 feet to the mile. Mr. Merchant's half interest in this property is under bond to M. E. Downs.

One of the natural curiosities of the district is a natural tunnel in the basin near the head of Eagle Creek, on the Golden Tunnel group of four claims, owned by Henry Olsen and C. J. Ingram, of Skykomish. On this group are three parallel ledges cut by the creek, one of which has been prospected by nature in a peculiar manner. A tunnel sixty-five feet long, fifteen feet high and twenty feet wide was found to run through a porphyry dike almost straight into the mountain and on the roof and walls are streaks of high grade copper pyrites in large crystals carrying gold and silver. On the surface above this tunnel are a number of stringers of mineral from one to twelve inches wide which appear to be running together. The natural tunnel has been extended eighteen feet on a two-inch streak which carries $54 gold, 35 per cent. copper. One of the other ledges is eight feet with an eight to ten-inch pay streak carrying 19 per cent. copper, $8 gold, $8 silver, shown up by a twenty-eight foot tunnel. The other ledge is about ten feet in a small shaft.

Cropping to a width of 250 feet up the side of a mountain, twelve miles above the mouth of Beckler River and four miles east of the Copper group on Trout Creek is a great copper ledge discovered in the fall of 1895 by J. Frank Bleakley and Charles Shepp, who have the Anaconda group of four claims on it. This ledge is cut and exposed by the river and has been traced for 3,000 feet in a north and south course, pitching slightly to the west. It is in a contact between porphyry and slate and carries chalcopyrite and copper pyrites, with bunches of bornite mixed with porphyry, spar and quartz stringers, and is pronounced by men familiar with the ore of Anaconda, Mont., to be exactly like it. Three tunnels have been run from the foot wall to cross-cut the ledge, one of them being in thirty feet, and assays run from 5 to 32 per cent. copper, five to eleven ounces silver.

Development is already in progress by Lot Wilbur and others of Snohomish, on the recently discovered Pride of Index group of two claims, near the base of West Index, one mile from the Great Northern Railroad and two miles due south of the town of Index. The ledge runs through a small mountain north of West Index and crops from twelve to twenty feet wide, being traceable 700 to 800 feet on the surface. A tunnel was started on the ledge and showed eight feet of mineralized ledge matter, but as it gave too little depth a new tunnel was started on the hanging wall 200 feet below. This ran through slide rock for the first twenty-one feet, but for the next twenty feet has been in the solid ledge, showing chalcopyrite across the whole face, with bunches of bornite all through and with mineral also on the walls. There is a pay streak of fourteen inches of solid chalcopyrite, which assayed 38½ per cent. copper, $4 gold, $29.90 silver, a total value of $112.10. A test carload shipment will be made in June.

Two miles south of Index, on a small stream running into the main Skykomish river, is the Alpha group of three claims, owned by the Alpha Gold & Copper Mining Company. One ledge, on which are two claims, generally follows the course of the stream and has been uncovered by it for several hundred feet. It is twenty feet wide, heavily mineralized with iron pyrites on the surface, the ore in places being almost solid and assaying $5 to $6 gold and copper. The indications are, however, that, as depth is gained, copper will predominate. The third claim is on a forty-foot cross ledge running at right angles to the first and containing concentrating iron pyrites for its entire width. Both ledges can be opened by tunnels at great depth, the upper end of the property being 2,000 feet above the lower, and a bucket tramway two miles long would transport the ore to the railroad.

A recent discovery of the same kind of ore was made by A. W. McRee and the late Bud McRee three miles west of Index and one-quarter mile north of the Great Northern Railroad. Three claims were taken on a series of parallel ledges of copper ore of great size, surface specimens of which assayed $15 gold and copper.

MILLER RIVER.

Although the people of Seattle are too broad-minded and energetic to confine their efforts to the development of the mining districts of their own county, the district drained by the streams flowing northward into the Skykomish south fork has a peculiar interest for them, for it is close to their home and in King county. To arrive at it, they have only to take the Great Northern train to Skykomish, eighty-five miles, and then go by road five miles, and by trail two miles further, to reach the head of Miller River, to which the road will be extended this summer. Skykomish is distant fifty-two miles from the Everett smelter and 126 miles from the Tacoma smelter.

If any man has any doubts as to the strength and permanence of the ledges of this district, he has only to visit them and he will be convinced. The country rock on the backbone of the ridge in which the ledges are found is granite and syenite, and the mineral-bearing rock has filled fissures in these strata, only to be worn down by snow and water as it is decomposed by the action of the air, leaving perpendicular walls 100 to 200 feet on each side. Thus the ledges are usually found in the beds of narrow gorges in the basins at the head of the streams or on the sides of the mountains which form the canyons, and are easily traceable from base to summit of the range. The ledge matter is generally porphyritic quartz, often so uniformly mineralized as to pay for concentration on the ground, and carries pay streaks rich enough to pay for shipment, even with the present costly means of transportation to the railroad. The ore carries iron and copper sulphides, gray copper and galena, carrying gold and silver, the pay streaks giving usually from $50 to $60 a ton, the second grade ore from $10 to $20. Some of the ledges, however, are much richer, those on the Cleopatra Basin carrying several hundred ounces in silver, and those near the summit overlooking that basin running high in copper. Further northward, towards the mouths of the streams, are dikes of diorite, in which occur ledges of pyritic ore carrying native copper and gold near the surface; also dikes of dolomite and porphyry with ledges of sulphide and gray copper ore. The ledges of pyrites are heavily capped with magnetic iron and are rich in copper and gold and often carry silver.

Prospecting in this district began while the Great Northern Railroad was under construction in 1892, by W. L. Sanders and Archie Williamson, and successive discoveries have shown such wealth that active development by outside capital is in progress and the district can now boast of the possession of the second power-drill plant in the Cascade mountains. Its principal mine, which is being developed by this plant, has already made large shipments giving conclusive evidence of its value. This is the Coney mine, owned by the Baltimore & Seattle Mining & Reduction Company. It is on the basin at the head of Coney Creek, which flows into Miller River from the west and is six miles from the Great Northern Railroad. The group consists of nine claims on three parallel ledges running diagonally up the basin to the summit, ten, seven and six feet wide respectively, two of them uniting on the summit in a blow-out 100 feet wide and all three being traceable across to the Snoqualmie side of the divide. A strong spur runs up the center of the basin into this series of ledges and is the point where development began. The ledge matter is porphyritic quartz carrying auriferous galena and iron sulphides between syenite walls. The spur above mentioned cropped five feet wide on the surface and a tunnel has been run along it for 225 feet. This tunnel cut an ore chute thirty feet long and five feet wide forty feet from the mouth, and eighty feet further the ledge widened to fourteen feet wide, half of which was good ore. From the first chute forty tons was shipped in 1895 and returned $58.70 per ton over freight and treatment. In the fall of 1896 a power drill plant of three drills operated by compressed air was installed, power being generated by a dynamo driven by a water wheel at the falls of Coney Creek and conducted to a motor in the tunnel, which is connected with the power house by telephone. The machinery was put in operation on January 12, 1897, and after being supplemented with a fan to clear away smoke after the blasts, continued the tunnel at the rate of nine feet a day. After penetrating 180 feet it cut a second chute of concentrating ore eight feet wide and twenty-two feet long, carrying iron sulphides and galena. After cutting through a granite horse, it ran into soft rock heavily mineralized, five and one-half feet wide between straight and smooth walls. This tunnel, while developing good bodies of ore in the Coney spur, sufficient to pay its cost, is designed to cross-cut the main ledges, the first of which it will tap 800 feet further at a depth of 800 feet, the second 150 feet further still at a depth of about 1,000 feet and the third 300 feet further at a depth of 1,200 feet, while a further extension under the highest point will give a depth of 2,500 feet. The company is putting in a larger drill to work in the hard rock and intends to use the smaller ones for soft rock and stoping. Twenty men are employed on double shift.


Mil
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Komish River
BERLIN.
Railways.
Wagon Roads.
Trails.
Summit Lines.
Money Creek
Soda Springs
Kimball Creek
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Cabin
Sandy
BASIN
Blue Lake
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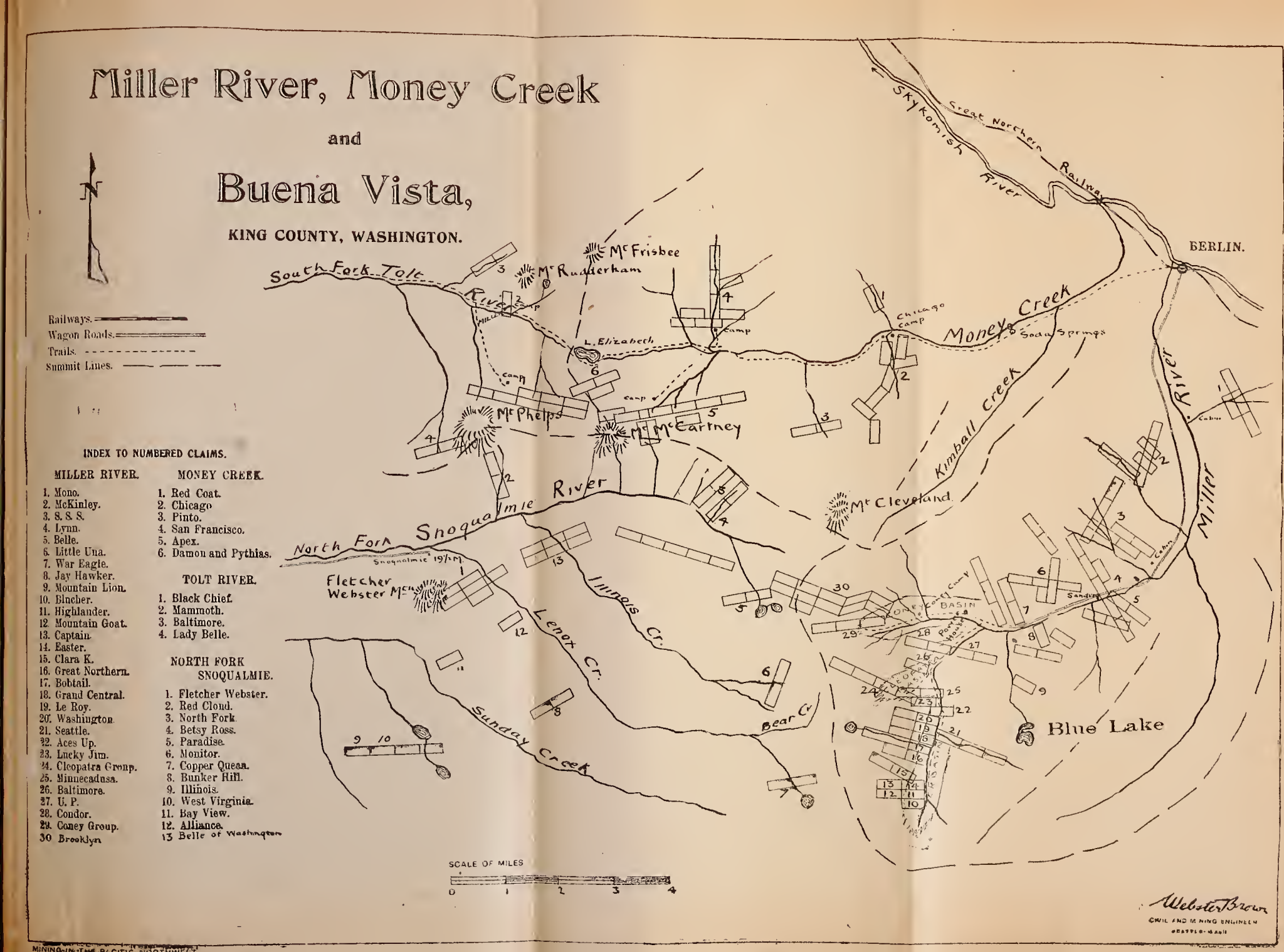
30 Brooklyn
Webster Brown
CIVIL AND MINING ENGINEER

Miller River, Money Creek

and

Buena Vista,

KING COUNTY, WASHINGTON.



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Webster Brown
CIVIL AND MINING ENGINEER
SEATTLE, WASH.

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The Brooklyn group of thirteen claims, owned by Andrew Hemrich, D. N. Baxter, George A. Pratt and Dexter T. Sapp, is on two ledges twenty-five and ten feet wide, traceable along a canyon which runs into the basin from the west and extending over the summit. They show on the surface streaks of high grade ore two and four feet wide, with smaller streaks through the gangue. The ore is iron and copper sulphides carrying 8 to 12 per cent. copper, $10 to $20 gold and silver.

On eastward extensions of the Coney Basin ledges is the Tornado group of three claims, owned by Frank Campbell and George M. Bonney, showing pay streaks six to twelve inches wide, on which a shaft is going down and tunnels are being run.

The property next in rank to the Coney, so far as active development is concerned, is the Cleopatra group of three claims on the King Solomon Basin, owned by the Cleopatra Mining Company. The three claims are on one ledge, which crops to a width of forty feet between the perpendicular granite walls of a gorge wnich cuts the basin clear over the summit, the walls, which are 150 to 200 feet high, making its course clearly traceable. On the hanging wall an ore chute is exposed five feet wide and at least thirty feet long, carrying antimonial silver, chlorides of silver and gray copper ore, an average sample of which assayed 368 ounces silver, $10 gold. There are several other pay streaks assaying $35, $46 and $107 gold and silver, and the whole ledge is well enough mineralized with iron sulphurets to pay for concentration. A cross-cut has been run 129 feet, striking a stringer which runs into the ore chute. The tunnel was then turned to follow this stringer, which showed streaks of galena and sulphides in all the seams of the ledge matter, and ran along it for 299 feet, when all the stringers ran together in a streak of ore two to three feet thick and the tunnel pierced the hanging wall of the ledge, with quartz carrying streaks of sulphurets and gray copper in the face. The ore in the feeder was left in the tunnel wall and drifting is being continued for twenty feet on the ledge before cross-cutting to the foot wall, in which the ore chute crops. An assay of one stringer ran 581 ounces silver, $10 gold; another of gray copper carried 45 ounces silver and $6 gold; while the quartz in the ledge proper carried $7 gold in sulphurets, but no silver.

On extensions on the Cleopatra group down the mountain and on parallel ledges the Miller River Mining Company has seven claims, located in the fall of 1896. Work was continued until winter and will be resumed in the spring. Three tunnels were driven about fifteen feet each, one showing two feet of ore which assayed $10 to $70 gold and silver in gray copper, sulphides and a little galena; another showing a twelve-foot ledge carrying streaks of ore which assay $15 to $65.

The Cleopatra ledge is paralleled in another similar gorge by a seven-foot ledge which runs into it near the summit, and by a third on five feet of ore, George A. Pratt and F. D. McNaughton having the Cataract group of three claims on them.

The two Unicorn claims, owned by S. J. Marquis and Albro Gardner, Jr., are on a ledge ranging from six to eight feet wide, carrying sulphides and gray copper, which has been traced half a mile up the Cleopatra Basin, while Mr. Marquis has the Sphinx on another twenty feet wide and the Ironsides on one of twelve feet, all of similar character.

On the summit of the Cleopatra basin and extending down both the Snoqualmie and Miller River sides of the ridge, Dr. L. M. Lessey and A. S. Nickerson have the Romeo group of seven claims. One of these is on the Cleopatra ledge, with as good a surface showing as that property, assaying $87 gold and silver in gray copper, galena and antimonial silver. Two more are on a parallel fifteen foot ledge with numerous feeders running into it. The other four are on a ledge of the same character traced from the summit down to the base of the ridge, an open cut showing it to widen from eight to ten feet with only slight depth.

To the east of the Cleopatra Basin is a forty-foot ledge of porphyritic quartz and spar between walls of granite and diorite, showing six feet of copper sulphides and white iron, on which T. F. Townsley and J. W. Perkins have the Etta. On the summit of the basin T. A. Woodworth and Al Eurich have the King David on a ledge of sulphide ore which crops eight feet wide. These are recent discoveries which there has been no opportunity to develop.

A ledge which promises to be as rich as the Cleopatra, though with less showing, is cut by King Solomon Creek a little below the Cleopatra Basin and is held by the Sunday and another claim of W. L. Sanders, E. B. Palmer and H. S. Phinney. On the surface it showed several streaks of gray copper and antimonial silver broken by granite horses and assaying 50 to 77 ounces silver, $10 to $16.40 gold. Two cross-cuts opened a streak of gray copper six to twenty inches wide, which assayed 365 ounces silver, $2.40 gold. A tunnel was then started further down, on which the ore is coming in.

During the summer of 1896 discoveries were extended to the basin at the head of the west fork of Miller River, one mile east of the Cleopatra Basin. The Highlander group of four claims, in a block 1,200x3,000 feet, and a millsite, owned by the Highlander Gold & Silver Mining Company, has four ledges running through it, ranging in width from six to fourteen feet, the widest being traced the whole length of the claims between well defined walls. All show streaks of sulphurets, gray copper and some galena, assaying $5 to $23,

principally in gold. The discovery was made too late in the season to allow of much development, but trails were cut, camp built and a tunnel started in readiness for thorough work this season.

The Clara K. group of five claims on this basin, under bond to William Garrard, has a series of ledges on which considerable prospecting was done before winter. One ledge is ten feet with a ten-inch streak of ore on each wall; another is covered by two claims and is six feet, with six inches of ore; a third shows six inches of pay ore in a thirty-inch ledge.

The Mountain Gem group of four claims, owned by G. W. Morley, has two ledges each cropping eight feet wide and carrying sulphurets. One of them gave an assay from the surface of $20 gold, $4 silver. Directly across the river from them he has the Jumbo on a body of pyrites covered with an iron cap fifty feet wide.

The two Bobtail claims, which Frank Campbell, G. M. Bonney, Pat Campbell and Bat Wilkinson have on the west of Miller River, are on a six-foot ledge with eight to sixteen inches of pay ore similar to that of the Cleopatra, the remaining ledge matter carrying enough mineral to pay for concentration. A late discovery was an eight-foot ledge with a sixteen-inch pay streak of similar ore, on which Frank Campbell, R. K. Anderson and John Corrigan have the Aces Up.

On a mountain-top eight miles from the mouth of Miller River is a great blow-out of iron covering a blanket ledge at least 100 feet wide carrying pyrites, which gives surface assays of $35 gold and a little copper. Further down the mountain is another similar ledge running along the shore of a small lake and partly under water, the exposed part being six feet wide and carrying pyrites which assays $8 gold. This was only discovered in October, 1896, and is covered by the Twin Lakes claim, which the Cynosure Mining Company has bought and is preparing to develop.

Cropping on both sides of Coney Creek is an iron-capped ledge which was originally located for iron several years ago and which shows in many places seventy feet wide, its ordinary width being twelve feet, with twenty feet of gray quartz beside it. On this ledge the Mount Cleveland Mining Company has the Le Roi and War Eagle, from the surface of which it has taken ore assaying $17 gold, $6 silver, besides copper. The company intends to cross-cut the ledge in the spring to define its width and character.

The Katie group of three claims, held by Henry Nute, covers a four-foot ledge, with eight to ten inches of pay ore carrying galena, sulphides and gray copper, on which he is tunneling.

Development has been pushed to good purpose on the Triune group of six claims by W. L. Sanders and Frank Wandschneider. On one ledge from eighteen inches to six feet wide are two claims, on which a 140-foot tunnel shows twelve inches of ore, assaying $40 to $60 gold and silver, and four feet of concentrating ore full of streaks of sulphides, arsenical iron and galena.

The pioneer locations by W. L. Sanders are the two Lynn claims, on a ledge running nearly north and south in a canyon on the left bank and cutting across the stream. It is three to six feet wide and has been traced 2,000 feet, showing sixteen inches of sulphides, galena and gray copper. The supposed extension runs through the two Belle claims, owned by Messrs. Sanders and Schlegel. A twelve-foot ledge with four or five inches of $24 ore carrying copper, lead and sulphides runs through the two Hawkeye claims, and a stringer with six to eight inches of $11 ore carrying gold and silver is held by the remaining two of the Hawkeye group.

Another strong ledge is on the Lone Star group of four claims, owned by Archie Williamson and William Timpe. It runs northwest and southeast across Great Falls Creek, between walls of granite, and is twelve feet wide, with four streaks of pay ore aggregating fifteen to twenty-one inches, which carry iron sulphides and gray copper and assay $57 silver, $10 gold, with concentrating ore filling the remainder of the ledge. A sixty-foot tunnel on the footwall shows one pay streak to widen to sixteen inches, with galena coming in. On extensions are the Mina, by James Dougherty and Hugh McIntosh; the Spider, by William Lee, A. L. Bayliss and A. Williamson, and the Markley, by James Dougherty and William Lee. On two parallel ledges, two and four feet wide, with four and six inch pay streaks, Mr. Williamson has the Double Stamp, and on another five feet wide, with three or four inches of ore, H. S. Phinney and E. B. Palmer have the McKinley.

Adjoining the Lone Star is the Little Una group of eight claims, owned by W. L. Sanders and M. L. Ransom, of Toledo, Ohio. The group has three iron cap ledges, two parallel ones varying from thirty to sixty feet and a cross ledge twenty feet. The mineral is iron pyrites, with some copper in ore chutes fifteen to twenty feet wide, and assays give $3 to $11 gold on the surface and all the way from $2.50 to $62 gold at greater depth. A cross-cut tunnel is being run to tap the ore chute on the widest ledge.

Another of the early discoveries is the Mono, by Archie Williamson, on a ledge of pyrites forty feet wide, carrying ore which assays 7 to 30 per cent. copper, $7 to $36 silver, $5 to $8 gold. This ore shows in tunnels twenty-eight and sixty feet across the ledge, which have not reached the wall. Extensions of this ledge are the Orphan Boy, by Duncan Graham, J. J. Ferguson, James Dougherty and A. Williamson, and the Orphan Girl, by Messrs. Williamson and Dougherty.

The large investments of outside capital in the principal properties in this district are an assurance of continued development, and the showings so far made warrant the expectation of further investment to put the mines on a producing basis.

MONEY CREEK.

The series of mineral ledges which is exposed at the head of Miller River, and in the mountains through which it flows, extends beyond the sources of Money Creek through the ridge dividing the Skykomish and Snoqualmie watersheds, the Tolt flowing southward into the latter river from a point whence Money Creek flows northward into the Skykomish. The mineral discoveries extend along the mountains on each bank of Money Creek, having begun with the Apex ledge of galena, gray copper and sulphurets on the headwaters by Alexander McCartney in 1889. Further down the stream and on the tributaries which leap down precipitous gorges, there are great bodies of sulphide ore carrying gold and copper, which from their proximity to the railroad are likely to be early developed. The route from Seattle is by the Great Northern Railroad to Skykomish, eighty-five miles, by road one mile, and by trail six miles, to the head of the creek. The distance from the Everett smelter is fifty-two miles; from that at Tacoma, ninety-three miles. Communication will be much improved this season by the construction of a wagon road up the creek within a short distance of the most remote properties.

The first discovery was also the first property to be developed and ship ore. This was the Apex group of five claims, recently bonded by Alexander McCartney, G. R. Procter, Edwin Stevens and Miss Fanny Stein to J. R. Stephens, of Spokane, for $20,000. Four of these claims are on one ledge, which crops in the gorge of Milwaukee Creek between syenite walls and has been traced up the mountain and over the summit to Lake Elizabeth. At one point in the gorge it crops forty feet wide and at another thirteen feet wide, but the richest ore is found on the side of the Milwaukee Basin, 700 feet above, where the ledge is three to five feet wide between strong walls. It has been opened at the latter point by means of two tunnels, the upper 118 feet and the lower 300 feet, with a lift of seventy feet between them. The lower tunnel was driven forty feet through the slide rock and cut three ore chutes, each about forty feet long with a six-inch pay streak of smelting ore. The third chute has been stoped out from the upper tunnel and for a lift of fifty feet from the lower tunnel, the ore being shipped to the smelter and returning an aggregate of over $13,000. It carried about 2½ ounces gold, 6 ounces silver and 4 per cent. copper, being steel galena, gray copper, sulphides of iron and arsenical iron. The other two chutes carry $43 and $46, respectively, in gold and silver and have in sight over $15,000 worth of smelting ore. Beside the pay streak is a streak of concentrating ore from six to forty inches wide assaying about $12 a ton. There are several hundred tons of second-grade ore on the dump. The ore shipped has paid for development in the face of a cost of $13 a ton for packing seven and one-half miles to the railroad.

The same parties have the Damon and Pythias on a four-foot ledge of similar ore, and on Goat Basin, four miles above the mouth of Money Creek, they have the Sockless and Solomon on a ledge seven or eight feet wide, with twenty inches of high-grade ore similar to the Apex, which assays $17 to $60 in gold, silver and lead, chiefly gold. A forty-foot tunnel on the ledge shows good ore all the way.

The Bonanza Queen group of eight claims, owned by the Gold Mountain Mining Company, consists principally of several properties on a gulch running down to Money Creek's left bank. The Bonanza Queen itself is on a ledge which crops on the face of a perpendicular cliff to a width of about seventy-five feet, with a defined hanging wall of soft granite, the footwall not having been found. The ledge matter is porphyry and is shown by a tunnel run twenty-five feet along the hanging wall to be veined throughout with sulphide ore carrying $5 gold and copper, while a sample taken across the face of the tunnel assayed about $25. Half a mile further up this gulch is the San Francisco on a mass of similar rock striking into the face of a bluff. A tunnel sixteen feet in this rock shows a streak of six to twelve inches of solid sulphide ore. On a parallel fifty-foot ledge of porphyry, three-quarters of a mile further up the creek, is the Paymaster, on which two tunnels have been run about thirty-five feet apart. One starts near the footwall and has run forty-five feet through mineralized rock, and the other has run thirty-five feet towards the hanging wall on heavy sulphide ore similar to that in the Bonanza Queen, which will pay well to concentrate, the value being about $8 gold and silver. The other claims have good surface showings, but are undeveloped.

One of the strongest showings on Money Creek is on the Chicago group of four claims, owned by C. W. Frisbee, Malcolm McFees and Mike Earles, of Seattle, A. D. Smith and Joseph Rudderham. The first discovery was a great deposit of magnetic iron in the rocky peak at the summit of a mountain

rising 1,500 feet above Money Creek, four miles above its mouth, and in a gorge down the slope, and it was proposed to mine the ore for the iron, a tunnel being run forty feet on it. A tunnel lower down the mountain last summer ran into a body of fine copper and iron pyrites carrying flakes of native copper and some peacock copper. The outcrop is in a ravine between high walls of diorite and is fully fifteen feet wide, but further down the pyrites itself was found cropping to a width of eight feet. Three claims are on this ledge, the ore in which assays 20 per cent. copper, besides gold and silver, and the fourth claim is on a similar parallel leage. Thorough development will be carried on this year.

On the east fork of Money Creek H. H. Darst and W. M. Lee have the Vandalia, on which a twenty-five foot tunnel shows a twenty-inch pay streak carrying $23 gold and silver in a seven-foot ledge.

SNOQUALMIE.

The mountain ridges among which the several forks of the Snoqualmie River flow to their confluence near North Bend have long been the scene of prospecting trips on the part of the settlers in the valleys and the inhabitants of the surrounding country, including some of the pioneer residents of Seattle, and it has been proved beyond doubt that great bodies of mineral existed there. A number of reasons can be assigned for the failure to transform these promising prospects into mines. The first was, in the early times, the difficulty of access to the country, for not only were there no railroads, but the country was without wagon roads until the toll road was constructed through the Snoqualmie Pass. The valleys were a jungle through which dimly traceable Indian trails led, and, there being no grass for horses, men had to pack their supplies on their backs. Another reason was that the country was settled by farmers, who knew little or nothing of mining, and they did not readily turn their hands to this unfamiliar and laborious occupation. A third reason was that the ore bodies, while large, were of low grade and could not be mined profitably without large investments of capital, which could not be obtained in the country, especially in days before low grade mines had come into demand among investors.

But these difficulties are fast being surmounted. The Seattle & International Railroad runs from Seattle to Sallal Prairie, far up the Snoqualmie Valley, and a road has been built some distance up the middle fork. The settlers are adapting themselves more and more to the new industry and the general demand for mining property has encouraged them to develop their claims, which they are showing to be equal in merit to those in other districts in the Cascade Mountains. With roads, intelligent work and capital, the Snoqualmie District will take rank with the other promising districts to the north, south and east, and will be able to boast of mines instead of prospects.

The route to this district from Seattle is by the Seattle & International Railroad to North Bend, sixty miles, for the north and middle forks and the claims on and around Mount Si, or to Sallal Prairie, sixty-three miles, for points on the south fork. From the latter point the Snoqualmie Toll Road leads up the south fork to the pass, thirty miles, and trails branch off at short intervals to the various claims. From North Bend to the Everett smelter is ninety-three miles and to the Tacoma smelter 101 miles.

The geology of the Snoqualmie Basin has been little studied, the first attempt to describe it being made by Professor W. H. Ruffner in his "Report on Washington Territory" for the Seattle, Lake Shore & Eastern Railway Company, published in 1889. He says:

"The core of these high ranges (the Cascades) is chiefly rock originally stratified, which has been metamorphosed by heat, and perhaps inside of all, with branches bursting out at various places, are plutonic rocks which have never been stratified. This is the state of things on the top of the Cascade Range near Snoqualmie Pass, as well as on some subordinate peaks and ranges. On Mount Logan, the Denny Mountain, etc., are large bodies of syenitic granite, whose age I have no means of determining. Associated with this are quartzites of fine grain and extremely hard, porphyries and serpentinoid and chloritic rocks of different sorts, in which are imbedded the magnetic iron ores; and also large beds of crystalline limestone, both fine and coarse grained. Crossing these at various angles are veins containing the precious and base metals."

The rocks forming this section are described by a well-informed prospector as granite, gneiss, diorite, talcose slate and chloritic talcose slate, with large dikes of porphyry, and he says that in the contact between these dikes and the talcose slate the mineral ledges are mostly found.

The first mineral discovery in this district of which there is any record was on Denny Mountain, nineteen miles from Sallal Prairie. It is reached by following the Snoqualmie wagon road to a point four miles west of the pass and then taking a trail for one mile. It was made by Arthur A. Denny, father of the City of Seattle, in 1869, from information obtained from the Indians. He went to Snoqualmie Pass in search of plumbago, which he


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Chair Peak.
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Mt. Thompson
Kate's Peak
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Red Mountain.
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Guye's Peak.
Mountain
19
Kendall Peak.
SNOQUALMIE PASS 3010
20
Gold Creek
LAKE KICHELOS
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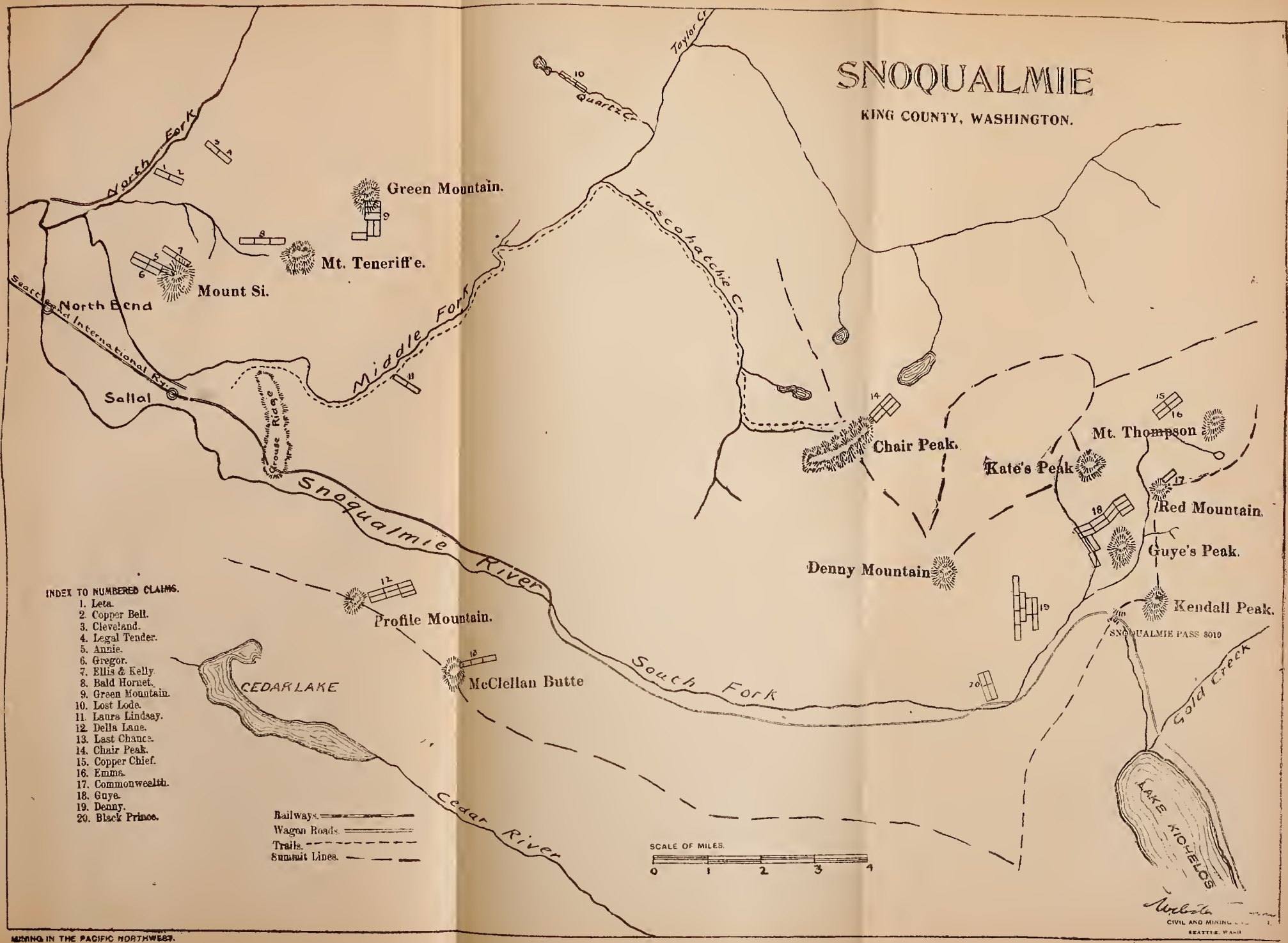
MINING


SNOQUALMIE
KING COUNTY, WASHINGTON.
North Fork
Green Mountain.
Mt. Teneriffe.
Mount Si.
North End
Seattle and International Ry.
Sallal
Middle Fork
Grouse Ridge
Snoqualmie River
Taylor Cr.
Quartz Cr.
Tuscohatchie Cr.
Chair Peak.
Kate's Peak
Mt. Thompson
Red Mountain.
Guye's Peak.
Kendall Peak.
SNOQUALMIE PASS 3010
Denny Mountain
Profile Mountain.
McClellan Butte
CEDAR LAKE
South Fork
Cedar River
Gold Creek
LAKE KICHELOS
INDEX TO NUMBERED CLAIMS.
1. Leta.
2. Copper Bell.
3. Cleveland.
4. Legal Tender.
5. Annie.
6. Gregor.
7. Ellis & Kelly.
8. Bald Hornet.
9. Green Mountain.
10. Lost Lode.
11. Laura Lindsay.
12. Della Lane.
13. Last Chance.
14. Chair Peak.
15. Copper Chief.
16. Emma.
17. Commonwealth.
18. Guye.
19. Denny.
20. Black Prince.
Railways.
Wagon Roads.
Trails.
Summit Lines.
SCALE OF MILES.
0 1 2 3 4
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supposed they used to paint their faces, and, climbing a mountain near the pass, he observed a great streak of iron rust in a gorge on the opposite mountain, which has since been named Denny Mountain. Climbing to it, he found the gorge to be a rift in the side of the mountain, pitching about 40 degrees at its foot. On each side was a vertical cliff about 150 feet high, in which were vertical ledges of magnetic iron about sixty feet wide, large bodies of this mineral being also found on the top of these cliffs. He located several claims, but did nothing to improve them.

In 1882 Mr. Denny, Angus Mackintosh, C. D. Boren, James Taylor and Jeremiah Borst, the last three of whom have since died, went to this mountain to make locations and, on further investigation, found three parallel ledges of the same character. The one first discovered, which crosses Denny Creek at the falls, they named the Denny Lode; another 500 feet south, which is 132 feet wide and stands out in a cliff several hundred feet high, they named the Cliff Lode, and the third, about six feet wide, was called the Climax Lode. They located nine claims, four on the Denny, three on the Cliff and two on the Climax Lode, and Messrs. Denny, Mackintosh and others organized the Denny Iron Mines Company, which still owns the group.

In 1883 about $7,000 was spent in development and patents were obtained. A tunnel was driven 100 feet on the Climax Lode, proving it to be valueless as iron ore, as it carried white arsenical iron. Several thousand tons of ore were blasted from the cliff on the Cliff Lode and tests were made by a number of assayers. Analysis showed it to carry the minimum of sulphur and phosphorus and it was pronounced the best quality of Bessemer ore. It was also subjected to working tests by the Moss Bay Iron Company, of England, which used marble from one of the walls as a flux, and was proved to be free from sulphur and phosphorus. Some surface work was done on the several claims on the Denny Lode, and C. K. Jenner, of Seattle, who had charge of the development, determined that it was of no value for iron on account of the large quantities of sulphur it contained, even on the surface. In 1885 he had an assay made of a piece of peacock copper float, believed to be from the Denny Lode, and it carried $20 gold, $8 silver and 33 per cent. copper. In that year he put a force of men to work on this ledge and, finding a deep snowdrift in the gorge, he tunneled through it to the bottom of the ledge and then drilled into the cliff for a width of fourteen to twenty feet. In doing so he ran through what proved to be an iron capping three or four inches thick into a body of carbonates, copper sulphurets and pyrites. Mr. Jenner took a ton of this ore and had a working test of it made in San Francisco by an assayer, who pronounced it the highest grade of precipitating copper ore. Later in the season of 1885 the members of the company went to the scene and found the snow out of the gorge and that the workings were forty or fifty feet above its bed. In 1890 and 1891 steps were taken towards the mining of the iron ore for smelting at the blast furnace and steel works then under construction at Kirkland, but when that enterprise failed during the panic, work was stopped and has not been resumed.

Another early discovery of iron ore, which may also prove to be only the capping of a body of copper pyrites, is the Guye Iron Mines on Guye's Peak, overlooking Snoqualmie Pass. It is reached by following the wagon road for twenty-five miles from North Bend to a point directly west of the pass and then taking a trail for one and one-half miles. The mountain is formed of porphyry, diorite and quartzite and the ore bodies follow a northeast by southwest course in a formation of porphyry and marble. Near the foot of a cliff on this mountain the body of magnetic iron crops to a width of sixty or seventy feet and has been stripped to a depth of 100 feet, while another cropping is 100 feet deep and 150 feet wide. The ore carries 60 to 72 per cent. metallic iron, with only traces of sulphur and phosphorus, and is pronounced by metallurgists to be first-class Pessemer iron. On the summit of the mountain, 300 feet higher, is a round knoll of similar ore 300 feet long and 100 feet wide, but not as rich in iron. On these several croppings and the extensions of the ledges F. M. Guye, Hon. Thomas Burke, Hon. John Leary, B. F. Briggs and John W. Guye have twelve claims patented.

Another body of what is, on the surface, iron ore is on the six claims owned by F. M. and John W. Guye and known as the Green Mountain group. These are on the mountain between the middle and north forks, six miles from Sallal Prairie. The deposits are red hematite and magnetic iron thirty feet perpendicular and twenty-five feet wide in a formation of porphyritic granite, but they have only been stripped and thus it has not been ascertained whether the ore changes character with depth. The magnetic iron ore carries 69 to 72 per cent. and the hematite 50 to 65 per cent. metallic iron and both are almost free from sulphur and phosphorus.

Yet another similar body of magnetic iron exists on the Chair Peak group of five claims, owned by the Chair Peak Mining Company. Leaving the railroad at Sallal Prairie, one goes by the wagon road up the middle fork to Rushing's ranch and by trail up Tuscohatchie Creek to Chair Peak, so named from its having the form of a great arm-chair. A great cliff of magnetic iron eighty-two feet wide rises from Snow Lake on the east side of the mountain and also crops on the west side. It shows copper in the croppings, and will probably change to copper ore when the capping is pierced. There

are on the same mountain deposits of marble and limestone, but the former has been so shattered by convulsions as to be commercially worthless.

On the next ridge to the east of Chair Peak Lon Jose and others, of North Bend, have a similar surface showing on the Copper Chief group, from which they have run a tunnel 300 feet in the form of a horseshoe, for the purpose of reaching the solid formation, and have shown sulphide ores and some galena. Adjoining this group Victor Penberthy and others have the Emma group, on which a fifty-foot tunnel has shown a body of copper sulphides, and on Red Mountain, to the northeast, J. W. Walrath and Robert Diamond have the Commonwealth, on which a 250-foot tunnel has shown a large body of copper pyrites.

Returning to North Bend, we find a number of claims on Mount Si, the bold shoulder of the ridge dividing the north and middle forks, and on the continuation of that ridge.

On the north fork side of Mount Si, three and one-half miles from North Bend, Fred Ellis and Albert Kelly, of New York, have two claims on a ledge which is said to crop eighty feet wide and in which a seventy-foot tunnel shows a sixteen-inch streak of sulphides with some galena, assays running as high as $20.

On a heavily iron-capped ledge traced up this mountain W. C. Keith, W. H. Clark and F. Henderson have the Annie group of three claims. A fifty-foot tunnel is in sulphide ore and chalcopyrite all the way between well-defined walls pitching 80 degrees, and a seventy-five-foot tunnel is also in ore almost its whole length, while an eight-foot shaft shows the ledge seven feet between walls. An average of several assays is about $28 gold and silver. Another ledge crops on the middle claim, but has not been defined.

On a parallel ledge John B. Gregor has shown similar ore in a sixty-foot tunnel, and in a new tunnel started below it in the fall of 1896, he struck two feet of fine sulphide ore, while further down the mountain he discovered a new ledge containing three feet of ore, which assayed $75 in all values.

The Copper Bell and Leta are new locations by Sherry McElroy, Joseph Sherk, George Sharik and Charles Baxter on what was formerly well known as the Black Jack ledge, two and one-half miles from Sallal Prairie on the north fork. The ledge is a large one, in the contact between granite and gneiss, and carries low-grade concentrating ore in the form of sulphides, which assay about $10 in gold, silver and copper, while four cross ledges, one to four feet wide, carry ore of higher grade, which is free milling on the surface. A tunnel was run 136 feet on a stringer and showed the ore to change from free milling to concentrating. A drift from this tunnel ran forty feet to the left and then ran sixty-eight feet to strike the contact of the main ledge. Another tunnel is in 170 feet on a stringer, 200 feet below, to tap the same ledge. The owners propose to erect a small mill this spring to reduce the free milling ore.

On Mount Teneriffe, about half a mile further up the north fork, W. C. Keith and W. B. Akers have the Cleveland and Legal Tender on a twenty-foot ledge, carrying fine sulphurets of iron and copper, which assay about $40 gold. The ledge has been cross-cut for sixteen feet, and a thirty-foot tunnel follows the pay streak on the hanging wall.

Near the foot of Chair Peak is the Laura Lindsay, one of the oldest locations in the district, now owned by the Bowker brothers. It has a four-foot ledge of sulphide ore in a soft talcose gangue between walls of granite and slate and a 250-foot tunnel shows ore carrying $30 to $40 gold and silver.

On Taylor river, a tributary of the middle fork, Thomas Niles has the Lost Lode, on which an eighty-foot cross-cut has tapped a strong ledge, but has not struck the wall, showing ore well mineralized with gold, silver, lead and molybdenite, generally associated with hornblende.

The Last Chance group of three claims on McClellan Butte is on a true fissure ledge of quartz, carrying pyrites, which has been traced for a mile. Three tunnels, the longest one of which is sixty feet, have shown four feet of ore between strong walls, assaying $7.50 to $45 in gold and silver.

On Profile Mountain, so called from a big cliff which, when seen at a certain angle, forms a perfect profile of George Washington, the Pacific Mining Company has the Della Jane group of seven claims. The ledge is a true fissure two feet wide, as shown in a twenty-foot cross-cut, and carries about $17 free gold in decomposed quartz gangue. Another ledge of the same size and character runs into a porphyry dike and has been opened by a seventy-four-foot tunnel. This company is preparing to resume work this spring.

At the Star Cabin, twenty-six miles from North Bend on the south fork, W. C. Weeks and George W. Tibbetts have the Black Prince group, on which they have done a good amount of work.

The miners along the south and middle fork of the Snoqualmie have organized the Summit Mining District, but it is generally known as the Snoqualmie district, and that name has been adopted to avoid confusion with the Summit District in Pierce County.

SUMMIT.

PIERCE and YAKIMA COUNTIES, WASHINGTON.

INDEX TO NUMBERED CLAIMS.

1. Mascot.
2. Knox.
3. Comet.
4. Frater.
5. Ophir.
6. Fairview.
7. Goodenough.
8. Mammoth.
9. Campbell Group.
10. Hawks.
11. Neptune.
12. Terror.
13. Current.
14. Flora.
15. G. A. R.
16. Black Hawk.
17. White Elephant.
18. White Quail.
19. Viles or Star Group.
20. Little Gem.
21. Mastodon.
22. Blazing Star.
23. Highland Mary.
24. Forrest & Farrell's Group.
25. Cold Spring.
26. Parrot.
27. Forest Queen.
28. Tip Top
29. Emma.
30. Silver Reef.
31. Blue Bell.
32. Crown Point.
33. Warrior's Mask.
34. Dry Spring.
35. Dam Ohio.
36. Gold Spring.
37. Lamson & Cole.
38. Comstock.
39. Lauretta.
40. Gold Finch.
41. Boston.
42. Lady of the Lake.
43. Bonanza.
44. Summit Co.
45. Black Diamond.
46. Bertha Georgie.
47. Holley.
48. Combination.
49. Elizabeth.

Webster Brown
CIVIL AND MINING ENGINEER,
SEATTLE, WASH.

BUENA VISTA.

This district lies along the north fork of the Snoqualmie river and its tributaries and is an extension across the ridge of the Miller and Money Creek districts, having the same characteristics. In fact, many of the principal claims are on extensions of the great ledges of Miller river and Money Creek traced through the ridge to the Snoqualmie side—a striking evidence of the strength and permanence of the mineral bodies of the Cascade Range.

It is only within the last year that much work has been done on the north fork, its distance from the railroad—about twenty-five miles—being an obstacle, though the extension of the road by King County would do much to make it accessible. The route to it is by the Seattle & International Railroad to North Bend, sixty miles from Seattle, then by road for nineteen miles and the remainder of the distance by trail.

A notable instance of the tracing of a series of ledges through a lofty mountain ridge is the Mastodon group of eleven claims, near the head of the north fork. These are on the extension of the Brooklyn series of ledges from Coney Basin in the Miller River district. On one of these work has been continued since June, 1896, having begun on a small scale in the previous year. A shaft is down fifty feet, cutting a ledge ten or twelve feet wide, in which there is three feet of copper sulphurets and galena assaying as high as eighty ounces silver, $20 gold and 29 per cent. copper. The other ledges are of the same character and equally strong. This group is owned by J. M. Sharp, the estate of John Miller and J. L. Warner, of Rossland, B. C.

One mile from this group are the Arizona and Washington, owned by the Arizona Gold Mining Company, which are on the extension of the Money Creek ledges through the ridge, being one and one-half miles from the Apex and one mile from the Brooklyn. The Arizona has an east and west ledge of porphyry forty feet wide between walls of granite which stand up 100 feet perpendicularly on each side and carries a body of copper sulphide ore assaying $35, mostly gold, on the surface. The Washington has a similar ledge fifty feet wide, mineralized throughout and carrying twenty feet of pay ore, being clearly traceable up the face of the cliff. The company has a millsite on two small lakes 400 feet south of the Washington, the outlet of which will furnish water power.

One mile above the mouth of the middle prong of the north fork is the Fletcher Webster group of nine claims owned by Andrew Hemrich, Philo Rutherford and others. The main ledge is eight feet wide in the croppings, but widens at one point to forty feet. An open cross-cut and a forty-foot tunnel show it to be mineralized enough throughout to pay for concentration and to carry four feet of pay ore averaging $32 in gold and silver, from a number of assays. The mineral on the surface is iron sulphides, but changes at depth to galena ore, with increasing value. This change in character is general throughout this district.

On Illinois Creek, a tributary of the main north fork, George A. Pratt and David Rushing have the Belle of Tennessee group of nine claims on a ledge twenty feet wide, showing in the croppings an ore chute forty feet long, carrying $15 gold, $5.60 silver on the surface.

SUMMIT.

Deriving its name from its position on the summit of the Cascade Range among the foothills of Mount Rainier, this district, which was organized in 1891, occupies the northwest corner of Yakima and the eastern part of Pierce counties. On the west it is at the sources of Silver Creek, flowing into White River, and on the east its waters form Morse and Union Creeks, which unite in American River, an affluent of Bumping River, which empties into the Yakima. Accessible alike from the east and west, it has been explored by the people of Tacoma and Buckley on the latter, and of Yakima on the former side, but the western men have the majority of the properties. The country formation is mostly of crystalline eruptive rock, although slate and limestone are to be found. The ledges are large and well mineralized throughout, carrying gold on the surface which has been made free by oxidation, but as depth is attained the ore will probably become base, as in other districts on the Cascades. The ores also carry a small silver value, and galena and iron sulphides are also found associated with the precious metals.

Tacoma is the headquarters of those interested in the district, and Buckley, thirty miles east on the Northern Pacific Railroad, is the outfitting point. Thence a good horse trail leads up White river and Silver

Creek to Gold Hill, at the head of the latter stream, a distance of fifty-five miles. From North Yakima on the east, the district is entered by horse trail sixty-eight miles long, up the Yakima River and its upper tributaries to the summit. A movement is now on foot to construct a wagon road from Buckley to Yakima by way of Greenwater River, White River, Silver Creek, to the Silver Basin, then down the Yakima watershed on the eastern slope. This would reduce the distance from Buckley to Gold Hill to forty miles and the Buckley people have by voluntary effort constructed six miles of it. The state legislature has made a liberal appropriation for an extension from the summit to Yakima.

The first mining in this district of which there is any record was done in 1880-82 on some placer ground near the head of Morse Creek, below the present Comstock Mine. Here H. L. Tucker, George Gibbs and others, of North Yakima, took out good wages, one nugget of $80 having been found, a $7 nugget being taken out last season and $1 nuggets being not uncommon. This mine came into the hands of Robert Fife and others, who lately sold it for $3,000. The first owners of this mine, however, found that somebody had been there before them, for an old cabin stood far up the west fork of White River and some trees on the west side of the east fork of that stream were marked with old blazes.

Led on by float in White River, George M. Brown, Frank W. and George W. Gibbs, of Tacoma, and Thomas and Robert Fife, of Yakima, made the first quartz location in the summer of 1888 on Gold Hill and have since proved them to be among the best in the district. Other claims took up the hill and spread all around it, making it the center of a fast-widening circle of activity. One of their first locations was the Comstock, already mentioned, on which the ledge has not yet been defined, though a pay streak shows the full width of a seventy-foot tunnel and in several open cuts, and has given an average assay of $39.40 gold and silver. This claim, together with thirty-five other quartz claims and one placer claim, is now owned by the Summit Mining and Reduction Company, of Tacoma, which in 1896 purchased it, together with a number of claims on Gold Hill owned by Mrs. Emily Knight, of Tacoma. Much money has been spent on these claims in the way of cutting trails and building cabins, but little has been done to prove the value of the ledges. That they have much merit is shown by the following assays made at the Tacoma smelter from the principal ones:

DESCRIPTION.	Per Ton of 2,000 lbs.		Value Per Ton of 2,000 lbs.
	Ounces Gold.	Ounces Silver.	
Sailor Queen	4.04	44.00	$110 72
Blue Bell	8 per cent	48.30	48 84
Boston	13.20	1.20	264 81
Current	4 per cent	3.60	10 44
Comstock	1.80	5.00	39 40
Blue Grass	2.40	17.60	59 96

This company now controls the ground in the vicinity of Gold Hill and will begin development in the spring.

The Crown Point, a little west of the Comstock, owned by George M. Brown, has a seven-foot ledge in which a thirty-foot tunnel and several open cuts have shown ore averaging $38 gold and silver, though assays have run as high as $60 gold, 6 ounces silver. East of the Comstock Mr. Brown has the Lolette on a four-foot ledge, on which a tunnel has been driven fifteen feet, showing ore which averaged $36 gold. From a four-foot ledge on the Eva he has also obtained assays of 4 ounces gold and 44 ounces silver.

The Fife brothers retained their faith in the district when all others lost heart, and remained at work until late in December, only leaving when supplies ran out and hunger drove them back to civilization. At that time, too, they had no roads, nor even trails, and had to find their way by blazes. Their best group is the Blue Bell of six claims at the head of Union Creek, a mile west of Gold Hill. The Blue Bell ledge itself is on the summit of the range, the ore being in a porphyry dike, with a seam of quartz and a seam of porphyry. All of this carries value, but the quartz assays high in free gold. A roughly constructed arrastre was erected several years ago on Union Creek, below the mine, and has made a run each season. Ten tons of ore was milled last season without any pretense of sorting and a little over eight ounces of amalgam was cleaned up. Robert Fife also has the Elizabeth, on Morse Creek, on which a five-foot ledge has been opened in several places, giving an assay of $72. Mr. Fife and J. J. Armstrong, of Yakima, have run a tunnel twenty-five feet and made several small cross-cuts on a similar ledge on the Morning Star and Bonanza, just below the Comstock.

James A. Farrell and J. R. Forrest, of Tacoma, made their advent in the district in 1891 on a hunting trip, but turned their attention to prospecting

and made a number of valuable discoveries on a mountain spur near the head of Silver Creek, which they named Pick-handle Point. They have done as much as any two men to open up the district. This mountain seems to be transversely cut by numberless narrow but very rich parallel ledges. On the Blue Grouse and Sure Thing there is a network of parallel ledges two to three feet wide, opened by a twenty-foot shaft and numerous cross-cuts. Their first assay was $3 gold, but last year they took out ore running $52 gold and 31 ounces silver. On the Damfino and Dry Spring they have free milling ore which carries $13 gold and 2 ounces silver, and have also some good placer ground on Morse Creek. On this mountain is the Little Gem, owned by Edward Collins, of Buckley, and below it on Silver Creek he and William and Alexander McNicol, of Buckley, have the Collins.

Near the summit of the range, two miles south of Gold Hill, George Sedge, of Yakima, has a group of claims on which he has driven a tunnel 110 feet, exposing ore which averages $33 gold. Below this claim William and Alexander McNicol and M. B. Compton have the Blazing Star on an eight-foot ledge, in which a twenty-five foot shaft and a cross-cut show a three-foot pay streak assaying $190 gold and 10 ounces silver. The Highland, with three and one-half feet of similar ore on the surface, has the same owners. The Evening Star, owned by John Shantz and George Fuller, is on a thirteen-foot ledge, believed to be an extension of the Blazing Star.

In 1894 exploration was extended by E. K. Current and his son, J. B. Current, of Buckley, John Wilkeson and Samuel Fletcher to Crystal Mountain, an extension of the Summit ridge dividing White River on the west from Silver Creek, its tributary, on the east, and rising to an elevation of 8,000 feet. This mountain is formed of gray and purple porphyry, dotted with crystallized feldspar, and is cut by ledges of decomposed porphyritic quartz ranging from twelve to twenty feet in width, carrying free gold on the surface, and assayers pronounce the ore first-class free milling. As in other parts of the district, the gold is chiefly found in the form of fine sulphurets and is free on the surface only through the oxidation of the iron.

One of Mr. Current's groups, comprising nine claims, is owned jointly by him and his brother-in-law, James Gebert, of New Iberia, La., and they have pushed development during the past year. On one of their claims a shaft is down eighty-five feet, showing a fourteen-foot ledge, all pay ore. Assays range from $15 to $103 gold, but the most reliable returns are three mill tests giving an average of $13 free gold. A twenty-foot tunnel on an extension shows the ledge eight feet wide with ore assaying $4 to $28 gold, mostly free. On an immense parallel ledge, of which the walls have not been traced, are three claims. On one of these a forty-five foot cross-cut has shown ore assaying $8.75 to $150 gold and silver, mostly the former. Another has the ledge defined to a width of nine feet, and from a forty-foot tunnel assays of $53 gold and 5 or 6 ounces silver have been obtained. A sixty-five foot tunnel on the third claim showed ore assaying as high as $28 gold. Another claim is on a large ledge of low grade ore, assays from a twenty-five foot tunnel averaging $25. It is intended to erect a stamp mill on this group during the summer.

The Crystal Mountain group, owned by Mr. Current, in conjunction with A. W. Frater and A. W. Hawks, of Everett, comprises five claims south of the Current group and 1,500 feet below it, along Silver Creek. On one of these the ledge is twenty-two feet wide and a ten-foot shaft is down on ore assaying from $10 to $250. Another has a six-foot ledge assaying from $28 to $44, and the others make good showings on the surface. The same parties have some valuable placer ground below these claims, and Messrs. Frater and Hawks have three other claims on the same mountain. It is proposed to erect a stamp mill on this group also during the summer, ditches having been cut and buildings erected in readiness. Despite the great height of the mountain, it will not be difficult to transport machinery over ziz-zag trails up its sides.

Another group of six claims, owned by John Campbell, of Yakima, covers some good-sized ledges on Crystal Mountain, which assay well on the surface, but little work has been done. North of the Crystal Mountain group William H. Dooley, Herbert Rease and John Stone have a group of claims, on one of which a seven-foot ledge has been stripped for eighty feet and shows ore panning well, though no assays have been made. Adjoining the Frater-Current group on the southeast, Mr. Presby, of Goldendale, has the Nell, on which a small amount of development shows good ore, carrying free silver.

Adjoining the Current Group No. 2 the Gold Hill Mining & Milling Company has the King Group of three claims on extensiohs of three of the principal ledges, which are shown by development on other properties and by surface cuts to be three to fifteen feet wide, carrying free gold and some native silver. Assays range from $3 to $50 and average about $12.

Other ledges that have been located near the Current group No. 2, and of somewhat similar formation, are the French, the Thompson, the Ewing, belonging to gentlemen whose names they respectively bear, and the King, owned by E. K. Current, of Buckley, and Dr. Fletcher, of North Yakima. These are all large and prominent ledges.

On the summit, south of Gold Hill, J. A. Viles, W. S. Viles, L. W. Rogers and H. F. Rogers, of North Yakima, have the Star group of four claims on

a contact ledge between granite and slate, and have done considerable development, showing ore which assays from $7 to $60.

The Black Hawk group of three claims, owned by the Northwest Mining Company, lies three miles southwest of Gold Hill, and will begin operations in the spring. On one ledge it has two claims and two tunnels about thirty-five feet each and a third twenty-five feet long are in ore assaying $33 to $101, mostly in free gold. The third claim is as yet undeveloped, but the surface ore pans well. Near this group Thomas Baker, of Goldendale, and Spencer Jacobs, of Yakima, have the McKinley on a seven-foot ledge, which pans well on the surface.

W. J. Knapp, T. J. Sullivan, William Dougherty and Professor Fred Chamberlain, of Buckley, have the Welcome group of four claims on a ledge which averages about four feet in width and assays from $2 to $8 gold, on the east branch of White River.

Messrs. Knapp and Chamberlain are owners of the White Glacier and the Cascade lodes, near the glaciers. In this locality are also the Lone Star, White Fawn and Esther, owned by W. J. and Guy Knapp, the walls of which are thirty-two feet apart, and assay, copper $25, silver 42 ounces and gold $29.70. Together with Professor Chamberlain and Drew Jones they also own the Blue Marmot and the Blue Wednesday, situated between the Crow Creek and Silver Creek Basins. Mr. Knapp has a promising placer claim, which he intends working with sluices next summer, situated very close to the glaciers of the east branch of White River.

William A. Rainey and A. W. Tweedem, of Tacoma, are also on Upper White River and own the Gold Standard group of four claims. In the same vicinity F. C. Brodie and William Hart, of Goldendale, have six claims, from which they have taken good ore.

Late last summer a number of claims were located west of Gold Hill, on which no work has yet been done, but which prospect well on the surface. Chief among these are the Parrot and Forest Queen, owned by George Brown, T. Sullivan and T. L. Baker; the Forest King, owned by Herbert Morris; the Tennis, by A. R. Scott; the Ethel, by W. Froggett, and the Florence and Mahapac, by Charles E. Gregory.

A group of six claims was located along the headwaters of Rattlesnake Creek, on a range of mountains called the Nelson's Peaks, in August, 1894, by F. E. McDougal and S. P. Bennett, of Buckley. The ore carries $20 gold, 16 ounces silver and 2 per cent. copper. P. Henning, John T. Davis and C. B. Talbot, of Tacoma, have covered 220 acres of nickel ore territory, situated twenty-five miles eastward of Buckley and on the lower Green Water River. While these groups are not in the Summit District, they are naturally tributary to it.

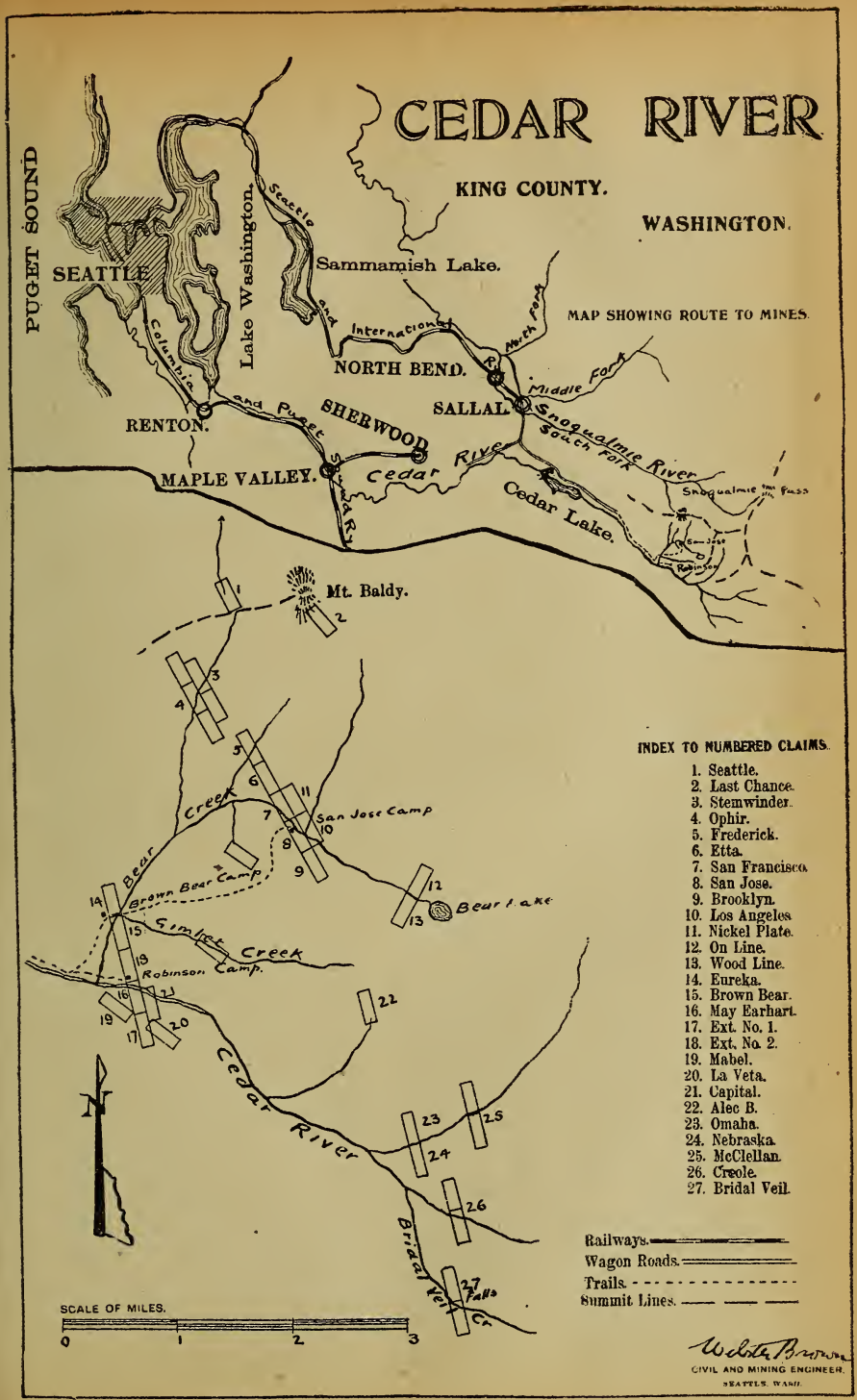
A remarkable discovery comes within the same category, for it is tributary to Tacoma. This is the Vanguard group of four claims in the canyon of the Big Mashell River, one and one-half miles from Eatonville, which is reached by the Mount Rainier wagon road, thirty-two miles from Tacoma. This is a ledge of volcanic cement about 400 feet, running northwest by west and southeast by east between walls of trachyte, the rock being similar to the tufa channels on the Forest Hill Divide in Placer County, California. It shows only sixty feet up the sides of the canyon, being capped with gravel wash from Mount Rainier. Two or three feet below the surface indications of copper appear in the shape of prills, or small grains, of copper. As a shaft, which is down sixteen feet, was sunk it encountered sheets of copper, thin as paper, wherever there were any cracks or seams in the rock, and the proportion of copper has increased 300 per cent. in sinking. This strange deposit is owned by C. P. Topliff, William Foran and Wilbur Todd, of Tacoma, who have bonded it to Spokane parties.

Although the whole of the Summit District was included in the Pacific Reserve in 1892, this fact has not deterred the miners from continuing operations, and they have taken steps to obtain exemptions from interference with their work.

CEDAR RIVER.

This district has peculiar interest for Seattle people, since it is tributary to the Seattle & International Railroad, one of the chief feeders of the city's trade, is at the head of a stream flowing down to that city's suburbs and the mining properties are almost entirely owned in Seattle. The route to it from the city is by the Seattle & International Railroad to North Bend on the Snoqualmie, by a good wagon road to a point six miles below the confluence of Bear Creek with Cedar River and thence by trails, one running up each of those streams. The commissioners of King county propose this season to extend the road to the mouth of Bear Creek, the mining men agreeing to make further extensions to their properties.

The mineral belt is an extension of the granite and syenite formation which has been traced north and south through the backbone of the Cascade


CEDAR RIVER
KING COUNTY.
WASHINGTON.
MAP SHOWING ROUTE TO MINES.
PUGET SOUND
SEATTLE
Lake Washington.
Seattle
Columbia
Sammamish Lake.
3rd International
NORTH BEND.
North Fork
Middle Fork
SALLAL.
Snoqualmie River
South Fork
RENTON.
and Puget
SHERWOOD
MAPLE VALLEY.
Cedar River
Cedar Lake.
Snoqualmie Pass
Mt. Baldy.
INDEX TO NUMBERED CLAIMS.
1. Seattle.
2. Last Chance.
3. Stemwinder.
4. Ophir.
5. Frederick.
6. Etta.
7. San Francisco.
8. San Jose.
9. Brooklyn.
10. Los Angeles.
11. Nickel Plate.
12. On Line.
13. Wood Line.
14. Eureka.
15. Brown Bear.
16. May Earhart.
17. Ext. No. 1.
18. Ext. No. 2.
19. Mabel.
20. La Veta.
21. Capital.
22. Alec B.
23. Omaha.
24. Nebraska.
25. McClellan.
26. Creole.
27. Bridal Veil.
Bear Creek
San Jose Camp
Brown Bear Camp
Bear Lake
Gimlet Creek
Robinson Camp.
Cedar River
Bridal Veil Falls
Railways.
Wagon Roads.
Trails.
Summit Lines.
SCALE OF MILES.
0 1 2 3
Webster Brothers
CIVIL AND MINING ENGINEER.
SEATTLE, WASH.

Range almost the whole width of the state. The course of the ledges is generally northeast and southwest. The original discoveries were iron and copper pyrites carrying gold and silver, but more recently great ledges of free milling quartz have been found to parallel them. Discoveries began in 1891 and have been steadily continued, with the inevitable lull during the panic years, to the present time, and development was prosecuted with renewed vigor during 1896. The principal discoveries were made by E. B. Robinson, P. E. Mills, Harry Earhart, Sherry McElroy, William and James Irving, B. C. Ives, Fred Turner and J. M. Hamilton, the more recent by L. Lewis.

The May Earhart mine, which promises to become the first producer, consists of six claims half a mile up Cedar river from the confluence of Bear Creek, and is owned by the Robinson Mining Company. The ledge has been broken over on the surface, so that it lies almost flat, cropping out on the river bank to a great width under an iron capping, and is in a contact between granite and syenite. The first work done was to sink a shaft, in which the width of the ore was seven feet. As the accumulation of water caused trouble in this shaft, a tunnel was run eighty-nine feet into the hill, on a level with the top of the shaft, and diagonally with the course of the ledge, but over the top of the ore body. This shows the ore body to be fully forty feet wide, with no hanging wall in sight. Work was then resumed on the shaft which is now down forty feet and shows the ledge to have straightened up. The ore is copper and iron sulphides, with a large proportion of silver and copper glance and pockets of bornite, and also contains a large quantity of hornblende carrying gold, the gangue being porphyry, easy to mine. An average of four assays made from samples taken from the dump gave $14.98 gold, twenty-nine ounces silver. At that time the shaft was only down sixteen feet and there were 125 tons on the dump, from which thirty tons could be sorted averaging $100 a ton, the remainder averaging about $30. The shaft has since been sunk to a depth of forty-three feet on the footwall, and is all the way in high-grade ore, which continually improves in quality with depth. Assays made at various times during operation have shown much higher values than those given above, but the company is content to rely upon these moderate results. There are about 200 tons of ore on the dump, of which about one-fourth is of high enough grade to ship. Two claims are on a cross ledge.

The Brown Bear and Eureka, on the north extension of the May Earhart ledge across Bear Creek, are owned by B. C. Ives and others. The ledge cropped out in the sidehill with only four inches of ore on the surface and a two-inch stringer twenty feet distant, which is making for the ledge. A twenty-foot shaft showed the main pay streak to widen to sixteen inches, and a ten-foot shaft on the feeder showed it to widen to eight inches, the ore being of the same character in every respect as that taken from the May Earhart shaft.

A short distance further up Cedar River are the Woodline and Online, owned by E. B. Robinson and John Curry, on a thirty-foot ledge containing several streaks of sulphides. From a small shaft ore assaying about $30 gold and 14 per cent. copper has been taken.

The most development work in the district has been done on the San Jose group, now owned by T. F. Townsley and others, and perseverance in the face of many discouragements has been rewarded by the discovery of a large body of ore in the last tunnel. The main ledge crops out on the right bank of the creek, and running across, shows up again on the other side and runs up the mountain diagonally from the left bank, with a blow-out on the right bank. The ledge matter is porphyry and is forty feet wide where it shows up in the solid granite formation, and the ore carries iron and copper sulphides, black oxide of copper carrying gold and silver. The course of the ledge is about northwest and southeast, with a pitch of 65 degrees east.

The first work done was a cross-cut 300 feet through the granite on the left bank, showing one ore body eight feet wide and a number of stringers, ranging from one to eight inches. A shaft was sunk thirty-four feet on the eight-foot ore body, and a stope was raised thirty feet from the tunnel immediately above the shaft. Assays of this ore averaged $9 to $12 gold, silver and copper, and a badly sorted shipment of ten tons made in 1894 returned $12 a ton from the smelter. A shaft was then sunk on the solid cropping to a depth of twenty feet, but proved not to be in the pay chute and was abandoned. A cross-cut was next started on the left bank and continued for 180 feet, cutting through about forty feet of ore in a broken formation, which carried $2 to $5 gold and would concentrate forty to one. A short tunnel was started further up the creek, with a view to following a stringer eight to ten inches wide into the main ledge, and in this ore was struck averaging $30 to $40 for all values. The following year a cross-cut was started on the San Jose with a view to striking the ledge, but after it had been run 300 feet work upon it was suspended, as the croppings on the creek proved to be in a slide which had crushed the ledge matter nearest the surface. This fact, too, had misled the owners as to the strike of the ledge. The proximity of the main ore body was evidenced by the fact that the tunnel cut seven or eight stringers, from four to eighteen inches wide, the lowest assay from which was $22 for all values, while an eighteen-inch stringer showed an average of $60 for all values, including 27 per cent. copper. A shaft was then

sunk on the mountain above, where the stringer was supposed to run into the ledge, and the junction was found in a broken formation. A tunnel was started immediately below this, and at the end of thirty-four feet entered a broken ledge of talc and crushed quartz, highly mineralized with pyrites of iron and copper, chalcopyrite and pockets of bornite. It was continued for 180 feet through this broken ledge matter, with frequent large bodies of chalcopyrite ore, and then ran into an unbroken ledge and continued along the wall for fifteen feet. The gangue in this ledge is porphyritic quartz containing patches of white quartz and some calc-spar, and is fairly well mineralized with iron pyrites and some chalcopyrite. The depth now gained is seventy-five feet and the tunnel will be continued along the wall, gaining depth rapidly. The general run of the ore in this property will well pay for concentration, and much of it is of high enough grade to pay for smelting, whenever the road is extended to the mine.

The free milling quartz claims located by L. Lewis last year are also owned by Mr. Townsley and his associates, and, though no work has yet been done, the surface showing is so large and strong that development may prove them to eclipse the San Jose group in value, with the further advantage that they are evidently in the solid formation. The Ophir and two extensions are on a ledge, or rather dike, cropping in a great bluff up the mountain side, half a mile from and parallel with the San Jose ledge. The rock is quartz, carrying feldspar, and in many places highly crystallized, and the dike is fully sixty feet wide. Several pieces knocked off the surface at various points across the ledge gave an assay of eighteen ounces of gold and seven ounces silver. The Stemwinder and an extension are on a similar ledge, cropping to a width of at least 100 feet in two gulches which it crosses, only a few hundred feet from the Ophir ledge. Further up the same mountain a solid mass of the same kind of ore is exposed, 400x200 feet, on which the Seattle is located. This season's prospecting on these deposits will show the amount and value of the pay ore they carry, but they are certainly promising prospects.

The Christina ledge, further up Bear Creek, below Bear Lake, is of good width, as yet undetermined, and is in a broken formation; but a tunnel driven fifteen feet on it shows ore all the way, with one wall of slate, from which great cubes of quartz are taken. The ore carries copper pyrites and gold, but, unlike the other ledges, contains no hornblende. Assays show $6 to $30 gold, 15 to 20 per cent. copper, one giving as much as 75 per cent. copper.

The Bridal Veil, owned by Sherry McElroy and William Irving, has a ledge cropping out under Bridal Veil falls, two miles above the May Earhart. The croppings show oxidized iron to a width of sixty feet, and a 100-foot tunnel on the ledge is in white quartz carrying iron and copper sulphides, assaying from $6 to $12 gold and silver, besides copper. Below this ledge is a parallel one, on which the same parties have the Oriole. They have driven a tunnel 200 feet on a syenite wall, with ore the whole width, assaying $7 to $15 gold, and have not cross-cut to the footwall.

Above the Bridal Veil Joseph Linz has the Victoria on a four-foot ledge, carrying gold and copper and assaying $31 for all values.

The Last Chance, on a ledge cut by the river above the Victoria, is owned by Fred Damburrat and Michael Wise. They have about six inches of sulphide ore, carrying $38.50 gold and copper on the surface.

The route followed by the wagon road from North Bend would be a good one for a railroad, for the pass over the divide from the Snoqualmie south fork to Cedar Lake is low, with a plateau of considerable width on the summit, and beyond Cedar Lake the difficulties are not great, nor expensive to overcome. The Columbia & Puget Sound Railroad might also be extended up Cedar River without great difficulty, whenever the development of the district promises enough traffic to offer an inducement.

ST HELENS.

The St. Helens Mining District is among the foothills of Mount St. Helens, one of the great peaks of the Cascade Range, near the southern boundary of Washington, and comprises an area of about 1,000 square miles in the middle ground marked off by the three great extinct volcanoes—Mounts Rainier, Adams and St. Helens—although exploration has not extended much beyond the region north of Mount St. Helens. The route to this district from Seattle is by the Northern Pacific Railroad to Winlock Station, 108 miles, thence by stage to Toledo, six miles, where parties outfit for the mountains. From Toledo a road runs up the Toutle River about twenty-six miles to the confluence of the north and middle forks. From this point two trails diverge, one up the north fork to Samson's, the other up the middle fork via Spirit Lake to the St. Helens group, the distance in each case being about thirty miles. Another trail leads up the Cispus River and Quartz Creek. The

ST. HELENS

LEWIS, COWLITZ and SKAMANIA COUNTIES. WASHINGTON.

INDEX TO CLAIMS.

1. Great Eastern.
2. Mountain King.
3. Mountain Queen.
4. Toledo.
5. Last Hope.
6. Black Falls.
7. Germania.
8. War Eagle.
9. Tip Top.
10. Golconda.
11. Cinderella.
12. Ironclad.
13. Grizzly.
14. Green River.
15. Venus.
16. Crystal.
17. Minnie Alice.
18. Athens.
19. Peter Jackson.
20. Norway.
21. Sweden.
22. Mount Rainier.
23. Chicago.
24. Cristobel.
25. Mountain Fairy.
26. Mary.
27. Jack Pot.
28. Royal Flush.
29. Jumbo.
30. Eureka.
31. Good Hope.
32. Morning Sun.
33. California.
34. Argo.
35. Copper Bottom.
36. Bumble Bee.
37. Wisconsin.
38. Goat Crag.
39. Cispus Group.
40. Gladys.
41. Mammoth.
42. Ozark.
43. Union Basin Group.
44. Mount Hood.
45. Samson Group.

Walter Brown
CIVIL AND MINING ENGINEER.
SEATTLE, WASH.

opening up of the country is due mainly to the prospectors and settlers, who found it a pathless jungle.

There are evidences, however, that in the 50's California gold-hunters had visited the region in search of placer gold, and that the Indians had dug out the bright crystals of pyrites from the mineral croppings. About ten years ago W. W. O'Connor, of Toledo, discovered placer gold on the middle fork of the Toutle and worked it for several years, but, despairing of securing means of transportation, abandoned his claims. In 1889 K. Ludloff, of Toledo, was sent up into the mountains by the Northern Pacific Land Department to report on the resources of the country, and on the banks of the North Toutle, near the mouth of Devil's Creek, found a piece of gold-bearing copper ore hanging to a piece of syenite. No attempt was made to follow up the discovery for some time, but it ultimately induced a Mr. Witt, of Oregon, Peter Koontz, a hotelkeeper of Toledo, and Ed Burbee, a merchant of that town, to go into the wilderness. They returned for several succeeding years, but kept silent about their discoveries until others had penetrated the district, when they made a number of locations. In the meantime settlement had extended into the foothills and lower valleys of the North Toutle, the newcomers being mostly Swedes and Germans, and they cut trails and opened the way into the mountains.

The credit of making the mineral wealth of the district known to the world belongs to W. W. O'Connor, Robert Brown and A. Hoofer, who went up the North Toutle in the spring of 1892 and made several good locations on the main spurs of St. Helens. They were followed in a few weeks by Al Maker, Mr. Duffy and others, of Chehalis. Some excitement followed and, the ledges being of large size and carrying gold, silver and copper, extravagant expectations were indulged by those unfamiliar with the character of the ore. When they learned that it was refractory and could not be treated by the crude processes applicable to free milling ore, enthusiasm cooled somewhat, but prospecting continued and proved the district to abound in copper ore, rich in gold and silver. The prospectors helped themselves before seeking the aid of others, and have enlisted Eastern capital to some extent in the work of development, the principal investments coming from Milwaukee.

The country rock of the higher altitudes is gneiss and schist, but in various localities porphyry occurs in dikes and overflows. The ore bodies are many and large, as shown by the comparatively little development which has been judiciously done, and are equal to those of any other district in the Cascades. The mineral belt extends through all the mountain spurs of the district, but the ore of each locality has its peculiar characteristics. That of the Samson group differs from that of nearly every other locality, while on the upper North Toutle the ore is in true fissure veins of quartz averaging about five feet in width and carrying much iron sulphide, with frequent occurrences of black sulphurets, and copper in many combinations. This locality, however, has but little development. The Black Mountain Belt has well-defined fissure veins carrying iron pyrites, of which assays average $20 gold, $30 silver. The Shovel Lake country has an altitude of about 3,000 feet above the valley, crater lakes being an evidence of great volcanic disturbance. Some fine fissure veins have been opened, showing ore which carries sulphurets and magnetic iron and assays about $70 gold, silver and copper. The Spirit Lake Belt is in a formation which gives evidence of great volcanic action. Very limited development has shown bodies of ore carrying arseno-pyrite, iron pyrites and in some ledges copper pyrites, all bearing gold. On Mining Creek, where the first discoveries were made, development has in every instance shown marked improvement in the ore, which carries copper, gold and silver, with copper predominating, and some galena, assays ranging from $2 to $20 gold.

The Samson group comprises eighteen claims and one tunnel site on the upper North Toutle, near Ludloff's Pass, on the south slope of the Goat Mountain Range. The whole mountain, about 3,500 feet high, is mineralized with pyrites. On the Samson is a deposit so large that $8,000 expended in development has not yet defined its extent. A tunnel has been run 190 feet, a cross-cut 103 feet and a shaft sunk thirty-seven feet at the bottom of a gulch, which is 100 feet deep. This shows a mass of talcose matter carrying iron and copper pyrites, gray copper, traces of galena and native copper, assays of which run as high as $10 gold, several dollars silver, $60 copper. A new tunnel has been started at greater depth. In one of the quartzite ledges were found pockets six feet high, four feet wide and eight feet deep, lined thickly with cubes of iron pyrites, quite regular and often as large as a man's hand. The discovery was made in a gulch, and at the foot of the mountain the decomposed ore, mixed with pulverized pumice stone and sand, has been deposited to a depth of twenty feet. This deposit assays $4 to $6 gold and is held as placer ground.

The Golconda group, southeast of the Samson, includes two claims and a tunnel site, covering a body of ore in talcose slate and quartzite, of which assays run as high as $30 gold. A sixty-foot cross-cut shows ore the whole distance similar to the Samson.

The Sweden and Norway group, comprising four claims on the northeast end of Spirit Lake, are on true fissure veins with well-defined walls. A thirty-

foot tunnel showed rich copper ore carrying $5 gold, and the ore shows continuous improvement. Some fifteen test pits around the lake show good ore.

On the divide between the heads of the North Toutle and Lewis Rivers veins of free milling gold quartz were discovered last fall, one of them containing red ore similar to that of Cripple Creek.

The St. Helens Gold Mining Company, of Milwaukee, owns two groups of claims on Mining Creek, on which it has established a camp and done a large amount of prospecting, preliminary to vigorous work this season. The Minnie Alice lode embraces four well-defined veins between syenite walls, all pointing to one center, which will be reached by a 300-foot tunnel at a depth of 100 feet. A tunnel for this purpose has been run forty feet. Each of these veins has its distinctive characteristics. One has quartz gangue carrying much copper and iron oxides, and some copper and iron pyrites; another is much decomposed and stained with copper and iron; another has heavy spar gangue carrying argentiferous galena.

A mile further up Mining Creek this company owns the Athens group of ten claims, on each of which prospecting has been done. On the Copper Bottom a tunnel has been started and a shaft sunk eleven feet, showing very fine copper ore carrying gold, silver and some lead. On the Bumble Bee a twenty-foot shaft shows a well-defined fissure vein four and one-half feet wide, with eight and ten inch pay streaks carrying copper, galena, much iron pyrites and some blende. On the Wisconsin a shaft is down six feet, showing three feet of iron pyrites and arseno-pyrite. A twelve-foot shaft on the Snowflake shows three and one-half feet of ore carrying galena and some blende. A four-foot ledge on the Black Hornet carries iron and copper pyrites. All these claims will probably be developed by a tunnel about 2,000 feet long, which would tap the main group at a depth of 600 feet and from that point would gain foot for foot in depth.

Near the head of the North Toutle, five miles south of the Samson, A. Hoofer, T. W. Shultz and Victor Carlson have the Chicago, on which a twenty-foot open cut shows a ledge twelve to fourteen feet wide between syenite walls with six to seven feet of solid copper ore, native copper showing in bunches throughout.

The Mountain Fairy, owned by the Bennett sisters; the Mary, Jackpot, Royal Flush, Transvaal and Mount Hood, are in the vicinity of the Chicago and are nearly all of the same character. These claims are mostly new discoveries, with little development, but the Mountain Fairy shows a fine body of ore.

The Toledo group consists of six claims, owned by Charles and Joseph Schmand, E. C. Weiler and J. H. Spangler, on the North Toutle five miles west of Camp Samson. On the Toledo tunnels sixty and twelve feet long show a five-foot ledge carrying iron and copper pyrites. A tunnel on the Bonanza shows a ledge averaging two feet, with eight inches of galena and iron pyrites. On the Carbonate a cross-cut tunnel has been started to tap the ledge at a depth of 120 feet. The Last Hope shows a body of pyritic ore about 100 feet wide, carrying some copper, on which a tunnel is in twelve feet. On the Cinnabar a shaft is down twelve feet on similar ore, but the width of the ledge is not defined. A sixty-foot tunnel on the Star shows two feet of ore.

On Grizzly Creek, two miles south of Camp Samson, is the Grizzly, owned by J. W. and Gertie Shultz. A twenty-foot tunnel shows a well-defined ledge of heavily mineralized quartz six to seven feet wide.

Messrs. Koontz, Witt and Burbee have sunk a shaft thirty-six feet on the Crystal and done considerable work on the Black Falls, showing good bodies of copper ore.

The Polar Star, owned by W. Gray, Thomas Gray and James Pyron, is one of the best copper properties, assaying as high as $30 and $40 in gold alone. Frank Thorne and James Pyron have fine prospects on the Cross Lode and Kentucky Belle, assays running about $55 silver. Many other prospects have good surface showings.

The district is now comparatively accessible through the opening of about 150 miles of pony trail with easy grade, including the three main trails already described. Two packtrains are running regularly, one up the North Toutle, the other up the Cispus and Quartz Creek. The development of this district will ere long justify the construction of a branch railroad, which would also draw much traffic from the opening of the coal fields in the foothills.

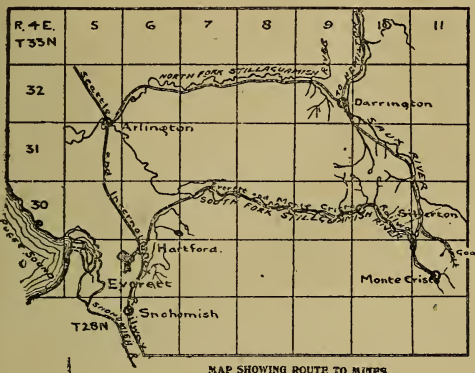
WHITE HORSE.

The whole watershed of the north fork of the Stillaguamish River, covering a strip from Arlington, at the confluence of the forks of that stream, including White Horse Mountain, on which the north fork has its source, and extending over to the Sauk River near Darrington, is comprised within an unorganized district. Like the adjoining districts on the north and south,

WHITE HORSE

SNOHOMISH COUNTY

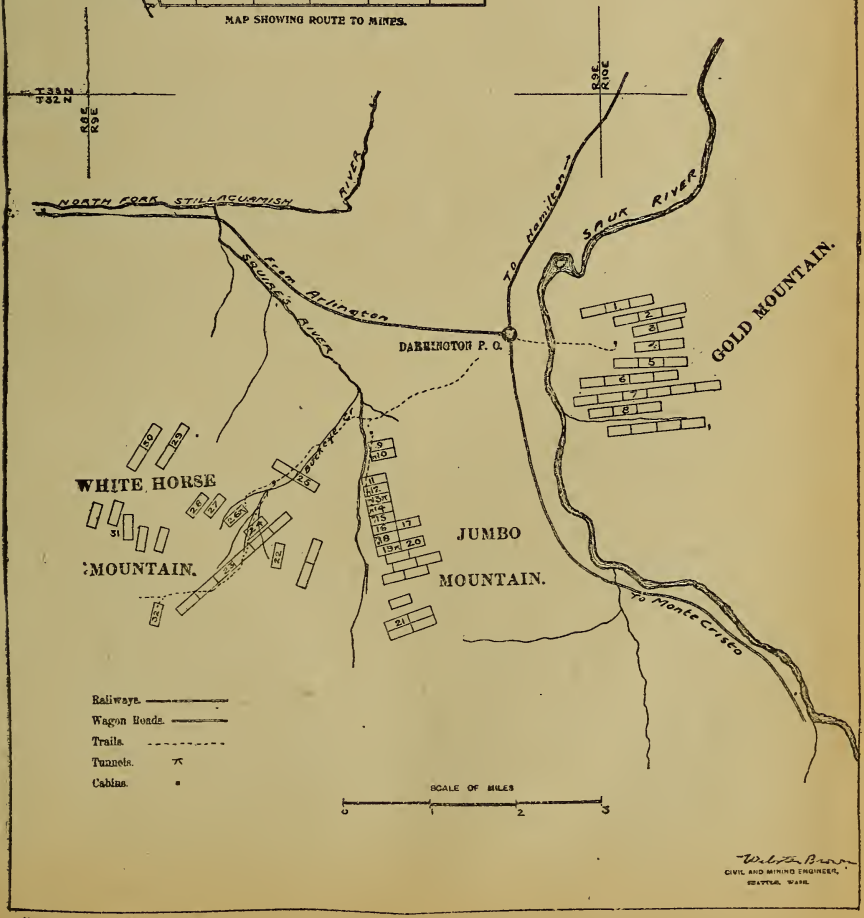
WASHINGTON



MAP SHOWING ROUTE TO MINES.

INDEX TO NUMBERED CLAIMS.

1. Burns Group.
2. Moline.
3. North Pole.
4. Forest Hope.
5. Hornet.
6. Bon-Ton.
7. Myrtle C.
8. Justin.
9. Last Chance.
10. Darrington.
11. Western Union.
12. Courtney.
13. Manley.
14. Pelican.
15. Key Winder.
16. Howard.
17. Rose.
18. White Gander.
19. Hunter.
20. Lone Star.
21. Smith & Armstrong.
22. Highland.
23. Hannah.
24. Jessie.
25. Arthur.
26. Buckeye.
27. Red Cloud.
28. Bon Ton.
29. Wellman.
30. Schloman.
31. Moran's.
32. Green Crown.



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it has granite and porphyry as the country rock, with frequent belts of slate, this formation being cut by numerous ledges of iron and copper pyrites and arsenical iron, of great strength and traceable over the mountains for great distances. One of these ledges, forming the backbone of White Horse Mountain, is fully 100 feet wide and is richly mineralized with copper pyrites, and on Gold Mountain, near Darrington, a dike of cinnabar carrying quicksilver has recently been discovered. These properties are generally in the hands of the original locators and only a limited amount of development has been done on them, but it has usually made good showings, sufficient to warrant further exploration of the ore bodies.

The White Horse District is easily accessible from Seattle. The outfitting point is Arlington, on the Seattle & International Railroad, sixty miles from Seattle. Thence a county road leads up the north fork to the headwaters and over the ridge to Darrington, a distance of twenty-eight miles; another road leads down the Sauk to Sauk City at its mouth, twenty-six miles, and another up that river to Monte Cristo, at the head of its south fork, twenty-seven miles. Thus the district is quite accessible from several directions, and the Sauk City road is a good one, teams having hauled 3,300 pounds over it. It is also within easy reach of a smelter, Arlington being only thirty-four miles distant by rail from Everett and 108 miles from Tacoma.

This mineral belt begins about four miles east of Arlington. As was the case with most mining districts in the Cascades, the first prospecting was done for placer gold. Some pay dirt was found in clay benches and bars along Deer Creek, which enters the north fork from the north about twelve miles east of Arlington, and an attempt was made to reduce it to a condition for washing, but the process was too slow and the attempt was abandoned, as cradle rocking and sluicing were out of the question.

The presence of float in the Stillaguamish first led to prospecting for quartz ledges six years ago, when the Welman, on White Horse Mountain, was discovered by Charles Welman and Victor Thorp. It has a fourteen-inch ledge of sulphurets carrying $94 gold. Aroused by this discovery, the prospectors pushed their explorations, and the Schloman ledge, carrying three feet of iron and copper sulphides, was located in 1892. A twenty-seven foot tunnel on this ledge has shown ore assaying $27.70 gold, $9.80 silver, and a mill test showed $17.75 gold, $7 silver, $5.60 copper, a total of $30.35.

Meanwhile Charles Burns, Knute Neste and Soren Bergersen had in May, 1890, made a number of discoveries on Jumbo Mountain. The country rock is here syenite and quartzite cut by serpentine dikes. The two Hunter claims are on a true fissure ledge running a little south of east and north of west, three feet wide and having on the walls a nine-inch pay streak of sulphide ore carrying gold and silver near the summit. A thirty-foot tunnel 1,500 feet below the summit shows galena, gold and silver, assaying $20 gold, 8 to 40 ounces silver, 10 per cent. copper and 4 per cent. lead. The White Gander ledge, which is considered the best on this mountain, and on which A. H. Andrews, of Toledo, Ohio, has two claims, carries three feet of solid ore, arsenical iron and copper pyrites carrying gold and silver. Three claims on two parallel ledges complete this group. On the Pelican ledge a twelve-foot tunnel shows twelve inches of white arsenical iron carrying $12 gold. On the Keywinder a seventy-five foot tunnel 1,500 feet below the summit shows three feet of quartz carrying copper sulphides with gold and silver. A ten-foot tunnel on the Courtney shows a three-foot ledge carrying $8.50 gold, 14 per cent. copper, 15 ounces silver and 4 per cent. lead. On the Manley a 130-foot tunnel 800 feet below the summit shows a thirty-six inch streak of copper pyrites carrying $8 gold, though copper is the predominant value. A tunnel has been started 600 feet lower, showing the same width of ore between well-defined walls of quartzite.

What appears to be the mother lode of White Horse Mountain was discovered by Charles Burns in July, 1895, and is covered by the Hannah group of five claims, owned by Albert H. Andrews, of Ohio, Knute Neste and Soren Bergersen. It cuts the granite formation for over two miles, for which distance it can be traced to the almost uniform width of three feet, as appears whenever openings have ben made on it. For the whole width it is solid ore, assaying $19.85 gold, 41 ounces silver, 30 per cent. copper. Adjoining the Hannah ledge on the east is the Highland group of five claims, owned by Messrs. Andrews and Neste, showing eighteen inches of similar ore, assaying $20 gold, 15 to 40 ounces silver, 18 per cent. copper. The Jesse shows nine to eighteen inches of pay ore carrying the same minerals.

In the Buckeye ledge, extending through two claims, Messrs. Tvete and Johnson, of Arlington, Knute Neste and A. H. Andrews have a small pay streak on the surface and in a nine-foot tunnel on the Buckeye Basin 2,500 feet below the summit, where silver is the predominating value.

The Green Crown ledge runs north and south through two claims and forms the backbone of White Horse Mountain. It is about 100 feet wide, with numerous stringers of blackish quartz about ten inches thick, and is so rich in copper pyrites that a blowpipe test leaves a button of pure copper one-fourth the size of the original piece of ore. Assays run about $100 gold, 32 ounces silver, 26 to 42 per cent. copper.

The most recent valuable discovery in this district was made in July, 1895,

by Charles Burns on Gold Mountain, on the east bank of the Sauk River, within half a mile of Darrington Postoffice. All the claims on this mountain are owned by Mr. Andrews, with the exception of two.

There are three main groups on this mountain, chief among them being the Gold Mountain group of eight claims. Three of these are on the Burns ledge, which is readily traceable over the summit and down the east side, showing four feet of ore carrying $26.65 gold, 8 ounces silver, 18 per cent. copper. On the Moline ledge are three claims, which have an eighteen-inch streak of chalcopyrite carrying $18 to $36 gold, 14 ounces silver, 32 per cent. copper. The two other claims in this group are on a ledge showing three feet of gray copper ore which carries $20 gold and a trace of silver. The mineral has broken through the capping in many places on all these ledges and crops for several hundred feet. The side of the mountain is covered with float, some pieces weighing a ton or more.

The Myrtle C. group consists of nine claims on seven parallel ledges. Three claims are on a ledge showing a nine-inch pay streak of gray copper ore on the surface, an assay of which ran $20 gold, 26 per cent. copper, a trace of silver. Another string of three has a twelve-inch streak of copper pyrites carrying $26 gold, 18 per cent. copper. The other three claims have a three-foot vein of gray copper ore on the north line; a six-foot ledge of solid chalcopyrite carrying $18 gold, 18 ounces silver, 30 per cent. copper, lies seventy-five feet to the southward; a ledge carrying nine inches to three feet of gray copper ore runs along the center of the string of claims. On the south side of these claims are two other ledges of gray copper ore, each carrying a three-foot pay streak, beside which there are bodies of reddish quartz ten to twelve feet wide, carrying $8 to $12 gold. On the north of some of the pay streaks is a body of cinnabar, heavily charged with quicksilver, and showing free gold to the naked eye. Assays on the whole group range from $8 to $26 gold, 8 to 41 ounces silver, 18 to 32 per cent copper.

The Justin group of three claims is on the southeast side of the mountain and has a ledge showing twelve feet of red iron capping 2,000 feet down the side and three feet of gray copper ore at the summit, carrying about the same value as the other groups. On the Forest Hope ledge, where Stacy B. Emens owns two and Mr. Andrews one claim, there is eight feet of ore cropping for 1,000 feet. About 500 feet below the summit it splits into three ledges, four, five and six feet wide respectively. About twenty assays have been made, ranging from $6 to $36 gold, 8 to 41 ounces silver, 10 to 18 per cent. copper. On the north wall of this streak of mineral lies a dike of cinnabar from which, it is said, one can break a piece and, holding one's hand under it, can catch enough quicksilver to fill the palm. The ledge has been prospected by nature so thoroughly that a small amount of labor would give vast bodies of ore in sight.

Gold Mountain has one peculiarity which gives it a great advantage for mining purposes, in that it faces towards the southwest and thus catches the full force of the warm ocean winds from that direction. This melts the snow from its whole slope as early as from the valleys and prevents such a depth of snow as will interfere with traffic or mining operations.

THE SKAGIT COPPER BELT.

One of the most notable discoveries of the past year was that the great gold-bearing belt of copper ore, which is being worked in the Coast district of British Columbia on the north and in the Silverton, Sultan, Index, Money Creek and Cedar River Districts on the south, crops out in the foothills of the Cascade Range for miles along the Skagit River. The presence of the capping of magnetic iron has been known for years and has led to the erroneous impression that this mineral ran down into the earth, but only recently has it been proved that it was merely the capping of the copper ores similar in character to those of Trail Creek, Boundary Creek, the Kettle River District of the Colville Reservation, the Silverton, Sultan, Index and other districts west of the Cascade summit.

This district has the advantage of being easily accessible and of having the mineral deposits at so low an elevation that snow rarely lies any length of time and work can be continued without difficulty the year round. The principal discoveries are on what is known as Iron Mountain, on the south bank of the Skagit River, opposite the town of Hamilton, but prospecting has rapidly traced the belt, even in midwinter, along the foothills to Marble Mount and up the Sauk River. Hamilton is the eastern terminus of the Seattle & Northern Railroad, and is distant only ninety-four miles by that road, and the Seattle & International road from Seattle, while the former road extends to tide water at Anacortes, thirty-four miles west, and the latter connects with the Everett & Monte Cristo Railroad at Snohomish. Thus a haul of sixty-eight miles would take the ore to the smelter at Everett, and 135 miles to that at Tacoma. The Skagit River is navigable for good-sized steamers as far as Hamilton, and for light-draft steamers as far as Portage,

forty-two miles further and eight miles above Marble Mount. The ore from Iron Mountain could be dumped almost from the mines on board steamers, which would take it by water to the smelter at very low rates. With both railroad and steamer transportation at its doors, the district has every opportunity of rapid development.

Iron Mountain, the scene of the principal discoveries, is also the scene of the most active development. It is the easterly one of two rounded peaks rising 2,500 feet above the river and 2,800 feet above the sea, almost directly from the south bank of the Skagit, opposite Hamilton, Cumberland Creek flowing between them. The more westely of the two peaks is known as Coal Mountain, its geological formation being entirely different from that of Iron Mountain. It is of sandstone and contains numerous veins of coal, hence its name. Iron Mountain and the country six miles eastward, as far as Birdsview, is formed of schist and diorite, which is cut off near the latter place by the granitic rocks of which the main trunk of the Cascade Range is built. This belt is cut by ledges of copper pyrites, carrying gold and a little silver, in a course 22 degrees south of east and north of west, with a dip to the southwest.

The first mineral was discovered on Iron Mountain in 1881 by J. J. Connor, whose attention was concentrated on iron ore. He found magnetic iron on the surface of the Mabel claim and brought it to Seattle to be tested. He obtained a button so thickly coated with copper that he at first thought it was entirely composed of that metal. He then had assays made which showed the ore to carry 4.80 per cent. copper, 35 per cent. magnetic iron, 4½ ounces silver and a trace of gold. Considering the ore of too low grade to work for gold, silver and copper, and having his mind fastened on iron, he continued his explorations in search of richer iron ore. He discovered the Tacoma ledge in 1887 and shipped twenty tons from the surface to the Irondale smelter, near Port Townsend, but in the course of his mining he again struck iron and copper sulphides carrying gold. Still bent upon having an iron mine, he avoided this point also in his search for mineral.

Others made the same mistake, for W. D. O'Toole, now register of the United States Land Office at Seattle, patented seven claims in the same vicinity. L. F. Menage, of Minneapolis, obtained patents to 900 acres, organized the Puget Sound Iron Company, and in 1890 and 1891 spent a large amount of money on surface prospecting, but only gained slight depth. Thus the true nature of the mineral remained a mystery, for Mr. Menage failed in the panic of 1893 and his operations on Puget Sound came to an end. These deposits of magnetic iron were the subject of frequent comment and gave rise to the belief that they might be made the basis of a great iron and steel industry on Puget Sound.

These discoveries long ante-dated the similar discoveries in the Trail and Boundary Creek Districts of British Columbia, but it remained for the latter districts, through the pluck and persistence of a coterie of Spokane lawyers, to prove the wealth concealed beneath the capping. Mining experts have examined the Skagit deposits and made learned reports on them as iron deposits. Other experts examined the capping of magnetic and oxidized iron on the ledges of Trail Creek and declared them worthless as gold mines. Development has proved them to have been wrong in both cases and they have since been occupied in revising their opinions to fit the newly discovered facts.

The credit of the discovery of the true nature of the Skagit mineral belt belongs to E. C. Strong, a miner of long experience in Colorado, who now resides at Hamilton. In October, 1896, he visited another supposed iron deposit in the Cleveland group, on Mount Cleveland, Money Creek District, and found that in prospecting those claims Peter Olsen had uncovered a clearly defined ledge of iron and copper pyrites on the side of the mountain. He examined the capping and found it similar to that of the Skagit ledges. On his return to Hamilton he questioned Mr. Connor on the subject of indications of copper and the information he thus obtained confirmed his opinion. Further confirmation was furnished by an examination of the croppings and he then prospected systematically for copper signs. He sank a shaft by contract with the owners of the Everett claim and at slight depth ran through the magnetic iron into copper sulphides, thus proving finally the correctness of his theory that the magnetic iron was merely a capping. Assays have since proved that the ore is valuable for gold, silver and copper. The highest obtained from the surface was 20 per cent. copper, ½ ounce gold, 6 ounces silver, the aggregate value being $44.

The news of this discovery caused a general renewal of activity and attracted numbers of prospectors, who have traced the copper belt along the Skagit foothills beyond Marble Mount and southeast for fifteen miles up the Sauk Valley, fully 150 new locations having been made. After years of neglect, the district is at last in a fair way to be developed and the prospect is that several camps will be opened this spring.

Iron Mountain, the scene of the discovery, is veined throughout with great ledges of the character already described, ranging in width from eight to thirty feet, with chutes of ore ranging from 100 to 300 feet long. The Everett, on which Mr. Strong made his notable discovery, is owned by W. M. Mackintosh and Dr. G. B. McCulloch, and has a ten-foot ledge on which the shaft

is just beginning to show the change from magnetic iron to copper pyrites.

The most vigorous development is in progress on the Hamilton group of five claims, owned by the Hamilton Copper and Gold Mining Company. Four of these claims are on one ledge varying from eight to thirty feet in width, while the fifth shows croppings six feet wide. Six men are sinking a shaft on an ore chute in the main ledge, and at a depth of ten feet took out ore assaying from $18 to $44 for all values, including 7 to 20 per cent. copper. At this writing the shaft is down twenty-five feet and the ore carries copper pyrites, with chalcopyrite coming in.

On the same mountain J. J. Conner and E. C. Strong have the Last Chance and Star on a parallel ledge with the Everett and an extension on that ledge, and Mr. Conner, H. S. Conner and Judge Henry McBride have the Tacoma and Scottish Chief on a third ledge, on which they are sinking a shaft. The Little Pittsburg group of three claims, owned by W. H. Hainsworth and Samuel Thompson, is on a ledge varying from eight to twelve feet, and several open cuts have been made through the capping and shown copper ore carrying gold and silver.

The O'Toole group of seven claims, which has been patented by Register W. D. O'Toole of the Land Office as iron property, lies mostly on one ledge along Marietta Creek, two and one-half miles southeast of Hamilton, and the ledge will be cross-cut by a tunnel which has now penetrated between fifty and sixty feet.

Six miles further up the south side of the Skagit, above Old Birdsview, David Kellogg and others, of Seattle, have fourteen claims on a series of ledges from five to twenty-five feet wide on the surface, which they have traced from the river to the summit of the mountain, in every case showing copper stains and in some places streaks of chalcopyrite. In the bed of a creek near Birdsview Mr. Kellogg found pieces of float in which chalcopyrite and galena were mixed. In the same vicinity Messrs. Thompson and Fitzgerald have seven claims and Harry Tappan has three.

The recent influx of prospectors has traced the same belt onward beyond Marble Mount. A. Von Pressentin has four claims near Sauk City, twenty-four miles above Hamilton, and on the foothills north of Marble Mount, ten miles further up, E. C. Strong, William Perry, of Anacortes, F. S. Backus, of Hamilton, and John Russner, of Marble Mount, have begun work on a group of eight claims, with ledges cropping eight to fifteen feet wide.

On Dispasi Creek, which runs into the Skagit five miles above Marble Mount, C. H. Landers, A. E. Hardy and John Siegfried have during February located six claims on a ledge of quartz carrying copper and gold, with some indications of nickel.

THE CASCADE.

Among the earliest mineral discoveries in the Cascade Range was the galena district at the head of the Cascade River, one of the headwaters of the Skagit. Tradition dates it back to one of a party of soldiers, who were coming across the summit from Fort Colville to Fort Vancouver, about twenty years ago. This man found a piece of rich float and afterwards returned and located the Soldier Boy claim. But it was not till many years later that the discoveries occurred which led to the inrush of prospectors, for the district was then almost inaccessible, and only in the early 90's were trails made from the east and west to open it to packhorses.

There are two routes into the district. One is by the Seattle & International Railroad to Woolley, eighty miles, thence by the Seattle & Northern Railroad to Hamilton, fourteen miles; thence by wagon road to Marble Mount, thirty-four miles; thence by road six miles, and by trail twenty-four miles, to the Cascade Pass. From the east the district may be reached from Wenatchee, on the Great Northern Railroad, by the steamer City of Ellensburg to La Chapelle Landing, forty miles, and stage to Chelan, two and one-half miles, or the steamer to Chelan Falls, thirty-nine miles, and stage to Chelan, three and one-half miles. Thence the steamer Stehekin takes one up Lake Chelan, sixty-eight miles, and a horse will complete the trip over the trail to the mouth of Bridge Creek and over the state trail to the Cascade Pass, a total distance of thirty miles.

The mountains in this district are formed of granite, of which the direction is northeast and southwest, and are cut in the same course by true fissure ledges of quartz carrying galena, iron and copper sulphides and some gray copper. As in other districts, the croppings occur in the rocky beds and walls of the gulches and on the cliffs above timber line, so that they are traceable with small difficulty, though at times covered by soil or rockslides. Feeders run into the main ledges from all directions, the principal ones running north and south. The granite formation carrying this galena belt has been traced northeast across Doubtful and Horseshoe Basins, east of the main divide, to the divide between the north forks of Thunder and Bridge Creeks, eight

and Thunder Creek

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SHINGTON.

Wagon Roads
Trails
Summit Lines

CASCADE RIVER

1 PRIDE OF KILLARE
2 PRIDE OF W. SEATTLE
3 MIDAS
4 DIAMOND
5 SARATOGA
6 GOLD RUN
7 GOLDEN EAGLE
8 MOUNTAIN CHIEF
9 NORTH STAR
10 SOLDIER BOY
11 TACOO UNION
12 PROSPECTOR'S FRIEND
13 JOHNSBURG
14 LOOKOUT
15 GRANITE
16 BUCKEYE BOY
17 OHIO
18 BOOSIER GIRL
19 ROSCOE CONKLING
20 GRAND REPUBLIC
21 MICHIGAN
22 LONDON
23 SAN FRANCISCO
24 COMBINATION
25 BANNER
26 TRUANT
27 U. S. MINT
28 FATHER & SON
29 ELIZABETH
30 FAITHFUL
31 EPOCH
32 OLD HORSE
33 FOURTH OF JULY
34 GLADSTONE
35 LUCKY BOY
36 CASCADE
37 IRONCLAD
38 NORTH PACIFIC
39 OLD TIMER
40 WAYLAND
41 ALIQAN
42 LUCY
43 EMMA
44 WABASH
45 A. TABER
46 VENTURA
47 ELDORADO
48 KING SOLOMON
49 KEYSTONE
50 WILLIS & EVERETTE
51 HARTFORD
52 ICEBERG
53 BOSTON

STEHEKIN

1 DOUBTFUL
2 QUIEN SABE
3 QUEEN OF SHEBA
4 BLUE DEVIL
5 BLACK WARRIOR
6 WHITECAP
7 OPAL
8 ARIZONA
9 LITTLE BOY
10 GREY EAGLE
11 GOLDEN GATE
12 CULTUS
13 BLACK BEAR
14 ROWENA
15 CRESCENT
16 BERLIN
17 DAVENPORT
18 ISOLETTA
19 FOLLIES
20 FLAMINGO
21 LAKE SHEVALL
22 EILEEN
23 COLLEEN
24 MOUNTAIN GHICE
25 SHAMROCK

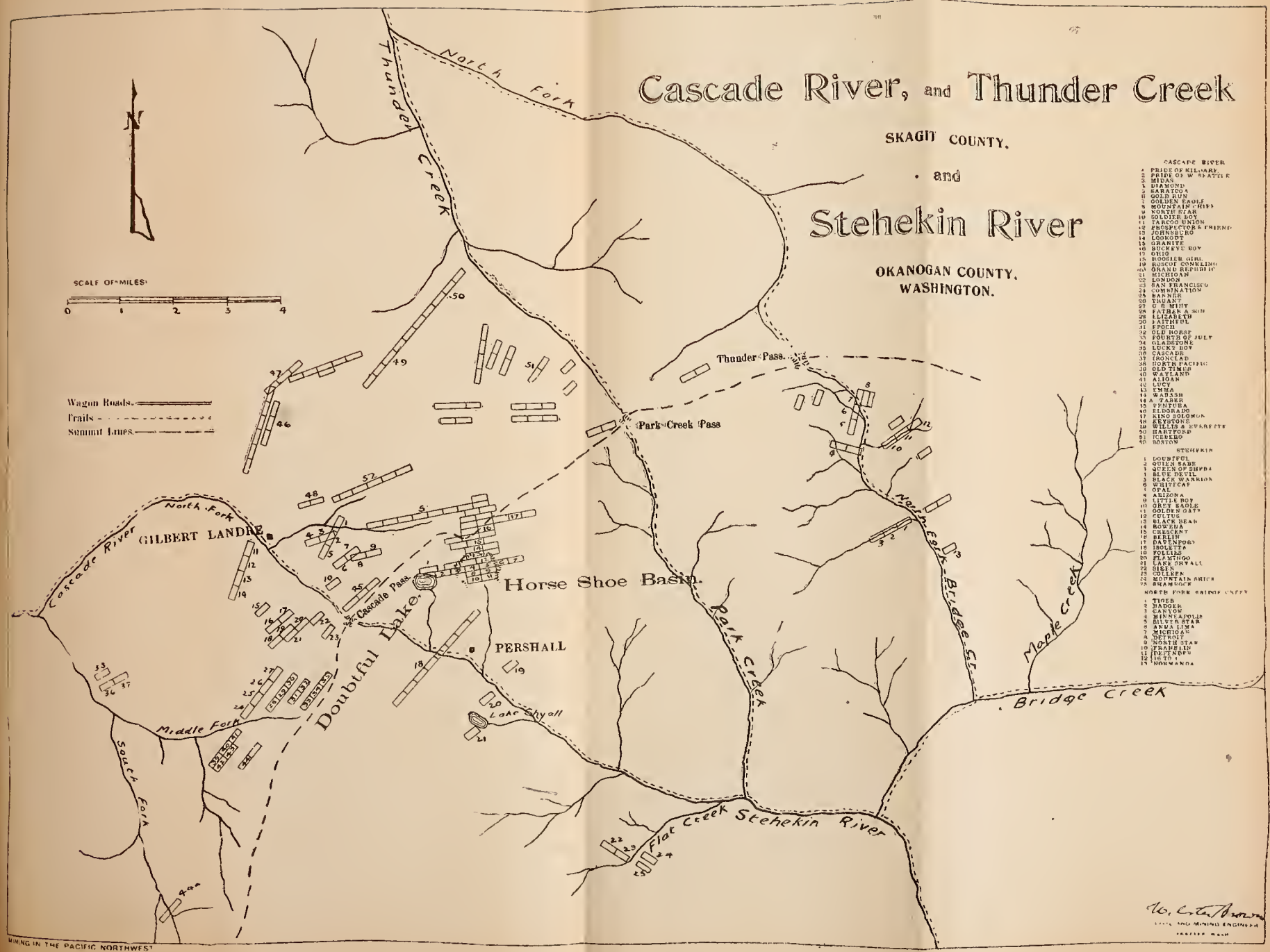
NORTH FORK BRIDGE CREEK

1 TIGER
2 BADGER
3 CANYON
4 MINNEAPOLIS
5 SILVER STAR
6 ANNA LIMA
7 MICHIGAN
8 DETROIT
9 NORTH STAR
10 FRANKLIN
11 DEFENDER
12 18 TO 1
13 NORMANDA

North Fork
Cascade River
GILBERT LAND
Fork Bridge Cr.
Maple Creek
Bridge Creek
Middle Fork
South Fork
33
36
37
24
4

W. Lee Brown
MINING AND MINING ENGINEER

MINING IN THE PACIFIC NORTHWEST


Cascade River, and Thunder Creek
SKAGIT COUNTY,
and
Stehekin River
OKANOGAN COUNTY,
WASHINGTON.
N
SCALE OF MILES
0 1 2 3 4
Wagon Roads
Trails
Summit Lines
Thunder Creek
North Fork
Thunder Pass.
Park Creek Pass
Cascade Pass.
Horse Shoe Basin.
Doubtful Lake.
Lake Shyall
PERSHALL
GILBERT LANDER
North Fork
Cascade River
Middle Fork
South Fork
Park Creek
North Fork Bridge Cr.
Maple Creek
Bridge Creek
Flat Creek
Stehekin River
CASCADE RIVER
1 PRIDE OF KILDARE
2 PRIDE OF W SEATTLE
3 MIDAS
4 DIAMOND
5 SARATOGA
6 GOLD RUN
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44 WABASH
45 A. TABER
46 PINTURA
47 ELDORADO
48 KING SOLOMON
49 KEYSTONE
50 WILLIS & BURRETTE
51 HARTFORD
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STEHEKIN
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4 BLUE DEVIL
5 BLACK WARRIOR
6 WHITECAP
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8 ARIZONA
9 LITTLE BOY
10 GREY EAGLE
11 GOLDEN OATS
12 CACTUS
13 BLACK BEAR
14 ROWENA
15 CRESCENT
16 BERLIN
17 DAVENPORT
18 ISOLETTA
19 POLINA
20 FLAMINGO
21 LAKE SHYALL
22 SIBER
23 COLLEEN
24 MOUNTAIN SHEEP
25 SHAMROCK
NORTH FORK BRIDGE CREEK
1 TIGER
2 BADGER
3 CANYON
4 MINNEAPOLIS
5 SILVER STAR
6 ANNA LIMA
7 MICHIGAN
8 DETROIT
9 NORTH STAR
10 FRANKLIN
11 DEFENDER
12 UNION
13 NORMANDA

miles from Cascade Pass and southwest through the whole watershed of the Cascade's several forks to their confluence.

The discovery of the Cascade District was made by George L. Rouse, John C. Rouse and Gilbert Landre in September, 1889, while tracing across the summit the great ledges exposed by the glaciers of Horseshoe Basin and on the rim of Doubtful Basin. They discovered the Boston ledge cleaving the summit and cropping far down the eastern slope, and the Rouses located the Boston claim and Mr. Landre the Chicago on its west extension. In November of that year Gilbert Landre and John Russner also located the Buffalo on that ledge.

The Boston, owned by George Sheckler, G. L. Rouse and J. C. Rouse, has the greatest showing in the district. The ledge crops on the west side of the Boston Glacier, which in places has worn away one of the walls, leaving a great body of galena exposed in a cliff to a height of forty feet. The ledge, which is divided in the middle by a three-foot horse of black porphyry, crops at this point to a width of fifty feet. A cross-cut of eighteen feet from the side of the glacier showed ore for ten feet, and a tunnel sixty feet along the wall showed galena and sulphides almost solid for the whole width. A thirty-five foot tunnel at a point 150 feet higher made a similar showing. The thickness of the ore body where it has been exposed some distance higher is four feet. Assays run as high as 110 ounces silver, 60 per cent. lead and a little gold, and two tons shipped to the smelter returned $92 silver and lead per ton.

Below the Boston the ledge forks, with galena predominating in one and sulphides in the other fork, and is covered by the Chicago group of six claims, held by Gilbert Landre and C. H. Landers. Several short tunnels have been run to strike the ore bodies in ledges which run about six feet wide, showing streaks of galena and sulphides.

Southeast of the Boston and on the eastern rim of the glacier is the Ventura, or San Francisco, group of four claims, owned by the Cascade Consolidated Mining Company. They have, parallel with the Boston, a well-defined three-foot ledge with six inches of galena showing in a small tunnel, samples from which assayed as high as 104.26 ounces silver, 40.1 per cent. lead and $4.40 gold.

West of the Boston William McKay, John Millett and others have the Eldorado group of five claims on a parallel ledge four feet wide, well defined for some distance down the mountain, and carrying a pay streak which runs well in gold. An eighty-foot cross-cut will, when extended, tap the ledge at great depth, and a forty-foot drift shows good ore bodies, of which the main one assays $70 gold, silver and lead. On a parallel ledge William Mertaugh, Charles Simpson, George W. Boles and Alexander Munroe have the Bunker Hill and Sullivan, with three or four inches of high-grade ore, of which assays have run into the hundreds of ounces of silver.

South of the Boston and traceable over the summit is a ledge on which Gilbert Landre and others have the Denver group of three claims. The ledge, which is nine feet wide and is broken by granite horses, carries eighteen inches of ore on one wall and two inches of mineralized talc on the other, shown in a twenty-foot tunnel. Assays run as high as 140 ounces silver and a trace of gold, and it is claimed that the ledge will average nearly $50. All of Messrs. Landre and Landers' interests, comprising fifteen claims, have been acquired by the London and Galena Mining and Milling Company, which will develop them.

The largest single investment in this district has been made by the Silver Queen Mining and Smelting Company, which has fourteen patented claims in several groups. The Midas group is a mile west of Cascade Pass and has two claims on a ledge opened by tunnels fifty and fifty-eight feet, with twelve to sixteen inches of ore on the footwall assaying $47 in silver and lead, and a two-inch streak which carried $604 silver, $12.50 lead, a total of $616.50. A cross-ledge is covered by three claims, on one of which a twenty-foot tunnel shows one to four inches of ore assaying $98.90 and $101.80 from two samples; on another there are a twenty-foot cross-cut and a thirty-foot tunnel, with two to ten inches of fair ore showing on the floor all the way in, while the face of the drift is in ore of lower grade. The Soldier Boy group is composed of five claims near the pass. Three are on the Soldier Boy ledge, the pioneer location of the district, in which a twelve-foot tunnel shows ten to fourteen inches of good ore carrying some native copper and assaying $21. A cross-cut has been run seventy feet to tap this ledge in 250 feet at a depth of 200 feet. A ten-foot cut nine feet wide on another claim shows four feet of ledge matter with a two-inch pay streak on the hanging wall, and another cut eighteen feet long and twelve feet deep shows five inches of iron sulphides and galena. The other claims are on a parallel ledge, in which a sixteen-foot cut shows four inches of iron pyrites and a little galena. The Johnsburg group consists of four claims on a ledge running up to the summit from the south bank of the Cascade River, three miles west of the pass, and cropping on the side of a gulch. A tunnel intended for a main working tunnel has been run fifty feet at a point 1,500 feet above the valley, but is not yet through the slide rock. Another tunnel has been driven 200 feet at a point 500 feet higher and shows a good strong ledge four feet wide, with eight inches of ore, while a third tunnel is in fifty feet at a point 800 feet higher and shows three feet of solid

galena. Samples taken for the full width between the walls in each of these tunnels, and ground together, gave an assay of $51.75 for all values.

A number of ledges parallel with the Soldier Boy cut the curve of the basin, but have had little work done on them. On one of these R. A. Osterly and others have the Grand Republic group of three claims, on which tunnels twenty-five and fifteen feet and a twenty-five-foot open cut show a nine-inch pay streak carrying about $40 for all values. On other ledges with about as much pay ore are the St. Patrick and Nip and Tuck.

The same mineral formation extends across to the middle and south forks of the Cascade, where the granite is cut by dikes of quartzite, gneiss and schist. The largest group, consisting of six claims, is the Fourth of July, owned by Joseph Rigby, of Omaha. One ledge shows twenty-four inches of ore in a fourteen-foot shaft and fifteen-foot open cut, carrying galena, carbonates and sulphurets to the value of $50 and upwards in gold and silver. Another ledge showing twelve inches of $80 ore in the croppings will be tapped by a cross-cut, now in forty feet. Another ledge shows sixteen inches of pay ore in a thirty-five foot cross-cut, assays showing 13 per cent. copper, besides good gold and silver values. Below this, on the Granite, Thomas Barrett, of Woolley, has shown up sixteen inches of pay ore in a four-foot ledge by means of a ten-foot shaft, and on the Jumbo he has ten inches of pay ore, though a forty-foot tunnel on the ledge has not penetrated to the ore chute showing in the croppings. Half a mile below this he has the Homestake on a five-foot ledge, in which several small streaks aggregating sixteen to eighteen inches assay from $40 upwards.

Charles L. Pollard has the Michigan group of five claims on two parallel ledges which have been traced for 1,500 feet. One of these is five feet wide, with a sixteen-inch pay streak showing on th wall of a tunnel run sixty-five feet along the ledge. Two assays show 192 ounces silver, 60 per cent. lead and $3 gold; 204 ounces silver, 40 per cent. lead, $3 gold. Southwest of this group Thomas Barrett has the Black Canyon on a four and one-half foot ledge, in which an open cut twelve feet long shows twelve inches of good galena ore.

A great blow-out of oxidized iron which has been traced 4,000 feet up the mountain from the south fork is covered by Richard Joy and Joseph Peraud with the Cascade group of three claims. A sixty-five foot tunnel shows a ten-inch streak of black sulphurets and iron pyrites carrying gold and silver.

SLATE CREEK.

By Douglass Allmond, of Anacortes.

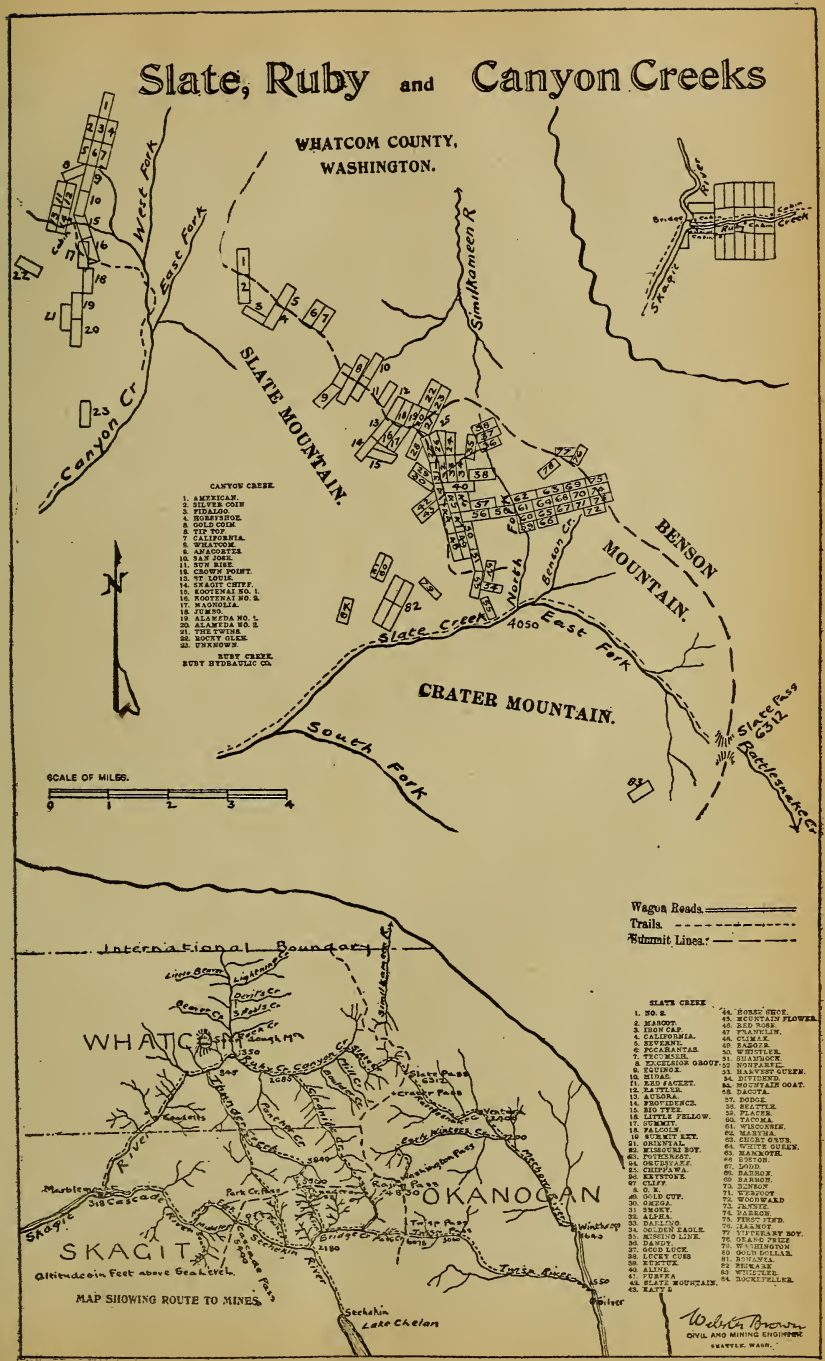
The mining regions of the Skagit Valley, for the sake of convenience, may be divided into five distinct districts, as follows: Slate Creek District, embracing the country between the Slate Creek summit and the mouth of Ruby Creek; Thunder Creek District, including all that section drained by Thunder Creek; Cascade District, the country about Cascade River; Monte Cristo District, at the headwaters of the Sauk, and Hamilton District, including all that section of the valley from Marble Mount to tide water.

The route to the Slate Creek District from Seattle is by the Seattle & International Railroad to Woolley, eighty miles, and thence by the Seattle & Northern to Hamilton, fourteen miles. From Hamilton a good road can be followed up the Skagit Valley to Marble Mount, thirty-four miles, and from that point a pony trail leads to the mouth of Ruby Creek, the western boundary of the district, twenty-nine miles, and to the headwaters of Slate Creek, twenty-five miles further, with branch trails to the various sections of the district. From the head of Slate Creek a trail leads down the Methow River for fifteen miles and a wagon road thence to Ives Landing, seventy-five miles.

The Slate Creek District includes Ruby, Canyon, Granite, Mill and a number of lesser streams and the country north toward the international boundary line. The principal mines, however, are near the headwaters of Slate Creek, hence its name. The first discoveries in this country were made nearly twenty years ago by a man named Rowley. Then prospectors looked for placers only, but as the placer ground was limited, the creeks were difficult to handle, the cost of getting to the camp was enormous, and the trip extremely hazardous, the camp was short lived, although upwards of 2,500 men went in the first season and fully $100,000 worth of dust was taken out. In those days the only route to the diggings was through British Columbia.

After abandoning the district for twelve or thirteen years, prospectors again went in, and not succeeding very well in getting at the placer gold, turned their attention to prospecting for ledges. On and on they pressed, until, on nearing the source of Slate Creek, they found that some of the gold in the creek carried particles of quartz. But at first the ledges could not be found, so it was determined to dig for them. The result was that a number of blind leads were located, some of them proving very rich.

One of the first and also one of the most valuable finds was the Eureka


Slate, Ruby and Canyon Creeks
WHATCOM COUNTY, WASHINGTON.
West Fork
East Fork
Canyon Cr
SLATE MOUNTAIN.
Similkameen R
Skagit
Bridge Creek
Cabin Creek
Ruby Creek
CANYON CREEK.
1. AMERICAN.
2. SILVER COIN
3. TIDAL BORE.
4. GOLD COIN.
5. TIP TOP.
7. CALIFORNIA.
8. WHATCOM.
9. ANACORTES.
10. SAN JOSE.
11. SUN RISE.
12. CROWN POINT.
13. ST. LOUIS.
14. SKAGIT CHIEF.
15. KOOTENAI NO. 1.
16. KOOTENAI NO. 2.
17. MAGNOLIA.
18. JUMBO.
19. ALAMEDA NO. 1.
20. ALAMEDA NO. 2.
21. THE TWINS.
22. MOCKY GLEN.
23. UNKNOWN
RUBY CREEK.
RUBY HYDRAULIC CO.
Slate Creek
North Benson Cr
BENSON MOUNTAIN.
East Fork
4050
CRATER MOUNTAIN.
South Fork
Slate Pass 6012
Rattlesnake Cr
SCALE OF MILES.
0 1 2 3 4
Wagon Roads.
Trails.
Summit Lines.
International Boundary
WHATCOM
SKAGIT
OKANOGAN
Slate Creek
Canyon Creek
Ruby Creek
Lake Creek
Crater Creek
Rattlesnake Creek
Slate Pass 6012
Crater Pass
Harrington Pass
Tyrie Pass
Tyrie River
Marblemount
Park Cr Road
Ross Lake
Skagit River
Similkameen R
Winthrop
Seekatin
Lake Chelan
SLATE CREEK
1. NO. 2.
2. MASCOT.
3. IRON CAP.
4. CALIFORNIA.
5. BENJAMIN.
6. CENTENNIAL.
7. TYCHANIA.
8. EXCELSIOR GROUP.
9. EQUINOX.
10. MIDAS.
11. RED FACETT.
12. KATTLER.
13. AURORA.
14. PROVIDENCE.
15. BIG TYEE.
16. LITTLE FELLOW.
17. SUMMIT.
18. FALCON.
19. SUMMIT EXT.
20. ORIENTAL.
22. MISSOURI BOY.
23. POTENTATE.
24. ORIENTAL EXT.
25. CHIPPAWA.
26. KETYTOWN.
27. CLIFF.
28. GOLD CUP.
30. OREGO.
31. SMOKY.
32. ALPEN.
33. DALLING.
34. GOLDEN EAGLE.
35. MISSING LINE.
36. DAISY.
37. GOOD LUCK.
38. LUCKY CUSS
39. KUMTUX.
40. ALINE.
41. EUREKA.
42. SLATE MOUNTAIN.
43. KATY 2
44. HONEY CROP.
45. MOUNTAIN FLOWER.
46. RED ROSE.
47. FRANKLIN.
48. CLIMAX.
49. RADOLF.
50. WHISTLER.
51. SHAMROCK.
52. MONTARIO.
53. HARVEST QUEEN.
54. DISTINCT.
55. MOUNTAIN GOAT.
56. DACOTA.
57. DODGE.
58. BEATTIE.
59. TACOMA.
60. TYRONE.
61. WISCONSIN.
62. MANUMA.
63. GREAT GUNS.
64. WHITE QUEEN.
65. MAMMOTH.
66. BOSTON.
67. GOOD.
68. BARRON.
69. BARRON.
70. DUNBOW
71. WEBSTOW
72. WOODWARD
73. JENNIE.
74. PARSON.
75. FIRST STED.
76. LAMONT.
77. STUPENDEY BOY.
78. GRAND PRIZE
79. CHIMOGUM.
80. COLUMBIAN.
81. ROYAL.
82. PENRAM.
83. WHITAKER.
84. ROCKEFELLER.
MAP SHOWING ROUTE TO MINES.
Altitudes in Feet above Sea Level.
Webster Brown
CIVIL AND MINING ENGINEER
SEATTLE, WASH.

group, which was located in 1893, its owners incorporating under the name of the Eureka Mining Company of Anacortes in 1895. In this group are six quartz and two placer claims. These are all situated on the eastern slope of Slate Hill, and, except the Lowman, are extensions on the Eureka lode. Slate Hill is a part of a spur of the main Cascade Range, and with Benson Mountain forms the divide between Slate Creek, the waters of which find their way into the Skagit, and the headwaters of the Similkameen River. After running westerly about three miles this spur turns to the south and forms the divide between Slate Creek and Canyon Creek. The spur is composed mainly of slate, with poryhyry overlying or capping the summit in places. The Eureka lode, the only one on Slate Hill on which any systematic mining has been done, is probably the principal lode of the hill. Nowhere does it show any outcropping, being covered with from four to eight feet of earth, the top two feet being soft earth and the rest a hard cement compounded of clay with oxide of iron. At the Eureka this surface dirt was stripped off for about forty feet in length and thirty feet in width, exposing the ledge. In this process of stripping the cement was washed through a primitive cradle and yielded good wages. The ledge thus exposed is thirty feet between walls. The quartz, which extends from wall to wall with very little slate intermixed, is much decomposed and mixed with oxide of iron. The entire ledge assays high in free milling gold. Seemingly there is little difference in value of any part of it. Pieces picked up at random, being broken, usually show free gold. The ledge runs nearly north and south, parallel with Slate Hill, dipping to the east about 70 degrees, the walls, so far as exposed, being well defined. A shaft 5x9 feet, starting on the east side or hanging wall, was sunk in 1895 to a depth of fifty-four feet. At this depth a cross-cut was run six feet to the footwall, and was then run in the opposite direction twenty-four feet without reaching the hanging wall, making thirty feet of solid quartz, all well mineralized and assaying well in gold. The ledge shows in the shaft to a depth of twenty-five feet the same brown iron oxidized ore as on the surface. At this depth it changes to a hard white quartz, impregnated with fine iron pyrites, carrying gold apparently in a free state, as several tests show it will amalgamate to 80 per cent. of the assay value. Work in this shaft was abandoned late in the fall of 1895, owing to the difficulty of hoisting the ore by hand. A tunnel was then started further to the east and below the shaft. Work was continued in 1896 and the tunnel is now in 270 feet. This will cut the ledge at a depth of 124 feet perpendicular below the shaft. The mine can be easily worked by comparatively short tunnels to a depth of 1,400 feet, this being the level of the creek. The ore carries $30 in gold, apparently free milling even when in sulphurets.

The Beck group of five claims is situated on the western slope of Benson Mountain, a part of the same spur as Slate Hill, and is distant from the Eureka group about three miles. There are two parallel ledges, about 400 feet apart, with three claims on one and two on the other. These claims are owned by Melville Curtis, A. M. Barron and H. H. Soule, all of Anacortes. The veins run northeasterly and southwesterly, with a dip of 80 degrees northwesterly. The outcrop is well defined and is traceable through all the claims. The quartz shows from three to six feet in width, with a slate footwall, and porphyry in places on the hanging wall. The quartz is generally white, carrying very little oxide of iron. It carries gold, silver and a small quantity of copper, an average of four assays giving 2¾ ounces gold and 51 ounces silver. Tunnels have been started on three claims and are in from twenty to fifty feet. Situated on the sidehill, all these claims can be worked from one main tunnel to a depth of 1,200 feet.

The Mammoth, also on Benson Mountain, and near the Beck group, is owned by Messrs. Risley and Woodin. It is a four-foot ledge, from which some very rich ore has been taken. Very little development work has been done, however, although the surface showing would seem to warrant it.

Northerly from the Eureka group and on the Canyon Creek slope of Slate Range, is the Excelsior, owned by Messrs. Benson and Templar. This is a six-foot lead, well defined, but of comparatively low grade, shown by an open cut and short tunnel.

Four miles northwesterly from the Eureka is what is known as the Anacortes group, near the headwaters of Cascade branch of Canyon Creek. Probably thirty claims have been here located, and without doubt some of the richest ore ever taken from any mining camp came from some of the ledges of this locality. The first location was made in 1894. In 1895 ten pounds of ore from the Anacortes claim yielded $76.40 in gold. The ledge from which this rich rock was taken runs through four claims of the Anacortes group, which, with four others, are owned by J. H. Young, T. B. Childs, P. E. Nelson, D. M. Woodbury, M. S. Smith, John Russner and Douglass Allmond. The ledge is small, not showing over twenty inches in any place. Eleven hundred feet up the hill from where the rich rock of 1895 was taken the ledge was again uncovered and very rich rock struck. Surface work only has been done on this property.

The Crown Point, alongside the Anacortes, has a ledge four feet between walls, the gangue being quartz mixed with black slate, and carrying gold and a little silver. The owners, R. C. Sylvester, C. I. Carpenter, W. J. Farrell and

C. Ashley, have carried on development work systematically from the beginning, and have a sixty-foot tunnel.

Other promising claims of this group are the Gold Coin, Kootneai, Whatcom and Gold Coin.

The Alameda group is southerly of and across Cascade branch from the Anacortes group. Unlike most of the other mines of the Slate Creek country, which are blind leads, the Alamedas show on the surface a three-foot ledge of white quartz. The Alamedas are owned by P. E. Nelson, J. C. Phelps, G. B. Smith, of Anacortes, and others. From the assays it would seem that the ore runs from $28 to $35 per ton in gold, and that it is free milling. The find is a late one and very little work has been done.

The Whistler is on Crater Mountain, five miles southeast of the Eureka, and is owned by J. W. Romaine, R. A. Maxwell and John Leedy, of Whatcom. The ledge is about twenty feet in width, with a fifteen-inch streak of rich ore, carrying gold in a free state and also in black sulphurets. Shipments of ore have been made, yielding, it is said, $200 in gold per ton.

The Rockefeller, owned by John McCullough and James Bedell, is on Slate Hill. A ton shipment of ore yielded good results. The Bismarck group of four claims on Slate Mountain is owned by C. F. Megquier, H. Havekost and P. W. Law. A fifty-foot tunnel has been run on a four-foot ledge. The ore carries gold and a small quantity of silver and copper.

While placer mining on a small scale will not, in all probability, ever be a success on Ruby or Canyon or their tributaries, there is every reason to hope that with proper appliances, hydraulicking will prove remunerative. Gold can be panned from almost any of the benches along the creeks, and nuggets weighing as high as $20 have been found. During the past season F. J. Scougale worked a group of fourteen claims near the mouth of Ruby Creek with a small hydraulic plant and in six weeks took out $950 in nuggets ranging from 10 cents upwards. Frank Ledger and others built a flume a mile long and worked the Old Discovery claims near the mouth of Canyon Creek for about a month, employing seventeen men.

But the placer ground can only be worked thoroughly on a large scale, and this will be done during the coming summer by the Ruby Hydraulic Gold Mining Company. This company has bought the Scougale claims, extending a mile up Ruby Creek from its mouth and covering an area of 420 acres. It has a depth of auriferous gravel ranging from thirty-five to 200 feet, estimated to contain from 15,000,000 to 20,000,000 cubic yards, carrying from 25 cents to $1 in gold per cubic yard. There are several prospect holes on the property, one of them being eighty feet deep. At the bottom the gravel runs about 80 cents to the yard in coarse gold and the gold grows finer as the surface is approached, but it shows good colors all the way down. On the north side of the creek the ground is broken in places by rock, the gold is coarser and bedrock is frequently exposed.

The company proposes to equip this property with a complete hydraulic plant. It will make about three miles of ditch and flume, with a capacity of 2,000 miner's inches, giving a pressure of 300 feet, lay 1,000 feet of twenty-four inch steel pipe, with giants, install a dynamo for electric lighting, in order that work may continue night and day, and build a sawmill to cut the necessary lumber. A five-foot tailing flume will carry the debris into the Skagit Canyon, where the river is swift enough to carry off the largest boulders. Estimates of the cost of this plant and of the necessary buildings range from $16,000 to $30,000, and it is estimated that it could move from 4,000 to 6,000 cubic yards of gravel every twenty-four hours.

There is a prospect that a similar plant will be erected on Canyon, near Boulder Creek.

THUNDER CREEK.

By Douglass Allmond, of Anacortes.

Not until late in the fall of 1891 did the prospector penetrate to the headwaters of Thunder Creek. This stream has its source at the backbone of the main Cascade Range, a little north of east of Marble Mount, in Skagit County, and, flowing northwesterly for twenty miles, empties into the Skagit River about four miles south of the mouth of Ruby Creek. The headwaters of Thunder Creek and Cascade River (the next large stream to the south) are not more than four miles apart, but the divide is rugged in the extreme, well deserving the name of Sawtooth Range.

In 1891 John Russner and two other prospectors crossed the Boston Glacier, at the head of the Cascade, climbed the Sawtooths, and descending the northerly slope crossed another glacier that really forms the head of Thunder Creek. The trip was a dangerous one, but the men were rewarded by finding a "good prospect," although they did not then have any conception of the richness or extent of their find. Cascade District prospectors had found only galena ores, and this was what Russner and his companions were looking for;

so when they located a ledge of green ore, not having any of the attractiveness of bright galena, they put in their stakes simply because the lode was well defined, and carried away samples, having only a faint hope that these might show some value, although there did not seem to be anything to cause enthusiasm. The locations were called Willis and Everett. To the surprise of all, however, this greenish ore proved to be very rich in silver, some assays running as high as 3,400 ounces.

In 1892 there was quite a rush to the new camp, and many more good finds were made, although galena ores predominated. Six more claims were located on the Willis and Everett lead and covered the entire distance from these two claims, which were at an altitude of about 7,500 feet, down to Thunder Creek. The works at the lower claim are near the creek, and at an altitude of perhaps 2,500 feet above sea level. At this point the ledge carries galena.

Perhaps several dozen claims in all have been located in the Thunder Creek country, but the amount of development work done is very limited. In the fall of 1892 the Skagit Mining and Milling Company was formed and obtained control of the Willis and Everett claims. This company shipped several tons to the smelter, the returns being 190 ounces in silver. But notwithstanding the richness of this ore, it was found unprofitable to ship, because of the heavy charges for packing, etc., and mining was not again resumed. This was the only ore ever shipped out of the district, owners of claims contenting themselves, on account of the low price of silver, with merely doing assessment work.

A. E. Hartay and others own two good claims at the head of Thunder Creek Basin. They are northerly of the Boston, in Cascade District, and it is believed that the Boston lead cuts through the Sawtooth Range, again cropping on the Thunder Creek side, where Hartay made his locations. Assays show about $140 for all values.

Among other promising locations in the district may be mentioned the Hartford and extensions, on the Willis and Everett lead; the Ice Gate group, a high-grade galena; the Major, Silver Queen, Jasper, St. Louis and Puget Sound.

The Thunder Creek country may well be said to be a camp of great promise, although difficult of access, only awaiting the quickening touch of capital and energy. It can be reached by two routes. One of them is by trail up the Skagit; the other via Lake Chelan. From Marble Mount to the mouth of Thunder Creek is about twenty-five miles, and from the mouth to the headwaters is about twenty miles. It is about forty miles from Lake Chelan to the headwaters of Thunder Creek. This latter route is up the Stehekin to Park Creek, thence up the latter stream and across the main Cascades via the Park Creek summit.

RUTH CREEK.

Prospecting in this district only dates back to the close of the summer of 1894, but the few discoveries so far made are an earnest of what remains to reward more general and thorough work and an evidence that the mineral found further north and south in the Cascade Range extends through the whole width of Whatcom County. The district lies between the main range of the Cascades and the loftier parallel range on the west, of which Mounts Baker and Shuksan are the principal peaks, and is drained by the Nooksack River and its tributaries. Most of the ledges so far discovered crop in the south slope of the ridge closing in the Ruth Creek Valley on the north, and in and about Hannegan Pass, which crosses the divide between the headwaters of the Nooksack and Chilliwack Rivers.

The exploration of this region began in 1894 with the partial construction of the state trail up Glacier Creek, due north of Mount Baker, for twenty miles eastward, with the intention of crossing the Baker Range north of Mount Shuksan, thence down Beaver Creek to the Skagit, across the main range and down the Methow. This route was abandoned in favor of the one by way of the Cascade and Twisp Passes, over which the trail was last year constructed, but its partial construction by the Hannegan Pass route opened the way to prospectors. Whatcom County has followed up this work by building bridges across the north fork of the Nooksack and converting the trail into a wagon road, thus making it possible to haul supplies within fourteen miles of the camp. The route from Seattle is by the Seattle & International Railroad to Deming Station, 112 miles, thence by wagon road twenty-six miles and by trail fourteen miles.

Late in the summer of 1894 E. H. Thomas, of Blaine, and J. W. Hulett made the first discovery, on which they located the Hulett. This was a ledge of great width, heavily capped with iron at frequent intervals, which crops high on Burnt Mountain, north of the nineteenth mile post. The walls are granite and hornblende and the ledge is easily traced for several miles over the mountains. The ore carries iron and copper pyrites and arsenical iron, and assays from surface specimens range from a trace to $23 gold, with traces of

silver and a small percentage of copper. This was the first of five parallel ledges, all heavily capped, running through Ruth and Granite Mountains. The country rock is granite, in which large masses of hornblende occur, but at the base of Ruth Mountain is a trap overflow. On one of the parallel ledges, with a large heavy capping, are the Granite and Edith, which have been little prospected. On another, near Hannegan Pass, Messrs. Galloway and Shoemaker, of Lynden, have several claims from which good gold assays have been obtained. A good prospect was found in the Marine, located in September, 1895, by J. W. Barber and others on Burnt Mountain, half a mile east of the Hulett. In the cropping was twenty inches of honey-combed guartz carrying pyrites and arsenical iron, of which three assays of surface samples ran $5.60 gold, $24.58 silver and lead, 6 per cent. copper; $23.20 gold; $19 gold, respectively. In an eighteen-foot shaft the ledge widened to five feet and carries five inches of solid mineral.

Last season George Longdon and others discovered near the head of Beaver Creek a small lake formed by a dike of granite against a mass of quartz 300 feet wide. This quartz constitutes the bed of the lake and is plainly visible through the clear water, evidently carrying mineral.

THE CHICO TIN MINES.

A great deposit of tin ore cropping near Wildcat Lake, four miles from Chico in Kitsap county, has for some time been the subject of much speculation and its value has been attested by such authority among mining engineers as to warrant the organization of the Cook Kitchen Mining Company to develop it. The deposit is held under twenty-six mining claims, covering 462 acres of land, with a water right on Wildcat Lake, a sheet of water covering 160 to 200 acres.

The deposit consists of a great body of killas carrying cassiterite, or pyrites of tin, native oxide of tin, with considerable wolframite, tourmalin, arsenious iron and mica. It is over 400 feet wide and of much greater length, running six degrees north of west and south of east, the contact south about one mile being gray sandstone, and north a hard calcine dolomitic rock. Four shafts are down for depths ranging from twenty-five to eighty-five feet, the deepest being at the footwall with an extension now in progress fifty feet deeper. One of these shafts shows solid tin ore on all four sides, increasing in value as it goes down, while a small cut near the footwall shows rock richly impregnated with arsenious iron, sulphate of iron, cassiterite or tinstone and brittle argentum, the cassiterite crystals being in plain sight. Another cut shows more malachite copper than the first mentioned. A number of assays have been made, showing the percentage of tin in the ore taken from the deepest shaft to range from three to five and one-half, while samples from one of the cuts carried traces of tin, iron and copper, and from another cut ten ounces silver and 4 per cent. tin. An assay from a depth of twenty-five feet in the shaft ran: Silver, 39¾ ounces; tin, 4¾ per cent; copper sulphides, 5¼ per cent., and another assay for gold and silver alone showed $3.72 gold, $2.32 silver.

This deposit is peculiarly accessible, being only four miles distant by road from Chico, on Port Washington, a branch of Puget Sound. With deep water navigation thence to any railroad the cost of transportation will be at the minimum.

In order to reduce the ore, it is proposed to crush it and wash out the lighter waste, then roast the concentrates remaining in order to get rid of the arsenic and sulphur and oxidize the iron pyrites, which is removed by a second washing. Oxide of copper will be extracted with diluted sulphuric acid and the copper in the solution then precipitated with iron. The purified ore, known as black tin, will then be shipped to the smelter.

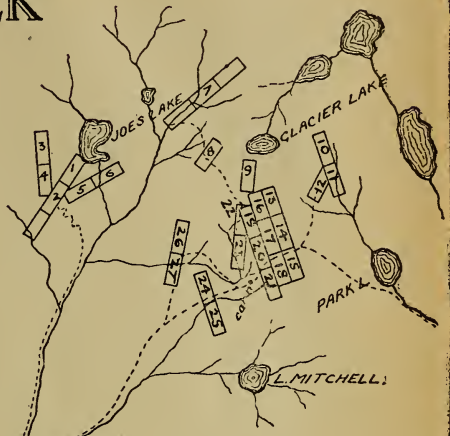
GOLD CREEK.

A short distance east of the summit of the Snoqualmie Pass is a mining district, of which little has been heard but where much has been done with satisfactory results. At the head of Gold Creek, which flows into Lake Kitchelos, the source of the Yakima River, the granite and syenite country rock is cut by true fissure ledges, running almost north and south, with the line of the divide, and sometimes cutting both granite and syenite in their course. The surface ledge matter is porphyry, but as one goes down in it, it changes to quartz. The mineral carries gold and silver in the form of sulphides, bromides of silver, ruby silver, steel galena and carbonates of lead.

The nearest route by rail from Seattle is by the Northern Pacific to Martin Station, 101 miles, thence northward on the Snoqualmie wagon road along the east bank of Lake Kitchelos, ten mlies, and by trail up Gold Creek,

GOLD CREEK

KITTITAS COUNTY, WASHINGTON.



INDEX TO NUMBERED CLAIMS.

1. Mildred.
2. Granite King.
3. Original.
4. San Francisco.
5. Granite Point.
6. Highland.
7. Revington Group.
8. No. 15.
9. Mazama.
10. Victoria.
11. Brown Peak.
12. Superior.
13. Kittitas.
14. State of Washington.
15. Cleveland.
16. Ptarmigan.
17. Inspiration.
18. Transit.
19. Esther.
20. Lonisa.
21. Toppenish.
22. Ivanhoe.
23. Silver Bell.
24. Handy.
25. Jupiter.
26. Fourth of July.
27. Good Luck.

SCALE OF MILES
0 1 2 3

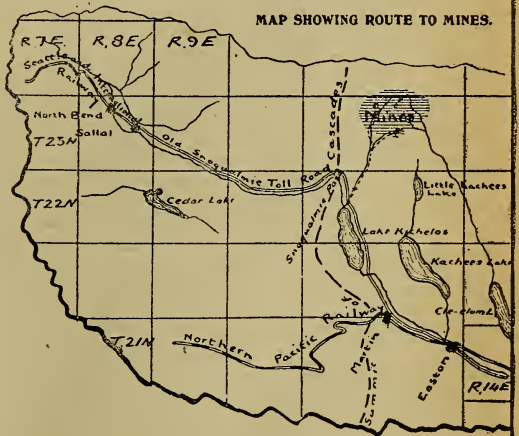
Railways
Wagon Roads
Trails

GOLD CREEK

Old Snoqualmie Toll Road

COAL CREEK

MAP SHOWING ROUTE TO MINES.



Lake Kichelos.

Walter Brown
CIVIL AND MINING ENGINEER
SEATTLE, WASH.

eight miles. The district can also be reached by the Seattle & International Railroad to Sallal Prairie, sixty-three miles, and the Snoqualmie Pass road, thirty-four miles. Prospecting began in the year 1890 and has been followed up by a large amount of development.

The principal property is the Esther and Louisa group of twelve claims, owned by the Gold Creek Mining Company of Seattle. One of the main ledges running through two claims has widened from thirty-six to forty inches in the face of a thirty-foot tunnel and carries concentrating ore ranging in value from $10 to $40, according to various assays. Two lower levels have been run seventy feet each on this ledge and two feeders have been opened. Several shipments of sorted ore aggregating about ten tons were made to the Tacoma smelter in 1896 and the returns showed an average gross value of about $100 a ton. A parallel ledge has been opened, varying in width from two to three feet, with a pay streak of eight to twenty-two inches. On another ledge extending through two claims a twenty-foot tunnel has shown a pay streak of six to eight inches and a 100-foot tunnel on another ledge has shown six to twelve inches of ore assaying from $20 to $100. This company has two power drills, operated by steam, and an ore breaker. It will this season erect a concentrator and put in a water power plant to run all the machinery.

On the right bank of the Creek is the Granite King group of six claims, owned by the Granite King Gold Mining Company, two claims being on each of three ledges. One of these has three tunnels, the upper 180 feet, the second seventy feet long 150 feet lower down the mountain and the third thirty feet, showing it to be about four feet, mineralized for the full width between strong walls and carrying twelve to twenty inches of highly mineralized rock. A second ledge runs into this one from the right and has twelve inches of pay ore carrying gold and copper. The third shows galena and copper sulphides in a twenty-foot tunnel. Assays from these several ledges have never gone below $26 and have run as high as $180. Work was continued far into the winter, until the cabin was carried away by a snowslide and the occupants had a narrow escape with their lives.

On the Good Luck, Lon Jose and Mrs. Revington have run a cross-cut 100 feet to tap a good ledge, cutting a number of stringers ranging from six to twelve inches and carrying rich galena ore, on one of which they have run a drift. The same parties have run a tunnel thirty feet on the Fourth of July ledge, showing a good pay streak.

CLE-ELUM.

The great belt of copper and gold ledges which runs through the backbone of the Cascade range crops with great strength on the mountains drained by the Cle-elum River and extends northeastward across the Teanaway to the base of Mount Stuart and west to Lake Kahchees. In the same belt are many ledges of quartz carrying free gold and sulphurets, with galena in its various forms. Further southeast, down the course of the river, is a belt of pyrites ledges capped with magnetic and hematite iron, which have caused them for years to be miscalled the Cle-elum iron mines. The district has been legally organized and extends from the headwaters of the river to Cle-elum Lake and from Kahchees Lake on the west to the Teanaway divide on the east. Recent discoveries have, however, extended beyond the latter line to a connection with the Negro Creek unorganized district among the foothills of Mount Stuart.

The district is easily reached from Seattle or Spokane. From the former city one takes the Northern Pacific train to Cle-elum, 122 miles, and the branch line to Roslyn, four miles distant. A wagon road leads thence to Cle-elum Lake and up the Cle-elum River to I-i-ass Lake, near its source, thirty miles away. Trails branch off from the road up all the principal creeks and traverse the district to the summits on the right and left.

The country rock of the district is granite, syenite, porphyry and slate, with dikes of serpentine and the mineral ledges cut in a generally northwest and southeast direction, with some cross ledges running east and west. Discoveries in this district began about 1881, when A. P. Boyls, the present venerable but vigorous mining recorder, in company with S. S. Hawkins and Moses Splawn, traveled up Camp Creek and on Hawkins Mountain traced three parallel ledges carrying iron sulphurets. From that time forward prospecting traced the belt twenty miles down the Cle-elum from its head and east and west for fifteen miles as already outlined.

The best developed property is the Aurora group of five claims on Mammoth Mountain, owned by John and Timothy Lynch, which carry high-grade gold and silver ore. The mountain is composed mainly of metamorphic rock, cut diagonally by dikes of granite in which are fissure ledges of quartz running east and west. One ledge has been traced five feet wide over 2,000 feet and carries free gold and sulphurets, being heavily oxidized to a depth of fifty feet. A shaft fifty feet deep on the hanging wall cut a twelve-inch stringer at thirty-five feet and showed ore averaging $40 gold. A six-inch

feeder widened to eighteen inches in a sixty-foot tunnel, from which a winze is being sunk. A twenty-foot dike of porphyry crops out very distinctly on the west and carries decomposed red oxide of copper and iron, with two feet of red ochre on the hanging wall carrying $114 gold, 8 ounces silver. On a parallel five-foot ledge, enclosed in a porphyry dike, a tunnel is in twenty feet, showing free gold and sulphurets. Another ledge four feet wide runs parallel and will be tapped by a tunnel now in seventy feet. An average of the croppings shipped to San Francisco returned $126 gold, $1.09 silver and assays have shown $200, $269, $229 gold, with a trace to $1 silver. On another parallel ledge three feet wide and traced for 1,000 feet, a tunnel has penetrated sixty feet showing ore the full width, after cutting a slate horse carrying pyrites, and another tunnel is in 115 feet at a point 100 feet deeper, while a third tunnel is in twenty feet and shows good mineral. A shipment of twenty tons from the two last-named ledges returned $56 gold and a trace of silver. A mill of four 320-pound stamps and one four-foot concentrator was erected in 1896 on a millsite at the foot of the mountain and made a successful run, exact results of which were not obtainable. The running of a 2,000-foot cross-cut to tap al lthese ledges at depth is contemplated for this season.

West of this group E. P. Gassman has the American Eagle group of four claims on a parallel four-foot ledge with two feeders, and a shaft is down ten feet on it showing ore which assayed from $27 to $125 gold. A cross-cut has been run sixty feet to tap the main ledge, which would also be struck by the proposed cross-cut on the Aurora group. On a twenty-four inch ledge on the Vidette, A. P. Boyls is sinking a shaft showing similar ore.

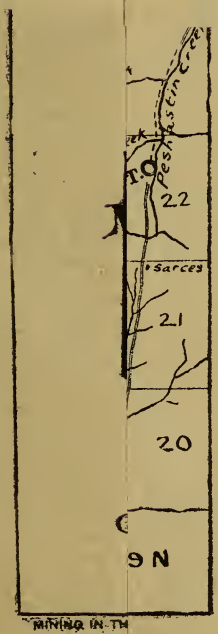
On another parallel ledge to the southwest P. A. Stanton and James Grieve have the two Bronco claims. A thirty-foot tunnel has been driven on a four-foot ledge of sulphurets and arsenical iron, and 100 feet below another tunnel is in 110 feet, striking a 26-inch feeder. A sackful of ore shipped to the Tacoma smelter returned $138 and assays have run $140 to $180.

Also on Mammoth Mountain, J. H. Topping, of Seattle, has the Topping on a six-foot ledge of free milling and concentrating ore, on which an inclined shaft is down thirty-three feet, and a cross-cut has been started. Two assays ran $60 and $37 gold, $23 and $3 silver. The Prince group, owned by Mr. Topping, J. A. Johnson and Mrs. J. F. Cummings, of Seattle, comprises five claims on a ledge of sulphuret ore traced through the whole string across the head of the river, with one claim on the Topping ledge. A tunnel has been run a short distance.

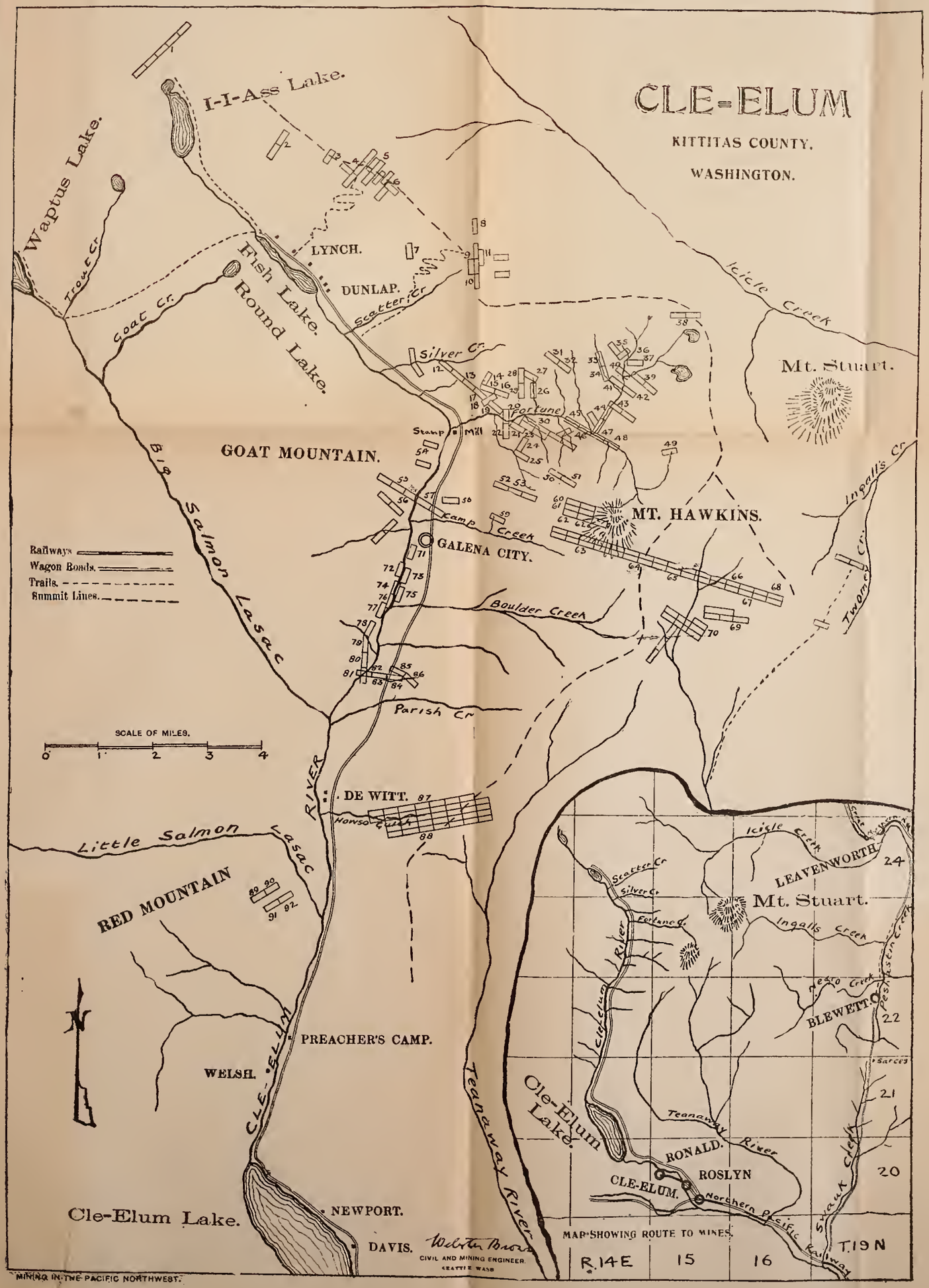
On the south side of Mammoth Mountain is the Fish Eagle, owned by James Grieve and K. W. Dunlap, on a great outcrop of copper ore stained red with oxidized iron, blue with bromide of copper and black with oxide of copper, at least forty feet wide. A cross-cut tunnel has been driven 262 feet to tap the ledge at a depth of 190 feet and is expected to strike it in twenty-five or thirty feet more.

On a sharp granite peak at the head of one of the forks of the Icicle, but reached by a trail branching off for three miles from the Cle-elum road, is the King Solomon Mine, owned by James Grieve, K. W. Dunlap and August Sasse, where development has been prosecuted with fifteen to twenty men. The ledge cuts through this peak in a north and south course and is of white quartz, fully eight feet wide. It carries galena, antimonial silver and gold with a trace of copper, and will average $133, mostly in gold. Assays of the rich streaks give $180 gold, 60 ounces silver, 22 per cent. lead. A tunnel was first driven 300 feet from the summit and is now in 130 feet on the ledge and an upraise has been made for twenty-two feet, from which the ore is being stoped out for smelting. The same ledge has been traced 1,200 feet over the summit of the peak and down a gulch on the north side, in which it crops eight feet wide between granite walls 100 feet high. A tunnel has been driven fifteen feet at this point, where Mr. Grieve has the Silver Fiend, and a cross-cut will be driven 200 feet to tap the ledge near the King Solomon line. On an eight-foot ledge parallel with the Silver Fiend, and carrying similar ore, Messrs. Grieve, Gassman and Dunlap have the Humbug, on which they are tunneling. On the next gulch east of the Silver Fiend Messrs. Grieve and Sasse and Mrs. Churchill have the Last Chance on a six-foot ledge, carrying gold, lead and plumbago, assays giving $4.30 in gold. A cross-cut has been run thirty feet and a shaft sunk twenty-five feet. On another six-foot ledge parallel with the Silver Fiend John Stewart has driven a tunnel twenty feet on the White Star, showing similar ore to the Silver Fiend with several feeders. A water jacket smelter will be erected this summer to reduce the large quantity of high grade ore on the King Solomon dump.

On the mountains on each side of Fortune Creek, flowing westward from Mount Hawkins, is a belt of ledges some of which carry free gold and sulphurets, while others carry iron and copper sulphides. On Huckleberry Mountain, south of the creek, Robert Montague, O. R. Johnson, Andrew Jackson and Simon Justhand have the Huckleberry group of three claims on a ledge of sulphuret ore three to four feet wide, opened by tunnels forty and twenty feet long, which assays about $35 in gold, silver and copper. On the same mountain the Rocky Point Mining Company has the two Rocky Point claims on three strong fissure-veins of pyritic ore running up and down the mountain. On one of these a fifty-foot tunnel shows ore the full width with



66. Crown Point.
67. Butte.
68. Grand View.
69. Chesapeake
70. Keystone.
71. Iron Duke.
72. Iron King.
73. Iron Boss.
74. The River.
75. Iron Monarch.
76. Iron Prince
77. Iron Monitor.
78. Iron Clad.
79. Iron Ship.
80. Leader Queen.
81. Leader.
82. Iron Yankee.
83. The Tacoma.
84. Sunset.
85. Hard-scrabble.
86. Conqueror.
87. Morning Star.
88. War Eagle.
89. St. John.
90. St. Luke.
91. Thorp.
92. John C.



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an eighteen-inch pay streak assaying $3 to $50. The second ledge shows three feet of ore in an open cut and the third shows thirty inches on the surface.

On the divide between Fortune Creek and the Teanaway the Ballard Gold Mining & Milling Company has the two Tip Top claims on parallel ledges. One is shown by a thirty-five foot shaft to widen from three to eight feet and carries $14 to $20 gold, silver and copper in sulphurets and carbonates of copper. The other ledge is similar in character. The same company has the Gold Mountain near the mouth of the creek, on which a small tunnel shows two feet of free milling ore.

A mile above the mouth of the creek the Mountain Chief Gold Mining Company has the Mountain Chief on a three and one-half foot ledge of talc between walls of granite and black quartz. An incline following the ledge at an angle of 45 degrees shows black oxide of copper assaying from 10 to 40 per cent. copper, and a trace to $104 gold, the average being about $30 gold. On the extension up the mountain the Fortune Creek Mining, Milling & Smelting Company has the Mountain Belle, in which an open cut makes an equally good showing.

The Mayflower, which is on the extension of one of the Rocky Point ledges, is owned by Dr. C. S. Emery and H. F. Weise, of Ballard. It has a ledge of crystallized quartz, in which two small tunnels have shown about thirty inches of pay ore carrying $14 gold, largely free. On the extension of one of the Rocky Point ledges to the river, with two others parallel, Mr. Weise and S. Kedzie Smith have the Big Bug. One ledge is seven feet of quartz carrying ruby silver and bromides, another of undefined width carries copper pyrites; the third carries streaks of iron and copper sulphides in a black quartz gangue. On the Mayflower ledge Mr. Weise has the Just in Time, on which a ten-foot shaft has shown six feet of free milling ore assaying $45 to $178 gold and a little silver.

The Queen of the Hills, owned by John Kelly and John Bailey, has a five-foot ledge on which a fifteen-foot tunnel has shown free gold and sulphuret ore, assaying $9.45 gold. On the Whippoorwill, R. S. Ward, of Ballard, has shown three and one-half feet of similar ore to the Mountain Chief on an eight-foot open cut.

The Standard and Ohamer, owned by George W. and E. H. Terwilliger and Ole Ohamer, of Ballard, are on three parallel ledges, two about three feet and the third twenty inches. Extensive open cuts have been made on all three, showing sulphides carrying gold, silver and copper. The twenty-inch ledge assays $13 gold and contains a rich one-inch streak carrying native lead. There are fifty tons on the dump. Adjoining these the Terwilliger brothers and Ralph Miles have the two Ruby King claims on a six-foot ledge discovered in September, 1896, on which an eight-foot shaft has shown seven inches of sulphides and antimonial silver, one assay running 643 ounces silver, $18 gold. On a twenty-four inch ledge of sulphides crossing the Ruby King the Terwilligers have the Lake City. Above these the two Rushing Water claims, owned by the Terwilligers, are on a forty-foot ledge of quartz carrying free gold and sulphurets and assaying $5 gold and silver on the surface. On the Twin group of four claims, the Terwilliger brothers have three parallel and two cross ledges. One of these carries two feet of copper sulphides in a fifteen-foot tunnel, an assay showing $23 gold, silver and copper, and another crops thirty feet wide and shows quartz carrying galena and sulphides in an eight-foot cross-cut. At the head of the north fork John Berg and John Kelley, of Roslyn, have the Tip-Top No. 1 on a thirty-inch ledge, carrying gold, silver and copper in sulphurets, which a fifteen-foot shaft shows to be widening. John Grosso, John Somers and Adolph Elsner, of Roslyn, have the Mary on a seven-foot ledge which assays $9 gold, $6 silver, 1 per cent. copper, and is believed to carry nickel.

On the left bank of the creek, running to the summit, is the Family group of four claims on a great body of low grade ore, owned by E. O. Marsh, Andrew Teuke, Henry Langenbacher, Charles Sears, of Ballard, and A. C. Bowman, of Seattle. This body of ore crops eighty feet wide on the summit and 225 feet wide at a lower point, where it is cut by a small creek, and has a syenite hanging and granite foot wall. The ledge matter is talcose quartz with talc gouge and is mineralized throughout with fine-grained white iron sulphurets. A tunnel has been driven thirty-three feet, running into a hard, dark quartz, and a cross-cut runs ten feet towards the hanging wall, all in ore which assays $1.80 gold, 20 cents silver. On a supposed spur from the summit outcrop of this ledge Thomas and Don Smith have the two Don Tom claims, on which surface ore assays $2.27 gold and silver. On the same gulch as the Family group William McKasson, John H. Corbins and Mayor H. P. Fogh, of Roslyn, have the two Mountain Whistler claims on a parallel ledge of similar ore fourteen feet wide, shown in a surface cut twenty feet long and twenty feet deep.

On the next gulch below, the Clermont Gold Mining Company has the Silver Queen group of two claims on two parallel ledges, one of which shows three and one-half feet wide in a fifty-foot tunnel and carries $16 gold, $2.30 silver in sulphurets. There are seventy tons of ore in the ore house. Above these claims Terwilliger brothers and Ole Ohamer have the two Goldbug claims on a four-foot ledge showing free gold in an eighteen-foot open cut.

L. F. McConihe, of Roslyn, and W. E. Head, of Seattle, have a four-foot ledge of sulphuret ore assaying $18 gold on the Gambler's Dream.

At the mouth of Fortune Creek the Fortune Creek Mining, Milling and Smelting Company has erected a mill with two 600-pound stamps, of which the weight and number of drops will be increased by coil springs forcing them down. The river has been dammed to produce fall enough to run a water wheel, which was ready to turn last summer, but was carried out by the fall floods. The company has also shipped in a pyritic water-jacket smelter of twenty tons daily capacity, which will be erected in the spring.

The great copper belt extends for seven miles northwest and southeast from the base of Mount Hawkins through the Teanaway watershed to the source of Ingalls Creek at the base of Mount Stuart, and is covered with locations for the whole distance. There are two main ledges, which have been traced on the surface at intervals, one being fifteen to twenty feet and the other five feet and upwards, with walls of granite and porpnyry on one side and granite and serpentine on the other. Both carry red and black oxide of copper and masses of native copper weighing 400 pounds and upwards, the ore always having a considerable gold value as well.

The most easterly group is the Grandview of three claims, owned by Paul Gaston, J. T. Hamilton and Dr. R. C. Corey, on which one ledge crops ten to twelve feet wide. In a tunnel sixty feet long at a depth of eighty feet is a pay streak eighteen to forty-eight inches wide, in which bodies of native copper frequently occur, surrounded by black oxide. The lowest assays have shown 10 per cent. copper and $6 gold, and the value has run as high as 60 per cent. copper and $15 gold. A cross-cut has been started to tap this ledge at a depth of 140 to 150 feet. Then come the Butte group of three claims, owned by the Anaconda of Washington Copper & Gold Mining Company, on which two open cuts have defined the smaller ledge to be three to fourteen feet wide, and the Crown Point group of five, owned by Messrs Gaston, Corey and Hamilton, where the ledge is shown up by an open cut and has been stripped. The Swayne and Haight group of seven claims, bonded to D. N. Baxter, adjoins on the west, having a 120-foot tunnel showing good ore in one ledg e. The Johnson group of eight claims, owned by Messrs, Gaston, Corey and Hamilton, has a fifteen-foot shaft and several open cuts showing a streak of native copper two to twelve inches wide for the whole length. The Boyls group of eight claims on both ledges, owned by A. P. Boyls is bonded to Messrs. Corey and Hamilton. The wider ledge has been opened by tunnels forty, seventy, ninety and 200 feet, giving a depth of 300 feet and blocking out 1,000 tons of ore similar to that in the Grandview and assaying 10 to 48 per cent. copper. On the smaller ledge are tunnels thirty and 100 feet, ore from which carried 48 per cent. copper and about $10 gold and silver. A ledge of free milling ore eighteen to thirty-six inches wide and assaying from $75 to $175 gold on the surface crosses these two at right angles.

The first discovery on Mount Hawkins was three parallel ledges carrying iron sulphurets, on each of which two claims have been taken. In the Cle-Elum and Hawk group A. P. Boyls and W. B. Kelly have four claims, two on each of the lower two ledges. One shows two to five feet wide in a fifty-foot inclined shaft, from which assays averaged about $50, though a sample across the bottom is said to have shown $455 gold. A 120-foot cross-cut will tap this shaft in thirty feet more. On the other ledge an incline of thirty feet shows it to be eight to ten feet wide, carrying $25 gold and a little silver. The I-i-ass, owned by P. J, Flint, is on the third ledge, which is defined as forty feet wide by a cross-cut, and has a pay streak in the croppings four or five feet wide, assaying $25 gold and upwards, with a little silver. On the extension Moses Emerson and John O'Neil have the Epha and an extension showing four to six feet of quartz carrying $7.20 gold and an ounce of silver on the surface.

On the west spur of Mount Hawkins is the Ida Elmore, owned by Messrs. Hawkins, Grieve and Dunlap, on which a tunnel thirty-six feet shows a ledge eighteen to thirty-six inches, assaying $45 free gold and $82 gold in sulphurets. A cross-cut has been run 236 feet to tap it. On a parallel ledge is the Maud O., owned by A. D. Olmstead, C. O. Swayne and A. W. Haight, of Roslyn, E. W. Wilson and C. W. Sill, of Seattle. A tunnel and incline have been run 147 feet on the ledge, showing eighteen inches of solid free milling ore, of which an average assay gave $74 gold and $1 silver. A small stamp mill has been bought for this property and will be erected when the snow goes off. Near the mouth of Camp Creek J. C. Jackson and Charles Eaton have the Beaver on a four-foot ledge between granite walls, on which a tunnel is in thirty-five feet. The ore assays $18 gold, silver and copper in sulphurets.

The Ruby group of two claims has five closely parallel ledges, which have been traced across the river to Goat Mountain, and is owned by H. F. Weise and S. Kedzie Smith. One ledge of great size has a fifty-foot tunnel along the hanging wall, which shows iron sulphides on the wall and fine-grained arsenical iron in a number of streaks, assaying $7.35 to $28 gold and silver. Another ledge is six or seven feet between walls and shows eleven similar seams of arsenical iron and sulphides in a small tunnel. A third ledge is similar in size and character and the two appear to be running together. Another is sixteen feet wide, similar in all respects, and the remaining two,

thirty inches and five feet wide, are also like them, except that they carry more copper, assays running $13 to $20 silver, $4 to $5 gold and 10 per cent. copper.

Three of these ledges show very prominently on the extension up Goat Mountain, on which Messrs. Weise and Smith have the Brown Bear group of three parallel claims. The widest is sixty feet, cropping in a gully where a waterfall pours over a cliff of ore twenty-five feet high. A ten-foot tunnel shows galena and sulphides assaying $48.85 gold and silver and 5 per cent. lead, and sixteen feet of ore shows in the croppings and assays $63.40 gold and silver. The two parallel ledges are thirty and forty feet wide, and carry more galena, being similar in other respects to the first. On the extension of the same series down the mountain to the river the Jackson brothers located the Cascade in the fall of 1896 and by their first shot took out $65 ore carrying more galena than on the other claims.

On Goat Mountain a good showing of galena ore has been made by Curtis Homer, of Roslyn, and Michael McHugh, of Buckley, on the Silver Dump, nearly opposite the mouth of Camp Creek. A tunnel has been driven forty feet on the river bank, and shows an eighteen-inch pay streak of solid galena, assaying $63 silver and some gold. Near this claim David Payne, Robert Babcock and Charles Roberts, of Roslyn, have a ledge of great width, which assays $35 gold, $6 silver and 3 per cent. copper. On the southeast end of Goat Mountain William McKasson has the Hardscrabble on a six-foot ledge carrying iron pyrites and capped with iron-stained porphyry. On a ten-foot cross ledge of similar ore John H. Corbins has the Mattie.

A great belt of ledges runs across Howson Gulch and up the mountain on the left bank opposite Red Mountain, in a northeast and southwest course, cutting the granite, while a number of cross ledges run almost at right angles. The most active work is being carried on by the Morning Star Mining Company, which has seven claims on three ledges. One of these measures sixteen feet and a 100-foot tunnel shows the ledge matter mineralized the full width. An assay a few feet from the mouth showed $9.60 gold, besides copper and silver. Another ledge crops eight feet wide and shows white iron sulphides carrying $5.70 gold in a fifteen-foot tunnel, which is being driven 100 feet. Another ledge eight to ten feet wide is being opened by a tunnel, ore from which assays $7 gold and silver.

On the same belt John McDonald, of Seattle, and William Campbell, of Port Blakeley, have the War Eagle group of twenty-eight claims, which they are developing. On the War Eagle ledge, six feet wide, are four claims, and a sixty-foot tunnel shows iron sulphides the full width, assays running about $40 gold and silver, mostly the former. Another seven-foot ledge runs through four claims and a thirty-foot tunnel shows sulphurets and molybdenite. Another claim is on a twenty-six foot ledge, on which a fifteen-foot tunnel shows galena and sulphurets its whole width, assaying $8 to $10 gold and silver. An eight-foot ledge running through two claims is opened by a ten-foot tunnel, now being extended, and has been stripped, the surface ore carrying $5 free gold. A forty-foot tunnel shows galena ore carrying $8 or $9 gold and silver in a six-foot ledge and a tunnel of the same length shows sulphide ore in a four-foot ledge.

At the head of Boulder Creek, on the summit of the ridge between the Teanaway and the Cle-Elum, is a great porphyry dike running southeast and northwest, which is fully 100 feet wide and spreads at one point to a greater width. It is veined with quartz ledges four to twenty feet wide, carrying gold, silver and nickel. On the Keystone group of ten claims, owned by Adolph Elsner, John Grosso and John Somers, of Roslyn, is a ledge twenty feet wide, in which a twenty-foot shaft shows a twenty-four inch pay streak assaying 8 to 18 per cent. quicksilver, $2.40 to $15 gold. On an eight-foot ledge a twenty-eight foot tunnel shows six inches of talc on each wall, which assays 2½ to 8 per cent. quicksilver, $5 to $24 gold, besides nickel. A cross-cut has been driven thirty-two feet. The Chesapeake group of five claims was located in 1896 on the northeast end of the dike by John Mulligan and others. The surface ore assayed $13 gold.

One of the famous claims of this district is that located by the late Elvin Thorp ten years ago on Red Mountain and now owned by Edward Pruyn and J. B. Davidson, of Ellensburg. The ledge is iron pyrites twelve feet wide under a red iron cap, and assays have ranged from $18 to $165 in gold, silver and copper. A tunnel was run 240 feet on the ledge by the original owners. On the northeast extension J. S. McConihe and Jacob Welsh have the John C., and on one of the peaks William McKasson and John H. Corbins have the St. John and St. Luke on a ledge eighteen feet wide.

The famous Cle-Elum Iron Mines, which may yet turn out to be gold and copper mines, are on a seven-foot ledge showing red hematite and magnetite in the croppings, which assays 56 per cent. metallic iron. It has been traced two miles down the river and bears eastward across the Teanaway to the headwaters of the Peshastin. On this ledge the Pacific Investment Company has twelve patented claims, on which it ran a number of tunnels and surface cuts.

Placer gold is found throughout the bars of the Cle-elum River and has been mined spasmodically for many years, but the gold is mostly fine and the best pay would probably be found on the bedrock of the old channel. Several

parties are working to reach bedrock, among them Messrs. Hicks and Jones near the mouth of Fortune Creek, L. F. McConihe on the Princeton bar, John H. Corbins and William McKasson at the Battle Ax camp. The high bars on the sidehills are evidently old river wash and skill and persistence, backed by money, might show good pay on bedrock, but it is probable that only hydraulicking on a large scale would be profitable. Until the last year work was confined to the low bars, from which Theodore Cooper, James Wright and John Lind took $400 in 1895 in coarse gold with some pieces of platinum at the China camp. R. De Witt and William Taylor have wing-dammed the channel at Big Salmon le Sac and taken light gold from bedrock.

THE ICICLE.

The mountain walls between which this stream flows from the snows of Mount Stuart into the Wenatchee offer an inviting field to the prospector, in which he has barely begun to uncover the mineral. If the discoveries already made may be taken as an earnest of what remains to be found, this is as rich a part of the Cascade mineral belt as many already described. It lies in a direct line with districts which make good showings, on the north, south and west, being divided by a single mountain ridge from the headwaters of the Cle-elum.

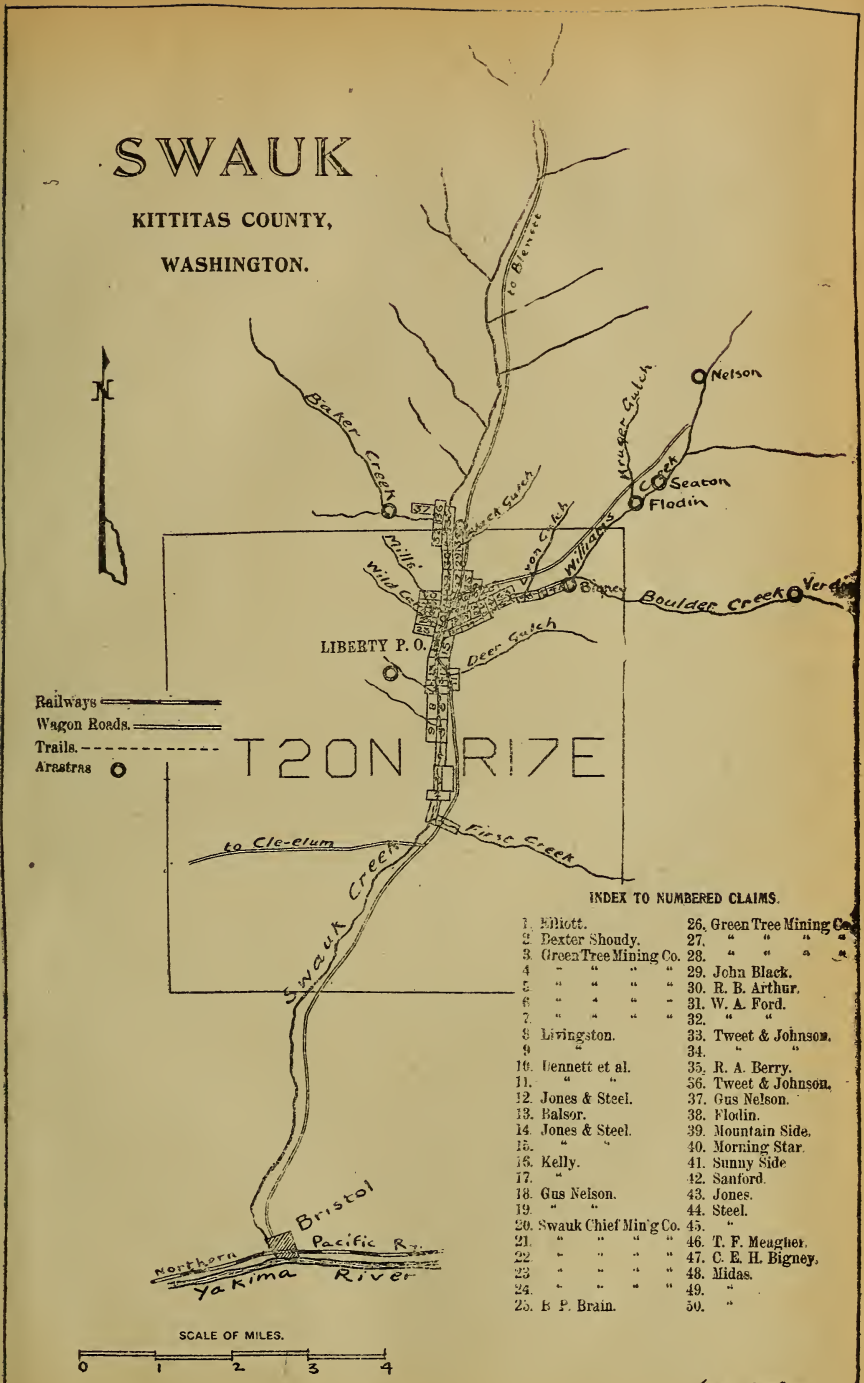
The district is reached from either the Northern Pacific or the Great Northern Railroad. The former is left at Cle-elum, 122 miles from Seattle, a branch line followed to Roslyn, four miles, and the wagon road followed up the Cle-elum Valley, twenty-five miles, to the mouth of Scatter Creek. Thence a horse trail leads three miles over the divide to the headwaters of the Icicle. The Great Northern Railroad may be taken to Leavenworth, 151 miles from Seattle, and thence a trail leads up the Icicle thirty miles to its head.

The greatest discovery, and the one having most development, is on the Pickwick group of thirteen claims, from which the Pickwick Mining and Development Company expects to ship ore this season. This is a great deposit of decomposed quartz, carrying copper carbonates, sulphides and bornite, which covers a great but undefined area in the basin at the head of Phantom Creek, an affluent of the Icicle near its source. It has been traced over a space 6,000 by 145 feet and its boundaries were not found. From an open cut thirty feet long a shaft was sunk forty feet and cross-cuts made from the bottom seventy-five feet one way and forty-five feet the other, and all the rock cut through had the minerals already mentioned disseminated through it. A mill test of this rock showed it to carry 15 per cent. copper, $14 gold, $5.40 silver, a total of $34.40. At another point a tunnel was driven 100 feet and a cross-cut forty-five feet each way, and all this work was in ore carrying a smaller percentage of copper but more gold than that taken from the shaft. The company has recently bought two adjoining claims and will make a road to connect with the Cle-elum Valley road, with a view to shipping ore this season.

A number of locations—probably fifty—have been made during the past year on the two forks of Jack's Creek, which enters the Icicle about twenty miles from its mouth, and on some of them work was continued until snow fell last winter. On one of these A. F. and F. D. Estes ran a thirty-foot tunnel on a twelve-foot ledge assaying $28 gold and copper. L. A. Parker and H. C. Castlebury have shown gray copper in a sixteen-foot cross-cut on a ten-foot ledge, where they have the Bald Eagle and Gray Eagle. A five-foot ledge carrying arsenical iron, on the mountain overlooking the left fork of Jack's Creek, gave a surface assay of $13.80 gold, and extends through the Blind Lead group of three claims held by John Bjork, A. Van Epps, H. L. Farley and Camille Massey, and four extensions held by Ed Gonsur, with Messrs. Massey and Farley. On the left bank of the right fork of Jack's Creek a dike of dolomite and quartz is slightly mineralized throughout with white iron and sulphurets, carrying gold, silver and nickel, and is opened by a twenty-six foot tunnel. On this ledge are the Nevada and Excelsior, held by Messrs. Bjork and Van Epps.

THE SWAUK.

In other sections of Washington placer mining has quickly become dwarfed in importance by quartz mining, but on the Swauk and its tributaries the former system still holds pre-eminence. It is only during late years that discoveries of mineral-bearing rock have distracted attention from the auriferous gravel which has yielded nuggets large enough to become the talk of the state. The district is easily accessible, considering its distance from a railroad. From Seattle the route is by the Northern Pacific Railroad



INDEX TO NUMBERED CLAIMS.

1. Elliott.
2. Dexter Shoudy.
3. Green Tree Mining Co.
4. " " " "
5. " " " "
6. " " " "
7. " " " "
8. Livingston.
9. "
10. Bennett et al.
11. " "
12. Jones & Steel.
13. Balsor.
14. Jones & Steel.
15. " "
16. Kelly.
17. "
18. Gus Nelson.
19. " "
20. Swauk Chief Min'g Co.
21. " " " "
22. " " " "
23. " " " "
24. " " " "
25. B. P. Brain.
26. Green Tree Mining Co.
27. " " " "
28. " " " "
29. John Black.
30. R. B. Arthur.
31. W. A. Ford.
32. " "
33. Tweet & Johnson.
34. " "
35. R. A. Berry.
36. Tweet & Johnson.
37. Gus Nelson.
38. Flodin.
39. Mountain Side.
40. Morning Star.
41. Sunny Side
42. Sanford.
43. Jones.
44. Steel.
45. "
46. T. F. Meagher.
47. C. E. H. Bigney.
48. Midas.
49. "
50. "

Wolcott Brown
CIVIL AND MINING ENGINEER.
[illegible], WASH.

to Cle-elum, 126 miles, and thence by a good wagon road sixteen miles to Liberty, the center of the district; or by the same railroad to Ellensburg, 151 miles, and thence by an equally good road to Liberty, thirty-six miles. From Liberty roads branch out up the several creeks and buggies can be driven through the open, grassy pine woods in many places where no road has been made.

The gold of the Swauk's placers is believed to have come from Table Mountain on the east and the Teanaway Range on the west, and is found in the bars which cover old creek channels along the banks of Williams, Boulder and Baker Creeks, and of Swauk Creek between Baker and First Creeks, a distance of three miles north and south and about the same east and west. The country rock is sandstone and slate, with dikes of basalt and porphyry, the bedrock of the old channels being slate, with occasional dikes of sandstone and basalt, carrying 2 to 3 per cent. of iron, which is locally known as iron rock. One theory is that the gold in Williams Creek, and in the Swauk below that creek, came from the summit of Table Mountain, for on this level plateau there is said to be good pay dirt, and all its drainage runs into the Swauk, and all the valleys and gulches carry more or less placer gold. However, the fact that little gold has been found in the Swauk above Baker Creek, and that all the coarse gold is found on the bedrock of old channels between this stream and First Creek, leads to the conclusion that the gold deposits in the Swauk itself were not washed down by that stream, but by its tributaries, Baker, Williams and Boulder Creeks. The upper dirt carries only fine gold in most instances, and the miners do not take the trouble to attempt to save it, but in the old channel big nuggets are found. The character of the ground above Baker Creek is also different, for it is all hill wash, while below that stream it is evidently channel wash, with boulders of a different character. The nuggets range in size from a pinhead up, the larger ones being generally rough, flat pieces about three-quarters of an inch thick, or in the shape of a network of wires, mashed together by the action of the water. They are found in the three or four feet of dirt next to the bedrock. The product of Williams Creek is worth $1.50 to $2 an ounce more than that of Swauk and Baker Creeks, as the latter carries considerable silver. The Swauk gold is worth $13.50 an ounce, and that of Williams Creek $14.50 to $15.

The good pay in coarse gold has led the miners to despise fine gold as not worth the trouble of saving, yet it has been proved by panning the dumps that they will pay well for working over, and that more careful and systematic work would bring good results. Experience has shown that the gold is finer towards the mouth of a stream and thus it is that the nugget hunters have only worked the bars for two miles below Liberty. That there is good pay in the gravel beyond that point is proved by the fact that Chinamen who worked there many years ago earned $2 or $3 a day to the man, and that shafts sunk deeper than their workings showed dirt carrying twenty colors to the pan.

The Fraser River miners passed through this district on their return southward without discovering its wealth. Bent Goodwin, a deaf-mute, made the discovery by accident in 1868, while hunting. Going to the creek for a drink at a point a little below John Black's present mine, he fished up a piece of gold worth $10 or $12, which he found lying on the bedrock. He and his companions went to work and their success soon caused a rush of miners, who located the flats all along the creek. Among them were M. Cooper, Frank Gibbs and John A. Shoudy. The oldest pioneer now working is John Black, who came about twenty years ago and finally went to work on the high bars, half a mile above Liberty. In 1893 he replaced his primitive outfit with a hydraulic plant and has since worked on a large scale on a bar twenty-five feet high. He uses six Hungarian riffles in thirty feet of sluice box, with no quicksilver, and saves nearly all the gold in the first two riffles, making no effort to catch the fine gold. His biggest nugget was worth $565, while others have weighed 23 and 20 ounces respectively.

The placer claim furthest up the valley now being worked is on the high bar north of the mouth of Baker Creek, which has the honor of having produced the champion nugget, weighing $1,004. This claim is now owned by Gus Nilson, who has been drifting on bedrock. On the other side of Baker Creek is a range of six 200-foot claims, from which the late J. C. Pike took out a $745 nugget. These claims, which aggregate thirty-seven acres, all high bar, with ten to eighteen feet of dirt above bedrock, are now owned by W. A. Ford. A tunnel has been run 196 feet due west from the rim of bedrock until it reached a point where it dropped off nine feet at an angle of 45 degrees and the water drove the miners out. This is supposed to be the old channel, from which the gold has been washed up to the high rim. Mr. Ford is using a hydraulic and has found nuggets of $5 up to $300 on bedrock. He found spots of blue gravel which seemed to run back under the mountain to the west, and this fact, together with the discovery in the tunnel, leads to the belief that the old channel ran from northwest to southeast, obliquely across the present one. This theory will explain the failure to find pay dirt on the Swauk above Baker Creek, although the prospecting in that part of the valley has not been thorough.

The next four claims on the east below Black's are owned by the Green Tree Mining Company, of Tacoma which has at times leased them on shares,

but is now tunneling on bedrock. At the forks of Swauk and Williams Creeks Gus Nilson has tunneled 600 feet on bedrock and drifted 900 feet, taking out about $30,000. L. H. Jansen, of Tacoma, is drifting on bedrock on the two next claims. H. C. Jones and H. C. Dennett, on the two next adjoining claims, are drifting on bedrock under a bar seventy feet high and find the pay dirt closer to bedrock as they go down stream. Beyond them, David, Thomas and George Livingstone have run a tunnel 170 feet to bedrock on three claims and have started another, taking out nuggets as large as 11 ounces and averaging about 50 cents. From one of their claims three nuggets were taken ten years ago, the largest of which weighed $400 and the smallest $200. Next below them John Mayer has sunk twenty feet to bedrock, which is here below the present channel, has erected a pump and raises dirt by a whim from three tunnels, one of which is 300 feet long. On the two next claims Dexter Shoudy has a tunnel 400 feet, and the furthest work down the creek is being done by two gangs of Chinamen, who strip off the surface dirt and wheel the pay dirt to sluice boxes.

The placer mines of the Swauk were extended up Williams creek in 1868 by H. M. Cooper, who found gold about a mile above the mouth of the creek, on ground now included in Thomas F. Meagher's claim, and the workings now extend two miles above the mouth. The first prospecting was done in the creek bottom, but this was found to give poor pay, and not until the bedrock of the old channel was struck were good results obtained. It runs a little south of west and north of east and is cut diagonally by the present channel about a mile from the mouth. The gold is all coarse, in pieces from 10 cents to 17½ ounces, and is in flat, smooth nuggets. It is nearly all found in the six or eight inches of dirt next to bedrock, and the miners rarely work the upper dirt.

The first claim above the mouth is owned by Andrew Flodin, who has run about 400 feet of tunnel on bedrock. Thaddeus Neubaur is drifting on bedrock. H. C. Jones' claim, next above, is being worked on shares by John Doyle, each taking half. He has run a drain race 484 feet across the bedrock and struck the pay streak, on which he has since been tunneling. He finds that the bar pays only on bedrock, but thinks it would pay all the way through if worked in conjunction with the claims below. It now pays $3 a day to the man after deducting the owner's half, the nuggets weighing $23 and less. Thomas F. Meagher has three claims next above, at the mouth of Lyons' Gulch, taking in all the old channel, from which he took out over $15,000 in 1895 with a hydraulic. He has about 3,000 feet of tunnel, and is now drifting on bedrock from an open drain. His gold is generally coarse, his largest nugget being $222, but there is fine gold all through the bar.

C. E. H. Bigney has some extensive workings on the eighteen acres next above Mr. Meagher's on the high bars on the left bank. He has sunk an inclined shaft to bedrock 116 feet on the upper edge of the claim, and put down an air shaft ninety-three feet. He has done 2,805 feet of tunneling on bedrock, and struck the old channel 160 feet from the face of the bar, at a depth of twelve feet below the present channel, so that he has to pump to keep clear of water. The dirt is raised by a water-power hoist from the incline and by a whim from the other shaft. He got the mine in shape to produce in 1892, and in 1895 took out about $16,000. William H. Elliott, on the next claim, has drifted 500 feet on bedrock from one side of the creek to the other, but has not yet reached the old channel, and, although he has struck some gold, he does not expect pay dirt till he does so. Nis Jensen, whose claims adjoins Mr. Elliott's, has driven a tunnel on bedrock 250 feet from the old channel and another 107 feet, which proved to be twenty feet above bedrock, but has not yet reached the pay streak. He finds that the whole bar carries gold, as large as pinheads near the surface, and in nuggets running up to $7.25 near bedrock. Louis Quietsch, next above Mr. Jensen, has run a tunnel 125 feet and drifted either way on bedrock, but, while he found fine gold, there was not enough to pay, and he has lately turned his attention to quartz mining. George D. Verdin, who owns the last placer claim up Williams Creek, has driven a bedrock tunnel and sunk two shafts, but has transferred his energies to quartz claims.

Placer gold was first struck on Boulder Creek by W. R. Hart in 1891. A shaft was sunk for bedrock and struck the rim, from which a cross-cut was started, but water forced a stoppage of work. The gold was in small nuggets, the largest weighing one-half pennyweight. The Livingstones prospected these claims eight years ago and found moderately coarse gold, from two feet below the surface downward. This claim, with another adjoining and two on a gulch leading down to them from the right bank, is now owned by Thomas F. Meagher, C. C. Whitaker and A. F. York. During two months' hydraulicking on the gulch claims they took out nearly $2,000, the dirt carrying gold from the grass roots down. It is in the form of both smooth nuggets and wire gold, and ranges down to flour gold. The largest piece was worth $160; others weighed $98, $95 and $45, and there was quite a number of $25 nuggets. The product brings about $15 an ounce at the mint, 1 per cent. silver bringing down the value. Adjoining the Boulder Creek claims of this firm Mr. Hart has two others, one on which he has three men employed in sinking a shaft to bedrock, while on the other two men are running a bedrock drain. On the claims next below the gulch James Sutherland and August

Ziegel have sunk a shaft sixty feet to bedrock and are tunneling from it. They found one nugget of $24 and got $10 or $12 in the bottom of the shaft, but have not so far found enough to pay. Their work is hampered by water, as bedrock is sixty feet below the level of the present creek, which the old channel seems to parallel. Prospecting is also going on above Mr. Hart's claim and in the adjoining gulches, but nowhere has the old channel been reached or pay dirt been struck.

The miners of the Swauk have hitherto shown a decided repugnance to the invasion of outside capital, which would work the placers on a large scale by modern methods and therefore more economically, but efforts are being made in this direction. Although hundreds of thousands of dollars have been taken out, the ground has only been worked enough to prove its value, only about one-tenth of the gravel having been worked. In fact, it may fairly be said that the work so far done is practically equivalent only to thorough prospecting. The consolidation of the placers and their operation as a whole, with proper water pressure, would make good paying property of all the placer ground, while now the cost of handling the dirt is so high in many places that it only pays ordinary wages.

Discoveries of free milling quartz, which is now diverting attention from the placers, date back to 1887, when Thomas Tweed and William Johnson found a pocket on the east bank of Swauk Creek, opposite the mouth of Baker Creek, which carries wire gold in nuggets ranging as high as $6, and was apparently a broken quartz ledge. A sixty-foot tunnel showed a number of stringers running into one, but no main ledge in place. They built an arrastre and ground between $10,000 and $11,000 worth of rock in it, twelve tons yielding $2,200.

Later discoveries show the quartz ledges to extend from some distance up Baker Creek across the Swauk and through the hills cut by Williams and Boulder Creeks and Kruger Gulch. The general course of the ledges is northwest and southeast, the walls being slate and the ledge matter blue and bird's-eye quartz. The ore carries enough free gold to make it pay well, and the miners grind it in arrastres, being content to let the sulphurets escape in the tailings, but as the ore grows baser at depth this crude process will have to be abandoned.

George Hampton located the first claim, the Red, on the hill between Kruger and Lyons Gulches in 1889. It is a three-foot ledge carrying about $16 gold, mostly in sulphurets. He sank shafts seventy-five and fifty feet and cross-cut 200 feet, taking out about fifty tons of ore.

Two years later Andrew Flodin located the First of August on a four-foot ledge of bird's-eye quartz between solid slate walls. He has sunk a shaft ninety-six feet, showing a pay streak twelve or thirteen inches wide, with well-defined walls. He has also run a cross-cut 170 feet, which will strike the ledge at a depth of 140 feet in seventy feet more. In 1894 he built a water-power arrastre on Williams Creek, with a capacity of 3,200 pounds a day, and averaged $21.23 a ton in a year's run. On the southwest extension of this ledge he has run three cross-cuts, of which the longest struck the ledge in eighty-five feet. He is sinking a shaft on another ledge on the same claim, of which he has not defined the width, the ore being black slate veined with quartz.

The Brown Bear group of two claims at the head of Kruger Gulch, owned by Keith W. Dunlap, Mrs. M. A. Chapman, Whitson & Parker, Vestal Snyder and Matt Bartholet, all of North Yakima, has a ledge about three feet wide which has assayed from $100 to $140. A shaft is down forty-five feet and will be extended before drifting begins. Below the Flodin claims on Kruger Gulch William Queitsch has the Dandy on a six-foot ledge and has run a tunnel twenty-five feet on a stringer, which returned from $20 to $25 at his arrastre.

On the Morning Dr. O. M. Graves has two ledges of bird's-eye quartz, one sixteen to twenty-four inches and the other three to four feet, the smaller one assaying $12.50 free gold. A tunnel has been driven fifty-five feet toward the face of the ledge and will strike it in fifty feet more, having cut two small feeders already. Dr. Graves has put in a steam stamp mill, with one 750-pound stamp for prospecting purposes.

On the extension of the Morning ledge Louis Queitsch has the Bunker Hill on which he has five veins ranging from seven feet down. A thirty-foot tunnel on the widest shows good free milling ore.

The ledges have been traced over the hills on both sides of Kruger Gulch and development is proceeding there also. A. B. Morrison and Daniel Morrison have started a tunnel on the Livingstone ledge adjoining the First of August on the northeast. On the south side of Williams Creek they have sunk a shaft seventy-five feet on a four-foot ledge on the Bullion, run a cross-cut tunnel over 100 feet and another sixty feet at a point fifty feet further down, yielding $8 a ton. Gus Nilson and H. C. Condon, of Yakima, have two feet of ore on the Great Wonder. A shaft is down twenty feet on the ledge and a forty-foot tunnel has cross-cut it. A few tons milled gave $35 a ton and they have built a one-ton arrastre. On another claim an eighteen-inch cross ledge of $32 ore, on which a shaft is down eighteen feet, with a tunnel twenty-three feet.

The Great Western group of two claims, owned by Gus Nilson, Evan Strander and Charles Kineth, has a fourteen-foot ledge, from which the

four feet next the footwall carries $6 free gold and a higher value in sulphurets, which they have tapped with a fifty-foot cross-cut. Another ledge four feet wide has a twelve-inch pay streak carrying $18 free gold, shown in a sixteen-foot shaft.

On the mountain south of the south fork John H. Price has the Wall Street group of six claims on a series of parallel ledges, two of which are cut by the creek. One of these shows up seven feet wide in a forty-foot shaft and sixty-foot drift and carries $8 free gold, besides sulphurets. Another is thirty inches wide in an eighteen-foot shaft and carries $4 to $5 free gold. Another, five feet wide, is cross-cut by a 145-foot tunnel, which also cut a series of stringers two to twenty-four inches wide, the main ledge assaying $4 free gold and the smallest stringer $10.

George W. Verdin has taken some of the richest ore in the camp from the two forks of the widest ledge of the Wall Street series, on which he has the Gold Vein and Badger. One of these shows a foot of ore in tunnels eighty and 100 feet and a small shaft, the average value being $30, though pockets have run as high as $1 a pound and several thousand dollars were cleaned up from one run of an arrastre.

A little to the left of the forks of Williams Creek G. W. Seaton has the two Gold Leaf claims on a ledge of free milling ore. A shaft is down sixty feet and is intersected by a tunnel of the same length. Another tunnel forty feet long taps the ledge at a depth of fifty feet and a third tunnel has been run 100 feet on the ledge. This work shows it to widen to three or four feet and fifty tons milled in a one-ton arrastre averaged over $30.

On the gulch running into Boulder Creek, from which they made their rich strike of placer gold, Messrs. Whitaker, Meagher and York have the two Bertha claims on a ledge of porphyritic quartz, similar to the rock found in the placers and carrying free gold of the same character. It crops out five to six feet wide, between walls of basalt and iron rock. They have stripped a stringer from four to eight inches wide running into the ledge, which is richly studded with small nuggets. They also have the North Star on a three-foot ledge across the gulch.

In the next gulch above the Bertha, Albert Tallicut has the Josie on two small seams of ore which he is milling in an arrastre, one pocket containing 25-cent nuggets. South of Boulder Creek Mr. York has the Uncle Sam on a three-foot ledge, carrying $8 free gold.

Free milling ore was discovered in the spring of 1896 a mile above the mouth of Baker Creek by George F. N. Watson. He has the Green horn on a three-foot ledge between walls of porphyry and iron rock, which gives 1,000 colors to the pan in fine round shot gold. The Bobtail, on the north extension, owned by Irvine Liggett, Isaac Zeran and Dr. H. B. Runnels, shows twenty inches of similar ore in a twenty-foot shaft. The Mary Ellen, owned by the same parties, is on a parallel ledge fourteen to twenty-four inches, showing well in a twenty-eight foot shaft. The Big Bear and Little Bear, on a four-foot ledge traced for 3,000 feet, are owned by F. D. Wilson and E. J. Young, and show ore rich in coarse and flake gold.

E. J. Gaffney and F. W. Clayton in 1896 discovered a ledge four to sixteen inches wide on the west bank of the Swauk below Liberty, assays from which range from $26 upward.

Some of the more progressive miners in the Swauk district are already preparing to erect stamp mills and concentrators and another year is likely to see quite an increase in production following upon such improvement in methods.

WENATCHEE.

This city is known chiefly as the outfitting point for the districts in Okanogan county north of it, being the connecting point of the Great Northern Railroad and the Columbia River steamer line, but it also has the making of a mining camp at its back door, within three miles of it by wagon road. The ore is low grade, bearing gold and a small proportion of silver, but is in such large deposits that, if worked on a considerable scale with modern methods and skillful management, it would pay handsome dividends. The deposit is a great dike of porphyry in which are numerous veins of quartz, and extends over three miles in an almost due north and south course from Squilchuck Creek to Canyon No. 2, directly back of the town, among the foothills. Another parallel dike of almost equal size has been located for a distance of five miles. The principal work in this district has been done on the Golden King group of three claims, located by M. J. Carkeek, of Seattle, and owned by the Golden King Mining Company, of Seattle.

The dike is a veritable landmark in the Squilchuck Canyon, standing out on the north side, one mile from the Columbia, from 100 to 150 feet wide between walls of bastard granite rising in a great cluster of pinnacles and spires of bright red, yellow and brown to a height of 150 feet above the road and growing taller toward the crest of the hill until it reaches an elevation of 500

feet. The whole dike is more or less mineralized, the porphyry carrying about $2 gold besides silver, but the best value is in the quartz stringers, which range in width from six inches to seven feet, and have given assays ranging from $4 to $16. The dike is so thoroughly mineralized from the very surface that it could be mined very cheaply, in fact it could be quarried out, and with a large stamp mill could be reduced profitably.

The Golden King Mining Company has a mill with five 500-pound stamps, operated by steam power, and in 1894 began to mill the surface ore, which was quarried. The intention was to mill only the quartz, but it was not carefully sorted, so that a large proportion of the less valuable porphyry went through the battery and the milling at times was not over-skillful. During a sixty days' run of four tons every twenty-four hours $1,600 in bullion was taken out. The mill was then shut down in October, 1894, and a tunnel was started at the foot of the hill on the roadside to develop the deposit at depth. It runs for the first 100 feet through surface wash and slide rock, which requires heavy timbering to prevent caves, and then runs for eighty-six feet through the dike at an acute angle, cutting thirty feet across at right angles to the course of the deposit. In this eighty-six feet about forty seams of quartz from six to thirty inches wide were cut, their width on the surface running as high as seven feet. This quartz is the pay ore and there is plenty of it to keep a mill busy without the lower grade porphyry. Since the mill shut down only assessment work has been done on the tunnel and several offers to lease the property have been declined.

Adjoining the Golden King on the south is the Charlotte, owned by D. P. Bigelow, of Seattle; Thomas Groves and F. M. Scheble, of Wenatchee, on which prospecting shows seventeen feet of porphyry veined with quartz, assaying $6 to $8 gold and silver on the surface. Parallel with the Golden King on the west is the Last Chance, owned by J. M. Rae, on which a tunnel has been run a short distance. On the main dike, extending northward, are the Gilman, owned by D. H. Gilman, of Seattle; the Eureka, running down to Dry Gulch, owned by Angus Mackintosh; the Sunrise, on the opposite side of Dry Gulch, owned by M. J. Carkeek; the Tibbie, owned by P. P. Shelby; the Bagley, owned by C. P. Converse, of Seattle. The only work worth mentioning on these claims is a surface cut forty feet across the dike on the Tibbie. On a parallel dike of the same character and carrying ore of the same value, 200 feet in width, extending from Squilchuck Creek, across Dry Gulch and Canyon No. 2 to the Wenatchee River, a distance of five miles, claims have been located by William Parry, D. A. Curry, W. B. Reddy, —— Lunn, W. H. Merriam, Arthur Gunn, George Evans and E. Ross, but the only work has been done by Mr. Lunn, who holds two claims and has sunk a shaft forty to forty-five feet from the highest outcrop.

PESHASTIN AND NEGRO CREEKS.

Almost midway between the two transcontinental railroads which traverse the state from east to west lies the district where the first stamp mill in Washington was erected. Taking the Northern Pacific train from Seattle to Cle-elum, 122 miles, one can ride or drive to Blewett, the center of the district, a distance of thirty-two miles over a good road; or taking the Great Northern train to Leavenworth, 150 miles, one can go over a good road fourteen miles to the mouth of Ingalls Creek and thence by trail five miles to the camp furthest up Negro Creek or four miles to Blewett. A road four miles long would close the only gap in the road between the two railroads.

The mineral belt through which Peshastin Creek flows northward into the Wenatchee River, receiving Ingalls and Negro Creeks as tributaries from the west and Ruby Creek from the east, has a totally different geological formation from the country north and south of it. To the north, from a line cutting across the Chiwah River some distance above its mouth, is a sandstone formation which terminates on the northwest about the mouth of Icicle Creek, a granite formation lying north of it up the Chiwah River to Red Hill. About seven miles up the Peshastin this sandstone gives way to a series of strata of metamorphic rocks, including serpentine, syenite, diorite, magnesian limestone, talc, porphyry, porphyritic quartzite and granite. In the dikes of porphyritic quartzite occur ledges of nickel, silver and copper ore and some gold with gouges of talc, the dikes having a general trend from northwest to southeast, but bending generally more to an east and west line. On the one side this belt terminates two miles southeast of Blewett and to the west it gradually widens toward the base of Mount Stuart, which peak it includes. It extends into the Swauk district, where it forms a basin and swings to the northwest.

Mineral was first discovered in this district about 1860 by a party of miners returning from Fraser River, but they only worked the placers and gradually drifted away, one of them, a negro, who took out $1,100 in a season from the bars at the mouth of Negro Creek, giving that stream its name. It was not till 1874 that the first quartz ledge was discovered. In that year John Shafer

located the Culver on a ledge of free milling ore near the summit of the mountain dividing the Negro Creek canyon on one side from the Culver draw on the other, but was a short time behind Samuel Culver, who located the Polepick on a parallel ledge. Culver then took the Humming Bird on another ledge. James Lockwood staked out the Bobtail adjoining it, and John Olden and Peter Wider took the Fraction; John Olden and Samuel Culver the Little Culver. All these claims, except the Polepick and Little Culver, were shortly afterward bought by James Lockwood and his son, E. W. Lockwood, and H. M. Cooper, who erected a six-stamp mill with one Frue vanner, which they operated by water power. The mill reduced eight tons of ore in twenty-four hours and the clean-up from the first nine days' run was $2,100. The company also had an arrastre with a capacity of 1,000 pounds a day, of which the product averaged $70 a day. After running the mine and mill for eight years this company sold it to Thomas Johnson, who shut down after a short run. Then arose the dispute as to the ownership of the property, which culminated in the killing of William Donahue by Thomas Johnson in 1896, but this did not prevent the sale in 1891 to the Culver Gold Mining Company. This company erected a ten-stamp mill with four Woodbury concentrators and stretched a bucket cable tramway from the mill to the Culver mine, one-fifth mile. Some ore was shipped before the completion of the mill, one lot returning $800 a ton.

In 1892 the Culver Company sold out to the Blewett Gold Mining Company, composed of Seattle capitalists, and this company set to work to thoroughly develop the mine and mill its ores.

On the Culver group are three parallel ledges between walls of serpentine and porphyry, that of the Culver itself being from two to ten feet wide, with occasional bunches of ore sixteen feet wide. The body of the ore is a reddish gray quartz and there occasionally occurs on the walls a transparent green talc with white crystals, through which, as in a magnifying glass, the flakes of free gold can be plainly seen. The Humming Bird and Bobtail ledge is two to four feet wide, and contains a blue quartz carrying a larger percentage of sulphurets than the Culver. The Fraction ledge is of about the same size and character and runs higher in iron sulphurets. As depth is attained the free gold runs out and the ore becomes base. The value runs all the way from $8 to $20 in free gold with occasional pockets as high as $700, and it carries a trace of silver. The group has been developed by a number of tunnels aggregating several thousand feet, the longest of which is 600 feet, attaining a depth of 350 feet on the Humming Bird.

The company has erected a twenty-stamp mill at the mouth of the Culver draw, near the old Lockwood mill, allowing space for twenty more stamps, and has four Woodbury concentrators, the whole plant having boiler capacity for forty stamps. The bucket tramway was moved to the new site and the mill equipped with every labor-saving appliance, such as self-feeders to the stamps. A steam sawmill was erected three miles up the creek with a capacity of 10,000 feet a day and sawed lumber for the mill buildings, the mine and repairs to the road and bridges over which the machinery was hauled from Cle-elum. The development of the mine and operation of the mill were continued together by the company until 1894, when the system of leasing sections of the mines to small associations of miners was inaugurated, and has been continued with good results ever since, it being found that when miners have a direct interest in the product they sort the ore more carefully than when working for wages. The company still runs the mill and charges a royalty on the product and a milling charge, graduated up to a certain value. Above that figure the company and the lessees simply share the product on a graduated scale, the company's share increasing the higher the value of the ore. Under this system about sixty men are employed in mine and mill when both are in full operation. During the year 1896 the mill reduced 2,469 tons of Culver ore, from which the extraction averaged $12.62 a ton, and 473 tons of customs ore, from which returns are not obtainable. The product of the Blewett Company in bullion was about $60,000 for the year 1896.

It having been found that with the most careful milling the arsenic in the ore floured the quicksilver on the plates and thus prevented it from catching the gold; also that much of the fine copper sulphides escaped in the slime in the shape of foam, the tailings have been reserved in dams, with a view to further treatment by some improved process. This was established in the summer of 1896 and is a small cyanide plant erected under the direction of A. J. Morse for Rosenberg & Co., one of the parties of lessees. It has a capacity of ten tons a day and throughout the winter has been treating the tailings, of which 600 tons, containing from $3 to $30 a ton in gold had accumulated, and has extracted from 70 to 75 per cent. of the value. This plant has demonstrated the presence in the ores of substances which prevent close saving of their values and some modern process such as the cyanide will be finally adopted by the Blewett company.

In 1878 the Culver ledge was traced over the ridge to Negro Creek and the Olympia group of five claims was located on it, its width averaging about four feet. These claims were sold to the Cascade Mining Company, which ran a tunnel southward on a stringer to the right of the ledge on one claim and struck two bodies of ore, of which it followed the wall. On another claim it

Negro Creek
AND
Peshastin

KITTITAS COUNTY,

WASHINGTON.

MAP SHOWING ROUTE TO MINES

INDEX TO NUMBERED CLAIMS.

1. Butte.
2. Boston.
3. Eagle.
4. Paymaster.
5. Ray and Roy.
6. Hindoo.
7. Lightning.
8. Western Star.
9. Red Pine.
10. I X L.
11. Columbia.
12. Tip Top.
13. Black Jack.
14. Peshastin.
15. Sandel.
16. Humming Bird.
17. Bob Tail.
18. Culver.
19. Olympia.
20. Polepick.
21. Polepick, No. 1.
22. Polepick, No. 2.
23. Red Chief.
24. Golden Phœnix.
25. Manistee.
26. Mountain Gem.
27. Schafer.
28. Vancouver.
29. Seattle.
30. Leavenworth.
31. Scotia.
32. Rainier.
33. Tacoma.
34. Wisconsin.
35. Union.
36. Gordon.
37. Dominion.
38. Ontario.
39. Arlington.
40. Idaho.
41. Champion.
42. North Pole.
43. Ivanhoe.
44. Acme.
45. Lynch Group.

Railways.
Wagon Roads.
Trails.
Tramways.

T.25N.
T.23N.
T.22N.
R.16E.
R.17E.
R.18E.
LEAVENWORTH
BLEWETT
Chiwaukum C.
Icicle C.
Ingalls C.
Negro C.
Peshastin C.
Swauk C.
Beaver C.
Wenatchee River
Peshastin Creek
Ingalls Creek
Banana Creek
Agnes Creek
45 Creek Falls
Negro Creek
Peshastin Creek
Railroad
Mill
Swamp
SCALE OF MILES
0 1 2 3

Webster Brown
CIVIL AND MINING ENGINEER
SEATTLE, WASH.

ran a sixty-foot cross-cut tunnel in the direction of the ledge, but did not tap it, and ran a tunnel about fifty feet on the ledge near the summit, but it has since caved in. A two-stamp Huntington mill was hauled from The Dalles on the Columbia by team and over the mountain by block and tackle. It was erected without concentrators and was run by water power in the expectation of saving the free gold. It was run for a couple of months in 1880 and reduced about fifty tons of ore, but the assay value of $10 to $70 a ton was chiefly in sulphides and very fine gold, so that only about $4.50 a ton was saved and the small percentage of copper was also lost. A year or two later, owing to the death of Marshall Blinn, the organizer of the company, the mill stopped and has never resumed. For a time the property was under bond to Edward Blewett, who ran a tunnel 200 feet in an endeavor to trace the ledge into the Culver, of which it has the characteristics and the same value in free gold, and several open cuts have been made, showing ore in a number of places. The Culver ledge spreads out towards the summit, and is divided by horses of syenite, which rock forms the hanging wall, and then disappears.

Much of the gold in early days was lost by the milling of ore in arrastres, three of which were built and one is now in operation at intervals. When it is remembered that the fine copper sulphides which go off in foam cannot be saved even by cyanide and that only pan amalgamation is effective with them, one can imagine how much value is lost by such a rude mill as an arrastre.

In the spring of 1896 the Blewett Company sold the ten-stamp mill to Thomas Johnson, who has been milling the Polepick ore in it, with the addition of canvas tables. This mine has a quartz ledge varying from eighteen to thirty-six inches, and occasionally widening to five feet. Assays range from $10 to $132 in free gold, and average about $27. Development began with a cross-cut tunnel 237 feet, from which an upraise was made 147 feet, in ore all the way. A drift has been run 100 feet west from the upraise at the 100-foot level, on which stoping is being done, and another upraise has been started.

Adjoining this claim on another ledge three feet wide is Polepick No. 2, owned by Dexter Shoudy & Co., on which a tunnel has been run eighty feet, showing ore which assays $28.

On the Culver draw is the Phoenix, on which D. T. Cross and John F. Dore, of Seattle, and the late William Donahue tapped a five-foot ledge of brown quartz at a depth of 100 feet by cross-cutting 125 feet. They have run three levels 100 feet long at intervals of twenty feet and have stoped the ore from the highest level to the surface, having taken out in all 1,000 tons, which was milled at the Blewett mill and returned about $20 gold on the average. Some of this ore was reduced in 1895 in a small mill with four 250-pound stamps and a side-jigger concentrator, which was erected by the California Milling and Mining Company, but the cost of operation was out of proportion to the possible product and it has been shut down for nearly two years.

The Peshastin is on a three-foot ledge, also on the Culver draw, on which William Donahue, Dore and Cross ran a tunnel and stoped some ore some years ago. In 1894 they bonded the claim to George W. Martin, of Minneapolis, who also leased the Blewett mill and built a chute down the hill to it. He ran through about 100 tons, but it was so poorly sorted that it did not pay for milling and the company canceled the lease. He then gave up, and Dexter Shoudy & Co. bought the mine. They ran a tunnel through the Fraction tunnel into the west end of the claim and took out about eighty tons of ore, which yielded about $21 a ton in free gold and eight tons of concentrates worth $100 a ton.

On what is supposed to be the Culver ledge J. L. Warner and his associates have the Lightning, with the White Elephant and Pine Tree on parallel ledges. They have simply kept up assessment work, driving a thirty-foot tunnel on the Pine Tree.

A short distance above the Culver draw, on the west side of the canyon, Dexter Shoudy & Co. are working the Black Jack on a ledge of blue quartz two to five feet wide. They have run a tunnel over 200 feet on the ledge, from which they have done some stoping, and are now cross-cutting toward a red porphyry dike which shows on the surface. They have found some cinnabar, yielding native quicksilver. About 260 tons of ore was milled last spring, and though not well sorted, yielded $8 a ton. The same parties own the Eureka, on the other side of the canyon, on a three-foot ledge which assays $16.64 gold and on which a tunnel has been driven forty feet. The owners bought the arrastre built by John Shafer sixteen years ago, and are milling the ore in it.

The Polepick, Peshastin, Black Jack and the Johnson mill have recently been bonded to parties in the East, who contemplate working them together.

On the Marion Charles Donahue has three veins, one of which is eight feet wide and carries $6 free milling and $9 concentrating ore. He has run a drift 150 feet on a small stringer and has cross-cut eighty feet to the ledge. One of the other ledges he has identified as the extension of the Polepick, and on this he has drifted sixty-five feet and cross-cut eighty feet. On the Gem is a five-foot ledge of concentrating ore which assays $8 to $16 gold and 75 cents to 54 ounces of silver. A cross-cut has been run sixty feet, but has not yet tapped the ledge, and a tunnel is in twenty feet on ore.

Between the Peshastin and the Gem is the Manistee, owned by William Donahue's heirs, Dore and Cross. A tunnel has been driven 140 feet on a

broken horse on the surface and the ledge has not been found in place. About eighty tons was milled in an arrastre in 1890 and paid $16 a ton.

On the east side of the creek John Bomaster has the I. X. L., on which he has run a tunnel forty feet on a blanket ledge six or seven inches wide and assaying about $20 a ton.

On the west side of the creek E. E. Keyes, of Menominee, Mich., has the Caledonia group of four claims on three parallel ledges. One of these has ledge matter on the surface, on which a tunnel driven twenty feet has not yet struck ore. On another, twelve feet wide, a shaft has been sunk thirty feet, in which iron pyrites is coming in. On the third there is a two-foot cropping of gray copper tapped by a cross-cut tunnel of about 120 feet. On the Goat there is a two-foot ledge of white quartz carrying free gold, from which some assays ran over $100. A shaft fifteen feet deep shows the free gold to continue.

Near the Tip Top, at the head of the basin and crossing the divide to Ruby Creek, Oliver Cloud and John Gilmore have the Sunset, on which is a six-foot ledge carrying gold and copper, and in two tunnels sixty feet and thirty feet on the ledge there is a showing of sulphurets on the face.

On the east side of the canyon is the Tip Top, which has had a varied career. It was first worked by the Tip Top Mining Company, which sank a shaft seventy-five feet and drove a cross-cut tunnel 380 feet quartering with the ledge and another 400 feet a short distance below. The ore was stoped out from the first two levels and run through the arrastre, its value averaging $40, while some ran up to $90. The company abandoned the claim in 1888, and in the following year T. J. Vinton relocated it, and held it until 1895. He then leased it to James Kirk, who took out considerable ore, from which the extraction at the Blewett mill averaged $22. It is now leased to George W. Porter, who realized $10 a ton out of sixty tons milled.

Just below the new mill, Peter Anderson and Thaddeus Neubaur have a vein of clear white talc ore, in which the free gold is plainly visible, similar to that of the Culver ledge. They have driven two tunnels, aggregating 400 feet, showing up the ledge well to a width varying from six inches to three feet.

Within the last few years John Kendle has been prospecting in the camp by means of an instrument which, he claims, betrays the proximity of an auriferous ledge by electric attraction and which has gained credit with some prospectors. His instrument is supposed to discover gold, silver and copper and to indicate within certain limits how deep it is beneath the surface. It is a brass or silver cup containing a secret composition of acids, from which a tube of the same material extends an inch or more and then turns at right angles. Into it is cemented a copper wire eight inches long, which ends in a flat circular brass elbow. From this another copper wire extends six inches at right angles, so that it is parallel with the cup, and by this last wire the prospector holds the instrument as he walks slowly over the ground, pressing his finger ends firmly against the wire.

Mr. Kendle claims to have located over twenty ledges by means of this instrument and to have proved its accuracy by showing ore on development, seven of them being on his own claims. One of these claims is the Snowflake, located under eight feet of snow, where other men had in vain run crosscuts thirty, forty and sixty feet to strike the ledge. He ran a tunnel on it for twenty feet and found six feet of quartz between walls of quartzite and porphyry, which he says carries $7 gold and some copper. He and Henry Weinmann, his partner, have a Dodge mill with a capacity of twenty tons in twenty-four hours which they propose to set up at the mine and run by water power to crush the ore, treating the pulp with cyanide. Another ledge located by this means and covered by two claims, is the Sunset, fifteen feet wide and carrying $10 to $15 gold. This is owned by Messrs. Kendle and Weinmann, who also have, in partnership with Paul Fein, three claims on the Yankee Doodle ledge, to strike which Mr. Weinmann had previously run cross-cuts 150, 125 and 100 feet. They have run a tunnel 140 feet on it, showing nine feet of talc and three of white quartz carrying $4 free gold. Mr. Kendle claims to have also located by means of his instrument a four and one-half foot ledge for James Smith, who struck it with a forty-foot cross-cut; a five-foot ledge for James Gilmore, who struck it in a tunnel driven to its face; and a third for McDonald & Perry, who struck it two to three and one-half feet wide, carrying ore worth $19 to $22, by driving twenty feet.

The mineral belt cut and exposed by the deep canyon of Negro Creek differs in many respects from that on Peshastin Creek, although only a high ridge divides the streams. Interest in this district languished after the suspension of work at the Cascade Mining Company's mill and did not revive until the great red buttes which stand out from the canyon walls of Negro, Ingalls and Peshastin Creeks attracted attention in 1892. Prospectors soon found that the dikes of which these buttes were the highest points contained chutes of porphyritic quartzite, between walls of lime and porphyry, the chutes ranging in width from three to thirty feet, and several occurring across the width of the wider dikes. The qnartzite carries not only gold and some silver, but nickel to an average of 2½ per cent. It also carries cobalt, and the walls carry traces of nickel. Some of the ledges furthest up the creek are distinctly copper ore, carrying 25 to 30 per cent. of that mineral, and one ledge carries cinnabar in which there is native quicksilver. Prospecting has gone on

steadily and has extended the belt across the divide at the head of Negro Creek to Falls Creek, across the north wall of the canyon to and across Ingalls Creek, down the Peshastin a mile below the latter stream and across Ruby Creek, an eastern tributary of the Peshastin. A large amount of development has been done on many of the claims, but lack of capital and the need of a wagon road has prevented the district from becoming a producer.

About a mile up Negro Creek, which cuts it in two, is a ledge of porphyry forty feet wide, on which is the War Eagle group of four claims, bonded by J. F. Buttles, George Hood and James Grant to the Co-operative Mining Syndicate, of Seattle. It cuts through the granite, slate and serpentine country rock in a course slightly east of north and west of south, from the summit overlooking the Culver draw, on one side of Negro Creek, to that overlooking Ingalls Creek on the other. It is veined with quartz and carries value throughout its width, gold predominating where it cuts the granite. An average assay from a shaft twenty-five feet deep on the Ingalls Creek divide shows $4.60 gold and numerous assays have run from $20 to $60 gold, some of the ore also carrying nickel. A tunnel has been run twenty feet from Negro Creek on the ledge and is being continued through well-mineralized rock.

On the divide between Ingalls and Negro Creeks, opposite the Cascade Mining Company's property, W. S. Newland and Henry Brenard have the New York group of thirteen claims, forming a square on which is a mass of quartzite carrying gold, silver and copper. Only assessment work has been done in the shape of a shaft or tunnel ten to fifteen feet deep on each claim, and none of these have defined any ledges. Specimens taken at random from the surface of one claim assayed $4.60 gold, 3½ per cent. copper and a trace of silver, and the Nellie assays $4 gold, $30 silver, besides nickel. The group could be worked from a tunnel on each side of the mountain, and a tramway half a mile long would take the product to Ingalls Creek.

Across the creek from the Cascade Mining Company's group are the Eagle and Iowa, owned by Henry Blinn, of Leavenworth. They have a ledge three and one-half feet wide of quartz carrying iron and copper pyrites, which assays $7 gold. A shaft is being sunk, and shows improvement in the ledge.

Next up the creek comes the Daisy Dean, owned by the Donahue estate and F. H. Osgood, on a twin ledge between walls of serpentine and diorite. One ledge three to four feet wide assays $32.30 gold, the other, three and one-half feet wide, carries $8 silver and 60 per cent. lead. Two tunnels have been run about twenty feet each at different levels.

Going up on the creek, there next comes the Rainier group of thirteen claims, with two millsites, owned by the Negro Creek Nickel and Copper Mining Company. The Rainier ledge is covered by four claims and is a dike running northwest and southeast across Negro Creek, three and one-half miles above its mouth. A cross-cut 170 feet on this dike struck a series of five nickel-bearing ledges from ten to thirty feet wide. The ore in the tunnel assays 2½ to 3½ per cent. nickel and $5.20 gold. The Tacoma has a quartz ledge four and one-half feet wide running into the Rainier series, and carrying copper and iron pyrites, with $8.20 gold and a few ounces of silver. Red Butte No. 1 and No. 2 are on a deposit of white talc thirty feet wide, carrying about $5 gold, of which a red butte forms one side, and a ninety-foot tunnel has shown up a large chute of nickel ore. The Montana is on a spur southwest of the Gordon ledge, carrying nickel, free gold and silver, twelve feet wide. Fractions A and B are extensions of spurs of the Ontario and Meridian. The South Ontario and two others cover a large dike of low-grade nickel ore about thirty feet wide. This company constructed an extension of the wagon road up the Peshastin from the mouth of Ingalls Creek two years ago, and partly constructed it to the Rainier group. It also surveyed a line for an electric road up the Peshastin and Negro Creek, thirteen miles, to the Rainier group, and three miles further, to the park on which the Persinger group abuts.

Adjoining Red Butte No. 1 and No. 2 are the Union and Dominion, which are three-quarters of a mile up Bear Creek, on the north of Negro Creek. They have been bonded by W. T. Rarey, G. S. Merriam, George Beam, James Fullweiler, C. Striker and H. Souder, to George E. Ward, of Seattle, who is to erect a plant and begin development by April 1, 1897. They have a ledge of free milling and concentrating ore east and west, cut by Bear Creek. Twelve samples were taken of different grades of ore across the ledge and the assays ranged from $107.49 gold and $1.10 silver up to $875.53 gold and $6.50 silver. Eight tons shipped to the Tacoma smelter only returned $11.30 a ton, because they were not sorted and were taken from a point beyond the ore chute. A tunnel has been run 100 feet on the ledge, showing it to range from eighteen inches to four feet, with good ore all through. Across Bear Creek from these claims is the Amigo, owned by Gus Guoin, S. W. Elliott and Charles Harvey, on a five-foot ledge of copper sulphurets running northeast and southwest, which assays on the surface $2.75 to $5.40 gold and silver.

Adjoining the Union and Dominion on Bear Creek are the Gordon and an extension, owned by Supreme Judge Gordon, W. I. Agnew and G. E.

Filley, all of Olympia. It has a ledge forty feet wide, running north and south and assaying 40 per cent. nickel, with free gold and silver. A tunnel fifty-five feet long has cross-cut the ledge, defining its width.

Following up Negro Creek comes the P. P. Nickel, owned by Tony Preston, of Leavenworth. A shaft is being sunk on the hanging wall, where is three or four feet of quartz, carrying $4.50 gold and a good percentage of nickel.

A little further up, on the north side, is the Ontario, owned by Martin Lewis and Mr. Morrell, who have a ledge forty feet wide, between walls of serpentine. The ore carries $7 to $8 gold, 3 per cent. nickel and 3½ per cent. copper in sulphides. A shaft is down about twelve feet on the hanging wall, a tunnel has been run ninety feet on the stringer, cutting towards the main ledge, and a tunnel is in seventy feet to cross-cut the main ledge, which it is expected to strike in another hundred feet.

On the south side of the creek, next above the Ontario, comes the Meridian, owned by George Persinger, of Leavenworth, and John Lindsay, of St. Louis. It has a ledge of dark blue quartz, forty feet wide, between serpentine walls, the ore carrying gold, silver, copper, sulphides and nickel. The outcrop is in iron-stained red and blue cliffs on the wall of the canyon. A tunnel has been run sixty feet on the ledge and a mill test of the ore, made in St. Louis, gave $10.50 gold, $5 silver, $2.50 copper and 2 per cent. native nickel, besides nickel sulphides.

The North Pole group of ten claims is next in order, and is owned by George Persinger, Michael Callaghan, John McKenzie, Andrew Stoughton and William Lee, of Leavenworth; George Kline of Wenatchee, and John S. Jurey, of Seattle.

North Pole No. 1 and two other claims are all on one ledge ninety-one feet wide running due north and south, which crops out in big red buttes on the Cinnabar King claim. The ore is red and blue quartz between walls of serpentine, and carries, gold nickel and quicksilver. A tunnel has been run ninety feet on the hanging wall on this ledge, and there was 200 tons of ore on the dump on the creek bank, when a flood swept half of it away in the spring of 1895. There is now, however, 150 to 200 tons on the dump. The Champion and Idaho are on another ledge four and one-half feet wide, which runs east and west, and joins the North Pole ledge at an angle on the east. It assays $12 gold and 10½ per cent. copper. A tunnel run forty feet to cross-cut the ledge has not yet tapped it. The Persinger Copper Lode and Gray Eagle are on a ledge running northwest and southeast, which outcrops three feet wide on the summit and contains copper sulphide ore carrying gold and silver. Assays range from 22 to 32 per cent. copper, $5 to $16 gold and 3 to 5 ounces silver. A tunnel twenty-five feet on the main ledge on the top of the hill shows good ore all through, and a cross-cut is being run 100 feet below, which is in fifteen feet and will tap the ledge in about twenty feet more. The Ivanhoe No. 5 is west of the Rainier group on the north side of the creek, and has a five-foot ledge of copper sulphide ore assaying about 20 per cent. copper with a little gold and silver. A cross-cut taps the ore in forty feet. About 200 feet of new tunnels has been completed on this group in the last year, and has shown up extensive bodies of copper pyrites.

On the Ivanhoe ledge John and William Lynch have the Leo, with four feet of ore assaying 25 per cent. copper, with some gold and silver. They ran a cross-cut tunnel sixty feet, following a two-foot stringer into the main ledge.

At the north end of the Everett are the Cinnabar King, owned by George Persinger, Harvey Souder and Charles Striker, on a dike 200 feet wide, which crops out in a line of jagged red cliffs on the north wall of the canyon. A surface cut across the dike shows it to be all mineralized red and blue quartz, with serpentine walls. An assay shows it to carry $3.50 gold, besides nickel and cinnabar.

On the first dike which cuts across the Peshastin canyon on the north is another string of claims. On the right bank are the Monarch No. 1 and No. 2, owned by Ralph White, of Rossland, Tim O'Leary, the contractor, and Mr. Walker. The dike is porphyritic quartzite seventy-five feet wide, running slightly north of east and south of west. A mill test of a ton taken from a ninety-foot tunnel gave $90 returns in nickel, cobalt and gold, and assays range from $4 to $5 gold, 2½ per cent. and upwards in nickel, 1½ to 2½ per cent. cobalt. On the opposite hill and on the same ledge, George Persinger, Tony Preston and Michael Callaghan have the Red Butte group of three claims, extending along the outcrop to the summit, with a fourth on a parallel ledge on the southwest. A tunnel has been run into the ledge at the base of the hill, ore from which assayed as high as 12½ per cent. nickel, 2½ per cent. cobalt and $12 gold. In the valley between the Monarch and Red Butte groups is the Rattlesnake, half of which is held by the owners of each group.

This dike has been traced across the mountains and one and one-half miles eastward to Ruby Creek, where it crops out on part of a group of thirteen claims held by Charles Harvey, S. W. Elliott and H. C. Castlebury. On this group are four parallel ledges from twenty to sixty feet wide between walls of serpentine and conglomerate, marked by red buttes like those on the rest of the belt. Assays average 8 per cent. nickel, gold and silver not being shown.

At the north end of this group are the Red Cloud and Tralee, owned by W. Kelly, of Spokane; C. King, of Kalispell; Charles Harvey and Charles Moriaritq, of Leavenworth, on a sixteen-foot ledge assaying $25 copper, $6 gold, as well as nickel and cobalt. Further up Peshastin Creek, below the mouth of Negro Creek, F. D. Estes and John W. Miller, of Leavenworth, have two claims on a seven-foot ledge of sulphide ore carrying $6 and $8 gold on the surface, besides copper.

Five miles above the mouth of Ingalls Creek is the State group of six claims, owned by John and William Lynch. They are on two parallel dikes sixty feet wide, which are cut by the creek.

The nickel-bearing formation has been traced across the Negro Creek divide to Falls Creek, a tributary of Ingalls Creek from the south. W. F. Patterson and Charles Newberry, of Blewett, have located the Bonanza and Deadwood, near the head of the creek, on the largest dike so far discovered in the district. The creek runs between the two locations, and the dike rises almost perpendicularly from it. The owners are cutting across the face of these cliffs to expose green ore. The surface ore assays about 5 per cent. nickel, $3.50 gold and a trace of copper. Adjoining this group and running to the forks of the creek, also extending westward to Cascade Creek, is the Nickel Plate group of twelve claims, owned by John and William Lynch. The main ledge is sixty feet wide and is covered by five claims, on which prospect holes have been sunk, while the other claims are on spurs from this and the Bonanza and Deadwood ledges, ranging in width from ten to thirty feet. The ore is of the same character and value as the Bonanza and Deadwood.

The placer ground from the mouth of Peshastin Creek far up towards its head is still being worked with a fair measure of success. The deposits of gold-bearing material are gravel hills built up in the course of ages on old river channels, running sometimes parallel, at others across the present channel of Peshastin Creek. In the old channels the gold is mostly coarse, and therefore easily saved, but where the present streams have acted on it it is fine and requires more care and skill. One of the largest enterprises of this kind is being carried on by W. M. Keene and O. A. Benjamin, of Seattle, on the flats beside the Wenatchee on its right bank, one and one-half miles below Peshastin. Mr. Keene began by sluicing back from the river bank, taking water from a point half a mile up that creek. He found that the old channel bedrock sloped back from the present river channel, and thus his ground was flooded. Being joined by Mr. Benjamin, he put in a hydraulic and a pump to raise the dirt from beneath the water on the old channel. The dirt pays well, even for manual work, good streaks running as high as $1 a yard. At the mouth of Ingalls Creek Mr. Hensel, a farmer, is working several claims with good results in fine gold. On the right bank of the Peshastin, at the mouth of Ruby Creek, James and Thomas Lynch, Riley Eisenhour and Thomas Medhurst have worked six claims with a big hydraulic giant at high water and ground sluiced at low water.

Where the canyon narrows below Negro Creek the late J. H. Crawford, W. H. Wilcox and Frank B. Holley had four claims on the left bank, to which they built 2,000 feet of ditch and flume from Negro Creek, with 150 feet of fall, and hydraulicked down to the old channel bedrock, which is thirty feet above the present channel. The gold is coarse, in nuggets as large as $6.75, and they are working with only wood riffles and no plates or quicksilver, not attempting to save the fine gold.

A mile above Negro Creek George W. and J. M. Bloom, two brothers, and John Snyder are working three good claims which take in all the bar ground on both sides of the creek, on the old channel. The Bloom brothers started in 1893 by sluicing out the dirt on the right bank of the creek and took $70 from a space fifteen feet square. In 1895 they took $20 from the space next below, ten feet square and at the most eighteen inches deep, and were last year joined by Mr. Snyder. They cut a ditch for a bedrock drain, but failed to reach bedrock, and then started a tunnel to cut across from rim to rim of the old channel, which is in twenty-eight feet, keeping the water down with a bucket wheel. From the first eight feet of this tunnel they took $4.20, and they have a be.. of gravel twenty feet deep, which they say carries 25 cents a yard from rim to rim and surface to bedrock. The gold is nearly all coarse, but they save the fine gold by means of pole riffles placed lengthwise of the sluice box, with cleats underneath which raise them an inch above the bottom. This arrangement causes a continual boil in the water, which thus sucks the gold under the cross-pieces. On the lowest claim they are driving a tunnel back to the old channel, of which they have not yet found the bedrock, the dirt running as well as on the upper claims. They propose to dig a ditch one and one-fifth miles along the creek, with a capacity of 1,000 inches, and will put in a six-inch pipe and hydraulic.

LEAVENWORTH.

The last five years have proved the presence of a great mineral zone in the mountains on each side of the Chiwah Canyon, as in other parts of the Cascade Range, and development is proceeding with such vigor that a year or two more should suffice to make the district a regular producer.

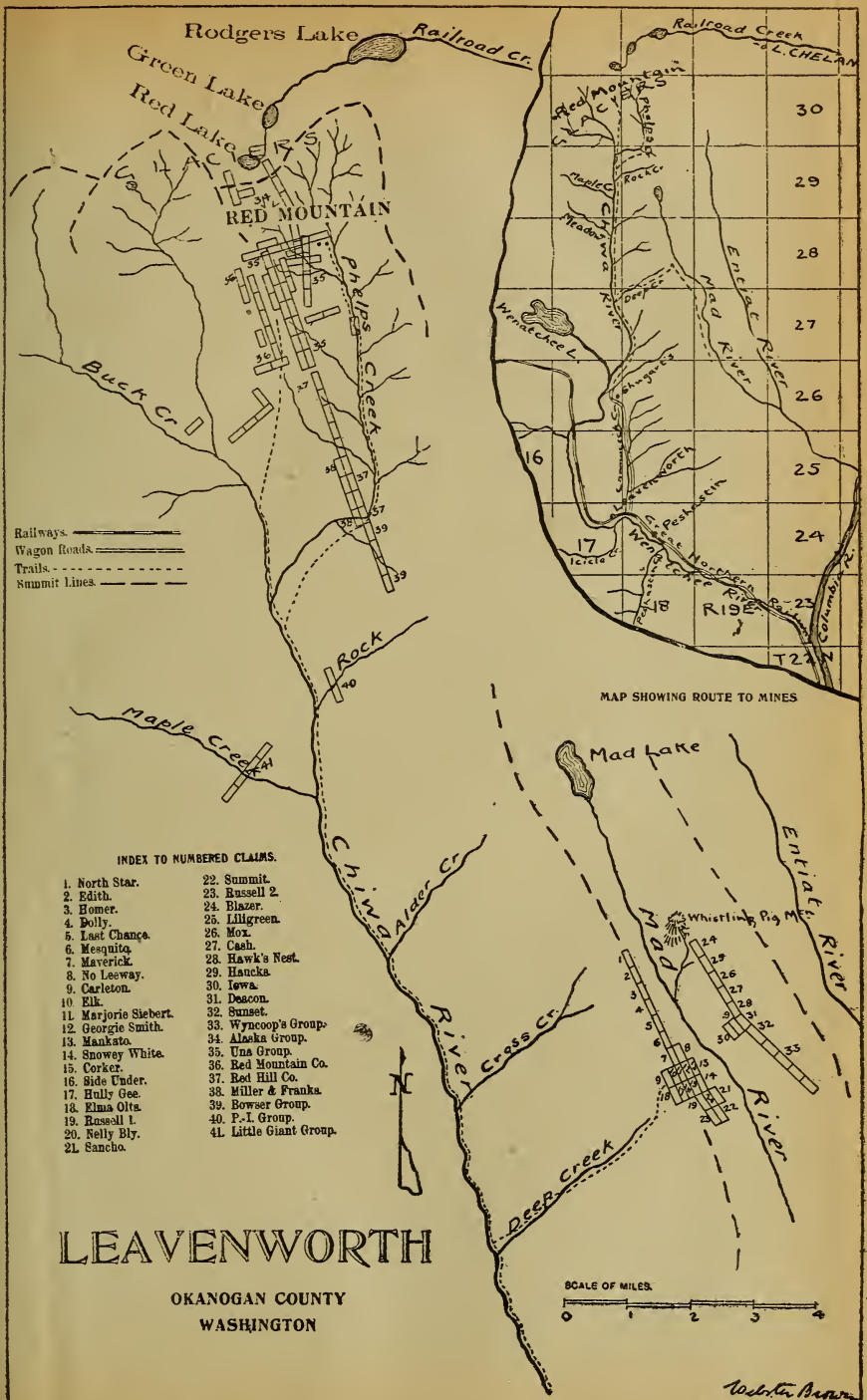
The Leavenworth District is easily accessible from Seattle. Leaving that city on the Great Northern train, one goes to Leavenworth, 151 miles, and then goes northward by a good road to Shugart's ranch, fourteen miles, and by trail to either the Phelps Basin or the Chiwah Basin, thirty-eight miles in each case. These basins are one at each side of a high ridge ten miles long, known as Red Hill, the Chiwah flowing down one side and Phelps Creek down the other, to unite at the tail of the hill. On this mountain, called Red Hill to distinguish it from Red Mountain in the Trail Creek District, is the greatest mineral zone with the most active work.

The first discovery of mineral on this mountain was made in 1893 by George N. Watson, who found in a low saddle on the summit, between porphyry and granite walls, a ledge of iron pyrites four feet wide, running a little east of south and west of north, with a slight eastward dip. He located the Emerald, and this ledge has since been traced on the surface through a string of claims for about five miles. On a parallel ledge he and Dr. L. L. Porter, of Roslyn, have the Esmeralda, which a shaft forty-two feet deep and drifts twenty-six and twelve feet have shown to widen from eighteen inches on the surface to five feet. The ore is arsenical iron and copper sulphides and assays $14 gold, 33 per cent. copper and a small amount of silver.

The thorough prospecting which followed on Mr. Watson's discovery and examinations by mining engineers have shown the mountain to be formed of granitic rocks, with cliffs of gneiss on the side of the Phelps Creek Basin, and to be a great mineral zone, in which the ledges, carrying chalcopyrite and pyrites, have been traced by croppings of ore and by locations for five miles across country. The ledges are true fissures of great size and strength, but have not yet been defined by development.

The largest property on the mountain is the Red Cap and Bryan groups of twenty claims, owned by the Una Mining and Milling Company, of Seattle, covering over 500 acres from the Phelps Basin southward and from the summit down to Phelps Creek, with a tunnel site on the Chiwah side, two of the claims being placers in the flat at the confluence of the Chiwah and Phelps Creek. The majority of the claims are on the main ledge or system of ledges, while five run continuously for 7,500 feet along the main cross ledge, which has a course south of west and north of east, breaking through granite, gneiss and syenite and dipping slightly to the northwest into the mountain. It shows well mineralized chutes of ore on the surface, carrying chalcopyrite, pyrites of iron and copper and some manganese. The lowest assay from the surface was $3.73 gold and the highest $72 gold, but copper will also form a large part of the value. The main ledge has ore bodies showing in numerous places, heavily charged with arsenical and sulphide ores, assaying from $3 to $180 gold. The average value of the ore through the mountain is $50 gold and silver, on the basis of a number of assays. A tunnel is in fifty-two feet to cut the broad main mineral zone at a maximum depth of 1,500 feet and is being continued with a double shift of miners. At 112 feet it will cut the first ledge, which shows three and one-half feet wide on the surface, carrying sulphides and black sulphurets and assaying $45 gold, silver and lead, and a little further will strike the second, which is seven and one-half feet wide and well mineralized on the surface with copper sulphurets, copper oxides and bunches of native copper, assaying $48.60 for all values. The Bryan group lies on the south edge of the company's holdings and has a ledge showing three and one-half feet of solid ore, heavily charged with copper sulphurets and native copper in bunches. Another ledge further up the mountain shows twenty-five feet of talc carrying sulphides, and will be tapped at great depth by the cross-cut tunnel, and yet another, which cuts the red cliffs forming the rim of the basin, has been defined to a width of seven feet, with only the hanging wall found. A tunnel has been started on this group also and will be pushed this season, when a tunnel will also be driven from the Chiwah side of the mountain. This company has already expended over $3,000 on development.

The company which had been most active in development until the advent of the Una was the Red Hill Mining Company, which owns ten claims on the two main ledges running across Phelps Creek south of the Una property. On the Black Bear a tunnel has been run sixteen feet, showing a twelve-foot ledge carrying copper and iron sulphides, which assayed $2.50 to $29 gold and silver; on the White Swan ledge, traced for some distance to a width of eight feet, a forty-foot tunnel showed arsenical iron assaying $12 to $18 gold, silver and copper.


Rodgers Lake
Railroad Cr.
Green Lake
Red Lake
RED MOUNTAIN
PHELPS CREEK
Buck Cr.
Railways.
Wagon Roads.
Trails.
Summit Lines.
Railroad Creek
L. CHELAN
Red Mountain
Phelps Cr.
Rocks
Chiwawa
Meadows
Entiat River
Mad River
Deep
Wenatchee L.
Lake Creek
Leavenworth
Peshastin
Wenatchee
Mountain View
Icicle Cr.
Columbia R.
16
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R19E
T24N
MAP SHOWING ROUTE TO MINES
Rock
Maple Creek
Chiwawa River
Alder Cr.
Cross Cr.
Deer Creek
Mad Lake
Mad River
Entiat River
Whistling Pig Mt.
INDEX TO NUMBERED CLAIMS.
1. North Star.
2. Edith.
3. Homer.
4. Dolly.
5. Last Chance.
6. Mesquito.
7. Maverick.
8. No Leeway.
9. Carleton.
10. Elk.
11. Marjorie Siebert.
12. Georgie Smith.
13. Mankato.
14. Snowey White.
15. Corker.
16. Side Under.
17. Hully Gee.
18. Elma Olts.
19. Russell 1.
20. Nelly Bly.
21. Sancho.
22. Summit.
23. Russell 2.
24. Blazer.
25. Lilligreen.
26. Mox.
27. Cash.
28. Hawk's Nest.
29. Hancka.
30. Iowa.
31. Deacon.
32. Sunset.
33. Wyncoop's Group.
34. Alaska Group.
35. Una Group.
36. Red Mountain Co.
37. Red Hill Co.
38. Miller & Franks.
39. Bowser Group.
40. P.-I. Group.
41. Little Giant Group.
LEAVENWORTH
OKANOGAN COUNTY
WASHINGTON
SCALE OF MILES.
0 1 2 3 4

The Red Mountain Mining Company also owns ten claims on the two main ledges, but has not as yet done any development.

Among the other extensions on the Emerald ledge are the Spokane, by J. D. Wynkoop, Capt. Benton and Henry Carpenter, of Yakima; the Emerald No. 2, by H. D. Watson and Tony Preston; the Standard, by G. N. Watson and Albert Medhurst; the Great Eastern, by D. H. Watson; the Eveleen and Ohio, by H. Blinn. On the Esmeralda ledge D. H. Watson has the Esmeralda No. 2 and on a cross ledge the Northern Light. On the latter an open cross-cut extending twenty feet from the footwall has not struck the hanging wall, and shows iron sulphides assaying $8 gold. Turner & Co., of Spokane, have the Fourth of July group of six claims on three parallel ledges. Running over the summit from the head of Phelps Basin to Red Lake, Frank Reeves and others have the two Alaska claims on a twenty-five foot ledge showing sulphides clear across the croppings. The Smuggler ledge has been traced up the hill and on it Carl Christianson has located the Standard, John M. Miller, William Nack and Carl Christiansen have the Morning, Custer, Liverpool and Cariboo. On another ledge Tony Preston and John W. Miller have the Queen Victoria group of three claims, and Turner & Co. have the two Great Northerns. On the Chiwah side of the hill, below the Emerald ledge, are the Mountain Goat and its extension by Frank A. Losekamp & Co., the Sacred Faith and its extension; the Portland and its extension, by Emil Frank & Co.; the German, by Sig. Frudenstein; the Black Diamond group of four claims, by Losekamp & Co.; the Black Man, by John W. Miller; the Black Crystal, by —— Karbs, of Spokane, and the Eagle, by William Nack and Carl Christiansen.

Until the last year but little development had been done on Red Hill, but the movement which has begun may be expected to spur owners on to show what there is beneath the surface.

Near the mouth of Maple Creek Charles Allen has the Champion group of five claims, where there were evidences of the presence of white men as early as the year 1866. One ledge cropped eight to ten feet wide, showing sulphurets, and former owners had run a cross-cut 310 feet to tap it and then abandoned it for lack of funds. The other ledge shows pyritic ore and is well defined to a width of fifteen to twenty feet between walls of syenite and porphyry running southeast and northwest, assaying $4 to $7 gold on the surface, and has an east and west spur on the summit. A cross-cut has been run about 300 feet to tap it at a depth of 250 feet. Further up the mountain Philip Hatch and others have the two Drummer Boy claims on a ledge showing four feet wide in an open cut, where the ore assays $5.68 gold and silver.

On the Rock Creek Canyon, half a mile from the Chiwah, is the P.-I. group of two claims, owned by Frank Schuenemann, of Pasco. The surface showing is a gneiss blow-out of oxidized iron, carrying gold and silver, and one streak of ore assayed 444 ounces silver. A cross-cut tunnel is in sixty-seven feet.

On Fall Creek, still further down the Chiwah, A. W. Purdy has the Big Elephant group of six claims on a large ledge of hematite ore, defined by a twelve-foot open cut, carrying gold, silver and copper, which assays on the surface $3 to $9 gold and $3.75 silver.

On the summit of the range between Mad River and the Chiwah is another section of the same district, of granite and shale formation, which is reached from Leavenworth by fourteen miles of road and three miles of trail. On this range are two great parallel ledges of light green schistose talc between granite walls, carrying free gold. The Monterey Gold Mining and Milling Company has nine claims, comprising the Georgie Smith group. Eight claims are on a ledge of light green talcose quartz sixty feet wide, with no defined pay streaks, which was tapped in thirty-five feet by a cross-cut last summer. The gold is said to be all free and assays of surface specimens have run $3.25, $125, $350 and $3,128 gold. The other claim is on a seven-foot cross ledge. The company is about to erect a ten-stamp mill and will begin milling ore this spring.

On the extension of the Georgie Smith ledge the Cable Mining Company, of Seattle, has five claims, which with two on a second ledge on the east bank of Mad River, are known as the Palmer group. The main ledge on this group is thirty-five feet wide and shows a pay streak of twenty-four inches at a depth of eleven feet in an open cut, ore from which assayed $186 gold. A cross-cut tapped the main ledge in forty feet, but has not cut through it. This ledge crops so strongly that it can be readily traced for 15,000 feet. The second ledge is also a true fissure in granite.

J. C. Parsons and Bickford & Son have the two Hawk's Nest claims on the Georgie Smith ledge. On a twenty-foot ledge of free milling ore Louis Houch, Charles Blazier, Charles Lilygren and Max Spromberg have the Mother Lode group of four claims, on which they have run a sixteen-foot tunnel.

At the mouth of Deep Creek the Deep Creek Mining Company has a group of thirteen placer claims, on which four men were employed last summer with a hydraulic giant. The dirt carried about 26 cents a yard and about 90 per cent of the value is saved in the sluice boxes with silver plates, though the gold in the Chiwah River bars is generally so fine that it can only be saved by great care and skill.

The extension of the wagon road from Shugart's ranch to the head of the Chiwah River or Phelps Creek would not be attended with any great difficulty and would do much to facilitate work. It is understood that the people of Leavenworth contemplate making this improvement, as it would redound greatly to their benefit.

LAKE CHELAN.

Development is fast proving that the precipitous mountains which shut in this beautiful body of water on each side are full of mineral equal in abundance and value to the mineral belt which is cut by the Columbia River and extends east and west along the boundary line for an indefinite distance. The principal ore bodies opened so far carry gold-bearing iron and copper pyrites, but there are also in close proximity rich narrow ledges of silver-bearing ores.

The district, while not tapped by any railroad, is easily accessible. From Seattle one goes by the Great Northern Railroad to Wenatchee, 174 miles; by the steamer City of Ellensburg to Chelan Falls, thirty-nine miles; by stage to Chelan, three and one-half miles, or to Lakeside, five miles; or steamer City of Ellensburg to La Chapelle, forty miles, and stage to Chelan two and one-half miles; by steamer Stehekin to Meadow Creek, fifty-two miles, or Railroad Creek, the same distance, these two streams emptying into the lake almost opposite one another. If one wishes to make a more extended trip to adjoining mining districts, the Seattle & International train can be taken from Seattle to Woolley, eighty miles; the Seattle & Northern train thence to Hamilton, fourteen miles; stage thence to Marble Mount, thirty-four miles; then go on horseback over the state trail, which runs up the Cascade River, over the Cascade Pass and down the Stehekin River to the mouth of Bridge Creek, forty-one miles. Leaving the state trail here, one would go sixteen miles over another trail to Stehekin, at the head of Lake Chelan, where the steamer Stehekin would be taken and one would go in the reverse direction over the route first described. Taking this route, the traveler would make a circuit of 471 miles and would pass through the Skagit copper belt, the Cascade and Stehekin silver belt, the Lake Chelan gold, copper and silver district, and the Wenatchee low grade gold district. This trip would at the same time give an opportunity to see the Switzerland of America and enjoy unrivaled hunting and fishing.

The country rock of this region is granite, amid which lie great dikes of porphyry, and the ledges are usually in the contact between these two rocks in the Meadow Creek District, their course being slightly south of west and north of east. The first prospecting was done in 1891 from rowboats on the lake, whence the croppings of mineral could be descried on the mountains on each side, but in the following year the heights were scaled and explored in a more thorough search.

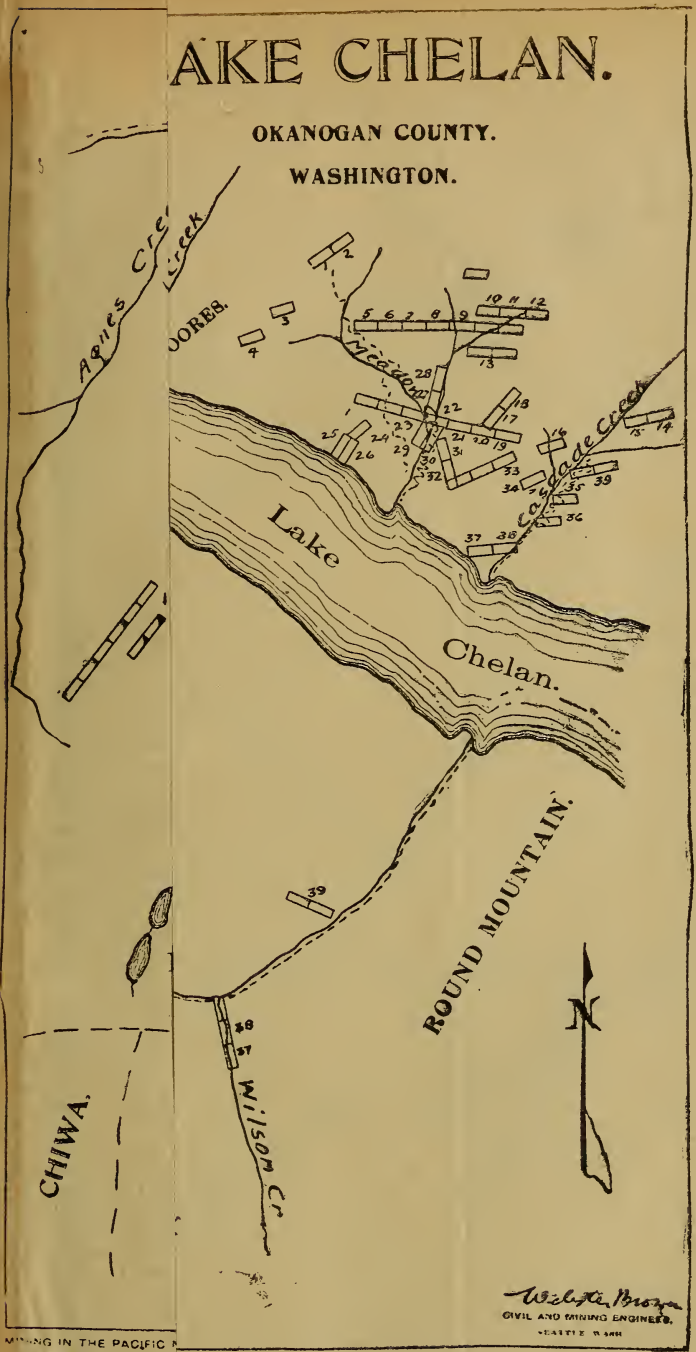
The first discovery has so far proved t he greatest, thanks to the energetic development of the last year, though others may yet rival it. This is the Blue Jay, on the east bank of Meadow Creek, 1,000 feet above the east bank of the lake, discovered by Capt. Charles Johnson, of Lakeside. It is now being developed to a depth of 150 feet by the Chelan Gold Mining Company, which has bought it. The red iron capping of the ledge rises in a series of big swells on both sides of and above a slide in which the crumbled, iron-stained rock slopes for 200 feet down to the next bench. It is a clearly defined ledge of iron and copper pyrites from thirty to forty-five feet wide between walls of granite and porphyry, the line of cleavage being marked by seams of quartz. Of the ledge eight feet is white quartz and ten feet is diorite exactly like that of other sulphide districts. An assay of the surface ore showed it to carry $8 gold, 12 per cent. copper and a little silver.

An open cross-cut and tunnel were run on the ledge for seventy-two feet, giving a depth of fifty feet, and cross-cuts were then run twenty-six feet to the hanging wall and fifteen feet to the footwall, defining the width of the ledge as forty-six feet. A winze was sunk on the hanging wall for nine feet to ascertain whether the ore chute widened. It proved that the chute widened from eighteen inches of broken ore at the roof of the tunnel to twenty-eight inches of solid ore at the floor of the winze, with a total width of seven feet. This improvement occurred in a depth of fifteen feet between the roof of the tunnel and the floor of the winze. There were also in the width of the ledge four other streaks of solid ore, one three feet wide composed mostly of oxide of copper, with decomposed quartz and iron pyrites; the three others, twenty, six and four inches wide respectively, of solid iron and copper sulphides, the last being against the footwall. The ledge is also mineralized throughout, and through it run various streaks of soft iron and copper sulphides, having a greater dip than the wider pay streaks and all tending towards the footwall —an indication that at depth they will come together. Assays from the average of the pay streaks in the winze range from $18 to $37 for all values,

AKE CHELAN.

OKANOGAN COUNTY.

WASHINGTON.



MINING IN THE PACIFIC N

Index to Numbered Claims South of Lake.

1. North Star Group.
2. Agnes.
3. Monarch.
4. Mystery.

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w.
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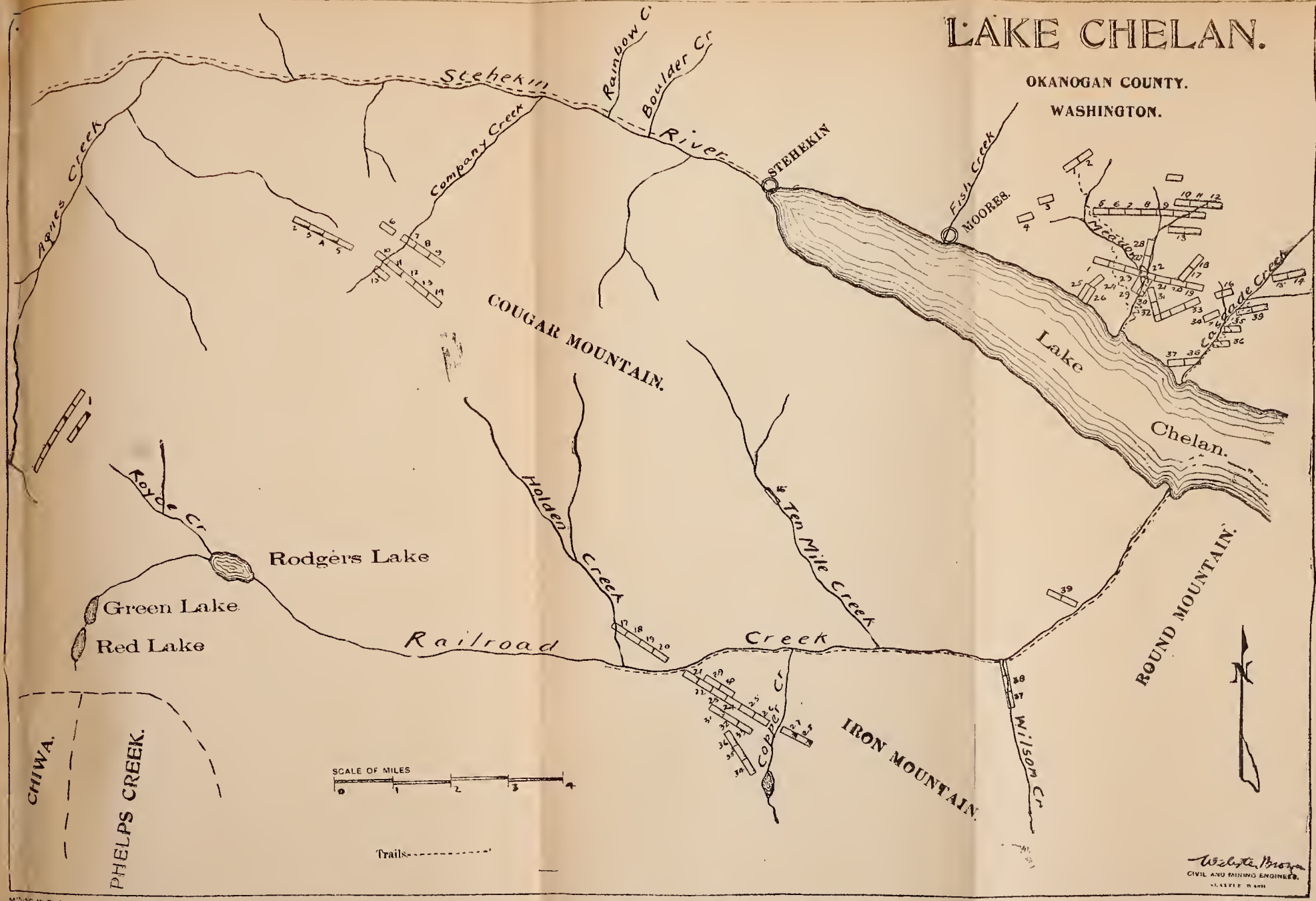
Ext.

23. Willie Gibson.
24. Little Jap.
25. Sunday Morning.
26. Happy Thought.
27. Chub.
28. Unique.
29. Black Bear.
30. New York.
31. Confidence.
32. Seattle.
33. Bismarck.
34. Johnson.
35. Iowa.
36. Carrie A.
37. Orphan Boy.
38. Hunter.
39. Silver King.



MINING IN THE PACIFIC NORTHWEST

Index to Numbered Claims South of Lake.

1. North Star Group.
2. Agnes.
3. Monarch.
4. Mystery.
5. Mystic.
6. Deer Park.
7. W. T.
8. Sunrise.
9. Sunset.
10. Stockholm.
11. Gold Bug.
12. Horton.
13. Goericke.
14. MonteRosa.
15. Dawn.
16. Mary G.
17. Black Cap.
18. White Cap.
19. Blue Cap.
20. Red Cap.
21. Tenderfoot.
22. Emma.
23. Minnie.
24. A. M. H.
25. Irene.
26. Gold Bug.
27. Buckskin.
28. Chelan.
29. Copper Mtn No. 1.
30. Copper Mtn No. 2.
31. Lulu H.
32. Lottie.
33. Sky Rocket.
34. MaryGreen.
35. Iron Dyke.
36. Last Chance.
37. Raymond.
38. Marcus Stein Group.
39. D.T. Denny Group.

North of Lake.

1. Moscow.
2. Silver Bell.
3. Buster.
4. Nebraska.
5. Clayton.
6. Phyllis.
7. Crumrine.
8. Emma Lee.
9. MattieJane.
10. Wolverine.
11. Idaho.
12. Canada.
13. Devonshire.
14. Mastodon.
15. Elephant.
16. Hard-scrabble.
17. Lake View.
18. Emma.
19. Diamond J.
20. Gem.
21. Blue Jay.
22. Blue Jay Ext.
23. Willie Gibson.
24. Little Jap.
25. Sunday Morning.
26. Happy Thought.
27. Chub.
28. Unique.
29. Black Bear.
30. New York.
31. Confidence.
32. Seattle.
33. Bismarck.
34. Johnson.
35. Iowa.
36. Carrie A.
37. Orphan Boy.
38. Hunter.
39. Silver King.

35. Iowa.
36. Carrie A.
37. Orphan Boy.
38. Hunter.
39. Silver King.

gold predominating. The highest assay was from the copper sulphides and showed 16½ per cent. copper, $16.80 gold, the remainder silver.

A contract has been let for 100 feet of cross-cut tunnel to follow a feeder and tap the ledge at a depth of 220 feet, after running 200 feet. This contract will be completed by May 1, when another will be let for an extension of the cross-cut to tap the ledge. The feeder to be followed crops two inches wide where the cross-cut enters it and widens to three feet at the point where it enters the ledge. In the first thirty-three feet it widened to eight inches of ore superior to that in the main ledge. The company is preparing to erect a compressor plant and power drills in the spring.

The Blue Jay ledge has been traced eastward, where it widens to sixty feet on the two Gem claims, owned by Capt. Johnson, and on the Blue Jay extension, owned by O. Graham, of Anacortes, where a thirty-foot open cut and tunnel show it to be well mineralized, with a pay streak carrying $10 to $19 gold and half that value in silver. Further extensions eastward trace the ledge through the Winnipeg, owned by A. Crumrine, the two Iron Cross claims of Messrs. Turner and Bull and onward to the summit. On the west extension E. F. Christy, A. H. Murdoch and —— Buckingham have the Gibson and Frank Lightner the Granite.

At least five distinct ledges parallel with the Blue Jay have been traced, some of them to the summit of the Methow Range. On one of these is the Emma Lee, owned by S. J. Gray and E. J. Wilder, where it crops fifteen feet wide in a porphyry dike and shows three feet of solid mineral in a fifty-foot open cut and tunnel. The surface ore assayed $14.35 gold, 6 ounces silver, 15 per cent. copper. The Mattie Jane, owned by S. J. Gray and "Bill" Rasnic, and the Iron Cap, by S. J. Gray, adjoin.

The Phyllis group of three claims on this ledge has been bonded by Andrew Crumrine, S. J. Gray and L. H. Millard to J. B. Powles and J. G. Cotton, of Seattle, for development. The ledge crops at least thirty feet wide, showing several pay streaks, and a tunnel 112 feet along it shows a two to seven inch streak of copper sulphides on the hanging wall assaying 21 per cent. copper, $6.50 gold, 6 ounces silver. It is intended to cross-cut at 100 feet and open up the other pay streaks.

The Nebraska, on the same ledge, is owned by L. H. Millard, and has eighteen feet of mineralized porphyry, with a thirty-six foot tunnel on the hanging wall showing a pay streak of copper sulphides, gray copper and galena to widen from four to eight inches, surface ore assaying $1.25 gold, 21 ounces silver.

The Idaho group of two claims, owned by the Seattle Gold Mining and Development Company, is on a parallel ledge of porphyry over fifty feet wide between granite walls, which has been traced to the Sawtooth Range and crops in a gulch running to the lake. It is capped with iron and the croppings show three feet of sulphides and gray copper, assaying $8 to $16 gold, 16 ounces silver, 16 per cent. copper. A tunnel has been run seventy feet in the hanging wall, and when it is in 100 feet the ledge will be cross-cut, with 200 feet of depth. The Canada, by William Bigger, is on the extension.

Another mineralized porphyry dike of great width, 1,000 feet northwest, runs through the Moscow, owned by Andrew Crumrine. An open cut thirty feet along the hanging wall is being extended in a tunnel and shows three feet of ore carrying copper sulphides and peacock copper which assays $8 gold, 11 ounces silver, 7 to 11 per cent. copper. The whole ledge is mineralized and the tunnel is being extended with a view to cross-cutting. A. Crumrine, J. W. Nicol and N. B. Church have the Silver Bell on the east extension.

The Buster group of three claims, owned by H. H. Hunt and Ole Olsen, is on a ledge near the head of Fish Creek, carrying pyrites, associated with native silver. On a parallel six-foot ledge of sulphide ore crossing Meadow Creek M. M. Kingman and R. N. Pershall have the Chub, and in a thirty-foot shaft have shown ore assaying $14 gold, $18 silver. A four-foot ledge crossing the Blue Jay is covered by the Emma group of three claims, owned by Spencer Boyd, who has shown three feet of sulphides in two cuts, ten and twenty feet long. The three Bismarck claims, owned by W. P. Robinson and A. H. Murdoch, are parallel with the Blue Jay and show copper sulphides in the croppings.

Crossing Cascade Creek, which empties half a mile below Meadow Creek, are four parallel ledges, on three of which J. Robert Moore has the Cascade group of three claims. Two ten-foot tunnels have been run, one showing a four-foot ledge carrying two feet of sulphides mixed with galena. W. H. Phelps has the Iowa on a parallel ledge, in which a forty-foot tunnel shows twelve inches of ore assaying $60 gold, 200 ounces silver. The two Silver King claims, on another ledge cut by Cascade Creek, have been bonded by the Seattle Gold Mining and Development Company. The ledge is ten feet wide and on one side shows iron and copper sulphides and on the other a twenty-four inch chute of galena ore, carrying a little copper. A tunnel is in thirty-five feet on this ore chute and when extended to 200 feet will give a depth of 500 feet. The Elephant and another claim, owned by J. M. Scheuyeaulle, are on a great body of ore 50 to 100 feet wide carrying silver, assays having run as high as 50 ounces.

The first ore shipped from Lake Chelan had silver for its principal value, and thus drew attention from the great ledges of pyrites on the heights. The

Sunday Morning, owned by J. Robert Moore, is on a twelve-inch ledge of quartz cropping on the water's edge at the foot of a granite cliff, and a seventy-foot tunnel showed it to widen to five feet, with a pay streak carrying galena and ruby silver two to four inches wide. A shipment of 4,600 pounds to the Omaha smelter returned $250 a ton gross. The floor of the tunnel is now being lowered three and one-half feet and the ore taken out in doing so is sacked for shipment, the latest assay being 2,005 ounces silver and $74 gold. When this work is completed the tunnel will be extended. Mr. Moore is also driving a tunnel on the Happy Thought, adjoining.

The Little Jap group of four claims is on a ledge of porphyry four feet wide and carrying two inches of high-grade ruby silver ore, cropping 250 feet above the lake, with a cross ledge of the same width carrying iron and copper sulphides. A tunnel thirty-five feet showed the pay streak to widen to four inches, with iron sulphides of smal value throughout the ledge matter. A cross-cut has been run fifty-five feet to tap both ledges at depth.

On the Hunter group of two claims D. H. Lord and A. W. La Chapelle have a four-foot ledge with a four-inch streak of gray copper and ruby silver cropping near the mouth of Cascade Creek. A fifteen-foot tunnel has shown ore assaying 140 ounces silver, $16 gold.

The Railroad Creek discoveries show ledges of galena on the summit of the Entiat Range, where this district adjoins Red Hill in the Leavenworth District, the Chiwah and Phelps Creek flowing south from one side and Railroad Creek flowing east from the other. The latter stream has its source in Red, or Nellie, Lake, and Green, or Jackson, Lake, and makes a leap of 1,350 feet at Beecher Falls into Rodgers Lake, two miles further east. On the summit, near the two former lakes, eighteen miles from Lake Chelan, the Cascade Range Mining Company has the North Star group of eight claims, six on one ledge and two on another, the formation being granite and the course southwest and northeast. The main ledge has a pay streak of fifteen to twenty inches, assaying 100 to 140 ounces silver and 33 1-3 per cent. lead, shown in tunnels twenty-five and thirty-three feet long.

A great deposit of gold-bearing copper ore was discovered in July, 1896, by J. H. Holden, of Seattle. The ledge is at least seventy-five feet wide between diorite walls and runs northwest and southeast from the base of Cougar Mountain across Railroad Creek and through Copper and Irene Mountains. The ore body is from thirty to fifty feet wide, containing five distinct streaks of copper and iron sulphides close together, carrying $4 to $10.20 gold and 2½ to 18 per cent. copper. There are intervening streaks of copper carbonates carrying 19 per cent. copper and $9.50 gold. On this ledge Mr. Holden has the Irene group of three claims, on which he has recently resumed work.

Ten miles from the mouth of the creek a ledge has been exposed by a slide in the bed of Wilson Creek between granite walls and shows in the croppings four feet of quartz carrying antimonial silver and fine-grained pyrites. The Seattle Gold Mining and Development Company has the Raymond, and Marcus Stein has two claims named after himself, from the surface of which he took ore assaying high in gold and silver, but he has done no development.

STEHEKIN DISTRICT.

With a story of a lost mine dating back to 1880, this district has a mining history beginning in the year 1885. It extends along the summit of the range northward from Cascade Pass and includes the whole watershed of the Stehekin River. Discoveries began on Doubtful Lake, north of the pass, then extended to Horseshoe Basin, then along each side of the Stehekin Canyon, next up Park and Bridge Creeks, flowing from the right, and then up Agnes and Company Creeks on the left. Development has proceeded far enough to prove the presence of small ledges of rich ore and large ledges of low-grade ore in close proximity, but hitherto the many handicaps which beset the progress of a mining camp have prevented any mine from becoming a producer. Yet the high-grade ore would pay a handsome profit on shipment to the smelter. The ore is of two kinds—one carrying galena, gray copper and sulphides in which silver is the principal value, though there is a large admixture of gold; the other carrying iron and copper sulphides under the familiar iron cap, which has been found a sure sign of a mineral deposit throughout the Cascades, as in the Gold Range. The sulphides are always of low grade, at least on the surface, their value being divided among gold, copper and silver, usually in the order named. While the sulphide ledges are of great size, those carrying mainly silver-lead ores are of no mean proportions, often spreading to a width of ninety feet on the surface. The ledges near the headwaters of the Stehekin generally run from east to west and cleave the granite country rock so strongly that they can be traced with the eye by the break in the line of the latter on the jagged summits for miles.

The most convenient route to this district at present is the most circuitous. Going by the Great Northern train to Wenatchee, 174 miles, one

takes the steamer City of Ellensburg up the Columbia to Chelan Falls, forty miles, goes by stage to Chelan or Lakeside, four or five miles respectively, and then by the steamer Stehekin to the postoffice of Stehekin at the head of Lake Chelan, sixty-eight miles. There horses can be procured to ride thirty miles over the trail to Horseshoe Basin, or the same distance to Doubtful Lake, in each case up the Stehekin River. Trails also branch off to Company and Agnes Creeks on the left and up Bridge and Park Creeks on the right. A shorter route with a longer horseback ride is by the Seattle & International Railroad to Woolley, eighty miles, and by the Seattle & Northern to Hamilton, fourteen miles, over a good wagon road up the Skagit Valley and six miles beyond Marble Mount, a distance of forty miles, then over the state trail twenty-five miles to the Cascade Pass. In the one case the distance is 317 miles, in the other 169 miles.

On the basin surrounding Doubtful Lake George L. Rouse and John C. Rouse in September, 1885, located the Quien Sabe on a ledge carrying galena, black sulphurets and copper sulphides, its unbroken width being twenty-five feet, while it spreads to 150 feet where broken by granite horses. It can be traced by the red iron stain eastward through the sawteeth to Horseshoe Basin and runs westward through the summit into the Cascade District, where it crops on the Boston, at the side of the Boston Glacier. Two claims are on the extensions. On a parallel ledge twenty feet wide and quite as clearly traceable east and west they took the Doubtful, and the Lake and Flora on smaller ledges parallel with it. The two Quien Sabe claims are now owned jointly by the Rouses, C. C. May, of Davenport, Adolph Behrens, of Seattle, and Harry Frank. They have run a tunnel 120 feet on the ledge, showing two feet of ore, with the remaining gangue more or less mineralized, but have not cross-cut to find other pay streaks. On the Doubtful tunnels have been run 110 and 30 feet, showing eighteen inches of ore which averages $15.70 gold, 37.80 ounces silver and 44 per cent. lead, while the rest of the ledge would pay to concentrate. The Flora has a six-foot ledge assaying $28 gold and 40 ounces silver on the surface. On extensions or parallel ledges Britanus Stennis has the Sunnyside and Genne and George Taylor the Gertie.

In 1889 and succeeding years the Doubtful Lake series of ledges was traced through to Horseshoe Basin by M. M. Kingman and Albert Pershall, who found the Quien Sabe ledge cropping in the lower basin, and by Lloyd Pershall, Ed Pershall and Ed Christy. In the end a series of thirteen ledges was located, cutting across the upper and lower basin and ranging in width from twelve to thirty feet. The Davenport and two other claims on the same ledge are still owned by Messrs. Kingman and Pershall, who have run a tunnel fifty feet, showing ore which assays 60 to 90 ounces silver, $3 to $5 gold and 40 per cent. lead. The other twelve ledges on Horseshoe Basin, with two claims on each, are known as the Blue Devil and Black Warrior group and are owned by Henry Rustin, of Hazelton, Pa. A cross-cut tunnel is in 125 feet to cross-cut all twelve ledges, and will strike the first 675 feet further at a depth of 440 feet. Open cuts have shown this ledge to be at least twenty-five feet wide and assays show $4.50 to $7.50 gold, 60 ounces silver and 14 to 17 per cent. copper.

Below the confluence of Horseshoe Creek with the Stehekin, a ledge crops twelve feet wide in a gulch on one wall of the canyon and has been located across the river and up the opposite mountain. The Isoletta group is on this ledge and is being developed by J. D. and R. N. Pershall, C. C. May and Mrs. Hess, of Walla Walla. A tunnel has been driven 215 feet on the ledge, showing four and one-half feet of pay ore, which assays 300 to 700 ounces silver and $3 to $7 gold. A shipment of 2,200 pounds from the dump, where it had been exposed to the action of air and water for two years, returned $60 a ton.

On the same ledge, across the canyon, R. N. Pershall, M. M. Kingman and Charles Johnson have the Homestake and Star, on which it crops thirty to fifty feet wide, with a body of ore four feet wide shown by a thirty-foot open cut. This ore carries chloride and bromide of silver and gray copper, and assays 112 to 400 ounces silver and $15 gold. The Twin Falls, under the falls of Horseshoe Creek, is owned in common with the Isoletta group, and has shown up three feet of gray copper ore. On extensions Albert Pershall and M. M. Kingman have the Christy, and F. F. Keller the Viola. The same ledge crops ten to twenty feet wide on the Flamingo, owned by J. M. Scheuyeaulle and others, where assays have run up to $3 gold, 20 ounces silver, 8 per cent. copper. Adjoining this the same owners have the Lottie S. on an eight-foot ledge assaying 9 per cent. copper, 2 ounces silver, and on Shyall Lake Mr. Scheuyeaulle has the Lake Shyall on a ledge 50 to 100 feet wide, on which assays have run $2 gold, 10 ounces silver and as high as 75 per cent. copper. On a ledge varying from eight to fifty feet wide, which crosses Flat Creek, Mr. Scheuyeaulle and his associates have the Sunset group of three claims, giving assays as high as $60 gold. The Mountain Sheik and another claim are on a parallel ledge about twenty feet wide, assaying 15 ounces silver, 10 per cent. copper, and are owned by the same parties.

The Crown Prince and Free Coinage, owned by Cook & Clarke and others, of Spokane, are on a ledge running into a steep cliff, and they will cross-cut it by tunneling on a stringer, which has already widened from

nine to twenty-three inches in a cut of only twenty-eight inches. The ore is copper sulphides carrying 31 per cent. copper, $4.85 gold and 3 ounces silver.

The galena ledges plowed down by the glaciers ofHorseshoe Basin nave been traced twelve miles eastward to the head of Bridge Creek, twenty-three and one-half miles by trail from Stehekin, but there they are found parallel or associated with ledges of pyritic ore in a formation of granite and porphyry. Of the Tiger group of seven claims, owned by E. S. Ingraham, H. O. Hollenbeck, Van Smith, Professor Piper, George Young, H. Willis Carr and others, three claims are on a ledge fully fifty feet wide, running northeast and southwest near the head of the north fork. The croppings show three pay streaks, twenty-four, eighteen and six inches wide, two of them carrying galena, steel galena, gray copper and sulphurets, as shown in a twenty-foot open cut, while a twelve-foot shaft shows the third to change from large galena crystals to sulphides. Assays range from 103 to 176 ounces silver and uniformly show about $24 gold. Three other claims are on a parallel ledge five feet wide, in which a twenty-foot tunnel shows a fourteen-inch streak of white iron assaying $6 gold, $8 silver, besides copper. On two of the claims cuts have been made preparatory to tunneling and have shown a quartz gangue, but in the other the gangue is porphyry carrying six inches of cube galena on one wall and a streak of iron sulphides on the other. The remaining claim is on a parallel ledge of hard crystallized quartz about ten feet wide, carrying sulphides, which assay $5 gold and silver on the surface.

The Minneapolis is held by William Keho and Joseph Lathrop on a ledge of iron and copper pyrites cropping fifty feet between walls and carrying mineral the full width to a value of $18 gold, silver and copper. A cross-cut has been driven forty feet and will tap the ledge in another sixty feet.

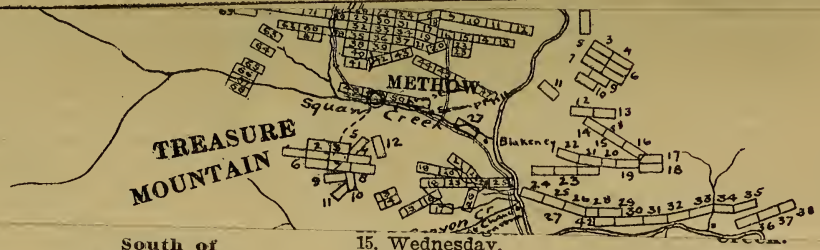
The Defender group of three claims is held by M. A. Allmandinger, Daniel Devore and others on three small ledges, each about two feet wide. The main ledge was supposed to carry ruby silver, but a cut to be continued by a tunnel showed a two-inch streak carrying gray copper and sulphides, which assayed 100 ounces silver. Another ledge showed four inches of galena in a twenty-foot open cut.

Among the other leading claims on Bridge Creek are the Mayflower on a thirty-foot ledge and the East Side on one five feet wide, both owned by William Keho and Henry Quinn. M. Bushman and W. I. Lyle have the Jefferson and Tennessee on parallel ledges about eight feet wide, carrying galena. In the Maple Creek Basin John Ferguson has the Prince of Wales on a four-foot ledge carrying eighteen inches of antimonial and ruby silver, Gilkey & Co., of Edison, having the Lulu on the extension, an assay from which ran $180 gold and silver, while ten other claims trace it across the mountain to Bridge Creek. Gilkey & Co. also have two claims on a four-foot ledge with eighteen inches of ore which averaged several hundred ounces in silver, and have the Sailor Boy on one thirty inches wide carrying $25 gold, 18 ounces silver. At the head of Bridge Creek is the Gray Eagle on a four-foot ledge assaying 140 ounces silver and $4 gold, the owners being Rogers & Howe, of Waterville, Oscar Johnson and Peter Dalberg.

The great deposits of sulphide ore extending across Company and Agnes Creeks near their sources and through the intervening ridge were first discovered eight years ago by Peter Goericke, of Conconully, but he strove in vain to find them again on a second trip and nearly lost his life in the attempt. Dennis McDonald and William Stillwell continued the search and in 1894 discovered a ledge of iron pyrites sixty feet wide, cut by Company Creek. They located the Well-known group of claims on this and parallel ledges.

Seven of these claims on one ledge comprise a group which has been acquired by the Stehekin Mining Company. The ledge is over 100 feet wide in walls of blue porphyry and the center claim is on both sides of the deep canyon of Company Creek, with perpendicular porphyry walls for over 600 feet, in which a 500-foot tunnel would give 2,500 feet of depth. The ledge is clearly traceable on both these walls and the quartz and schist gangue is impregnated throughout with iron and copper pyrites, assaying $2 to $7 gold and 2 to 15 per cent. copper.

The belt was then traced through the mountains from the head of Railroad Creek across Company Creek to the head of Agnes Creek. On another ledge, nowhere less than 100 and often 300 feet wide, and on spurs and lesser parallel ledges, J. M. Scheuyeaulle, J. W. Horton, Gus Anderson and J. E. Merritt have the Goericke group of ten claims, while on a parallel ledge from eight to fifty feet wide they have three claims. Surface ore on the wider ledge has assayed as high as $45 and on the smaller one as high as $60 gold, but the assays from these bodies of sulphide ore have generally averaged about $7 gold. As little work has been done, these assays are all of surface ore, and the precedents of other similar districts where depth has been gained warrant the belief that higher values will be obtained when work has been carried on some distance below the surface.



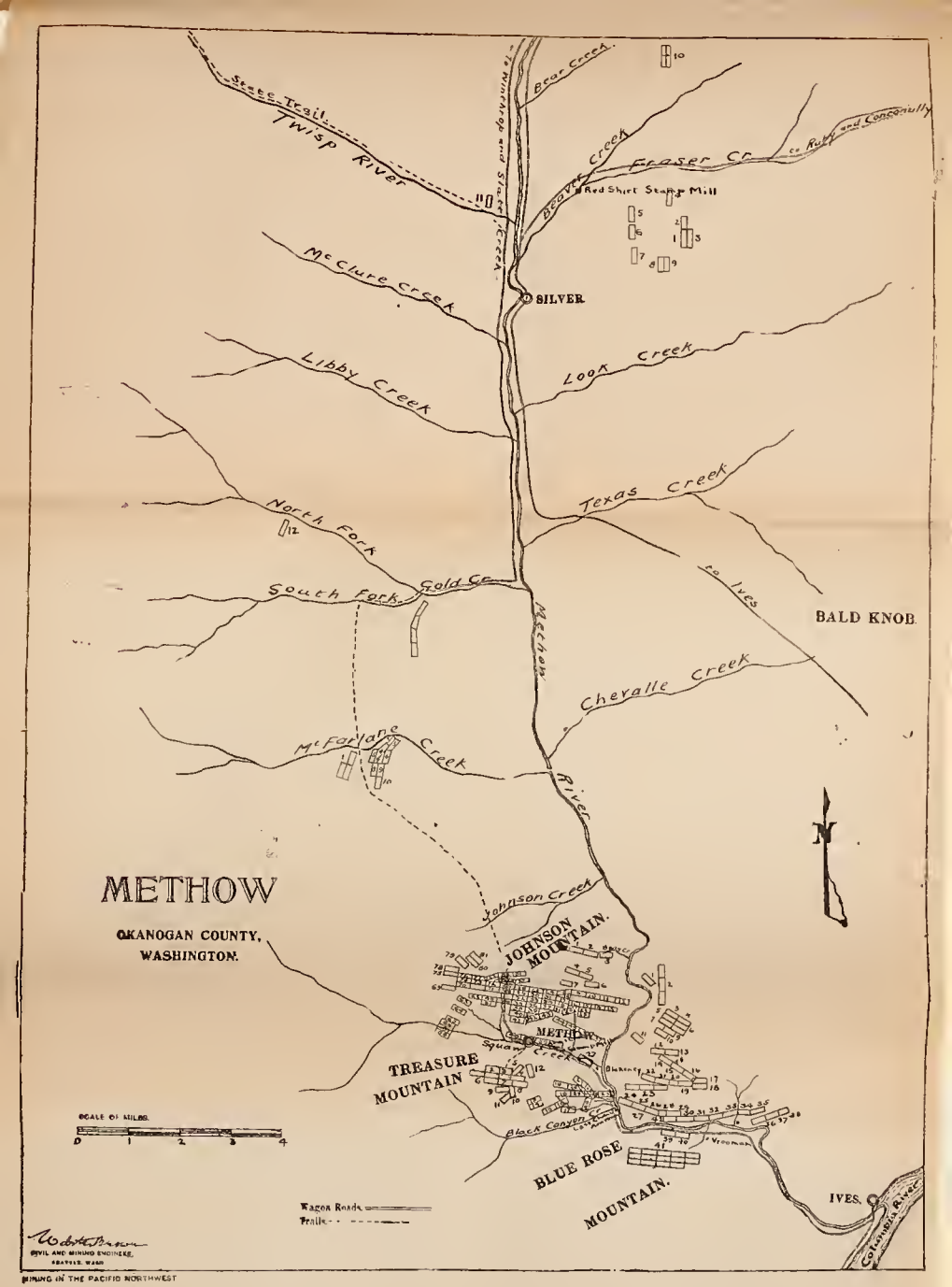
35. Just-in-time.
36. Henrietta.
37. Philadelphia.
38. Gold Dollar.
39. Mary Ann.
40. Dry Gulch.
41. Central.
42. Podunk.
43. Old Rye.
44. Snow Ball.
45. Aurora.

South of Squaw Creek.

1. Tiptop.
2. Excelsior.
3. Nip and Tuck.
4. Mountaineer.
5. O. K.
6. 'Alf an' 'alf.
7. Moonshine.
8. Ben Hur.

15. Wednesday.
16. Thursday.
17. Sunday.
18. Tuesday.
19. Monday.
20. Reno.
21. Parallel 1.
22. Parallel 2.
23. Navarre.
24. Savage Queen.
25. Diamond Flush.

1. Guy.
2. Bryan.
3. Damfino.
4. Black Jack.
5. Lucky Boy.
6. Jumbo.
7. Yesler.
8. Western Pride.
9. Northern Light.
10. Albion.



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3. Greenegage.
4. Black Boy.
5. Storm King.
6. Big 4.
7. Crystal.
8. California.
9. Milly.
10. Seven Up.
11. Twilight.
12. Badger.
13. Louise.
14. Standard.
15. Columbia.
16. Yakima.
17. Hidden Treasure.
18. Sunrise.
19. Grey Billy.
20. Seattle.
21. Austinburg.
22. Balance.
23. Dead Shot.
24. Lookout.
25. Sailor Boy.
26. Hunter.
27. Jefferson.
28. Washington.
29. Virginius.
30. Buckhorn.
31. Highland Light.
32. Cora.
33. Irene.
34. Chicago.
35. Just-in-time.
36. Henrietta.
37. Philadelphia.
38. Gold Dollar.
39. Mary Ann.
40. Dry Gulch.
41. Central.
42. Podunk.
43. Old Rye.
44. Snow Ball.
45. Aurora.
46. Trilby.
47. Methow Queen.
48. Paymaster.
49. St. George.
50. St. Patrick.
51. Full Moon.
52. Snowflake.
53. Lincoln.
54. Voltaire.
55. Okanogan.
56. Ophir.
57. Spring.
58. Grubstake.
59. Yes I Know.
60. Jeff Davis.
61. Eureka.
62. Spike Team.
63. Clifton.
64. Small Change.
65. Drumlummon.
66. Derby.
67. Elkhorn.
68. Sicily.
69. Ransomet.
70. Golden Eagle.
71. Homestake.
72. Golden Chariot.
73. Tiger.
74. Doubtful.
75. Little Fellow.
76. Seattle.
77. Second Thought.
78. Copper King.
79. Missing Link.
80. Inland Light.
81. Grand View.

South of Squaw Creek.

1. Tipton.
2. Excelsior.
3. Nip and Tuck.
4. Mountaineer.
5. O. K.
6. 'Alf an' 'alf.
7. Moonshine.
8. Ben Hur.
9. Lily.
10. Elephant.
11. Crichton.
12. Mammoth.
13. Old Man.
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15. Black Canyon.
16. Blue and Grey.
17. Portland.
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5. Josephine.
6. Last Chance.
7. Charleston.
8. Reno.
9. Albert Lea.
10. Sunny South.
11. Monte Cristo.
12. Boston.
13. Thompson.
14. Seven Eagles.
15. Wednesday.
16. Thursday.
17. Sunday.
18. Tuesday.
19. Monday.
20. Reno.
21. Parallel 1.
22. Parallel 2.
23. Navarre.
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25. Diamond Flush.
26. Monitor.
27. Carnival.
28. Bismarck.
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30. Friday.
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32. Decoration.
33. Humboldt.
34. Ida May.
35. Cripple Creek.
36. Dryville.
37. Riverside.
38. East End.
39. Blue Rose.
40. Twins.
41. Schultz-Chesney.
42. Saturday.

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2. Brooklyn 1.
3. Pride of the Hills.
4. Black Warrior.
5. Crockett.
6. Mike Maloney.
7. Silver Bow.
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9. Northern Light.
10. Albion.

THE METHOW.

This district was the first to feel the effect of a revival of interest in mining among the people of Seattle during the year 1896 and the principal properties are owned in that city and being developed by Seattle capital. After suffering the effects of ill-advised ventures during the period immediately following the first discoveries, it appears now to have entered upon an era of steady, careful development, and every day's work gives added proof that it is well worth the confidence being shown in it.

The route from Seattle to the Methow District, like that to Lake Chelan, is over the Great Northern Railroad to Wenatchee, 174 miles, by the steamer City of Ellensburg to Ives Landing at the mouth of the Methow, seventy-five miles. Thence a wagon road runs up each bank of the river, that on the left bank leading to Silver, twenty-five miles, and to the Twisp Ferry, seven miles further, while that on the right bank leads to the town of Methow, in the center of the district, eight miles, and when a gap of six miles has been closed, will extend to the mouth of the Twisp, twenty-five miles further. A stage runs to Methow on the one side and to Silver on the other side of the river.

The mineral belt through which discoveries extend and through which the Methow flows, is about twenty-five miles long and at least three miles wide, extending through the foothills on each side of the river. Its characteristics are thus described by S. G. Dewsnap, the mining engineer:

"The country rock of this belt is secondary granite, which is crossed and cut by dikes of bird's-eye porphyry, feldsite porphyry and diorite, which mostly strike northwest and dip southwest. The vein formation strikes a few degrees from east and west and dips northerly, cross-cutting the dikes at an angle of about 30 degrees. In many cases the dikes are not broken by the veins at the surface, but are found to have been broken at some little depth below. The croppings of the quartz veins are mostly blind, that is, the surface of the rock formation is largely covered by soil underlaid by glacial cement, which makes prospecting rather difficult, and the bedrock is only seen at points where the dike contacts have left ridges or hogsbacks not covered by detritus. Standing on the footwall and looking down the dip of the veins, the ore is found in well-defined chutes dipping to the left hand at an angle of 60 to 66 degrees from the plane of the vein. South of the belt proper, in Black Canyon, which runs parallel with Squaw Creek, are some veins in which the oxidized iron is magnetite, not hematite. On the north side of this belt is another of soft feldsite porphyry about half a mile wide, in which a number of locations have been made on quartz veins, none of which have been proved by development work. Beyond this is a belt of syenite, extending north on the divide between McFarlane and Gold Creeks, in which are veins carrying a little galena, mispickel and stibnite, and much richer in silver than the ores of the south belt, some tetrahedrite carrying much more both of silver and arsenic. The quartz in the three main veins, which form the letter N and have been traced and located for nearly six miles east and west, seems to have followed in its formation a seam of diorite porphyry, which is broken and replaced by quartz, sometimes shoving the diorite to the hanging wall, sometimes to the footwall. The ore occurs in chutes following the line of breaks in this diorite porphyry seam.

"The characteristic mineral on the surface is a wax-like compact hematite, filling the crevices in the quartz, probably arising from the oxidation of the different sorts of pyrites which are found at greater depth. Free metallic gold is very rarely found in the quartz, but fine colors of free gold are generally found in the hematite iron of the surface ore. The characteristics of the ore in depth, unoxidized, are a pyrites, compact, hard, crystallized, containing a little gold, a grayer, softer pyrites carrying traces of zinc and arsenic that is rich in gold; a further pyrites mineral carrying quite a little copper; traces of arsenic carrying moderate values in gold; a further sulphuret mineral resembling tetrahedrite of complicated composition, carrying considerable silver and gold, with a little bismuth, antimony, arsenic and zinc."

The first mineral discovery in this belt was made in 1887 by J. M. Burns on Polepick Mountain, near Silver, and has now developed into the Red Shirt mine. The ledge was cross-cut at 240 feet and shown to be five feet wide, and a shaft sunk on it for 150 feet showed five feet ten inches of ore at the bottom. The cross-cut was extended 210 feet and cut another thirty-inch ledge, while drifts were run 400 feet each way on the main ledge, showing its width to range from four to six feet. The ore carries iron and copper sulphurets and assays about $20 a ton in gold and silver. It was bought in the summer of 1896 by the Red Shirt Mining Company, which erected a twenty-stamp mill and began reducing the 1,700 tons of ore on the dump. It crushes sixty tons a day and concentrates 33 into 1. The company has also begun a cross-cut 160 feet below the upper tunnel and has run it 400 feet, expecting to tap the ledge in another 200 feet.

There are several promising prospects on the same and parallel ledges. On the Brooklyn, the extension of the Red Shirt, Mr. Burns has sunk a small shaft on the ledge. Frank Benson has sunk fifty feet on the two Pride of the Hill claims, on a parallel ledge, showing four feet of quartz assaying $30 gold. On the Capital, Love Hedge has sunk twenty feet, showing a five-foot ledge.

The next discovery near the Red Shirt was made in 1890 by Mrs. M. Leiser and is now owned by J. S. Crockett, who has extended the forty-foot tunnel run by the former owners and shown up a ledge of quartz and crystallized lime carrying a good value in gold and silver. Then followed the discovery of the Black Warrior, also owned by Mr. Crockett, where a small shaft shows eight feet of pyritic ore between walls of diorite. Several adjoining claims have good surface showings, but the extent and value of the ledges is not apparent for lack of development. Among these are the Mike Maloney, by W. H. Lilley and O. S. Booth; the Silver Bow, by James McCann and Sims Connelly; the Brother Jack, on an iron cap assaying $20 gold on the surface, and the Panic on a parallel ledge, both owned by Charles Klemme and J. J. Snyder.

Five miles northwest of the Red Shirt, at the head of Bear Creek and Pipestone Canyon, near Winthrop, is the Safe Deposit group of four claims, owned by the Safe Deposit Mining and Milling Company. The ledge runs north and south and, as the property is due north of the Red Shirt, is believed to be an extension of that ledge. The gangue is quartz and the mineral is copper pyrites carrying gold and silver, between walls of porphyry and granite. Assays range from $7 to $14 and the ore will concentrate 30 into 1. A twenty-foot shaft is down on one claim and on another is one of sixty feet, which is being continued with a double shift, each showing the ledge to range from three to thirteen feet and the ore to increase in value with depth. When the course and pitch has been defined, a cross-cut will be run 200 feet to tap the ledge at a depth of 240 feet. The company is negotiating with the Red Shirt Company to concentrate fifty tons of ore a day at its mill, a wagon road within half a mile of the property making transportation easy.

It was not till 1892 that discoveries extended southeastward to Squaw Creek, where J. W. Draa and Nels Johnson made the first discoveries, but so broad a belt of mineral was soon revealed in that vicinity that it became the center of interest and has since remained so, except for a lull during the year 1895. The principal ledges were first found cropping on Johnson Mountain, on the left bank of Squaw Creek, but they have now been traced across the Methow almost to its mouth and over the mountains to Gold and McFarlane Creeks in one direction and to Black Canyon in the other. The three main ledges are those already described as forming the letter N, but they are paralleled by a number of others and intersected by several cross ledges, showing the whole country to be veined with mineral-bearing rock.

The greatest depth so far attained in this part of the district is on the Highland Light, owned by the Highland Light Gold Mining Company. This is on one of the main ledges cropping near the summit of Johnson Mountain and has been developed by a shaft 140 feet deep, which cuts through an ore chute dipping towards it from the west and remained in it for the first fifty feet. A drift was run twenty feet at the twenty-five foot level and the ore above stoped out. Another drift was run forty-five feet at the fifty-foot level and from it some stoping has been done on an ore chute cropping east of the shaft, which ran $92 for all values. A drift was run fifteen feet to the east at the 100-foot level, showing thirty inches of similar ore. At the bottom of the shaft drifts were run sixty feet to the west and forty feet to the east. The west drift cut the ore chute through which the shaft was sunk and defined it as three feet wide and carrying ore worth about $45. There are 400 tons of ore of all grades on the dump, which is being reserved for local treatment, either in the existing five-stamp mill on Squaw Creek or by some other approved process. While much of the ore is rich enough to pay for shipment to the smelter, it is essentially concentrating ore and can be more economically reduced on the ground.

The property showing the next largest amount of development, although work has been suspended during the winter, is the Friday group of five claims, on the left bank of the Methow, owned by the Friday Gold Mining Company. At a point on the mountain side 225 feet above the river a tunnel 110 feet long taps the ledge, with drifts sixty-five feet to the east and forty-three feet to the west, the former showing the width to be ten feet, the latter twenty-two feet between walls. The ore is better where the ledge is narrower. The main station is at the inner end of the tunnel and from it a double compartment shaft has been sunk eighty-four feet. The ledge has been cross-cut at the bottom of this shaft and is twelve feet wide, and drifts extend fifty-eight feet to the east, forty-three feet to the west, the west drift showing fourteen feet of well-mineralized quartz, with lenses of high-grade sulphuret ore. Ten tons of this ore shipped to the Everett smelter recently yielded $70 a ton. Above the main station are two stopes, each 34x18 feet, exposing ten feet of solid ore of varying quality, a shaft extending from them to the open air. The ore is mainly iron pyrites, chalcopyrite and mispickel, with rare bits of zinc blende. In all, sixty-two and one-half

tons of ore have been shipped, returning an average of about $80, and assays of $97 have been obtained frequently, $140 repeatedly and $406 occasionally. The ore is essentially a gold ore, carrying from a trace to six ounces of silver and as high as 2 per cent. copper. There is a large quantity of ore on the dump, which is to be reduced by a stamp mill and concentrator to be erected this season. The ledge is tapped by a seventy-five foot tunnel on another claim and a drift has been run thirty feet to the west, showing good ore. On a third claim a ninety-foot shaft shows good prospects.

On the Friday ledge on the west is the Diamond Queen group of two claims on a bluff overlooking the river, owned by the Diamond Queen Gold Mining Company. Two tunnels have been driven on the ledge, one sixty feet showing it six feet wide and the other fifty feet at a point 300 feet lower, which will in twenty-five feet more cut an ore chute cropping on the surface. The ledge is well defined for 1,400 feet on the surface. An assay from croppings of the ore chute returned gold $10.80, silver 61 cents, and assays from the upper tunnel ran $3.65 to $32.70 gold.

Beyond this group and on the same side of the river is the Emerald group of three claims, owned by the Emerald Mining and Milling Company. The ledge crops five and one-half feet wide between granite walls and has been traced for 3,000 feet. A sixty-foot tunnel, attaining a depth of sixty feet, shows it to widen to nine and one-half feet, with a thirty-inch pay streak. The surface ore assayed $25 gold, silver and copper, while samples taken from the face of the tunnel at fifty-three feet assayed $122 and $157, the ledge matter outside of the pay streak being mineralized to the value of about $10. A contract has been let for a 200-foot tunnel, 300 feet below the upper tunnel, to be used as a working tunnel, and is being continued day and night.

Another property which has shown up well for a large amount of development is the Hidden Treasure, adjoining the Highland Light, owned by the Hidden Treasure Gold Mining Company. An upper tunnel has been run 200 feet, gaining 120 feet in depth, and has cut ore chutes sixty-five, thirty-five and twenty-five feet long respectively, being now in the fourth, which shows thirteen inches of ore. A second tunnel fifty feet below has been driven 115 feet through good concentrating ore and is now in the main ore chute, carrying twenty-six inches of high-grade ore. One shipment of seven tons of $70 ore was made last season and there are 100 tons of $30 ore on the dump. The company has built a wooden tramway down the mountain from the mine to the road, down which ore will be transported by gravity.

Another well-developed property is the Okanogan, one of the pioneer locations on Johnson Mountain, owned by the Okanogan Mining Company. A prospecting tunnel was first driven fifty feet on the ledge and a new tunnel was then started forty feet below. This is now in 165 feet, showing six feet nine inches between the walls, with twenty-six inches of copper sulphides at the 114-foot mark. A winze is being sunk from the face of this tunnel and is now down fifty feet, giving 130 feet of depth below the surface. The winze is now running through an ore chute three feet wide, assays of which run from $20 to $28 gold, and assays generally have ranged from $10 to $97.

The Hunter, the first location on Johnson Mountain, has also shown well under development, and has been bonded with two other claims for $10,000 to F. S. Mack, of New York. A tunnel has been run 200 feet on the ledge, gaining a depth of sixty feet and showing nine feet four inches of quartz carrying copper sulphides between perfect walls. The value averages from $16 to $20 gold and 8 to 12 per cent. copper.

The Methow Mining Company has the Washington group of seven claims, all but one of which are adjoining. Three of these are on the Hunter ledge, which is shown to be six to six and one-half feet wide in an open cut fifteen feet long and ten feet deep on one claim; four and one-half feet wide in a twelve-foot shaft on another, showing oxidized and decomposed quartz, and from four to four and one-half feet in the third, where it is well mineralized with copper sulphides on the surface and where two stringers run into it. Another claim is on a stringer three to eighteen inches wide, carrying high-grade ore with free gold often showing, and yet another has a ledge seven to ten feet wide cropping the entire length, though quite undeveloped. The last claim of the group is the Bill Nye, and, although three miles west of the others, is probably on an extension of one of the main ledges, showing five feet of similar quartz, partially decomposed, in a fifteen-foot shaft.

The Gray Eagle group of three claims, owned by Fischer Brothers, of Seattle, has made a good showing, being on the Friday ledge. A shaft has been sunk 140 feet, with a drift at the fifty-foot level driven 100 feet west and ten feet east, with a stope twenty-seven feet high on the west drift. At the 100-foot level there is a drift seventy-three feet to the west with an upraise of eighty-nine feet. All this work shows a vein from four to eight feet, with a diorite dike shoving it first to one wall, then to the other. Several car-load shipments of high-grade ore have been made and about 200 tons are on the dump.

Adjoining the Gray Eagle group is the Last Chance, owned by J. R. Esmond and Edward L. Ensel, on a well-defined ledge three and one-half feet wide with talc gouge on the walls, which are diorite and bird's-eye porphyry. A tunnel was run forty-five feet on the ledge by the former

owners, who stoped out the ore above and shipped three car loads to the Everett smelter, netting $39 gold and a little silver. A shaft was sunk fifteen feet from the tunnel, showing sixteen inches of ore all the way, which assayed $31 gold and a little silver.

The Hunter ledge also shows up well on the Sailor Boy, on which Nels Johnson and Alexander McKinnon have sunk sixteen and twenty-foot shafts along the footwall, showing four feet of good oxidized ore; on the Lookout, where John Summers and Thomas McLaughlin have sunk sixty feet; the California, where Andrew O'Malley, Richard Malone and William O'Neil have run a twenty-foot cross-cut; the Mills, where A. L. Johnson, S. P. Richardson and William Goggins sank inclines fifty feet and eighteen feet, showing the ledge to be at least six feet wide, and making a shipment, which returned $87.5 on the Crown Point, owned by A. McKinnon; on the Badger and its extension, where Lloyd Pershall and others have run a fifty-foot tunnel and sunk twenty feet. The ledge was then traced across the river and Messrs. Johnson and Draa located the Josephine group of three claims in that direction..

The Standard and an extension, both on the Highland Light ledge, owned by the Standard Gold Mining and Milling Company, have the ledge shown four to four and one-half feet wide where it has been stripped for twenty to thirty feet. There is ten to fourteen inches of ore, average samples of which assayed $38.60 gold and a little silver. Judging from adjoining properties, there is probably 5 per cent. copper. The company will tunnel on the ledge and by driving for 1,000 feet will gain 700 feet in depth.

Among the other properties on the Highland Light ledge, which forms the cross stroke of the letter N described by the three main ledges of Johnson Mountain, are the Columbia, owned by the Cable Mining Company, where it crops fourteen feet wide and carries some free gold on the surface; the Big Fraction, owned by John and Frank Welsh and others. The Gray Eagle ledge is the southern parallel stroke of the N and has been traced onward across the river through the Diamond Queen and Friday groups.

On extensions are the California Boy and Decoration, by C. L. Martin; the Humboldt, by Daniel Murray; the Ida May, by Daniel Murray and Harry Hayward, and the Cripple Creek. To the west the same ledge was extended by the location of the Mountain Lily group of five claims, owned by T. W. Robinson and J. R. Esmond. On this group a shaft is down ninety-five feet, with a fourteen-foot drift at the bottom, cross-cuts have been run fifty and thirty feet, defining the ledge to be four feet ten inches to seven feet wide, and an eighteen-foot shaft has been sunk.

On a parallel ledge to the north are the Parallel group of two claims, owned by C. R. Martin, Thomas Warren and A. F. Burleigh; the Reno fraction, by C. R. Martin; the Monday, by Charles Durr and Chris Stilrecht, and the Tuesday group of three claims, owned by the Tuesday Gold Mining Company. This ledge has so far been merely prospected, the most work being on the Tuesday group, and has been defined to a width ranging from two to seven feet. The Tuesday Company has sunk sixteen feet on the footwall, with ore the full width and no hanging wall in sight, and has defined the ledge by a ten-foot shaft in another place. Assays range from $58 gold upwards. Beyond these is the Riverside group of three claims, near the wagon road, owned by the Riverside Gold Mining Company, where the ledge shows four feet wide in a fourteen-foot shaft, with sixteen inches of pay ore, while the whole ledge assays $13 gold and silver.

Parallel with the Friday ledge the Ben Lummon Gold Mining and Milling Company has a claim on a four-foot ledge, and on the opposite side of the river, below the Gray Eagle, has two other claims on twin ledges, each six feet wide, with five and one-half feet of black slate between them and with porphyry walls. The ore is similar to the Gray Eagle and assays $15 to $18 gold on the surface. These three compose the Ben Lummon group.

Among other properties on parallel ledges showing well on development is the Ocean Wave, owned by Jacob Durr's heirs, L. W. Barton and Lee Bowen, where a seventy-foot shaft shows a six-foot ledge, on which another shaft is down twenty feet and several open cuts have been made. On the Chicago Andrew O'Malley and William O'Neil have stripped an eighteen-inch ledge for 300 feet and sunk eighteen feet, showing ore which averages about $100, three tons having returned $57.49 over freight and treatment. One of the famous pioneer claims is the Paymaster, adjoining Methow town, on which Claude and Burrell Johnson ran tunnels 235 and 65 feet and sank a shaft 105 feet, showing forty inches of ore which assayed $23 to $60. On this ledge J. M. Scheuyeaulle has the St. Patrick, in which thirty feet of work has shown three feet of ore assaying as high as $187 gold. On the Yes or No Melton Woods and P. H. Farley have shown three feet of ore in a fifteen-foot shaft. On the north side of Johnson Mountain Nels Johnson has sunk a ninety-foot shaft on the London, showing a ten-foot ledge, and J. R. Esmond has sunk a shaft on a parallel ledge six feet wide running high in copper sulphides.

The Just in Time group of two claims on Johnson Mountain is owned by the Just Gold Mining Company and has a tunnel 108 feet, showing up the ledge from five to six feet without the footwall, the ore assaying $24.40 gold. Another tunnel fifty feet higher taps a parallel ledge three to four feet.

The company is drifting west on the lower tunnel to locate an ore chute which appears to be about forty feet west, then will tunnel further down the mountain and cut the ore chutes to a depth of 400 feet.

On Blue Rose Mountain, directly across the river from the Friday, the Squaw Creek Mining Company has eight claims, commonly called the Schulz and Chesney group, after their locators. They are on a series of parallel ledges ranging from four to six feet wide, shown in a number of small shafts and open cuts, and carrying pay streaks of galena, gray copper and azurite, assaying 40 ounces and upwards in silver. A forty-foot tunnel has shown up ore carrying $60 to $70 gold, and development is now in progress on a ledge which has widened to twenty feet and carries lenticular bodies and pockets of copper pyrites and gray copper, often of high grade, besides large bodies of concentrating ore.

On the same series of ledges A. J. Dexter has the Blue Rose; R. S. Ells the Montana; William Noble and J. M. Sparkman the Overlook; Fred Simmons and George Gates the Idaho; E. A. Sartor the Lizzie; Fred Simmons and R. S. Ells the Ninety-five; Fred Simmons the Lone Star; Fred Simmons and Michael Long the Major and Summit; Rev. Mr. Thomas the Annie.

On Treasure Mountain is the Nip and Tuck group of four claims, owned by the Treasure Mountain Mining Company, of Seattle. A tunnel forty feet and another eighty-five feet at a point fifty-five feet below are on the middle one of three veins into which the ledge has split, and showed from three to twenty-five inches of ore, thirty tons of which reduced at the Squaw Creek mill was worth $16 gold. It is intended to cross-cut for the other two veins into which the ledge has split. Lee Ives and others have the Excelsior on the same ledge and have sunk twelve feet, showing it to be twelve feet between walls, with a number of stringers, the pay ore assaying $23.50 gold, $6 silver.

On Gold Point Hill, two miles west of Methow, Alexander McNeil and M. M. Kingman have the Larsen group of four claims on two ledges. One of these shows forty inches wide in a double compartment shaft forty-five feet deep, ore from which assayed $22 to $78. On the other ledge a fifteen-foot shaft shows sixteen to twenty-four inches of ore assaying $25 to $60. On the two White Elephant claims M. M. Kingman and R. N. Pershall have run a 100-foot tunnel on a five-foot ledge. Mr. McNeil has also the Chippewa group of three claims, two on a four-foot ledge on which he has sunk ten feet and the third on one five feet wide, shown by a similar shaft. The two Sacramento claims of C. J. Ogden and W. A. Bollinger are on a three and one-half foot ledge, showing in a twenty-foot shaft.

The most recent developments are on McFarlane and Gold Creeks, to the west of Squaw Creek, and good ore bodies are being shown up. On the Black Jack S. G. Dewsnap has run a tunnel 150 feet and has cross-cut from footwall to hanging wall, showing four feet of quartz well mineralized with gold, silver and copper for its whole width. The Damfino has a sixty-foot tunnel showing fort yinches of similar ore. On the Parallel a forty-foot tunnel showing forty inches of similar ore. The Catherine, on McFarlane Creek, makes a good showing on an eight-foot ledge. The Osiola, on the Gold Creek Divide, shows up six feet of copper and gold ore. On the Oregon group, on the south fork of Gold Creek, an incline shaft is down fifty feet, showing five feet of arsenical iron ore, which carries $10 to $40 gold. On the north fork of Gold Creek a number of discoveries have been made and development is being carried on with very encouraging results. On the North Star a ninety-foot shaft shows the pay streak to widen from two inches to four feet, surface ore assaying $20 gold, 234 ounces silver.

That the same mineral belt extends through the Methow foothills far up the river is shown by the discoveries in the Spokane mine at the mouth of the Twisp, owned by Morgan, Nichols & Co., of Minneapolis, who are actively developing it. The ledge is between four and five feet, between walls of porphyry, and runs northwest and southeast nearly perpendicular, with a slight pitch to the west. Prospecting was begun with a shaft sunk forty feet, showing ore all the way and a widening ledge. A tunnel was then run above the top of the shaft, which was covered up, and is now in eighty feet. A drift is being run 108 feet lower and will be used as a working tunnel, from which an upraise will be made for a shaft. The work so far has shown twenty-four to thirty inches of solid mineral on the footwall, sometimes crossing to the hanging wall. The pay streak carries about $50 gold and silver and the whole ledge carries good value. It is proposed to erect a matting plant on the ground this season.

Development in the Methow District would probably have proceeded much faster but for the ill-effects of some early experiments in the treatment of the ore. Some slight showings of free gold on the surface led the prospectors to the erroneous conclusion that it was a free gold belt and they proceeded on that assumption. A five-stamp mill with one concentrator was erected on Squaw Creek and two arrastres were built. Twelve tons of Paymaster ore run through the stamp mill barely paid expenses, and forty-five tons milled at Charles Austinburg's arrastre sent down tailings which assayed $45, assays of the ore having ranged from $23 to $60. The arrastres are now abandoned and the stamp mill has been bought by J. A. James, of Seattle, who contemplates some improvements with a view to doing a customs business. Experiments are, however, being made with

a view to the adoption of the cyanide or some other leeching process, and some such method will be adopted where the percentage of copper does not run too high. The country rock of the district is ordinarily so hard that tunneling costs $10 to $12 per foot and shafting by contract costs $16 per foot down to the 150-foot level. While the ore is rich enough to pay a good profit over cost of mining, freight and treatment, much better results can be obtained by the erection of a reduction plant on the ground, and the question as to the best process now occupies the minds of mining men. The small proportion of free gold is in extremely minute particles, rendering amalgamation not worth while, except in connection with concentrators, and the values are mainly in sulphurets. The percentage of copper ranges from 2 to 13 per cent., and where it does not exceed the former figure and the action of the solution is not hampered by other ingredients, the cyanide process may be successful. However, experiment will settle this question, and, now that the mining men have become aroused to the fact that the problem is not to find the gold-bearing rock, but to extract the gold after they have found it, ultimate success is assured.

THE TWISP.

While the first mineral discoveries on the headwaters of the Twisp River were made as long ago as 1884, general prospecting has only set in within the last two years, and the last flock of prospectors has defined the character of the country's mineral. Development began in earnest last year and will be continued with vigor during the coming summer, a large number of Spokane citizens having taken interests there.

The country formation is granite, as in other sections of the Cascades, and is broken by numerous dikes of porphyry. The ledges have assumed a reddish hue from oxidation, which makes them easily traceable, and carry free gold on the surface in most instances, though the change to sulphurets is already becoming apparent in the limited amount of development so far done. Towards the headwaters of the Twisp and on the Twisp Pass the ore is sulphide, rich in copper, and having the same characteristics as the older and more developed sulphide ore belts.

There are two routes to this district from Seattle. One is by the Great Northern Railroad to Wenatchee, 174 miles; by the steamer City of Ellensburg on the Columbia River to Ives, seventy-five miles; on horseback over a wagon road up the left bank of the Methow to Twisp, thirty-three miles; on horseback over the state trail to Gilbert's Camp on North Creek, twenty-four miles, and onward to the Twisp Pass, six miles further. The legislature has appropriated funds for the widening of the trail up the Twisp into a wagon road this season, a change which will greatly aid development.

The first discoveries were made in 1884 by E. W. Lockwood, of Wenatchee, Ed Shackleford and H. M. Cooper, who located what is now the Washington, but despairing of success on account of the remoteness of the district, abandoned it. They then went to the lake forming the source of North Creek and made a discovery there, but made no location.

John Gillihan was the next prospector to penetrate the district and in 1892 he located the Oregonian group of eight claims, in company with F. S. Sanford and James Gaston. This group is at the head of North Creek, near the glaciers which feed that stream, the walls being usually of porphyry. One ledge crops two to four feet wide for 800 feet. A twenty-foot shaft shows another four feet wide, traceable for 1,500 feet and carrying ore which assays $60 to $600 gold. Another has been traced for the same distance to a width of twelve feet and in an eighteen-foot tunnel shows ore assaying $11 to $114 gold. On another, which is held under two claims, a shaft twenty-five feet deep has shown three feet of ore carrying $15 gold. Another has been traced the whole length of two claims and is six feet wide, a ten-foot shaft and twenty-foot tunnel showing ore which assays $16 to $43. An assay from an average sample of the whole group showed $27.50 gold.

The next location was the Derby, by P. B. Shonafelt and R. P. Dolsen, who have bonded it for $10,000 to Frank Rosenhaupt, of Spokane. The ledge crops near the Oregonian twelve feet wide and in a sixty-foot shaft and forty-foot tunnel shows quartz carrying $8 to $10 gold throughout, with a pay streak of eight to twenty-two inches on the hanging wall carrying $100 gold and upwards.

In the summer of 1895 discoveries extended from North and South Creeks up the Twisp to the summit of the pass, and in 1896 development was inaugurated. On Gilbert Mountain were found eight parallel ledges, on which about thirty locations have been made, while the same belt has been traced across North Creek to Clark's Mountain. On Goat Park Mountain are two great main ledges with many cross ledges.

On Gilbert Mountain the pioneer claim is the Mountain Goat, owned by P. Gilbert, A. Raub, Nelson Clark, Henry Plummer, George Witte and Frank Thompson. It has two ledges five and three and one-half feet wide,

one of them with a cropping so strong that it was visible a mile distant, standing twelve feet high in a perpendicular cliff, and a fifteen-foot tunnel has shown three feet of free milling ore similar to that of the Derby. Four surface assays showed from $95 to $387 gold.

On the same belt is the Big Eight group, owned by the Big Eight Mining and Milling Company, on which the two main Mountain Goat ledges run through three claims from base to summit of the mountain and eight parallel ledges run through the whole group. A fifty-foot tunnel on one of the Mountain Goat ledges shows it well mineralized throughout, with surface ore assaying from $27 to $280. The surface ore shows free gold, but the sulphurets increase with depth. A contract will be let this spring for an extension of the tunnel.

On this belt the Washington, owned by Nelson Clark and R. J. Danson, has a five-foot ledge, which a twenty-foot tunnel shows to be fairly well mineralized. The Portland group of seven claims, owned by the Consolidated Twisp Mining and Milling Company, has three claims on a six-foot ledge shown by a fifty-foot tunnel, and two on cross ledges. The ore carries $13 free gold throughout, though two assays made of the drillings from the tunnel ran $1,500 and $1,900. On another ledge a ten-foot tunnel shows six feet of well-mineralized quartz. The Mobile, on the Mountain Goat ledge, is held by P. B. Shonafelt and R. P. Dolsen and has a twenty-foot cut showing a good pay streak.

The three great ledges on Goat Park Mountain crop out between walls of granite and gneiss on the side of a deep gulch on the north slope, and have been traced down the face of the mountain and up over its summit for a total distance of 12,000 feet. On the surface they show red oxidized quartz carrying free gold, but at two to ten feet below the surface the ore runs into copper and iron sulphides. Surface ore assays from $5 to $88 gold, besides good copper values.

The Orient Gold Mining and Milling Company has the Orient group of four claims on two of these ledges, which crop 250 feet apart, one thirty-three and the other twenty feet wide. A surface cross-cut twenty feet long showed ten feet of ore in one of these, carrying free gold and sulphides, a mill test giving $15 gold. A cross ledge seven feet wide, carrying copper sulphides, has been shown by a fifteen-foot cut, and a cut on the other ledge defines its width as twenty feet.

On the same series of ledges the Ben Lummon Gold Mining and Milling Company has six claims, on which it will begin development this spring. One claim has three ledges six to twelve feet wide of gold and copper; two others are on a ledge carrying gold and silver, and thoroughly mineralized, which an open cross-cut defines to a width of seven feet; the fourth is on a nine-foot ledge of similar ore; a fifth as a sixteen-foot ledge carrying gold, silver and copper, which on an adjoining claim carries ore assaying high in gold and silver; the sixth claim is on a seven-foot ledge carrying from $4.50 to $37 gold and a small percentage of copper.

On Bear Creek, at the foot of this mountain, E. W. Lockwood, O. D. Johnson and F. M. Scheble have the Cumberland on a sixteen-foot ledge of copper sulphide ore. J. H. Shepard has the Crown Prince group of four claims on a four-foot ledge, and George and Edward Witte, Henry Ramm and C. F. Wilke have the Marshal Ney on a four-foot ledge showing free gold with black sulphurets and iron and copper sulphides.

On the Lone Star and Cathedral, on Clark's Mountain, J. H. Shepard and R. A. Lee have a ledge four to six feet wide, and on the Chamber of Commerce and Jennie Lee they have one of about the same size, while in the Daisy they have a good showing of gray copper. On the White Bear F. P. Young, Bert Young and W. C. Campbell have a two-foot ledge of brown and white quartz showing sulphides, with a two-inch streak of what appears to be crystallized lead. On the Chamber of Commerce ledge Elmer Abernethy has located the Broadway, while Nelson Clark and B. R. Stafford have a ledge six to eight feet on the Latah, and Mr. Clark and his son Frank have the Everett on a small lead which shows good mineral. Elmer Abernethy has the Lulu on a four and one-half foot ledge carrying a foot of solid ore, which can be traced several hundred feet; has the Green Eye with two ledges, one of which is the same as the Lulu, and the Flossie, with a three-foot ledge. He and D. M. Henderson have the Summit and Princess on an iron cap of great width covering three and one-half feet of pyritic ore. On the west end of the mountain the Yellow Jacket is owned by John and Samuel Dimick, E. L. Tozier, A. L. Tozier and E. R. Gilbert.

On the summit of the Twisp Pass the Three Links Gold Mining Company has three claims on a twenty-foot ledge cropping for 3,000 feet between walls of porphyry and granite. It shows sulphide ore for its whole width, assaying on the surface $4 to $12 gold, 2½ ounces silver, 4 per cent. copper.

Adjoining this group is the Gold Bar group of five and one-half claims, owned by the Gold Bar Mining Company, on several ledges of sulphide ore cropping about twenty feet wide down the mountain side. A sixty-foot tunnel on the hanging wall of one ledge is in ore the whole length, and an eight-foot cross-cut did not strike the footwall. Assays run all the way from a trace to $600 gold, with some copper, the average value being about

$40. A fifty-foot shaft on another ledge shows four feet of similar ore, carrying from $40 to $60 gold.

On the same series of ledges the Golden Triangle Mining Company has nine claims, which it will develop this season. The ledges are of great size and carry fine-grained white iron sulphides, showing free gold on the surface.

The Twisp River Mining and Milling Company has the Hattie group of three claims on Elmer Mountain near the Derby, on three ledges of free milling ore carrying gold and a little silver, which were discovered late in 1896. One ledge crops twelve feet wide and has been traced across the mountain, while the others are of less width. Several assays have ranged close to $100.

SALMON RIVER.

This district was once the center of mining excitement in Washington and is likely to be so again, for the presence of large mineral deposits has been so conclusively proved that its eclipse can be but temporary. Its chief drawback is its remoteness from means of steam transportation, but the development of other districts to the north, south and west is likely to bring this ever nearer.

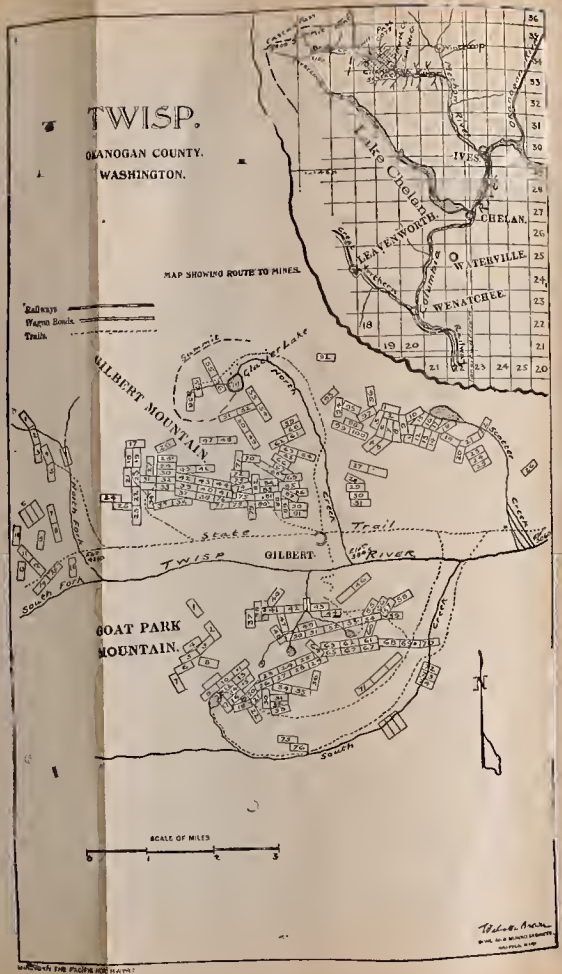
The route from Seattle is by the Great Northern Railroad to Wenatchee, 174 miles; thence by steamer City of Ellensburg up the Columbia and Okanogan Rivers to Brewster, eighty-five miles, and stage to Ruby, forty miles, Conconully, forty-six miles; at high water, steamers to Johnson's Landing, 130 miles; thence by stage to Ruby, sixteen miles, and to Conconully, six miles further.

The first mineral discoveries of this district were made after the opening of the Moses Reservation, in the fall of 1886, in Ruby Hill, a steep mountain rising to a height of 3,800 feet above the town. In a country rock of granite and gneiss were found ledges of quartz, carrying silver in almost all its forms, with a small quantity of gold, the croppings being stained with iron and copper. The ledges run a little west of north and east of south, and pitch about 22½ degrees east, and are on the summit of the hill, ranging in width from six feet upward. The ore is principally sulphurets, carrying from 10 to 100 ounces of silver, with rich pockets of native, wire and ruby silver running much higher, and an average of about $3 gold. The first discovery was made by Jack Clonan, Billy Milligan, Tom Donan and Thomas Fuller, who struck a ledge about eighteen feet wide, which ran uniformly from wall to wall about $14 gold and silver. They located the Ruby on it, and this proved to be the lowest grade mine on the hill, for Dick Bilderback and his father, Pat McGreel and Will Chilson, located the First Thought on a parallel ledge further east, which was thirty to forty feet wide on the surface and which ran about $28 gold and silver for its whole width. The discovery of the Fourth of July, showing the richest ledge on the hill, and the Arlington, both by the same party, came next. The discovery of the Peacock by John Pecar and the Lenora by James Robinson and James Gilmore, on Peacock Hill, to the northeast of Ruby Hill, then diverted attention.

About the same time the mineral belt was found to extend northward beyond Conconully to Mineral Hill, which is an extension of the same ridge, shutting in the Salmon River Canyon on the west, and is about two miles northwest of Conconully. Equally valuable discoveries were made on the opposite side of the canyon and through the lime belt, which runs north of Johnson Creek and east of Toat's Coulee up to Wagon Road Coulee, east of Loomiston. The ore in the lime belt is all high grade, carrying black sulphurets of silver and showing copper stains.

After sinking a fifty-foot shaft and running a 100-foot tunnel, both on the ledge, and discovering a small stringer running into the main ledge, with a rich pocket at the junction, from which $1,000 was taken, the discoverers of the Ruby sold it to Jonathan Bourne, Jr., of Portland. This was the beginning of a heavy investment by a large company of Portland people, headed by Mr. Bourne and by others who followed his lead. The First Thought showed $28 ore in an eighty-foot shaft, and was sold to Mr. Bourne and his associates for $40,000 cash. On the Arlington the locators sank a forty-foot shaft, showing a six-foot vein, which ran about $40 gold and silver, and in 1888 sold for $45,000 cash to the Arlington Mining Company, of which Mr. Bourne was president. Mr. Bourne incorporated the Ruby and First Thought, each separately, organized the Washington Reduction Company to put in a concentrating plant to treat the ores, and acquired other claims, so that he and the corporations which he controls now own twenty-seven contiguous claims on Ruby hill.

The Arlington Mining Company did about 800 feet of development in the shape of shafts, drifts and tunnels, reaching a depth of 225 feet, at which the ledge was the same in size and character as on the surface. The company then started the erection of a leeching plant, but, after expending about $130,000 on this and other work, discovered that no water could be



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Map of Twisp District.

West of North Creek.

1. Golden Eagle.
2. Jack Knife.
3. Twisp King.
4. Bamboo Chief.
5. Chief Moses.
6. Three Links.
7. I. X. L.
8. Anita May.
9. Surprise.
11. Anaconda.
12. Sarah.
13. Lucky Jack.
14. Chelan.
15. Copper King.
16. Gold Bug.
17. Tiptop.
18. Granite No. 2.
19. Chief.
20. Iron Horse.
21. Granite No. 1.
22. Accident.
23. Vincent.
24. Black Bull.
25. Last Chance.
26. Snowflake.
27. Climber.
28. Daisy.
29. Ivy.
30. Theresa.
31. Iron Goat.
32. Mountain Goat.
33. War Eagle.
34. Thursday.
35. Washington.
36. Franklin.
37. Quartette.
38. Rockford.
39. Mobile.
40. Pioneer.
41. Copper King.
42. Alabama Coon.
43. Royal Ann.
44. First Glance
45. Walter B.
46. James Earl.
47. Oregonian.
48. Fay D.
49. E. X. L.
50. Derby.
51. E. X. L.
52. Alpine.
53. Equinox.
54. Snowstorm.
55. E. X.
56. Lady of the L.
57. Spokane.
58. St. Laurence.
59. Roller Mill.
60. C. & C.
61. Bertha.
62. 4th July.
63. McKinley.
64. Yellow Rose.
65. Bryan.
66. Snow Slide.
68. Cap. Joe.
69. Sitting Bull.
70. St. Anthony.
71. Ben. B.
72. White Lily.
73. Admiral.
74. J. B.
75. M. J.
76. Hoosier.
77. St. Paul.
78. Minneapolis.
79. Franklin.
80. Dick.
81. Portland.
82. Trilby.
83. Norfolk.
84. Highland Chief.
85. Beatrice.
86. Allen J.
87. Bloomer.
88. Jack B.
89. Twisp Chief.
90. Oro.
91. M. & M.

East of North Creek.

92. Liza.
93. Josephine.
94. The Fountain.
95. Flossie.
96. Elmer.
97. Green Eye.
98. City of Salem.
99. Yellow Hornet.
100. Yellow Jack.
101. Robert.
102. Little Fellow.
103. Lulu.
104. Golden Gate.
106. Buckeye.
107. Gilbert.
108. McCord.
109. Summit.
110. Prince.
111. Mary.
112. Hattie.
113. Greenhorn.
114. Falcon.
115. Bryan.
116. Bright Eye.
117. Tenderfoot.
118. Vulcan.
119. Constitution.
120. Continental.
121. Constitution.
122. Ethel.
124. Dan Logan.
125. E. D. Baker.
126. Shamrock.
127. Myrtle.
128. Granite.
129. Delane.
130. Referendum.

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1. Ben. Franklin.
2. Ivanhoe.
3. Mayflower.
4. Q. D. Q.
5. Jennie.
6. Forepaine.
7. Cultus Jim.
8. Bandana.
9. Big Boy.
10. Mountain Lily.
11. Greenhorn.
12. Gold Bar.
13. No. 6.
14. Gold Brick.
15. Jessie.
16. Eva.
17. June.
18. Gladstone.
19. Golden Triangle.
20. Highland Scot.
21. Skylark.
22. Uncle Sam.
23. Kangaroo.
24. Union.
25. Nellie.
26. Cumtux.
27. Crown Prince.
28. Crown King.
29. Cornucopia.
30. Ella.
31. O. K.
32. St. Paul No. 2.
33. St. Paul Globe.
34. Burlington.
35. Waverly.
36. Bonanza.
37. Dewdrop.
38. Helena.
39. Irene.
40. Boston.
41. Good Enough.
42. Lucky Boy.
43. Daisy.
44. Bluebill.
46. Lost Boy.
47. Estella.
48. Bluebird.
49. Bull's Eye.
50. Cascade.
51. White Rose.
52. Columbia.
53. Bula.
54. Garfield.
55. Mingo Chief.
56. Peachblow.
57. Exchange.
58. Michigan.
59. Alpine.
60. F. & B.
61. Orient.
62. Little Giant.
63. M. & G.
64. Ben Harrison.
65. Florence Grace.
66. North Star.
67. Windsor.
68. Comstock.
69. Ben Lummon.
70. Wicks.
72. Bridge.
75. Garnett.
76. Fink Boy.

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Map of Twisp District.

obtained on the site selected, although there was abundance in the creek 200 feet below. Work on the plant was suspended, mining stopped and, of the several hundred tons of ore which had accumulated, the best was concentrated at the Washington Reduction Company's mill.

On the First Thought Mr. Bourne went vigorously to work. He first ran tunnel No. 3 900 feet, tapping the ledge at a depth of 400 feet, and then upraised a shaft to the surface, 234 feet. He ran another tunnel about 1,000 feet on the footwall, and made a cross-cut 112½ feet, all through ore. Another tunnel was run 800 feet on the hanging wall, which gave a depth of 200 feet. A number of drifts from the tunnel on the footwall to that on the hanging wall showed the ledge to be from thirty to sixty feet wide. It averaged from six to ten ounces silver and $3 gold, though there were rich streaks and pockets, showing native and ruby silver, which ran up to 1,000 ounces.

Meanwhile the Washington Reduction Company erected a concentrator at Ruby and built a cable bucket tramway a mile long, from the First Thought mine. It has two rock crushers, two Dodge pulverizers with screens, eight Frue vanners, canvas strakes, and an electric dynamo run by water power, the whole costing about $70,000. It ran for about three months in 1892, and, after a suspension during the winter, started again in the spring of 1893 and ran until July. As silver then fell below 70 cents, the mill was stopped after producing about $40,000 in concentrates, clear of freight and treatment charges, and has not since turned a wheel.

The Fourth of July was bought by a syndicate which incorporated, leaving out Mr. Bourne's one-eighth, as he refused to sell. The company sank about 780 feet, ran drifts for some 500 feet and stoped about 800 tons of ore. This was the richest ledge on the hill, being fifteen feet wide, with a pay streak four feet wide, from which one shipment of twenty tons paid $480 a ton gold and silver, while specimens of ore carrying native and wire silver were carried away, which would aggregate thousands of dollars in value. About 200 tons of ore were shipped and 300 tons were treated at the Ruby concentrator.

Among the first locations on Ruby Hill was the Wooloo Mooloo, by Hugh McCool and others, who found a ledge eight feet wide, carrying black sulphurets, the first two assays from which ran 3,000 and 5,000 ounces silver. They sank a shaft 160 feet on the ledge and then lost it. The War Eagle, owned by a number of St. Paul men, has an eight-foot ledge of low-grade ore on which a shaft has been sunk 150 feet. On the Idaho, George Turner, W. N. Drumheller and William Pfunder have a shaft about 150 feet deep on the same ledge.

The discovery claim on Anaconda Hill was the Anaconda, located by Thomas Higstrun, on a twenty-foot ledge of chloride ore, showing well on the surface and assaying 200 to 300 ounces. Higstrun sold it for $10,000 to John Rudberg, who resold to Hale & Smith, Xenophon Steeves and J. C. Moreland, of Portland, for $15,500, he retaining a one-eighth interest. The new owners sank a shaft thirty-five or forty feet and then lost the ledge. They ran a tunnel lower down the mountain to tap it in about 400 feet, at a point below the shaft, but did not strike it there. They have been continuing assessment work and have run on the ledge again, showing up good black sulphurets.

About the same time that the first discoveries were made on Ruby Hill a similar body of ore was found near the foot of Conconully Lake by "Texas" George Runnels and J. C. Boone, who located the Lady of the Lake on it the day the Moses reservation was opened. They bonded it to O. B. Peck for $40,000, and he made about 100 feet of drifts and cross-cuts, but forfeited the bond.

The Lone Star, on the west side of Salmon River, about a mile above Conconully, was located by Henry C. Lawrence, who interested Allen C. Mason, of Tacoma. There is a ledge of galena ore about twelve feet wide which assays about 100 ounces of silver, on which a shaft has been sunk 350 feet, and drifts have been run each way on the ledge at every 100 feet, aggregating 1,000 feet, about $40,000 being spent and a considerable quantity of ore taken out.

Directly across the river from the Lone Star is the Tough Nut, owned by H. C. Thompson, Milo Kelly and others. The ledge is about six feet wide, showing black sulphurets and galena like the Lone Star ore, and the work on it consists of a 100-foot shaft and a tunnel 150 feet, both on the ledge.

The Homestake, adjoining the Tough Nut on the south, is owned by Ben Everett, Charles Ulmann and Otis Sprague, of Tacoma. They ran a tunnel 150 feet through a twenty-foot ledge, well mineralized with silver-lead ore, and have 200 tons of ore in the bins.

Adjoining the Lone Star on the north is the John Arthur, owned by James Robinson, of Ellensburg, and Deputy Collector of Customs J. T. McDonald, of Oro. A shaft is down 125 feet on the same ledge as the Lone Star, showing the same kind of ore. The north extension on the same ledge is the St. Clair, located by Thomas Hanway and —— Dudley, who sank a 100-foot shaft near that of the John Arthur and on the same ore chute.

The greatest development in this section of the district, however, was on Mineral Hill, where the Bridgeport Milling & Mining Company bought five

claims. Double compartment shafts were sunk 125 feet on one claim and 130 feet on another, and a tunnel was run 160 feet on the hill above the latter. Shafts were also sunk on the other three. A pair of hoisting engines, boilers, air compressor, two machine drills and a sawmill were erected, the whole property representing an expenditure of $30,000 on mines and machinery. All the claims have ledges three to six feet wide of high grade silver-lead ore, of which a ten-ton shipment ran $300, $20 of this being gold and the balance silver.

The Buckhorn, adjoining this group on the west, is owned three-quarters by the Bridgeport company and one-quarter by A. C. Cowherd, and has a ledge forty to fifty feet wide on the surface.

Among the noted rich claims on Mineral Hill is the La Euna, for which T. L. Nixon, of Tacoma, paid $10,000. It has a small ledge of very rich ore, of which a five-ton shipment from a forty-foot shaft gave returns of 398 ounces per ton.

Mineral Hill also boasts of the Mohawk, for which H. C. Lawrence refused an offer of $30,000 and on which a tunnel 200 feet has shown a three-foot ledge of high grade ore, running over 300 ounces silver. On the Independence, John Stech, of Seattle, who paid $4,000 for it, has a 100-foot shaft on a four-foot ledge of similar ore to that in the Bridgeport group, and is keeping up his assessment work. In the Pointer, adjoining the Tough Nut on the south, Messrs. Hargrove and Stokesberry have a five-foot ledge, running 130 to 150 ounces silver, on which they have a 150-foot tunnel.

It was about the time that the first discoveries were made on Salmon River that the late ex-lieutenant governor, Charles E. Laughton, organized a company to build a concentrator to treat their ores on the customs plan. He erected a building in the canyon between the Tough Nut and Lone Star mines and put up a plant consisting of a rock crusher, a set of rollers to pulverize the rock, drum screens to size the material, wooden jigs and wooden bumper-vanners. But much of the mineral escaped with the tailings, so that the latter were richer than the concentrates, less than half the value being saved. About fifty tons from the Tough Nut and a little from the Homestake were concentrated, and then, as the assay value failed to show up, the mine owners refused to furnish more ore, and after a two weeks' run in 1889 the machinery stopped, never to run again. Some time later the machinery men foreclosed their mortgage and Allen C. Mason bought the mill, but has never run it. He has sold some of the shafting and parts of the machinery.

In the lime belt the principal group is the Silver Bluff of ten claims, owned by the Silver Bluff Mining and Milling Company. On the surface the ore in this group runs in great bunches of high value, and a large amount of prospecting has been done in the endeavor to find where it lies in the country rock below. Work was going on last summer, and one car load was shipped which netted over $100. The Belcher is another claim on the lime belt, owned by the Belcher Mining Company, about one and one-half miles from the Silver Bluff. A shaft has been sunk 275 feet and drifts run at the 100-foot level and at the bottom.

That Salmon River cuts some free gold ledges is evidenced by the discovery of gold in the sand at several points on its course. Charles H. Ballard and J. R. Wallace found gold in the sand of a bench about a mile square one mile below Conconully and took out $20 in prospecting it. The ground carries from one-tenth of a cent to 10 cents to the pan, and would make good hydraulic ground. Eight miles above town, at a place called the Meadows, on the north fork of Salmon River, Layton S. Baldwin, L. Irwin Baldwin, H. A. Wilder, John Armstrong, of Conconully, and J. P. Gleason, of Seattle, located claims on a bar which appears to be an old river bed and where the dirt carries shot gold to the amount of 10 to 15 cents a cubic yard.

OKANOGAN LAKE.

With a railroad penetrating its center and a steamer connecting with it on the lake, this district has every cause to look for rapid development. The Canadian Pacific Railroad runs from Vancouver to Sicamous, 335 miles, and thence a branch runs to Vernon, forty-seven miles, and to Okanogan Landing, fifty-one miles. Vernon is in a rich valley with good roads branching from it, and the construction of others to new camps will be inexpensive.

The mineral belt of this district runs through the hills which shut in the Okanogan valley on the east and west. The country formation consists of belts of diorite, granite and quartzite, cut by dikes of lime and porphyry. Running through this in a generally east and west direction are iron-capped ledges carrying gold, galena, iron and copper sulphurets and ranging in width from two to fifty feet. There are also large bodies of low grade free-milling quartz which carries gold, with little or no silver.

The pioneer mine of this district is the Monoshee, on the north side of Monoshee Mountain, about fifty miles southeast of this town and over-

looking Cherry Creek, in which placers have been worked for about thirty years. It was discovered about ten years ago by Donald McIntyre, and has a ledge of free milling gold quartz about three and one-half feet wide. Mr. McIntyre, with F. G. Vernon and a Mr. Riskie, drove five tunnels on the ledge to a length of fifty to 200 feet, and stoped out the ore thus opened. They erected a mill of an old style and ran about 200 tons of ore through it, and, finding it did not save the value, stopped operation and have never resumed.

The next important discovery was not made till 1891, and has the prospect of being developed on a large scale through the investment of a large amount of English capital. This is the Swan Lake group of six claims, discovered by the late Capt. F. D. Shorts and W. J. Armstrong, of Vernon. These claims are on a great deposit of free-milling quartz which crops out in steep buttes and bluffs through the hills sloping down from the east of Swan Lake, four miles north of Vernon. One of these outcrops has been opened in a point of rock on the roadside, and the ledge can be traced far up the hill. It appears to be an almost flat deposit, and has been traced on the surface over a square mile of ground. A shaft has been sunk fifty feet at a point 600 feet below the highest outcrop, with a twenty-foot drift from the bottom. All this work is in ore, which has given assays ranging from $3.25 to $13 in free gold, with a trace of silver. The deposit is pronounced to be similar in extent and character to the great Treadwell mine in Alaska, and with the Canadian Pacific railroad running along the lake shore only a few hundred yards distant, has every facility for cheap development and operation. The group is now owned by the Swan Lake Mining and Development Company, which has bonded it to Arthur H. Craven, the representative of London capitalists, for $120,000, and he has examined the property and tested the ore with a view to deciding the course to be taken with it. If the ore will average $4 a ton in gold he proposes to erect a fifty-stamp mill and chlorination works and reduce the ore by the method in use at Treadwell.

In the fall of 1895 the BX group of seven claims, adjoining the Swan Lake group, was located by Leo Simmons, E. C. Simmons, Charles Casterton and E. C. Thompson, all of Vernon. The greatest showing is where BX Creek had cut through the ledge down to the granite footwall and where, by stripping, it was exposed for a width of sixty feet. Assays from this place gave $6 to $8 gold and a little silver, which is a fair example of the whole group. The country rock, which is chlorite, is itself mineralized, having given an assay of $6.50 gold. A twenty-five-foot shaft sunk on a four-foot ledge showed plumbago mixed with the broken surface rock.

A little later, in December, 1895, James McClellan found a ledge of free-milling ore similar to that at Swan Lake on his ranch about eight miles north of town, and with Alex McArthur, J. Brown and Tom Clinton located the Larkin group of three claims. On an eight-foot ledge a hole has been sunk fifteen feet, assays of $1 to $8 being obtained from surface rock, while a parallel ledge is ten feet wide. A short distance further north, near Lumby, large bodies of free-milling ore were discovered by A. J. McMullen and Samuel McIlvanie in April, 1896.

Explorations had meanwhile turned southward along Okanogan Lake, and one result is the creation of Camp Hewitt, on a mountain 1,500 feet high, overlooking the lake from the west and sixty miles south of Okanogan Landing. Here, in June, 1895, Gus Hewitt and Alexis C. Broth found a cropping of free-milling quartz three or four feet wide in a porphyry dike in a granite formation, in which free gold was plainly visible, and located the Dandy and King Solomon on parallel ledges about four feet apart. The surface rock was much decomposed, and Messrs. Hewitt and Broth spent much of the summer in panning gold out of it and got good returns. In the winter of 1895 they ran a cross-cut tunnel 115 feet on the Dandy, but have so far been unable to locate the ledge, and will now drift from the tunnel for it. On the King Solomon the surface rock is in a slide, but the ledge in place has been traced for 6,000 feet through four claims and a cross-cut tunnel is being run. The Winifred, a supposed extension of the Dandy, located by C. Booth and R. B. Venner, has a shaft twenty feet deep on a ledge three feet wide. On a parallel ledge is the North Star, owned by George Bell and Donald McIntyre. There was a cropping three and one-half feet wide carrying free gold, but a ten-foot shaft has shown galena carrying about $20 gold, and also copper. With the Stag, an extension of the North Star, Henry Hardy and C. E. Casterton have had a similar experience, for, while they had a three-foot cropping of free-milling ore between granite walls, they ran into galena carrying gold and silver with copper and iron sulphurets, from which they got assays of $14 to $20 gold. The Mountain View, two miles nearer the lake, discovered by Messrs. Hewitt and Broth in April, 1896, has a ledge of galena ore five or six feet wide in a lime formation, running east and west with a dip to the south. An incline shaft has been sunk thirty feet.

Another place where the old placer workings have led to discoveries of quartz ledges is the ridge between Siwash and Six-Mile creeks, on the west side of Okanogan Lake, for the bars of Siwash Creek have been worked for over twenty years. Joseph Hitchier located the Jumbo and William Clark the E. S. on a ledge of iron and copper pyrites in a lime formation, running

almost due north and south. From the decomposed quartz at the outcrop, and from the fact that a cross-cut tunnel on the E. S. has been run thirty feet without finding the walls, it is believed that the ledge is at least thirty feet wide.

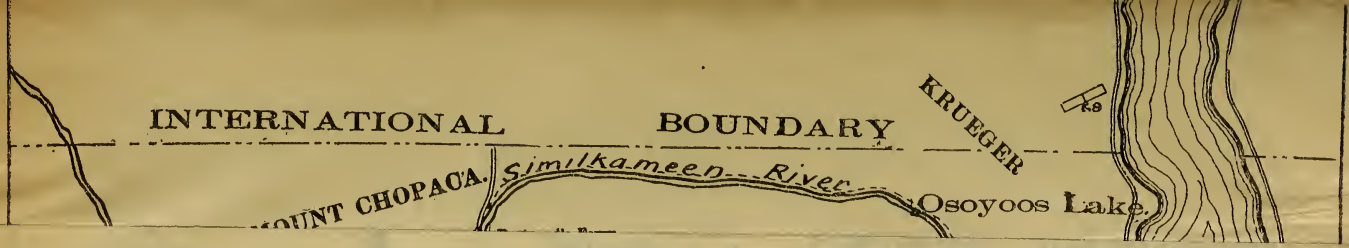
Still nearer the town, on the point which divides the east arm from the main body of Okanogan Lake, a cropping of galena ore was found last spring by J. N. Norden and his two sons, which was six feet wide on the surface and was traced for 100 feet. It runs a little west of a north and south line in a badly shaken formation resembling syenite. The first shot showed up ore, which assayed $10.80 gold, $54 silver and a little copper. The Mordens located the Morning Glory with the Jumbo on the north, and adjoining the Jumbo E. Harris located the Hardup. The south extensions, following the ledge to the water's edge, are the Morning Star by the Mordens and the Chieftain by F. H. Latimer. On another ledge, which runs at right angles to the Morning Glory, are the Close Call and Old Iron, owned by A. N. Pelly. This ledge is nine feet wide on the surface and ten feet on the face of the cliff overlooking the lake, and has assayed $3 to $17 silver, a good percentage of copper and a trace of gold. Mr. Pelly is driving a tunnel on the ledge in the face of the cliff and will sink a shaft from the bench above.

Prospecting then came closer to the town, and in December Camp Lefroy was established on the hills to the northwest, with locations reaching within one mile of Vernon. The mineral is in a belt of four parallel ledges three-quarters of a mile in width and well defined for a distance of three miles. The ore is quartz, carrying gold, copper and magnetic iron, with a little galena, and is between well-defined walls of slate and schist. The first location was the Mabel May, by Richard Shook and G. Milligan, who found rich float showing free gold, but have not yet found the ledge, though they have made a surface cut and are running a cross-cut tunnel. On the extension and on a parallel ledge further up the hill is the Babel group of four claims, owned by F. H. Latimer, F. M. Kirby, James Martin and G. A. Henderson. On another parallel ledge are the Warrior and Maverick, owned by H. F. Parke, F. H. Latimer and F. M. Kirby, and the Big D, by J. G. Webster and H. F. Dennison. Further west is the Little One, by Messrs. Kirby and Latimer, on a four-foot ledge, the Chariot, by Mr. Dennison, being an extension on it, while on the southeast is the Blue Jay, owned by Messrs. Kirby and Latimer, with an eighteen-inch ledge. All these ledges are from one to five feet wide and carry iron pyrites and gold, with a little arsenical iron, while the Falcon also shows galena and copper. Surface ore has assayed as high as $10 in gold.

On the hills between Okanogan Lake and Long Lake on the east, a number of locations have been made on ledges of iron and copper pyrites carrying gold. Among these are the Silver Queen and Barney Barnato, by Simon P. Ord; the Aberdeen and Countess, by John Howard and William Appleton; the Alexander, by George H. Meakins; the Sunset, by — Colbee and J. O. Williams; the Gold King, by J. K. Johnson; the War Horse, by F. H. Barnes and William Haupt; the IXL, by J. K. Johnson, and the Lark, by William Johnson.

Along both banks of Deep Creek, four miles west of Okanogan Lake and two and one-half miles southwest of Hewitt's Camp, a number of parallel ledges of iron and copper pyrites and galena carrying gold, between well-defined walls, have since been the scene of much work. On the north side of the creek is the Panorama, owned by J. L. Webster, showing a little free gold. Next on the west is the Little Duncan, owned by Mr. Webster and J. Walker, in which an open cut five feet deep showed ore assaying 101 ounces silver. On going fifty feet lower and starting an incline, ore was obtained which assayed $6.40 gold and $11.90 silver. On the same ledge is the Major, owned by J. L. Webster and James Martin. On the south side of the creek is a succession of ledges on which have been located the Stella, by G. A. Hankey and others; the Iron Mask, by Mr. Webster; the Farmer, by Messrs. Dennison and Latimer, on which a small shaft shows galena and copper pyrites widening from eighteen to thirty-six inches, and the Blind Man, by Messrs. Webster and Walker, which stands on the side of the gulch.

Further south and within twelve miles of Penticton, on the west shore of Okanogan Lake, Alexander Thompson in May, 1896, located the Aberdeen on a ledge of pyrites fifteen feet wide, which has been bonded by W. T. Thompson. Extensions on this ledge are the Rambler, by Joseph Thurber, and the Scrambler, by H. E. Walker.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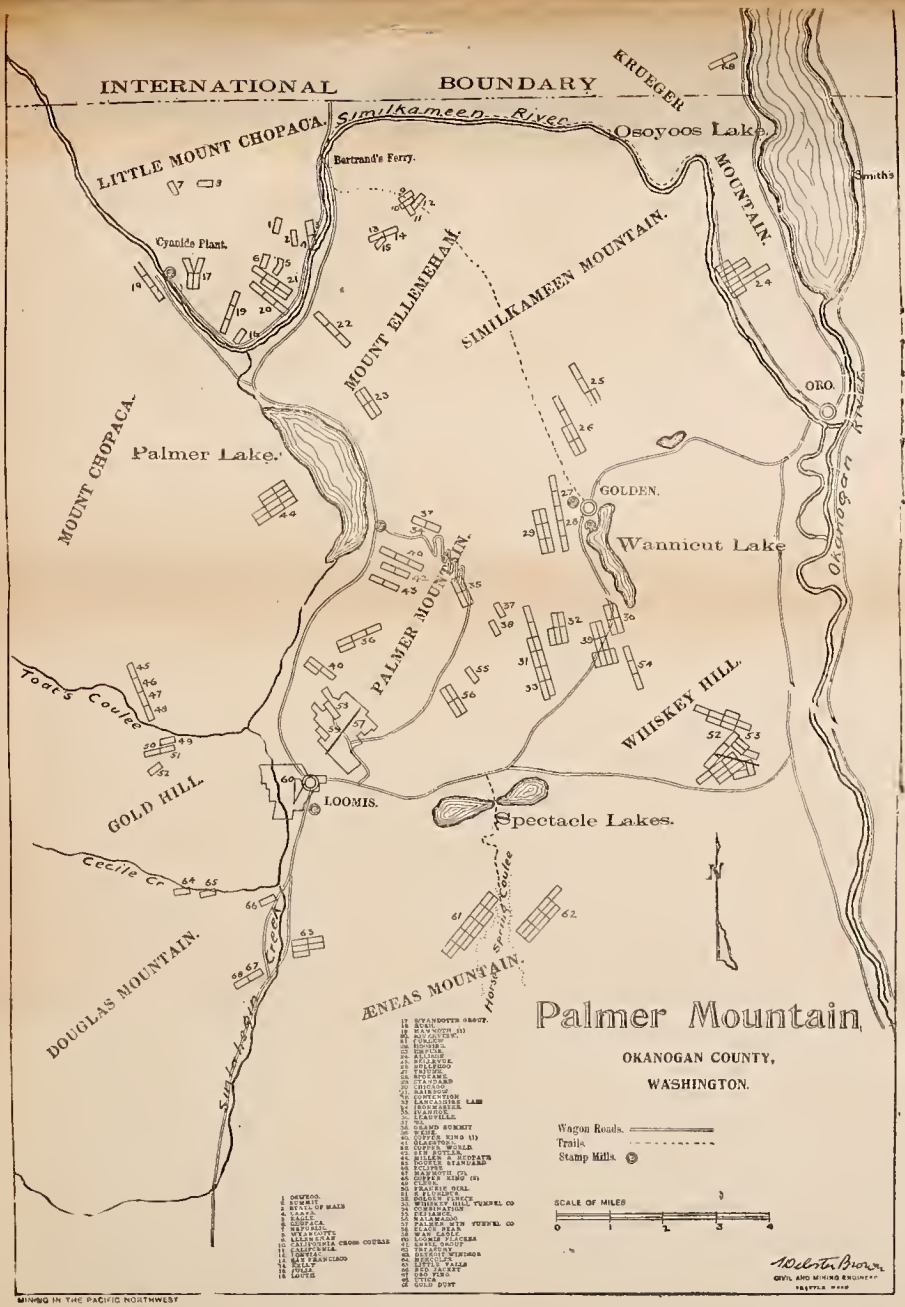
MOUNT CHOPACA
Similkameen River
Osoyoos Lake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KRUEGER MOUNTAIN
Similkameen River
Osoyoos Lake
LITTLE MOUNT CHOPACA
Bertrand's Ferry.
Smith's
'Cyanide Plant.
MOUNT ELLEMEHAM.
SIMILKAMEEN MOUNTAIN.
MOUNT CHOPACA.
Palmer Lake.
ORO.
Okanogan River
GOLDEN.
Wannicut Lake
PALMER MOUNTAIN.
Todd's Coulee
WHISKEY HILL.
GOLD HILL.
LOOMIS.
Spectacle Lakes.
Cecile Cr
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Palmer Mountain
OKANOGAN COUNTY,
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Wagon Roads.
Trails
Stamp Mills.
SCALE OF MILES
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1 OROVILLO
2 SUMMIT
3 ROYAL OF MAIN
4 LAKE
5 LAKE
6 KENPACA
7 METROLIA
8 ALLAMONT
9 ALLAKAHAN
10 CALIFORNIA CROSS COURSE
11 LOOMIS
12 LOOMIS
13 BAY VIEW CROSS
14 KELLY
15 JUNE
16 LOUIS
17 SWANDOTTE GROUP.
18 BUSH
19 NORTH (3)
20 SOUTH.
21 FURGUSON
22 HOOSIER
23 KELLOGG
24 KELLOGG
25 SHELDON
26 SHELDON
27 STUCAMP
28 STUCAMP
29 RAINBOW
30 CONVENTION
31 BIG MUDDY LAKE
32 ASSOCIATED
33 EVANGER
34 LEAGUEVILLE
35 GRAND SUMMIT
36 WHITE
37 COPPER KING (1)
38 COPPER
39 COPPER WORLD
40 BIG BUTLER
41 BIG BUTLER EXTRAPATH
42 POINTS STANDARD
43 BOUNDS
44 MARCUS (2)
45 COPPER KING (2)
46 COPPER
47 PRAIRIE PEAL
48 BIG BUTLER
49 GOLDEN CHANCE
50 WHISKEY HILL TUNNEL CO
51 COMBINATION
52 BALAMOOD
53 PALMER MTN TUNNEL CO
54 GRAY BEAR
55 GOLD HILL
56 LOOMIS PLACERS
57 LOOMIS GROUP
58 INTERNATIONAL
59 BIG BUTLER EXTENSION
60 BIG GOLD
61 LITTLE FALLS
62 LITTLE FALLS
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64 UTICA
65 GOLD DUST
J. Deloss Brown
CIVIL AND MINING ENGINEER
SEATTLE WASH

PALMER MOUNTAIN.

This name is given to a district of Okanogan county directly south of the boundary, comprising the area which extends southward along the Sinlahekin River to the mouth of Horse Spring Coulee, and from the Okanogan river on the east to Mount Chapaca on the west, a territory about fifteen miles square. Mineral was first discovered there nearly thirty years ago by the late "Okanogan" Smith, who made a number of locations in the mountains along the Similkameen River and claimed heavy compensation from the government when they were included in Chief Moses' reservation in 1880. As he refused the sum offered, $250,000, the government drew the lines so as to exclude a strip extending fifteen miles southward from the boundary and running across the whole breadth of the reservation. The fact that this strip was open to mineral entry did not become known in the then thinly settled territory, and prospectors did not enter it until the reservation was thrown open in 1886. Then it was that mineral discoveries followed one another in rapid succession, and this remote tract was found to be among the richest in the United States, not so much in the value of its ore as in the size of its ore bodies, though some of the richest discoveries in the state have been made here. At first attention was centered on silver ores, then it was turned to free gold, which was found in rich pockets in the oxidized surface of the quartz ledges. As depth was obtained, base ore soon replaced the free-milling ore of the surface, and the lack of equipment to save the sulphurets brought disaster to several pioneer enterprises. During the last year great bodies of iron and copper sulphides, carrying gold, have been discovered and have shared attention with the good results following deeper mining on the other classes of ore. The earlier miners and prospectors were too easily contented with gophering on the surface and working out rich pockets, but the present movement is all to gain depth and block out large bodies of ore for mining, then to erect carefully designed plants for reduction. This new movement has already brought such gratifying results that it is safe to pronounce the ore bodies to be of assured permanence and value, and the destiny of the district to be beyond question.

The center of the district is Loomis, at the south end of Palmer Mountain. To reach it from Seattle, one takes the Great Northern train to Wenatchee, 174 miles; the steamer City of Ellensburg up the Columbia River to Brewster Landing, eighty-five miles, or during high water from the middle of May to the beginning of August, to Johnson Creek, 130 miles; and the stage seventy miles from Brewster, or twenty-eight miles from Johnson Creek. For Golden, on the east of Palmer Mountain, the stage trip is eighty-two miles from Brewster and twenty-eight miles from Johnson Creek, and for Oro, at the confluence of the Okanogan and Similkameen rivers, the distance is six miles further. From Spokane the district can be reached either by the Great Northern to Wenatchee, 174 miles, and thence by the route already described, or by the Central Washington railroad to Coulee City, 125 miles, thence by stage fifty miles to Orondo, on the Columbia river, six miles above Wenatchee, and thence by the same route as from Seattle.

Palmer Mountain is a great, broad ridge, ten miles long from north to south and about six miles across, with numerous small peaks marked by cliffs of white dolomite. The formation of the mountain is diorite on the southern slope, extending as far as the summit, and on the northern portion this is intersected by dikes of black slate and serpentine. The eastern portion consists of slate capped with dolomite, which forms high white noticeable through all the country around, while further east are large dikes of wildly contorted dolomite extending to the Okanogan River. The black slate is only here and there overlaid with dolomite, where the latter has resisted glacial action. Minerals have been found in all these formations. On the eastern slope are veins of silver-lead ore carrying a good percentage of gold in contacts of dolomite and black slate. Through the black slate run on north and south lines great quartz veins carrying gold, on which are the Triune, Spokane and Wehe groups. On the northern part of the mountain, in the black slate, are large, prominent ledges carrying high grade silver ore, as well as a good percentage of gold, on which are the Ivanhoe, Empire and Bullfrog. In the serpentine and black slate contacts which extend on the northwest side to Mount Ellemeham and on the west overlook Palmer Lake are some of the richest gold-bearing veins on the mountain, among which are the Leadville group and the Bunker Hill. On the south end in the diorite are gold-bearing veins carrying a small percentage of silver, on which are the Black Bear, War Eagle, Wisconsin Central, Grand Summit and a large number of others, coursing northwest and southeast. Iron caps are found in the diorite identical in character and in identical formation with those across the boundary, and they also occur of large size in diorite walls in the syenitic formation to the west, which runs through Aeneas Mountain, Douglas Mountain, Gold Hill and Mount Chapaca. Palmer Mountain shows surface disturbances which account for the break-

ing over of some of the ledges, for as depth is attained it is found that they are permanent and that the break-over is merely a surface disturbance. This is proven in the Black Bear, where the greatest depth has been reached, and agrees with the experience at the Cariboo mine at Camp McKinney, B. C., which is on the same geological formation and shows the same surface displacement. These disturbances caused many prospectors to think their ledges near the surface had given out, and scared away some timid investors who were inexperienced in mining.

When it was thrown open to entry, iron caps were found all over the Okanogan country, but the great wealth of mineral which they conceal had not then been made known, and as the surface ore gave such low values that it would not pay to ship in a country where long wagon hauls shut out all but the highest grade ores, they were passed over or abandoned after a little work had been done. The prospectors turned their attention to the free-milling quartz and high grade silver, and soon found enough to occupy them.

The first strike which attracted notice was the Jessie, on the east side of the ridge, near the summit, by C. H. Schepstur, William H. Townsend and Charles Cole, and now owned by Mr. Townsend and Adelbert Hart. Here they found a four-foot ledge of high grade ore, having on the surface a great quantity of decomposed quartz carrying free gold. The owners pounded up some of this rock in a hand mortar, panned out the sand and melted down quite an amount of bullion. They ran a fifty-foot tunnel on high grade ore all the way. A number of similar discoveries followed, and then came the great silver-bearing ledge of the Ivanhoe group. It is only within the last year that the ledges of sulphide ore capped with iron have received the attention which development has proved they well merit.

The first property to attract general attention was the Black Bear and War Eagle group of five claims on the south end of Palmer Mountain, now owned by E. J. N. Hale and others, of Spokane. They have several parallel ledges, oxidized on the surface so as to free the gold, but growing base at depth. A shaft was sunk 190 feet on one ledge and cross-cuts were run at the 100-foot level to two other ledges, all being two to four feet wide and assaying $28 gold and upwards. Drifts were run each way on each ledge on this level and also on the 150-foot level, showing pay ore of increasing size and value. On another ledge a shaft is down 100 feet and a tunnel in 150 feet, showing twenty-four inches of good ore between strong walls. A five-stamp mill was erected at Loomiston, and in five months' run in 1892 produced $113,000 in gold, but it was badly managed, and, having no concentrators, sent all the sulphurets away in the tailings, from which one assayer says he has taken an assay of $43.50 gold and another $12.04 gold and thirty-six ounces silver. In 1895 O. S. Stocker and others did the assessment work in return for what ore they could take out in doing so and mill. After repairing the dilapidated plant, they milled forty-five tons and cleared a nice profit.

The depth attained on this group so far proved the permanence and value of the ore bodies as to encourage an enterprise which will in a year or two prove these facts beyond dispute. This is the great main cross-cut tunnel which is being driven into the bowels of the mountain from its south end by the Palmer Mountain Gold Mining & Tunnel Company. The company has acquired twenty-seven claims in a solid block, on which are sixteen known true fissure ledges, parallel or nearly so, and carrying gold, both free and in sulphurets of iron and copper. The company is driving a tunnel seven feet high and eight feet wide, with double tracks and steel cars, from a point one mile from Loomis and 120 feet above that town, with the intention of cutting all these ledges at a continually increasing depth until the furthest is tapped at a depth of 1,200 feet at a distance of 3,600 feet from the portal. It is also expected that many blind ledges will be cut, as geologists estimate that only a small proportion of mineral ledges crop on the surface. This expectation was confirmed by the tapping of two such ledges of fine-looking ore in the first 150 feet of work. The tunnel has at this writing penetrated 250 feet and its face is a mass of pyritic ore, carrying veins of white quartz running with the tunnel, an indication of the proximity of a rich gold-bearing ledge.

Mining is at present being prosecuted with hand drills, but the company will, when weather permits, construct a flume from Toats Coulee Creek, one mile west of the portal, and thereby conduct water from that stream which will develop 1,100 horse-power. This will suffice to generate electric power for a compressed air drill plant, tramways and reduction plants, as well as to other adjoining mining properties.

The ledges in this group contain free gold, auriferous sulphides, usually pyrite, small quantities of galena and silver. It is proposed to erect a plant at the mine for the reduction of these ores by modern methods and thus dispense with the necessity of shipping anything but bullion.

A kindred enterprise of almost equal magnitude has been undertaken by the Whiskey Hill Tunnel and Mining Company on the east slope of Whiskey Hill, a continuation of Palmer Mountain, about eight miles to the northeast of Loomis and one mile west of the Okanogan River. This company owns twenty-one claims on which are nine well-defined ledges running nearly parallel in a generally northeast and southwest course. It will run a cross-

cut tunnel, eight feet wide and seven feet high, 3,200 feet into the mountain, tapping the group at a maximum depth of 900 feet. Considerable prospecting work has been done on the different ledges. On one a shaft is down eighty feet and a sixteen-foot cross-cut at the bottom has not found either wall. The ledge matter is white quartzite, heavily impregnated with iron and lime, and in places carrying some galena, and the ore assays $37 gold and $7.20 silver. The company expects to strike many blind ledges, and from the fact that quartz encountered in facing up the tunnel site assayed $12.75 gold, it is believed that Whiskey Hill contains great masses of rock which will pay to mill. A gravity tramway one mile long will convey ore or concentrates to the Okanogan River, where it can be transported by boat four months in the year and, whenever the government removes the obstructions from this river, it can be navigated all the year round except during midwinter. The preliminary work is now in progress and the driving of the tunnel will begin very shortly.

The greatest depth so far attained is on the Ivanhoe group of four claims by the Ivanhoe Company, and the work done has been amply repaid by results. Where discovered, the ledge was almost flat on the summit of Palmer Mountain and the surface soil was stripped off it with a plow and scraper by A. C. Cowherd, the original owner. This exposed in an area of 175x50 feet a ledge twenty inches to four feet thick, carrying brittle, ruby, malleable and native silver and considerable free gold. From this cut about 1,000 tons of ore was taken and shipments of sorted ore were made with the following results per ton: 6,899 pounds, 1.62 ounces gold, 572 ounces silver; 15 521 pounds, 1 ounce gold, 278 ounces silver; 25,500 pounds, 1 ounce gold, 326 ounces silver. Several thousand tons of low-grade ore remaining, a ten-ton mill with Dodge pulverizer, amalgamating plates, concentrator and slime tables was erected at the foot of the mountain and considerable ore was reduced. But the plant was not adapted to the ore, which needed more skilful treatment, and is to be replaced by a more modern mill this season. During the last year the incline shaft, already started, has been sunk to a depth of 500 feet, showing the ledge seven feet wide and very strong, with three and one-half feet of pay ore, which in places is phenomenally rich, one assay running over 9,000 ounces silver and 3 ounces gold, and the pay ore generally running from 500 to 1,000 ounces silver. A drift had already been run seventy feet at the 120-foot level, showing the ledge six and one-half feet wide, and others have been run forty-five feet each way, all in ore and showing an increased width. Much of this ore was so rich in native silver that it was sacked in the mine. There are over 2,000 tons of shipping ore on the dump, besides a large quantity in sacks, awaiting the opening of navigation for transportation to the smelter.

The only regular producer of bullion in the district at present is the Triune mine, which is equipped with a ten-stamp mill and four Frue vanners operated by steam. This ledge has also broken over to the west and at this point carries much free gold, though sulphides are also mingled with it. Shafts were first sunk thirty-six and nineteen feet, the first showing no walls and the second not cutting the ledge. A tunnel was then run 125 feet on the blanket, only ten to twenty feet below the surface, and the ore above was stoped out and milled. The mill then, however, had no concentrators, and more than half the value, being in sulphurets, was lost in the tailings. It was in 1895 that the mine was properly equipped and the mill put under skilled management by the Triune Gold Mining Company, which then acquired the property. It has since run a cross-cut 165 feet, which cuts the ledge at an acute angle and taps the thirty-six foot shaft and has cut a feeder three feet wide. Drifts have been run on the main ledge, above which the ore was stoped. An open cut has also been made on the blanket, from which forty-four tons of ore were milled, yielding $450 free gold, besides concentrates. A tunnel has been run 225 feet, tapping the ledge at a depth of eight feet, higher up the mountain, following the blanket in that direction. In order to trace the solid formation down into the mountain below the break-over, a shaft has been sunk 150 feet, which showed it to straighten up, and followed down a number of stringers carrying $68 gold, 12 ounces silver, until they united in six feet of solid ore. To the south of the mill is a cropping of rose quartz twenty feet high and thirty feet wide, averaging $9 gold, according to a mill run. The mill in 1896 produced about $40,000 in bullion and after a suspension in November, enforced by frost, was started on February 1 and is now making a large monthly product of bullion.

Adjoining the Triune on the south is the Spokane group of three claims, owned by J. Barnett McLaren, of Vancouver, B. C., who has a ten-stamp mill on the shore of Wannicut Lake, a mile distant from the mine. A tunnel has been run ninety feet on a three-foot ledge, with a drift sixty feet south, a third sixty feet from the first, and a fourth connecting the first and third. A thirty-four foot winze has been sunk at the face of the ninety-foot drift and from it some of the richest ore in the mine has been taken. A forty-foot tunnel has been run on a twelve-inch stringer 500 feet further south and a twenty-foot shaft is down on a four-foot ledge carrying galena which assays 20 ounces silver, $5 gold. The mill was run for six months in 1893 on ore often carrying $100 gold, but much of the value was in sulphurets, to save

which concentrators were needed, and financial troubles followed during which work has been suspended.

Adjoining the Spokane is the Standard group of six claims, also owned by Mr. McLaren, on three parallel ledges. One of these is tapped by a 130-foot cross-cut and averages four feet wide, carrying about $4 gold. On another a forty-foot shaft shows eight inches of $6 ore, and the third makes a similar showing in a thirty-foot tunnel.

Among the well-developed properties is the Leadville group of four claims and two fractions on a series of parallel ledges, owned by John Judge. On one of these, five to six feet wide, an eighty-five foot shaft showed a twenty-four inch pay streak to often widen to six feet. A tunnel has been run 333 feet at a point 155 feet below and has been connected with the shaft by an upraise. This gives a large body of ore in sight, which averages $20 gold, though pockets of free gold have run as high as $5,000. Another ledge is shown to be ten feet wide by an open cut and has a pay streak assaying $20 gold, on which a shaft is being sunk. The third ledge, five feet wide, is shown up by a forty-foot shaft and has a pay streak from the croppings of which free gold can be taken and which assays $100.

One of the richest discoveries on Palmer Mountain was the Grand Summit, which was located directly on the summit by John Enright and William Towne. The ledge is two to three feet wide and had a rich pocket near the surface which assayed $39,000 a ton gold. A tunnel is in fifty feet on the ledge and a shaft is down forty feet, showing good average ore, of which fifty tons milled at the Ivanhoe and Black Bear mills averaged $20 gold.

Another fine showing has been made by John Mainwaring and Stephen Naggy on the Gladstone group of three claims, through which run four parallel ledges, eighteen, fourteen, twelve and thirteen feet wide, between walls of diorite and porphyry. About 500 feet of tunnel and drifting has been done, one tunnel running 300 feet on one ledge, which could be tapped at great depth from the base of the mountain.

On the summit of the mountain east of the Triune is the Bullfrog group of eight claims, bonded by Mrs. Adelbert Hart and Mr. J. Deuel to Mr. Stevens, of La Grande, Or. Through them a seven-foot ledge has been traced 3,000 feet along the apex of the mountain and a tunnel has been run 160 feet to cut the lead, and is now in ore, while two shafts forty and thirty-six feet have been sunk on the lead. A shipment of 4,600 pounds returned about $150 a ton in gold and silver, and twenty assays averaged $160 gold and silver. Work is being pushed on the tunnel and shipment continues.

To the east of the Bullfrog is the Bellevue group of four claims, on which Reilly Brothers, of Pittsburg, have done over 250 feet of development work, showing a high grade of gold and silver sulphuret ore and considerable telluride. Several tons shipped to the smelter have netted over $100 per ton, while some of the ore bodies have assayed $400 to $500 per ton.

On the Ninety-two, between the Ivanhoe and Grand Summit, William Deuel and William James have driven a tunnel 160 feet, showing three feet of free milling ore which assays $12 to $15 gold.

One of the noted properties is the Rainbow group of ten claims, which after many changes has come into the possession of the Anglo-American Gold Mining and Milling Company. It was bonded in 1892 by H. A. Noble and others, of Seattle, who erected a ten-stamp mill without concentrators, but through lack of skilled management failed to extract the value from the ore and abandoned the property, selling the mill. The main ledge is shown four feet wide in a tunnel 150 feet long, from which a winze was sunk sixty-five feet and a cross-cut has been run 312 feet, tapping the ledge 128 feet below the surface. From these workings there are from 400 to 500 tons of ore on the dump, and assays range from $5.61 to $323.94. On another claim a 316-foot cross-cut taps the ledge at a depth of 110 feet, showing it two to four feet wide, and a sixty-foot tunnel above is all in ore. Shafts eighty and ten feet deep and a thirty-foot open cut are said to define an ore chute 180 feet long. Assays from this ledge ran in gold, $4.72, $295.84, $270.21. On a third ledge shafts are down thirty and thirty-five feet, showing two to three feet wide of ore carrying $25 in free gold and sulphurets. The six remaining claims are undeveloped. The company proposes to erect a ten-stamp mill this summer and, if concentrators are added and skilled men are employed, may be expected to make it profitable.

Adjoining the Rainbow S. J. Sincock has the Lancashire Lass group of four claims, on extensions of two of those on the Rainbow and on a cross ledge, running east and west. On the latter a forty-two foot shaft shows three feet of ore assaying $25 gold. An eighteen-foot shaft shows a number of streaks of ore running into another ledge. Another ledge has a body of iron pyrites exposed by an open cut thirty feet long and six feet wide, with no walls in sight.

Up the mountain from this group is the Contention group of five claims, owned by Mosher & McDonald, of Seattle, on two ledges crossing one another. A ninety-five foot shaft shows three feet of free milling ore, on which a drift has been run at the fifty-foot level, another drift at the bottom being headed for the junction of the two ledges.

A mile north is the Chicago group of four claims, which J. F. Jordan is developing. A sixty-foot cross-cut has tapped a body of sulphide ore carry-

ing gold and silver, the croppings of which have been traced for half a mile. A thirteen-foot shaft on this ledge shows ore assaying $16.40 silver, $3.60 lead, $64 gold. A tunnel shows another deposit of sulphide ore and a twenty-foot shaft shows a twenty-four inch stringer, and another three-foot ledge is opened by a twenty-foot shaft and several open cuts. Further south on the mountain Mr. Jordan has the Oro Fino, on which a thirty-five foot inclined shaft shows a five-foot ledge carrying gold, silver and platinum to the value of $22.75.

The Wehe brothers have a group of fourteen claims on the east slope of the mountain, some of which carry rich ore. A shaft forty-five feet deep shows one ledge four feet wide with two feet of steel galena ore assaying 50 to 200 ounces silver and 1 to 2 ounces gold. A twenty-foot tunnel has shown six to eight inches of galena in another ledge. Shafts twenty-five and twenty feet deep show another ledge of three to four feet carrying galena, with free gold on the surface, assays running $6, $37 and $120 gold and silver, while bunches of telluride ore of course run much higher. Another ledge forty feet wide, with three to four feet of pay ore, is shown up by a forty-foot cut and a tunnel of the same length. A forty-five foot shaft snows six feet of ledge matter on another claim, with only one wall found. A twenty-foot shaft shows another ledge carrying galena five feet wide, and a fifteen-foot cut shows another eight feet wide, of which the pay streak carries $30 gold. On the Uncle Sam, a little to the south, Andrew O'Malley has run a cross-cut eighty feet to tap a small ledge carrying galena, in which a twenty-five foot shaft has shown ore assaying $4 gold, $41 silver and 15 per cent. lead.

On the north end of the mountain, half a mile east of Palmer Lake, is the Empire group of four claims, owned by the Empire Mining Company. A shaft eighty feet shows a ledge three feet and a tunnel sixty-eight feet shows it six feet wide. The ore carries iron and copper pyrites and galena and is free milling and concentrating, averaging $22 gold. A smaller vein runs $160 gold and 300 ounces silver and shows native silver and free gold on the croppings.

Attention has recently been fastened on the deposits of sulphide ore, which the earlier prospectors passed over as worthless, on account of their low surface values. The first rediscovery of this kind was on the Copper World group of four claims on the summit, south of the Ivanhoe, which John Wentworth and William Riley are now developing. The main ledge has been traced for over a mile and is shown to be at least twenty-five feet wide by a surface cross-cut, the surface ore assaying $5 gold, $2.50 silver, 35 per cent. copper. A shaft has been sunk fifty feet on the hanging wall and drifting has so far not reached the footwall, this work all showing chalcopyrite and iron pyrites. On the extension of this ledge John Wentworth and E. W. Pember have the Copper King, showing eight to ten feet of ore, which would be cut by an extension of the great tunnel.

Adjoining the Copper World Thomas Brown and William Riley have the Ben Butler group of three claims on a ledge which is widening from fifteen inches in a twenty-foot shaft and carries gold and copper, a surface assay showing $7.80 gold.

Another great showing of sluphide ore has been made on the Kalamazoo group, at the base of the mountain, two miles from Loomis, by Messrs. Harris and Boyd. After running an open cut thirty feet through cement gravel, they cut two feet of white quartz, heavily charged with iron and copper sulphides and native copper. They then sank on it and defined it to be at least fifty feet wide, of increasing value.

Another discovery of the same nature was made last October, one mile north of the Ivanhoe, by George King and P. H. Pinkston, who have taken the Ironmaster and an extension. The ledge has an iron capping from 20 to 250 feet wide at various points and the croppings show iron sulphides and a little copper, assaying $6.19 and $4.19 gold and silver from two samples.

On the Defiance, on the south slope, the Everett Mining Company has sunk 112 feet on a three-foot ledge of free milling ore, and at the ninety-seven foot level has drifted forty feet south and forty-two feet north. Near this J. M. Sparkman, Lotka & Allen and J. H. Sexton have tunneled eighty-three feet on a twelve-inch vein carrying $10 gold and some copper in pyrites, on which they have the Baltimore group of three claims. In the same vicinity George Paskel and the estate of John M. Hoe have the Combination on a sixteen-foot ledge of sulphide ore carrying $12 gold and 5 ounces silver, which will be cross-cut at a depth of 175 feet by a tunnel now in 200 feet. A twenty-inch stringer has already been cut by the tunnel.

Since the death of Okanogan Smith, all his claims along the Similkameen have come into new hands. On the San Francisco group of three Frank Grogan has run a tunnel sixty feet on a six-foot ledge of galena carrying a little gold. On another ledge of galena eight or nine feet wide John McDonald has tunneled 100 feet and sunk ninety feet. Two miles below this is the Cabba, another of the Smith claims, on a twelve-foot ledge well mineralized with galena, on which a shaft is down 100 feet. On the Julia, on the north slope of Mount Ellemeham, Allan Reiste and Guy Fruit have sunk eighty feet on a six-foot ledge of sulphide ore with a little galena, four feet of which carries $60 gold, 112 ounces silver.

The most work on the Similkameen has been done by the Wyandotte Mining, Milling and Smelting Company on the Wyandotte group of six claims and two millsites, running up the mountain from the left bank of the river, three miles south of the boundary. Near the summit of the mountain is a blanket ledge of free milling ore carrying $20 gold and $10 silver, twenty-five to thirty inches wide, between granite walls. An inclined tunnel was first run on the ledge and a few tons of the ore crushed in an arrastre. From a shipment of one ton was realized $50 above freight and treatment charges. Most of the work was done further down the mountain. The first ledge struck was iron pyrites between walls of porphyry and crystallized slate, running 40 degrees east of north and west of south, almost straight up and down the mountain. At the surface it is six feet wide, but in an inclined tunnel it widened to fifteen feet in 150 feet. At this point a stope was made to get the tunnel level, and then it was turned westward to develop the ledge. Near the surface this tunnel cut a blanket ledge of white quartz two feet thick carrying free gold, which cut across the pyrites ledge, and eighty feet higher up the mountain is another blanket ledge dipping 45 degrees to the east, on which a tunnel has been run 400 feet. The pyrites ledge is colored black with graphite and carries $8 gold, but no silver, while the lower blanket ledge runs $15 to $20 gold in the discovery shaft, changed to 80 ounces silver in the course of the tunnel and afterward back to the original gold value. On a parallel ledge of about the same size and character is a tunnel twenty-five feet. Another parallel ledge between granite walls widened in a fifteen-foot inclined shaft from ten inches to two feet, and increased in value from 30 ounces silver and no gold on the surface to 1 ounce gold and a trace of silver in the first five feet, the gold value continuing to increase with depth.

The company last summer erected a cyanide plant of 100 tons' daily capacity, under the direction of Dr. Paul Langhammer. It is operated by a sixty-horsepower engine and has an electric plant to furnish 200 lights. The ore will be brought to the crushers by a 400-foot cable tramway, and a cable ferry transports supplies across the river, thus shortening the distance to Loomis to ten miles. The plant will be put in operation this spring and meanwhile development is being pushed to prepare large bodies of ore for treatment.

The Wyandotte group is adjoined on the south by the Mammoth group of three claims, on which the Mammoth Mining Company has sunk thirty feet, showing an eight-foot ledge carrying pyrites which assays $16 to $18 gold. On the Pennsylvania J. E. Longacre, W. E. Meek and J. A. Meek have a blanket ledge twenty-eight inches wide, carrying $42 silver and a trace of gold, a twenty-five foot tunnel showing it to turn into the mountain. On the summit of the mountain they also have the Juanita on eighteen inches of ore assaying $32 gold, $2 silver.

Following down the left bank of the Similkameen, one comes next to the Curlew group of five claims, which Otto Hausing, Theodore Wilken and Joseph Linton have taken on three parallel ledges of gold-bearing quartz, each two to three feet wide on the surface between granite walls. Assays from the surface give $40 to $80 gold and a little silver, but one ledge carries galena and another a streak of high-grade brittle silver. Next below these are the three Riverview claims, on which Mosher & McDonald, of Seattle, have sunk 100 feet on a four-foot ledge of low-grade ore.

Across the river, on Mount Ellemeham, Stephen Cloud, William Bouchard, C. J. Sadenwater and others, of Michigan City, Indiana, have the Hoosier group of three claims on a ledge forty-seven feet wide, which they have traced from base to summit of the mountain.

On Kruger Mountain, which overlooks Oro from the north and is crossed by the boundary, are ten or twelve parallel ledges running east and west, carrying iron and copper sulphides, the country rock being hornblendic diorite with dikes of schist and granite. The first locations were the Allison group of five claims, now owned by Dr. Langhammer, who is developing them and has secured the power of Similkameen Falls to operate an electric plant, which he proposes to install, both to run a 100-ton cyanide plant and to light the town of Oro. A good body of gold-bearing sulphide ore has been shown up in a sixty-foot shaft, the average value being $45 in gold with no silver. There are four veins, two five feet and two four feet wide, which are being opened by a 200-foot tunnel 192 feet below the surface.

The Mammoth Mining Company has the Black Warrior on this mountain on two parallel ledges, each five and one-half feet wide, one carrying iron and copper pyrites, the other carrying galena. One ledge is almost flat and the hanging wall appears to have been carried away by glaciers, three shafts having been sunk on it. The galena ledge assays $60 gold and silver and 20 per cent. lead, the pyrites ledge $53 gold, 220 ounces silver.

Joseph Bertrand has, on the Warsaw, a six-foot ledge of free milling ore, carrying $18 gold, 20 ounces silver, on which he has sunk an inclined shaft sixty-five feet and which he has traced 600 feet.

On the British side of the mountain the first discovery was the Gold Dust, by George A. Engel and W. F. Keller, who have two claims on four parallel ledges and one cross ledge, one of which they have cross-cut for eighteen feet without striking the footwall. The ore assays from $4 gold, 6 per cent.

copper and 2 ounces silver up to $20 gold, 18 per cent. copper and 5 ounces silver. The Dividend is on the extension of these ledges and George Bauerman and Benjamin Anderson have stripped the northerly one to a width of sixteen feet and the southerly to a width of twenty feet, the ore assaying $12. The same parties have the Lakeview, on which a twenty-foot tunnel shows four feet of ore and a cross-cut defines the ledge as eight feet wide, assays running $14 gold, 4 per cent. copper. On the Lakeview extension W. T. Thompson has four ledges, a cross-cut showing one to be ten feet wide. Another Lakeview, on the American side of the line, is owned by E. J. Goddard and B. O. F. Farrar and has a ledge three feet wide on the surface, showing a good deal of free gold, which has been traced for 300 feet, but a shaft which is now sixty-five feet deep shows it to have split into two two-foot ledges. They are believed to come together again deeper. Assays average $12 gold, 12 per cent. copper, 4 ounces silver, though some specimens have run much higher. On the Calumet James Anderson and E. D. Boeing have a ledge twenty to thirty feet wide containing rich streaks of two to three feet carrying petzite. This mineral is 23 per cent. gold, 43 per cent. silver, 34 per cent. tellurium, and picked pieces of ore assay as high as $15,000, the average, however, being about $40. The ledge has been cross-cut. On the Gold Hill, bonded to Capt. Hall, of Rossland, for $8,800, a twenty-five foot shaft showed six feet of quartz, with only one wall in sight. On the International, bonded to George Canfield, of Oakesdale, and G. H. Norton, of Kettle Falls, a twenty-five foot shaft shows a four-foot ledge assaying 27 per cent. copper, $4 gold. The Satellite, bonded to Capt. Hall for $3,000, has a drift on the ledge about fifty feet and several open cuts, showing four feet of ore which averages $10 gold. The Copper King, also under bond to Capt. Hall, has a cross-cut four or five feet long, showing eighteen to twenty inches of copper sulphides, which assay $12 gold and 6 per cent. copper. The Copper Queen, which is believed to be on the Copper King lead, has a three-foot ledge of quartz, carrying copper sulphides, but no work has been done and no assays have been made. The New York, which is bonded to Mr. Canfield, has a shaft twelve feet deep and a cross-cut on a five-foot ledge, which shows well in gold and copper, though no assays have been taken. The Frosty, which is on the American side adjoining the New York, has a shaft ten feet deep on two and one-half feet of ore similar to the Gold Dust, which assays $9 gold and 15 per cent. copper.

On the steep face of Mount Chapaca, directly opposite the Wyandotte and 1,500 feet above the river, is the Rush group of three claims, located on a true fissure vein running almost north and south, and owned by the Chapaca Mining Company. A shaft was sunk on the ledge and a drift run 200 feet northward further down the mountain, where there is a ledge four to six feet, which assays from 20 to 200 ounces of silver and sometimes as high as $20 gold. An inclined shaft was sunk 175 feet and drifts were run both ways at the 100 and 175 foot levels, showing the ledge from five to eight feet. The company then started a tunnel to strike the ledge at a depth of 400 feet and cut three ledges with it, one of which did not show on the surface. At the point where it was struck, the main ledge was quite small, but drifting north and south showed it to widen to fifteen feet, averaging 200 ounces. The other two ledges were twenty-two inches, running $22 gold, and three feet, running $8 gold. A shaft was then sunk 175 feet from the upper drift for the purpose of connecting the two drifts, and in places it showed ore fifteen feet wide. Altogether, about 1,600 feet of development work has been done.

The next largest showing on Mount Chapaca has been made by J. W. Miller and George Redpath, of Seattle, on the Grandview group of eight claims, with two millsites. They have one great ledge of free milling quartz nineteen and one-half to twenty-two feet wide, running diagonally across four claims, on which they have run an open cross-cut and tunnel, showing two to fifteen inches of decomposed quartz on the hanging wall, which assays $115 to $484 gold, and five to six feet in the center assaying $6 to $58 gold. A thirty-three foot shaft also shows up this ledge. A parallel ledge is shown fourteen feet wide by an open cut and tunnel of 110 feet and carries ore in the center of five or six feet, from which gold can be panned. A three-foot cross ledge has four to eighteen inches of ore in a thirteen-foot shaft, assaying $33 to $270 gold. Three small parallel seams of similar character have merely been prospected. Another similar ledge is shown from six inches to five feet wide by open cuts twenty-eight, twenty-nine and thirty-six feet long, and assays from $37 to $280 gold. Two parallel ledges, eight and thirteen feet wide, on the same two claims, have not been developed. In the fall of 1896 one of the locations was made on a large iron capping, of which the surface ore assayed $2 to $6 gold and 5 to 29 per cent. copper, being typical copper sulphides. Another ledge is two and one-half feet wide and a twenty-nine foot open cut and tunnel shows twelve to fourteen inches of smelting ore carrying about $50 gold and silver, besides quite a per centage of copper.

Half a mile south of the boundary, on Mount Chapaca, Allan and George Reiste have the Golden Zone and an extension on a ledge which a 150-foot tunnel shows to be widening, with a continuous chute of ore carrying free gold and sulphurets. One ton of ore from the croppings milled $22 on the plates and assays average $40. On the Summit J. D. Lindburg and Clay

Taylor have a 140-foot tunnel on a six-foot ledge assaying $22 free gold. On the south end of Mount Chapaca is an iron cap fifty to seventy feet wide, which has been traced through four claims—the Copper King, by George Millberg; the Mammoth, by W. A. Berry; the Eclipse, by Peter Berg, and the Double Standard, by W. F. Kurtz. On the Double Standard, which was only discovered last spring, a shaft is down ten feet on copper and iron pyrites and is being continued. Surface assays on the Eclipse show $11 gold, and the oxidized croppings on the Copper King show $12 and $16 gold, with traces of copper and silver.

Separated from Mount Chapaca by Toats Coulee on the north is Gold Hill, on which free gold was discovered in 1892. The ledges are at an elevation of 4 000 feet above the sea and 2,000 feet below the summit, and range from four to eight feet wide in a red porphyry dike, cutting the formation. They run northeast and southwest and are almost perpendicular, with a slight dip to the northwest. The quartz carries free gold, but most of the gold value is contained in hematite of iron, there being but little silver. Assays average $19 gold, though specimens have run as high as $2,000. The pioneer location was the E Pluribus, by D. G. Chilson, of Loomis, and the Moody brothers, of Spokane, who have sunk shafts ten to twenty-six feet on the ledge, showing it to be four to ten feet wide. At the bottom of the deepest shaft the ledge is seven and one-half feet and averages $10 in gold. The northeast extension of the E Pluribus is the Frankie Girl, owned by Benjamin Hall and Daniel Mulcahy, of Loomis, and W. E. Hensley, of San Francisco. They have sunk several shafts ten to eighty-five feet, in the deepest of which the vein varies from four to seven feet, of the same grade as the E Pluribus, though some assays run very high. A narrower parallel vein runs through these two claims and is equally rich. On a parallel ledge northeast of the E Pluribus Henry Wellington and L. D. Burton have the Cleve and have made a twenty-foot open cut and started to extend it with a tunnel, showing about fifteen feet of low-grade ore. On another parallel vein Lester Sly, William Robinson and W. E. Hensley have the Golden Fleece, on which they have sunk shafts fifty-five feet on the hanging wall showing two and one-half feet of ore, and thirty-five feet on the footwall, showing three feet of the same grade as the E Pluribus.

Fifteen miles west of Loomis, at the head of Toats Coulee, D. G. Chilson has the Oceanic and Majestic on a six-foot ledge between granite walls, which has been traced 3,000 feet. A shaft twenty feet and openings along the ledge are said to show ore the full width, twenty assays of which range from $10 to $90 gold and silver. Of this value 65 per cent is free gold and the remainder in sulphurets.

West of Gold Hill is the El Dorado group of three claims, owned by Lee Brothers & Barney, through all of which a ledge at least ten feet wide can be traced. A shaft is down fifteen or twenty feet on each claim and openings along the ledge show free gold on the surface, assays ranging from $10 to $35, mostly in gold. The same owners have the Sunnyside a mile further west, on a ten-foot ledge of free milling ore, which assays $15 to $20 gold and silver from a twenty-five foot shaft.

Flowing into the Sinlehekin from the south side of Gold Hill is Cecile Creek, which has on its banks some rich ledges of iron and copper pyrites. On the Little Falls H. M. Redmond has a two-foot vein of quartz exposed throughout the depth of a fifty-foot shaft, and assaying from $20 to $350 gold. The Hercules, owned by the Hercules Mining Company, of Pittsburg, has an iron cap eighty feet wide between walls of diorite, running east and west and pitching north about 45 degrees. Several cross-cuts on the cropping have traced the cap rock for over a mile, for which distance it has been located. Surface assays give $2 gold, 5 to 9 ounces of silver and traces of copper, and development, which is now being prosecuted, shows high-grade gold-copper ore.

On Douglas Mountain, south of Cecile Creek, are a series of ledges of quartz running high in gold. The country formation is granite, like that of Gold Hill, and the ledges are in a porphyry dike running northeast and southwest, carrying more copper than those of Gold Hill. The first location was the Utica, by D. G. Chilson, John Boyd, Daniel Mulcahy and H. M. Perdue, who have a shaft fifty-eight feet on the hanging wall, showing ore the full width of five feet. An open cut from the footwall seventy-five feet from the shaft runs thirty feet toward the latter and is all in vein matter heavily impregnated with hematite. Assays average $12 to $15 in gold, silver and copper. On the Oro Fino, the northeast extension of the Utica, D. G. Chilson and John Woodruff have a cross-cut twenty feet and a shaft fifteen feet, showing a vein four feet wide, which assays as high as $60 gold. On the Red Jacket, a mile north of the Utica, R. H. Redmond has a shaft forty feet on a three-foot vein of fine ore, from which he sorted and shipped two tons of the highest grade and obtained returns of $80.

Across the Sinlehekin from Mount Douglas and Gold Hill is Aeneas Mountain, a ridge extending many miles south of Loomis and rising to a height of 2,800 feet above the town, on which are a series of parallel ledges of iron and copper pyrites, carrying gold and wearing red iron caps. The ledges run northeast and southwest across the granite and diorite formation. Seattle men are most active on this mountain, having joined with Loomis

citizens to form the Detroit-Windsor Mill and Mining Company and develop the Detroit-Windsor group of five claims, seven miles south of Loomis. Three claims are on a ledge capped with iron for a width of fourteen feet, with granite and diorite for the hanging wall and granitic porphyry for the footwall, the ledge cutting the formation up the mountain and being traced through the three claims. A shaft is down 100 feet, showing iron and copper pyrites, and a cross-cut at the ninety-foot level shows it to have widened to eighteen feet. Assays have ranged from $10 gold and 2 per cent. copper to $35 for both values, the copper ranging from 2 to 5 per cent. and the average value being $15 to $20 for the whole width of the ledge. The two other claims are on a parallel ledge lower down the mountain. The work so far done has demonstrated the permanence and value of the ledge. The shaft will now be continued to a depth of 120 or 130 feet and then a cross-cut will be run to tap the ledge at a depth of 400 feet. The nature of the ground makes it possible to attain a depth of 1,000 feet with a 1,500-foot cross-cut.

The two ridges of Aeneas Mountain which shut in Horse Spring Coulee have become the scene of mineral locations for a distance of six miles. The principal group here is the Treasury, of six claims, on which M. F. McConkey has been working for five years and in which he lately interested a Seattle company. Four claims are on a twenty-four foot ledge of rose quartz, on which a shaft is down eighty feet in ore assaying about $80 gold, and a number of open cuts have been made. A cross-cut has been run 200 feet and has cut a parallel ledge, the expectation being that in 800 feet more it will cut the main ledge at a depth of 500 feet. Assays run from $8 gold upwards and some of it has been milled in an arrastre.

Further to the east, on the same ridge, Ed Manuel and a number of others have located a string of claims on a belt of iron-capped ledges of sulphide ore, which has been traced for three miles north and south and for a width of two miles east and west. The ledges are twenty to thirty feet wide between diorite walls, and surface assays show $2 to $4 gold and 8 per cent. copper, while some have run as high as $70.

THE COLVILLE RESERVATION.

This broad stretch of country, comprising the central part of the northern half of Washington, had long been a forbidden land to the ubiquitous prospector, when, on February 20, 1896, the northern half of it was thrown open to mineral entry. It is usual to exaggerate the unknown, and the great mineral discoveries made on the north, east and west had given good ground for the general belief that this land, given over to the Indian farmers and hunters, abounded in mineral deposits of great wealth. Actual observation has confirmed this belief, and development on quite a number of claims during the past year has proved the previously accepted theory that the area of eruptive rock veined with sulphide ore, which has made Trail Creek famous, is only one of a series of such areas extending throughout the country to the south and west. Many of the ledges of sulphide ore have proved to be equally rich in gold with the average of those in Trail Creek, and some far richer in copper than the best in that district, nor do they yield anything in the size of the ore bodies. On the eastern border of the reservation is a belt of galena ledges, and over to the northwest, on Myers Creek and its tributaries, and on the head waters of Eureka Creek, is a belt of free-miling ore bodies of immense size. The sulphide ore belt seems to cover the greater part of the country opened, for it has been traced through the whole strip extending from the boundary south to Kettle Falls, between the Columbia and Kettle Rivers; also along the watershed of Kettle River, where it flows meandering from west to east.

The reservation is fast being made accessible from all directions by means of roads, although no railroad as yet enters its confines. From the west the Great Northern Railroad will take you 174 miles to Wenatchee, and the Columbia River steamer City of Ellensburg will carry you on to Johnson Creek, 130 miles, during the period of high water, which is from May 1 to August 1. Thence the journey must be made on horseback, ten miles up the Okanogan River road to Tenasket schoolhouse, thirty-three and one-half miles by the state road to Curlew Lake and thirty miles down Curlew Creek to Kettle River. From the east the starting point is Spokane, whence the Spokane Falls & Northern Railroad will take you 102 miles to Marcus, 110 miles to Bossburg or 130 miles to Northport. The state road runs from Marcus up Kettle River and across country to Curlew Lake, which is the center of the northern half of the reservation, to which all roads lead. Roads also cut across country from Bossburg and Northport to Empire Camp, Pierre Lake and other mining centers which have sprung up within a year, ferries crossing the Columbia at all these towns. The route from the south is by the Central Washington Railroad from Spokane to Wilbur, ninety-one miles, and thence by road across the Big Bend and up the Sans Poel River to Eureka Camp, sixty-two miles, this road connecting with that leading down

Curlew Creek. The Sans Poel & Columbia River Ferry & Transportation Company has established a free ferry on the Columbia at the mouth of the Sans Poel, and will complete the forty-eight miles of road to Eureka Camp by the end of April. This will materially reduce the distance by the present Sans Poel trail.

Reliable information as to the geology of this great area is scanty, and is only obtainable in scraps as to restricted tracts of country which have come under the personal observation of some individual. The simile applied to the Trail Creek country by Mr. Woodhouse, quoted in another chapter, would seemingly apply here also. As water pours through a hole broken in ice, so the eruptive rocks have burst through the older formation in patches and are generally veined with sulphide ore ledges, the richest of which are found along the edges of the area of eruption. The country rock is generally diorite, as in Trail, and the ledges have the same characteristics in the sulphide ore belt. This description applies to the eastern and northeastern part of the reservation. In the northwest different characteristics prevail, which will be described later in this chapter.

Within a few miles of the boundary, on the mountains through which Sheep Creek flows from Red Mountain into the Columbia River, there is an extension southward of the Trail Creek formation, in which much development work is being done. On a series of five iron-capped ledges, ten to fifty feet wide, running northwest and southeast between walls of syenite and diorite, is the Birton group of twelve claims, owned by the Birton Gold Mining & Milling Company. A shaft is down thirty-five feet on one ledge, showing the gold value to increase from $3 on the surface to $10, in iron and copper pyrites, and a contract has been let for 100 feet more on this shaft. The property is only one and one-half miles from the Red Mountain Railroad and six miles from Northport, where the erection of a smelter is under contemplation, and in that case freight and treatment would cost only $7.

Adjoining the Birton, the Fidelity Gold & Copper Company has the Fidelity group of six claims on an eight-foot ledge. A seventy-six-foot shaft shows thirty inches of pyritic ore, assaying $12.80 gold, 4 per cent. copper, and two smaller shafts and a thirty-foot tunnel show low grade ore throughout.

On a mountain rising from Sheep Creek, three miles by wagon road from the Red Mountain Railroad and twelve miles from Northport, is the Rich Four group of four claims, which the Rich Four Mining & Milling Company is developing. Three claims are on an iron-capped ledge cropping forty to 100 feet wide through their whole length in a ravine with perpendicular walls fifty to 150 feet high. The ledge is slate mixed with white quartz, all more or less mineralized with gold, one streak of quartz showing near the hanging wall. The other claim is on a similar ledge sixty feet wide, across the summit of the mountain.

The greatest showing so far on this part of the reservation is on the Big Iron, one and one-half miles from the boundary, five miles from the Red Mountain Railroad and eight miles north of Pierre Lake, which the Big Iron Mining Company is opening. Some conception of the extent of the surface showing can be formed from the fact that the location was made by a man so ignorant of the mining laws that he only covered the actual area of the outcrop, and yet this is a tract 450x250 feet. This is a huge blowout of blue iron, in some places twenty to thirty feet thick, covering a body of gold-copper ore, of which diligent development has failed to define the extent. A shaft is down seventy-five feet, all in mineral, and a cross-cut 110 feet is also all in mineral and has not struck either wall, passing through two good pay streaks seven and two feet wide. The pay ore is iron and copper pyrites, assaying ½ to 1½ ounces gold, 2 to 5 ounces silver and 3½ to 5 per cent. copper, while the ledge matter is very silicious, with the mineral apparently free, carrying $1 to $10 gold and very little copper.

Adjoining this property, on the same and parallel ledges, is the Little Iron group, owned by L. D. W Shelton, W. C. Morris and Edward Maloney.

Ore of the same character as at Trail Creek, but often running higher in copper, is being taken out of a number of properties around Pierre Lake, which is about midway between the Columbia and Kettle Rivers, some miles south of the boundary and sixteen miles from Bossburg. The ledges in this district are enclosed in porphyry dikes filling true fissures in diorite and syenite, striking northeast by southwest.

The Little Giant Mining Company has sunk 100 feet on the Little Giant, following three feet of copper pyrites, which assays over $100 gold and copper. At forty feet the shaft broke through the supposed hanging wall into more ore of the same grade. A drift is being run from the shaft and 100 sacks of ore have been shipped, being hauled over a road built by the company.

The Bald Eagle Gold Mining Company is developing the Bald Eagle group of five claims in the same district. Three claims are on a ledge which has been traced through them and through ten adjoining claims. It crops ten feet wide and shows somewhat greater width in a thirty-five-foot shaft. Another claim is on a parallel and the fifth on a cross ledge, which have been clearly traced by croppings. Work on the shaft was stopped by water and ore gas—the latter a favorable indication—but will be resumed when a

pump and fan have been erected. The surface ore assayed $7 gold and 4.14 per cent. copper.

The Syndicate group of five claims, owned by the Syndicate Gold Mining Company—an allied corporation to the Bald Eagle—has two claims on parallel ledges cropping three to six feet wide and running through into a third claim, which is located crosswise. A cross-cut, which is in twenty-five feet, will tap one ledge in fifteen feet more, when drifts will be run both ways. Another claim in the group has an iron capping four or five feet wide, thoroughly mineralized, and a fifth has four feet of ore in a fifteen-foot shaft, assaying $13 gold, $2.17 silver and 19 per cent. copper.

The Little Gem group of four claims, three miles northwest of Pierre Lake, owned by the Lincoln Mining & Development Company, has a quartz ledge cropping two and one-half inches wide and increasing to nine inches in a seventy-five-foot shaft. Assays have run 34 ounces silver, $3.60 gold and 5 per cent. copper.

Two miles east of Pierre Lake the Colville Gold Mining Company has the Mackinaw group of four claims. Three of these are on an iron-capped ledge thirty feet wide, traced for 2,000 feet, which a short inclined shaft shows to be heavily charged with chalcopyrite, increasing every foot. Another claim is on a parallel ledge of the same character, on which a shaft is being sunk. The same company has the Fidalgo on a twenty-five-foot ledge at the foot of Jumbo Mountain, one mile south. Near the head of Pierre Creek this company has the Eldorado group of four claims on three ledges which have been traced for over a mile, and it also has two claims in the Curlew Camp and three in the Eureka Camp. The company proposes to sink a shaft on the Mackinaw group.

Near the head of Pierre Creek and eight miles from the Spokane Falls & Northern Railroad, the Churchill Mining & Milling Company has the Churchill group of four claims on three ledges of sulphide ore of great width. A shaft is down thirty feet on one of these, in a good body of ore, carrying gold, with gray copper and chalcopyrite coming in. Assays at five feet were $6.40 and at thirty feet $18.60 in all values.

Five miles southeast of Pierre Lake and ten miles northwest of Bossburg, the Centennial Mining & Smelting Company is sinking on the Centennial group of ten claims, which has an iron cap over six feet deep. A sixty-foot shaft cut three streaks of arsenical iron ore, assaying $8 to $18 gold and copper. The shaft will be sunk forty feet more and then a drift will be run on the dip of the ledge, which is expected to show the streaks all running together.

Near the sources of Flat Creek, ten miles west of Northport, the Quadra Mining Company will this spring begin development of the Quadra group of four claims. The cropping is an iron cap twenty-five feet wide and a twenty-eight-foot cross-cut has pierced the footwall and run three feet on mineralized ledge matter, assaying $4 gold, $1.17 silver, besides copper.

West of this group the Searchlight Gold Mining Company has the Searchlight group of four claims on two ledges, which crop about forty feet wide.

On the north fork of Fifteen-Mile Creek the Alert Gold Mining Company has five claims on as many different ledges, ranging from ten feet upwards. A forty-eight-foot cross-cut has shown four feet of ore in one of them, carrying $6 gold, besides silver and copper.

On Iron Mountain, at the head of Flat Creek, R. B. Lane and Ledgerwood Bros. have the Lafayette group of four c laims on an iron capping 100 feet wide, and on the divide between Flat and Pierre Creeks they have the X-Ray group of eight, on which an iron cap forty-four feet wide has been traced 2,000 feet.

The Seattle Gold & Copper Mining & Milling Company will this season develop the Lucky Dog group of seven claims on several ledges between Pierre Lake and Saratoga Mountain, with a placer claim on Kettle River. Two claims are on a ledge near Pierre Lake cropping four feet, on which a fifteen-foot cross-cut shows streaks of sulphide ore aggregating eighteen inches. This cross-cut is being continued to strike the ledge in sixty feet, when drifts will be run. Four more are on two similar ledges two and one-half miles from Bossburg, and another is on Toulou Mountain, west of the Kettle River wagon road, which shows pyrites in the croppings, but has not yet been defined.

The Kettle River Mining & Milling Company has the Saratoga group of six claims on the ridge between Kettle and Columbia Rivers, from two to five miles up the road from Marcus. The Saratoga is on a mountain of the same name, on which there is an iron cap 200 feet wide. A sixty-foot cross-cut shows the whole ledge to be mineralized with copper and iron sulphides, and has cut three streaks of solid ore, each about six inches wide, assaying $47.80 in gold, silver, copper and lead. The five other claims are all on one large iron-capped ledge two and one-half miles further south, in which an open cut 200 feet long and ten feet wide showed ore assaying $4.95 gold, and a trace of silver, besides copper.

The Sunnyside Group Mining Company has great ore bodies on its seven claims, immediately south of the last-named group. There are two parallel ledges, with four claims on one and three on the other. A cross-cut, after running fifteen feet through diorite, has passed for forty-eight feet through

ledge matter carrying streaks of sulphide ore, and has not struck the hanging wall. A shaft is down twenty feet in ore, four assays of which ran from $21 to $48 in gold, silver and copper, including 14 per cent. copper. The company is installing a steam drill and hoist.

On the Nest Egg, at the rock cut in the stage road fifteen miles from Bossburg, T. S. Burgoyne, Hon. W. C. Jones, Dr. Edward Pittwood and W. W. Stearns have an iron-capped ledge in which a 100-foot tunnel shows good ore, carrying gold, silver and copper.

On the Scotia, on Toulou Mountain, a 200-foot cross-cut has tapped an eighteen-foot ledge of sulphide ore.

Adjoining the Sunnyside is the Empire group of four claims on a ledge of sulphide ore cropping thirty to eighty feet wide, the iron capping of which carries from $4 to $7 gold. The Empire Mining Company is now beginning development.

On the mountain fronting Northport from the east bank of the Columbia River, and within one and one-half miles by wagon road from the Red Mountain Railroad, is a series of ledges of galena and sulphide ore, of great size, which were the prize of a hot race between prospectors on the night of the opening of the reservation. They crop very clearly for over a mile parallel with a broad silicate dike, which is plainly visible from the opposite bank of the river, and runs northeast by southwest. The first location was the Mountain View or Contention, which is the subject of a contest among rival claimants. It shows eight inches of galena in the croppings, and in a forty-seven-foot shaft on the side of the mountain shows a good body of galena and sulphides.

On the extension of this ledge and on parallel ledges, the Colville Reservation Mining Company has the Mountain View Extension group of four claims. The Mountain View ledge has been tapped by a seventy-five-foot cross-cut, which shows four feet of ore carrying galena and sulphides and assaying $11 to $64 in gold and silver, but has not yet reached the further wall. A winze will now be sunk from the face of the cross-cut.

The Coyote group of three claims, which has been bonded for development by William Adams and others of Northport to John Leary, George Kinnear and A. H. Manning, of Seattle, has a cropping at least fifteen feet wide and in a fifty-foot shaft shows ten to thirty-six inches of ore, carrying $30 gold and silver. This shaft will be sunk to the 200-foot level this summer, and a test shipment of twenty tons will be made when spring opens.

The White Horse, owned by A. W. Ryan, is on the Mountain View extension, and the Bald Eagle, by Messrs. Harris, McFadden and others, is on the supposed extension.

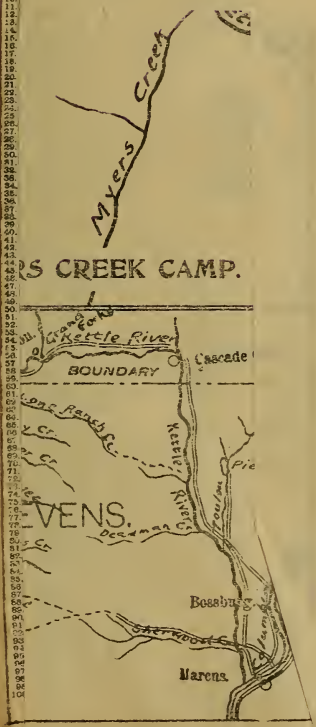
On one of these ledges, ten to twenty feet wide, between walls of slate and diorite, the White Otter Gold & Silver Mining Company has the White Otter, which will be developed this year. The ledge matter is lime quartz, with streaks of porphyritic quartz, and one ore chute of gold-bearing galena is exposed in the croppings. It cuts an abrupt hill at right angles, so that, by tunneling, great depth can be attained at short distance.

On three of these ledges the Northport Development Company has the Iron Horse group of nine claims, through which the quartz has been traced. On the Mountain View ledge a cross-cut of forty feet is all in mineralized quartz, with eight feet of ore, and a shaft is down forty-five feet. Another ledge has an iron cap thirty to forty feet wide and the third is three or four feet, showing galena. Surface ore assayed $14 to $25 gold, silver and copper. The company will run a 400-foot cross-cut, tapping two ledges at a depth of 350 feet.

The most famous series of mineral croppings on the reservation is on La Fleur Mountain, at the head of Koos Moos Creek, directly south of the boundary, being an extension of Smith's Camp in the Boundary Creek district. The La Fleur was discovered years ago, and numbers of men have since been carrying specimens of peacock copper from it as evidence of the mineral wealth that awaited development in this closed country. The result was the systematic movement in the winter of 1895-6 for the opening of the northern half of the reservation to mineral entry, which was crowned with success on February 20, 1896. A race for the La Fleur from Marcus followed between several rival claimants, and contesting locations were made. The ground of one claim was that congress had opened the reservation by an act passed in 1892, and that the president's proclamation was unnecessary, all locations made in the interval being valid. This claim was sustained by the United States courts, and the contest has recently been compromised between the Comstock and La Fleur companies, the La Fleur being now held as the Butte, together with its extension, the Comstock, by the Comstock Mining & Milling Company.

The croppings of this ledge were great masses of peacock copper or bornite forty to fifty feet wide. A shaft fifty feet deep shows the ledge five feet between walls, with two and one-half feet of solid ore averaging $75 a ton, viz., 30 to 45 per cent. copper and the remainder in silver. On the Comstock a shaft has been sunk making a similar showing.

The Lone Star and Washington group of eight claims is on the extension of the La Fleur ledge to within 154 feet of the boundary, and is being ex-


Myers Creek
RS CREEK CAMP.
Grand Forks
Kettle River
Cascade
BOUNDARY
Long Ranch Cr.
Kettle River
VENS.
Bossburg
Marcus

INTERNATIONAL BOUNDARY LINE

NORTHERN HALF of the COLVILLE INDIAN RESERVATION.

Railways.
Wagon Roads.
Trails.

Scale of Miles
0 1 2 3 4 5 6 7

Index Map
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Oro.
Koos Moos.
Curlew.
Curlew Lake.
Bossburg.
Marcus.
Gold Hill.
Spokane Falls & Northern R.R.

Boundary Mountain.
Copper Mountain.
Big Iron Mountain.
Boulder Mountain.
West Fork
Mineral Mountain.
Cement Mountain.
Lake Marie.
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15 Mile Creek
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37 TRAIL.
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41 PAOLI
42 RUBY
43 IDA
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45 SPOKANE No 2.
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48 PELICAN
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13 OHIO
14 NEW YORK
15 CLIFF MASON
16 TAURUS
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19 LE ROI
20 IRON
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22 LONE PIX
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19 LA FLEUR.
20 MISSOULA LIFE
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21 LAST CHANCE
22 LONE PIX
23 LUCKY BOY

Walter A. Ross
U.S. ASST. U.S. ENGINEER.
Spokane, Wash.

IN THE PACIFIC NORTHWEST

tensively developed by the Reservation Mining & Milling Company. The ledge crops thirty to forty feet wide, and carries copper pyrites and chalcopyrite. A tunnel was run in it for 125 feet, all in ore, when a cross-cut was run 144 feet east and thirty-five feet west, showing fifty feet of ore. A shaft is down 100 feet from the mouth of the tunnel, in ore the whole distance, and a cross-cut eighty feet westward from the bottom shows streaks of ore alternately with serpentine bands. There are 800 tons on the dump, and it is estimated that the ore in sight is worth $1,500,000. The value averages $30 to $40, though assays from the west drift from the tunnel ran $96, the average in copper being 10 per cent., silver 3 ounces, the remainder being gold.

Within one and one-half miles of the La Fleur, Edward L. Ensel, of Seattle; J. N. Scott and A. W. Hawks, of Everett, have the Mascot group of twenty claims on three iron-capped ledges over 100 feet wide, in one of which an open cut thirty feet long and seventy feet deep shows a great body of chalcopyrite ore.

The Edith group of four claims on Koos Moos Creek also has a good surface showing of copper sulphides, and has been bonded by A. E. aGlleger, H. J. Blaine, William Stoll and others to English capitalist for $10,000.

On Lone Ranche Creek, five miles south of Grand Forks, B. C., the Tenasket Gold Mining Company has the Sparling and Raymond on two large iron caps, of which the surface ore carries small values, giving promise of increased value when development, to be made this year, attains depth.

One of the greatest showings of free-milling ore has been made in Eureka Camp, along Eureka Creek, and near the headwaters of the Sans Poel River, thirty-five miles by wagon road from Grand Forks.

This mineral belt has been traced four miles wide and located for fifteen miles in length, the two principal ledges being traced for that distance in a north and south course. These ledges are twenty to fifty feet wide, with some blow-outs of much greater width, and are capped with iron and volcanic rock. This surface rock carries little value, but when it is pierced a blue quartz is encountered which assays quite well in free gold.

On the Great Republic, Patrick, James and Dennis Clark have a quartz ledge fifty feet wide, traced by the croppings for 1,000 feet, on which they have made a long open cut ten feet deep. Nine feet on the east side assayed $64 gold, another nine feet $24, and the west side showed values of $16 and $20. The Clark brothers have also cross-cut a ledge on the Lone Pine, one and one-half miles from the Great Republic, and have run fifteen feet through the ore body without striking the hanging wall The tunnel is 140 feet long and gains 100 feet in depth. This ledge assays $10 in free gold and sulphurets throughout. The Clarks will erect a stamp mill as soon as the snow is gone.

On the two main ledges, and on others parallel with them, Harry Kauffman, of Alma, Dr. Kittinger, of Wilmington, Del., and W. J. Grambs and others, of Seattle, have the Admiral group of nine claims. The Admiral is on the Lone Pine ledge, which is thirty to forty feet wide at this point, and is the strongest in the camp. The Treasury and Blue Jacket are on a twenty-foot parallel ledge; the Seattle Belle has a large ledge of undefined width, being covered with wash; the Rebate has a large body of good ore; the other claims are on large parallel ledges in the same belt. They have been defined by surface work and this year the Admiral will be cross-cut.

The Knob Hill, on the north extension of the Lone Pine ledge, is being cross-cut by Portland, Or., parties.

On the Paul and Brimstone Robert Neill and others have a ledge over sixty feet wide, of which the croppings average $15 gold, besides silver and copper.

A great iron cap 150 feet wide covers a ledge, on which the Copper Mountain Mining & Milling Company have three claims, with another on a cross ledge with a capping fifty feet wide. A tunnel has been driven 133 feet along the footwall, cutting several rich stringers, and a cross-cut from the face has been started.

On the cross ledge the Safe Deposit Mining & Milling Company has the Mountain Boy, with an iron cap cropipng for its whole length. A surface specimen assayed $340 gold, and the extent and actual value of the ore will be proved by the development this year.

On another cross ledge eight feet wide F. C. Robertson, J. M. Hamilton, R. F. Rogers and others have the Bryan and Sewall and are sinking on it. At a depth of six feet the shaft showed ore throughout, averaging $45 gold, $7 silver.

On the headwaters of Teroda Creek, three or four miles further west, the Gold Dust Mining Company has two claims on a ledge of free milling quartz, assaying $14 upwards in gold, one assay having run as high as $2,673. The company intends to develop this ledge during the summer.

Another series of free milling quartz ledges of great size has been discovered in the northwestern part of the reservation, on Myers Creek and Mary Ann Creek. In order to reach this section one leaves the steamer at Johnson Creek and goes by road thirty miles to the government sawmill, five miles from the head of Sawmill Creek, then takes the Kettle River wagon road for twelve miles to the head of Mary Ann Creek.

These ledges extend in a belt northward from the three-cornered divide,

from which Mary Ann Creek flows east to Myers Creek, Rock Creek flows east to Kettle River and Sawmill Creek flows southwest to the Okanogan River. It cuts through a series of four great, bald buttes extending northward, in diminishing size, from Mount Bonaparte to the boundary, and formed of quartzite. The country rock is metamorphic slate, cut by dikes of porphyry.

The Hehe group, five miles southwest of the Hehe stone, is owned by A. E. Anrud and J. H. Calvert, and covers five parallel ledges of free-milling quartz. One ledge is fourteen feet wide, and in a ten-foot shaft shows ore carrying $30.80 gold and silver, only a small part of the value being silver. Another ledge twenty feet wide runs up the mountain from Hehe Stone, and assays $6 to $8 free gold on the surface, while a third shows several seams of quartz carrying $4 to $8 gold on the surface.

Five miles southwest of this group and due north of Mount Bonaparte, Messrs. Calvert and Anrud have the Porphyry group of five claims on a porphyry dike eighty feet wide and parallel with it. In this dike a sixteen-foot ledge of quartz crops on three claims, as defined by an open cross-cut, and shows colors in panning, while an assay ran about $12 gold.

The greatest and richest showing in this vicinity is on the Big Hole, at the forks of Mary Ann Creek, eight miles south of Camp McKinney, owned by George King, Charles Armstrong, C. P. Devine and Neal Undem, of Seattle, who have resumed work. The ledge is thirty to forty feet wide, of honeycombed quartz, and carries from a trace to $18 free gold, with two feet of pay ore, the lowest assay of which was $108.50 gold and the highest $600 gold, 218 ounces silver. The indications are that at depth the ore will change to galena. The same parties have the Cleopatra, on which an open cut shows eleven feet of ore with only one wall in sight. A number of small streaks of ore run through, assaying $18 to $20 gold and 8 to 18 ounces silver, and small particles of galena carrying gold and silver are discovered all through the ledge matter. It is intended to sink fifty feet on each ledge and then cross-cut to define the width.

On the extension of the Cleopatra, A. Walker has the Wenatchee, on which the ledge crops twelve feet wide between slate walls, and carries free gold and a little sulphurets in a slate and quartz gangue. A small shaft showed ore assaying $12 to $28.

The Columbia, on the boundary, has another great body of quartz 250 feet wide, an average sample of which showed $10 free gold.

On the Poland China, Neal Undem and Jerome Haskins have stripped the ledge for 100 feet in width and have not found either wall. The quartz carries free gold throughout, assaying all the way from $2.50 to $600.

Eight miles up Myers Creek from Kettle River and one and one-half miles from the boundary, P. H. Pingston has the Pingston claim on a blow-out of arsenical iron 50x100 feet, of which the decomposed surface rock assays $4 to $16 gold.

The Chicago and New York are on a ledge of sulphide ore, carrying $4 to $12 gold and copper in a quartz gangue, which a ten-foot open cross-cut shows to be nine feet wide.

Near the source of Myers Creek, Senator Turner, Congressman Jones, United States Attorney Brinker and Deputy Marshal Vinson have the Bimetallic on a seven-foot ledge of sulphide ore, assaying 12 per cent. copper, 6½ ounces silver and $2 to $3 gold.

Another great body of white and grey honeycombed quartz crops 200 feet wide on the Andruss, one and one-half miles south of the boundary and fifteen miles northeast of Oro, the owner being the Tenasket Gold Mining Company. Surface prospect holes have shown free-milling ore assaying $2.62 to $74.80 gold.

Placers are extensively worked during the summer on Myers, Fourth of July and Deadman Creeks, and in some instances have paid good wages, even for work with pan and rocker. Deadman Creek is located for eight or nine miles, the dirt panning as much as 40 cents a yard, not only in the creek-bed but in the high bars, rising 250 feet above it, and hydraulic mining ought to be profitable here.

NORTHPORT.

This town is not only the junction of the several branches of the Spokane Falls & Northern Railroad leading to Trail Creek and Nelson, but is the center of an organized mining district extending from the Kettle River eastward to the Metaline District and from the boundary southward to Bossburg. The part ofthis district between the Columbia and Kettle Rivers is described in the chapter on the Colville Reservation. The section east of the Columbia comprises part of the belt of silver-bearing country, of which the Slocan, Ainsworth and Nelson Districts on the north and the Colville and Cedar Canyon Districts on the south have experienced most development. The principal work now in progress is on Red Top Mountain,

east of Northport between the forks of Cedar Creek, and on the headwaters of that stream and on Deep Creek. At the head of Deep Creek the ore is principally galena and carbonates, with some azurite of copper, red oxide of copper and gray copper. At the head of Cedar Creek the ores are all silver-lead and carbonates, while directly east and south of Northport the ores are lead and gray copper, and at Little Dalles are of the same character. The district has the advantage of wagon roads to Northport, making transportation to the railroad cheap and easy, and the contemplated erection of a smelter at that town by the Union Smelting and Refining Company, composed of strong capitalists, holds out the prospect of reduction almost on the ground.

On Red Top Mountain, three miles in a direct line and five miles by wagon road from Boundary Station on the Spokane Falls & Northern Railroad, is the Clara group of four claims, owned by the Trail Creek Midland Mining Company, which is actively developing. Of the two ledges, one is in the contact between porphyry and slate and the other between granite and slate, the gangue being quartz carrying gold, silver and copper. A tunnel is in over 125 feet on one ledge and will be continued to 200 feet, when an upraise will be made of 150 feet and stoping will begin. A cross-cut will also be driven for 150 feet to tap the parallel ledge, when both will be worked from this tunnel. This work has shown nowhere less than six inches of good silver sulphide ore, the width frequently increasing to six feet and averaging between eighteen and twenty-four inches. A thirty-five foot winze from the tunnel at the 100-foot line shows improved value. A shipment of fifteen tons to the Tacoma smelter in October, 1896, returned $63.70 in gold, silver and copper. Ore of less value than $30 is held in the dump awaiting the erection of the smelter at Northport, ten miles distant by rail, and meanwhile the company is investigating a newly invented smelter with a view to erecting one, if a test should prove successful. The property can be developed entirely by tunneling and therefore at slight cost.

The Lakeview group, owned by the Lakeview Mining Company, consists of two claims on the same ledge and one on a cross ledge. The main ledge has been stripped for 150 feet, showing twelve to twenty inches of ore, while a 180-foot tunnel, an eighty-foot incline and a fifty-foot incline show twenty to forty inches of ore, three shafts six to ten feet deep making a similar showing. The ore carries chlorides, sulphides and bromides of silver and some native silver, and a number of assays, not only of the solid ore but of the ledge matter intervening between pay streaks, range from $8 silver and 80 cents gold in the slate gangue to $386.40 silver and $15 gold in the chlorides and bromides. One car load of this ore is said to have netted $1,100.

The Red Top Mountain Mining Company has two claims on the same mountain, on which a shaft is down 125 feet, showing the ledge to widen from seven to eight and one-half feet, with eighteen inches of galena assaying $78 in silver and lead, with a little gold, the remainder of the ledge being good concentrating ore.

On Deep Creek George Foster has a claim named after himself, on a ledge cropping twenty feet wide, on which he has worked intermittently for eight years. A number of open cuts, a tunnel of about forty feet and a shaft of about fifty feet have shown a good body of ore carrying about 40 ounces silver.

On the Iron Horse, also on Deep Creek, W. C. Taylor has a good ledge of iron and copper sulphides, on which he has sunk a small shaft, showing ore assaying $2 gold and 2 to 4 ounces silver.

On Onion Creek, which flows into the Columbia from the east seven miles below Northport, is a belt of gold-bearing sulphide ore in a quartz gangue, cut by the creek from a point two miles above its mouth. On the Alice May Messrs. Hansen, Paulson, Sherman and Roseberry have a ledge cropping twenty feet wide, in which a seventeen-foot shaft shows five feet of sulphide. The Lisburn Gold Mining Company has sunk twelve feet on the Lisburn, showing the same width of ore, and good results have been obtained on the Etna, Occidental, Wall Street and several other claims.

COLVILLE.

This district has reached a more advanced stage of development and produced more ore than any other silver district in Washington. It forms the southern half of a belt extending about ten miles east from the Columbia River across the Colville, and from the headwaters of Cedar and Deep Creeks, which empty into the Pend d'Oreille River near the boundary, southward for seventy-five miles, terminating in that direction in the Cedar Canyon District, which is described in another chapter. Like all other pioneer discoveries, it has had its alternate periods of activity and torpor, and now appears to have become the scene of renewed develop-

ment, in sympathy with the movement generally prevalent throughout the Pacific Northwest.

The formation of this belt of country is granite, lime, slate and quartzite, and is veined with a belt of bodies of silver-lead ores, running sometimes north and south and others east and west. These occur either in contacts between granite and lime, slate and lime, or slate and quartzite, or in fissures in the slate or lime. Where they occur in the lime formation the ledges show a good deal of surface disturbance, but at depth settle into permanent bodies of ore, either in chutes or veins. In the slate formation the ledges are almost invariably in place.

The first discovery was made in 1883 at the Embry camp, two miles east of Chewelah, by a party of prospectors sent out by John N. Squire, of Spokane. The ore in that section carries galena, sulphide of silver, some carbonate of lead and chloride of silver, mixed with iron and copper pyrites. A rush of prospectors followed within two years and explorations extended northward. Thus followed the discovery of the Old Dominion, seven miles from Colville, where the ledge is in a contact between granite and lime, the ore carrying bromide, chloride and sulphide of silver, with occasional bunches of galena. Then followed the discoveries at the head of Deep Creek and Cedar Creek and along the range east of the Columbia to Little Dalles, this territory being included in the Northport District. Fifteen miles further south, in the Young America at Bossburg, the ore is lead and silver entirely. Five miles further southeast, in the Big Bonanza, we find a heavy mixture of galena and iron pyrites, carrying about 40 per cent. lead and 10 ounces silver. Still traveling southward, we come to Gold Hill, two miles east of Marcus, where the ore is copper pyrites carrying gold. On Rickey Mountain, five miles more to the south, there is a great quantity of gray copper ore, but it is very much broken and no solid bodies have yet been found. Going fifteen miles onward to the south, we come to the Summit camp, where the ore carries galena and lead carbonates, and five miles to the southwest of this camp is the Wellington, with the same class of ore. Five miles south of this is the Cleveland mine, where the ore is galena carrying about 40 ounces silver. This mine is treated of in the chapter on Cedar Canyon, of which it is the pioneer. All the ores of this belt are high grade, except those of Deep Creek, where thy carry from 25 to 40 ounces silver and 40 per cent. lead.

The best developed and most productive mine in this belt is the Old Dominion, which embraces a group of claims covering the whole mountain and which is owned by the Old Dominion Mining and Concentrating Company. It is reached from Spokane by the Spokane Falls & Northern Railroad to Colville, eighty-eight miles, whence a wagon road leads to the mine, seven miles distant. The ore chute crops on the surface to a length of 400 feet in the contact between lime and granite, and in chambers forty to fifty feet wide. The mine was first developed near the surface by a series of tunnels aggregating 3,000 feet in length, attaining a depth of 250 feet. A tunnel was then driven 3,000 feet on the contact at a further depth of 400 feet and at the end of that distance struck a chamber of ore, which is now being developed. A cross-cut has also been started and has opened other small veins, ranging from six inches to twelve feet. The ore carries bromide, chloride and sulphide of silver, with some native silver, and its contents range from 25 to 125 ounces silver, with 30 per cent. lead and $3 gold. There is on the ground a concentrator with a capacity of seventy tons a day to treat the low-grade ore. The smelter returns show that about $2,000,000 has been taken out of the mine and, when shipping regularly, it produces about $16,000 a month gross, or $12,000 net, employing seventy-five men.

The Young America group of four claims is a quarter of a mile northeast of Bossburg, on the Spokane Falls & Northern Railroad, 110 miles from Spokane, and is owned by the Young America and Cliff Consolidated Mining Company. The whole property is covered with float and a ledge cropping twelve to twenty feet wide runs across all four claims. A tunnel was run 120 feet soon after discovery, at a depth of only thirty feet, and ore stoped to the grass roots. From this stope ore netting $40,000 at the smelter was taken, at a time when freight and treatment cost $30 a ton. After a long suspension, the mine was worked by lessees, who operated in the wasteful manner to be expected under that system when not properly controlled, and shipped ore aggregating $25,000 in value. The old tunnel exposes a chute fifty feet long and five feet wide of high-grade silver-lead ore carrying 90 ounces silver, 50 per cent. lead, and the entire face of the tunnel is in solid shipping ore. A cross-cut is being run to tap the ledge at a further depth of seventy-five feet. The croppings of a parallel ledge have been discovered, showing six feet of carbonates and two and one-half feet of galena.

The Bonanza, which is also reached from Spokane by the Spokane Falls & Northern Railroad to Bossburg and by wagon road five miles in a southeasterly direction from that town, recently fell into the hands of a number of miners who held liens and who have leased and bonded it for two years to John Hanley. The croppings show a true fissure ledge of low-grade ore from ten to forty feet wide between walls of slate, with an ore chute 200 to 300 feet long. A shaft is down eighty feet and an incline 150 feet, the latter

on a continuous body of ore, and a 100-foot drift connects the two. Several thousand tons of ore have been shipped, its character making it desirable for fluxing, and three or four car loads will be shipped before the coming May.

Traveling on southward, we come next to the Summit group of five claims, owned by the Summit Mining Company, ten miles by wagon road from Addy Station, which is seventy-four miles by the Spokane Falls & Northern Railroad from Spokane. This group is on a series of five parallel ledges of sulphide and galena ore, one of which is in the contact between slate and diorite, while the others are in fissures in the slate. All are dipping into the mountain at such angles as to encourage the belief that they will unite in a great contact vein at a depth of 600 feet or less. In a 130-foot shaft one ledge widened from thirty inches to five feet, maintaining the latter width for the last sixty feet, and five drifts on it are each thirty feet long, all in ore. An average sample of hand-sorted ore assayed 50 ounces silver, 53.2 per cent. lead, and the whole ledge will concentrate. On a four and one-half foot ledge, 120 feet to the west, a shaft is down 110 feet, showing quartz mineralized throughout with galena and carrying occasional bunches of that mineral, with perfect walls. A fifty-foot shaft on the same ledge 125 feet further north also shows it equally strong and well defined, containing ore of which the concentrates will carry 1½ ounces silver to the unit of lead. Another vein eight inches wide is shown by a 125-foot shaft to be solid ore carrying gray copper, silver and gold, and assaying $90 to $1,000, one shipment having returned $155.15 gross, or $136.15 net. About 160 feet of drifts have been run from this shaft and a cross-cut is in forty feet to tap the ore chute shown in the croppings. A thirty-foot shaft on another ledge shows three feet of quartz carrying gold and silver. The company is continuing development, shipping the high-grade ore and reserving the second-grade, of which there is over 1,000 tons on the dump, for concentration by a plant to be erected in the fall. This ore will go 6 into 1 and make concentrates worth about $70 a ton.

Three and one-half miles by road northeast of Chewelah, in the Colville Valley, which is sixty-five miles by the Spokane Falls & Northern Railroad from Spokane, is the Eagle group of six claims, owned by I. S. Kaufman, C. D. Ide and C. W. Ide. The croppings show large deposits of galena and sulphides of silver in a limestone formation. Two shafts 200 and 115 feet deep respectively have been connected by a series of drifts on the ledge, making an aggregate of 2,500 feet of development. This work shows ore chutes ranging from eighteen inches to eight feet in thickness, connected by stringers, and about $20,000 worth of ore has been taken out, ranging in value from 25 to 100 ounces silver, 40 to 70 per cent. lead.

The Buck Mountain group of eight claims, owned by the Buck Mountain Mining Company, is four miles north of Cedar Canyon and twelve miles by road from Springdale, which is forty-seven and one-half miles from Spokane, on the Spokane Falls & Northern Railroad. One ledge is six feet wide in a twenty-two foot shaft and in tunnels sixty and forty-five feet, which show eight inches of solid galena and bunches of that mineral throughout the ledge, growing more solid with depth. One car load returned 61 ounces silver, 77½ per cent. lead, and assays have averaged about that figure. Another ledge is seven and one-half feet between lime and granite walls and in a thirty-foot shaft shows chloride and gray copper ore throughout, assaying 64 ounces silver, $3 gold, 8 per cent. copper. Another ledge crops ten feet wide and carries chlorides, which assay 36 ounces silver, 12 per cent. copper, $5.20 gold. Three claims are along another ledge between slate walls, which a forty-foot shaft shows to widen from three and one-half to seven feet. Three assays from samples taken at increasing depths showed 40, 52 and 64 ounces silver respectively.

Two miles southeast of Springdale by road is the Honest Johns group of three claims, owned by the Honest Johns Mining Company. The croppings show a sixty-foot ledge containing lead carbonates. A cross-cut has been driven 280 feet to tap the ledge 175 feet below the surface and will do so in about 100 feet more. It has cut a thirty-inch stringer carrying 41 ounces silver, 31 per cent. lead and $2.20 gold, besides 20 per cent. iron, which makes it a good fluxing ore.

CEDAR CANYON.

About most of the mining districts of the Pacific Northwest there is little of the romantic to make their names live in history, but Cedar Canyon is an exception. The greatest discovery there was made accidentally by a bankrupt farmer who knew nothing of mineral, and in the face of ridicule he persisted in shipping some apparently worthless sand to the smelter. When it netted him good returns, other bankrupts like himself went into the district, and most of them are now comfortably off, and regard the

foreclosing of mortgages on their farms as the beginning of their good fortune.

For Cedar Canyon the starting point is Spokane. The Central Washington train may be taken for Davenport, fifty miles west. Then a horse or buggy will take one over a good road for thirty-five miles to the head of the canyon, which is in the Huckleberry Mountains north of the Spokane River. Over this road the ore is hauled to Davenport in half a day, it having been greatly improved and shortened in the last year. An alternative route is by the Spokane Falls & Northern Railroad to Springdale and thence by a wagon road twenty-two miles, which will be shortened and improved this season.

A precursor of the discoveries on Cedar Canyon proper is the Cleveland, which was found in June, 1894, by Messrs. France, Finsley and Lingenfelter, who have bonded it to Messrs. Monahan, King and McAulay. The ledge is eight feet wide, carrying galena, with antimonial silver on the surface, and was tapped by a 200-foot cross-cut. From this a drift was run 150 feet, a winze sunk sixty feet and an upraise made for twenty feet, the ore being then stoped out. The ledge occasionally pinches to two feet, but has produced about 1,500 tons of ore, of which 800 tons shipped to the smelter assayed $22 to $80 a ton in silver and lead. The main ledge has been struck forty feet higher up the mountain and carries 25 ounces silver and 59 per cent. lead. This mine is now operated under lease from the owners.

On what is probably the extension of the Cleveland ledge Dr. J. P. Turney, A. W. Turner, C. G. Snyder, H. H. McMillan and C. E. Richard, of Davenport, have the Bland. It is six to eight feet between lime walls, as shown by a cross-cut, and carries antimonial silver, carbonates of copper and azurite, assaying 52 ounces silver, 5 per cent. lead and a trace of gold.

These locations were the forerunners of the most valuable discoveries on Cedar Canyon, in the course of which the extent and character of this mineral belt has been pretty clearly defined. The country rock is augite syenite overlaid with quartzite 100 feet thick. The ledges associate closely with phosphate lime, which varies in thickness from 4 to 100 feet. The ore is in quartz and includes sulphurets, which assay 500 to 2,500 ounces of silver, galena carrying 20 ounces of silver to each unit of lead. The lead carries considerable copper, which decomposes and colors the quartz with carbonates of copper and lead, azurite, malachite and yellow carbonates of lead. In some ledges there also occur silicate of copper and sulphide of silver in streaks, as well as a little zinc and brittle silver.

The discovery of the Cleveland stirred up interest in Davenport, and George Gibson, B. O. Gibson, Charles Golden and W. O. Vanhorn went prospecting in Cedar Canyon in August, 1894, and Golden located the Deer Trail and Royal. One day, while pursuing two deer, Vanhorn stumbled over a big quartz boulder carrying galena, and immediately went prospecting down the mountain, where he and his brother, Isaac L. Vanhorn, located the Deer Trail No. 2. They had pieces of the boulder assayed and found it carried between 70 and 80 ounces silver to the ton. A tunnel was then run for 100 feet from the croppings, partly through a solid formation and partly through red sand and gravel, but showed no regular ledge and therefore was stopped. W. O. Vanhorn panned down some of the red sand for gold, but found strings and flakes of native silver. He then sacked two and one-half tons and hauled it to Davenport. After enduring much ridicule and with great difficulty he raised enough money to pay the freight, and received in payment about $150 a ton. He then shipped nine tons more, which brought him $1,360.

The Deer Trail No. 2 is now the principal one of twelve adjoining claims, all owned by the Deer Trail No. 2 Mining Company, and has developed into one of the best paying mines in Washington. It has been shown with tolerable certainty that the red sand, gravel and boulders into which the tunnel ran is part of a true fissure ledge which has either broken off and settled with the settling of the mountain, or has been heated and decomposed by the slaking of the lime walls. The break-over pitches into the mountain at an angle of only 15 degrees, so that the face of a 200-foot tunnel is only seventy-five feet beneath the surface. The red sand is simply rich mineralized quartz, decomposed and acted on by fire due to the slaking of the lime. The croppings carried 28 ounces in the form of black sulphurets and galena. A tunnel run 180 feet into the mountain from this point showed the ore in a vein one to six feet thick, cutting through lime and quartzite and pitching east about 15 degrees, while the country formation ran almost perpendicularly into the hill. As the tunnel ran in the ore grew richer and began to show green carbonates of copper, azurite, malachite, oxycarbonate of lead, native silver in strings and flakes, and steel galena. The flakes of native silver are sometimes as large as a silver dollar and thin as tin foil. The first car load from near the mouth of this tunnel netted $237 at the smelter, the second over $600, the third $1,000, and they increased in value until one car load netted over $2,900. A quarter of a car load shipped later carried 5,600 ounces to the ton. As the tunnel advanced up the hill on the pitch of the vein, the latter grew thinner, until at last it ran out altogether.

CEDAR CANYON

STEVENS COUNTY.

WASHINGTON.

INDEX TO NUMBERED CLAIMS.

1. Ester Hilbert.
2. Nancy Hanks.
3. Home Stake.
4. Fairview.
5. Blue Grouse Ext 2
6. Horn Silver.
7. Plata Fina.
8. Plata Rica.
9. Sunday Morning.
10. Saturday Night.
11. Cluster.
12. Silver Basin.
13. Brittle Silver.
14. Shasta.
15. Lone Star.
16. Tenderfoot.
17. Silver Queen.
18. Brooks.
19. Dixie Queen.
20. Moonshine.
21. Elephant.
22. Legal Tender.
23. Victoria.
24. Providence.
25. Runyon.
26. Deer Trail No. 2.
27. Royal
28. Deer Trail No. 1.
29. Hoodoo No. 2.
30. Hoodoo No. 1.
31. Hoodoo Ext.
32. Josephine
33. Idaho.
34. Cleveland.

Hunter Creek

34

SCALE OF MILES

0 1 2 3

Columbia River

to Hunter Creek

FRUITLAND.

to Davenport

Cedar Canyon

to Springdale

CEDARVILLE.

Railways

Wagon Roads

MAP SHOWING ROUTE TO MINES.

Columbia River

HUNTER CREEK.

Hunter Cr.

FRUITLAND.

Cedar

CEDARVILLE.

Spokane Falls and Northern Ry

SPRINGDALE.

SPOKANE

INDIAN RESERVATION.

Spokane River

DAVENPORT.

Central Washington

30 29 28 27 26 25

36 37 38 39 40 41

N

Webster Brown

CIVIL AND MINING ENGINEER.

SEATTLE, WASH.

MINING IN THE PACIFIC NORTHWEST.

The theory as to there being a ledge in place was confirmed when No. 2 tunnel was started further south, for it was found close to the mouth, running down almost perpendicularly with the country formation between walls of lime phosphate and syenite. Several tunnels have been run into the ledge 100 feet below the highest workings, where it is still three to five feet wide and is straightening up, dipping at an angle of 40 degrees. From one of these tunnels a drift has been run 100 feet one way and fifty feet the other, showing up more solid ore, carrying sulphides and galena, of about the same value as that above. This proves the permanence of the ledge, which evidently changes its pitch according to the disturbance which has occurred in the mountain.

When development began on a large scale tunnels were run at five different places, showing up the ledge for about 600 feet in length. There is now an extensive system of tunnels and drifts aggregating about 2,000 feet. As the ledge is almost level, the ore was stoped out from the side of the tunnels and the old workings were filled up with the waste material. As work progressed, it showed the ore varying in thickness from one to six feet. It is richest at the thinnest points, the red sand carrying most value and being either distributed through or lying on top of the other mineral. The ore is so soft that it can be mined with pick and shovel and often crumbles in the fingers, but the increased cost of timbering and sorting offsets the saving in powder. Smelter returns have averaged about $150 a ton and have ranged from 150 to 500 ounces of silver, from $2 to $20 gold and 7 per cent. lead, but some assays have run as high as 3,000 and as low as 10 ounces. Only ore running over 80 ounces in silver has been shipped and there is now a quantity of this low-grade ore on the dump estimated to contain 500,000 ounces. In addition there is a vein of sand in the mine fourteen inches wide above and below the main ore body which contains about 20 ounces silver per ton and which has not yet been disturbed. Negotiations are in progress for the erection of a concentrator in the district to do a customs business and treat this large accumulation of ore.

Dividends have been paid aggregating over $40,000, in addition to the amounts divided among the owners before the property passed into the hands of the corporation.

The Deer Trail ledge has been traced to the south through the Jolly Boy, owned by W. A. Crawford, J. A. Cameron and Seth T. Emerson, and the Elephant and Moonshine, and to the north through the Royal.

The discovery of another ledge on the other side of the canyon followed that of the Deer Trail and this has been traced through a string of claims for 16,500 feet. It was found by C. W. Burdsal and C. T. Porter, who located the Saturday Night, Sunday Morning and Plata Rica. On the Saturday Night a 100-foot shaft and thirty-five foot drift showed two to five feet of ore, two tons of which, shipped from the fifty-foot level, returned 71 ounces silver at the smelter. In the second fifty feet the shaft ran through ore carrying 150 to 200 ounces, on which a drift is being run at the 100-foot level. A ledge eighteen inches wide is shown up in a cross-cut and a fifteen-foot shaft on the Sunday Morning, with streaks one to three inches wide carrying sulphurets running into it. A shaft is down on the Plata Rica ledge six feet wide, carrying streaks of ore two to twelve inches wide, and a cross-cut taps the ledge below in about 330 feet, one shipment giving good returns.

A good property on the same ledge is the Plata Fina, owned by Messrs. Burdsal, Porter and T. G. Smail. An eighty-foot shaft shows three feet of ore, on which considerable drifting has been done and the first shipment gave good returns. On the Delaware Harvey Jones has tunneled about 100 feet on a four-foot ledge. The Vanhorn brothers have sunk eighty-five feet on the Silver Queen, showing four feet of good ore; Mr. Keeler has tunneled on the Pride of the Valley with good results; and the ledge has been cross-cut on the Oro Fino by J. F. Conkling. The Esther Hilbert group of seven claims, owned by Len Coombs, Fred Lauer, H. Allen, I. Breslauer and Charles Young, has a shaft down fifteen feet on a thin streak of ore carrying 40 to 200 ounces silver, and the ledge has been cross-cut 100 feet deeper by a 160-foot tunnel, from which a drift has been run 100 feet on the ledge.

Discoveries were extended last year in all directions from Cedar Canyon. At the head of Oropathan Creek Alfred Hughes and John O' Leary have the Highland Chief on a four and one-half foot ledge between walls of granite and lime, the ore carrying carbonates of copper and sulphurets of silver, and assaying 120 ounces silver. On the Rattler group of two claims, seven miles west of Cedar Canyon, Dr. J. P. Turney and others have a large broken ledge of decomposed quartz carrying 12 to 300 ounces silver. A shaft is down sixty feet on the broken ledge and another thirty-eight feet on the solid ledge matter.

This district has the distinction of having been developed almost entirely by the original prospectors with the money they took out of the ground, the sole exception being the Deer Trail No. 2, which is paying good dividends.

Another section tributary to Davenport is the Egypt District, near the confluence of the Spokane and Columbia Rivers, where great ledges of quartzite jut out in the canyon walls. At the foot of Pitney Butte is the

Egypt, owned by Charles Grutt and sons, of Davenport, on which a four-foot ledge of galena is tapped by a 120-foot cross-cut and is opened by a tunnel. On the Silver Queen, Greenville Blake has shown eighteen inches of galena ore, assaying 60 to 130 ounces silver, besides copper and lead, by sinking a forty-eight foot shaft, from which he has drifted sixty-five feet. On Mill Canyon, ten miles from Davenport, C. G. Snyder, H. A. P. Myers, Dr. J. P. Turney, H. H. McMillan and Charles L. Young, all of Davenport, have the Iron Crown group of five claims on four parallel ledges, assaying from $33 upward in gold. One ledge is shown thirty feet wide by a thirty-foot shaft and thirty-foot cross-cut at the bottom. A cross-cut 100 feet below has tapped the second ledge, sixteen feet wide, assaying 7 per cent. copper, and is being extended to the first ledge. A mile south of this group C. L. Young, W. K. Snyder, C. G. Snyder, G. E. Brown and J. T. Young have the Elkhorn, on which a forty-foot cross-cut has tapped eighteen inches of galena ore. On the United Workman group of two claims Dr. Turney and C. L. Young have sunk a shaft twenty-six feet on a six and one-half foot ledge carrying gold and silver, while a tunnel showed ore in ten feet, assaying 12 ounces silver, $3 gold. The John L., near Fort Spokane, owned by Col. William Ridpath, has a 125-foot shaft on a ledge carrying galena, a sample shipment of which netted $135. A tunnel is being run on the ledge.

MINERAL CREEK.

In a broad belt of limestone cut by Mineral Creek and on a spur from Mount Rainier,, between Green River and the Summit district, is a series of mineral ledges carrying gold, silver and copper in various forms, principally galena, on which citizens of Tacoma, Centralia and Chehalis have done a large amount of development. The first discovery was made in July, 1891, by John T. Davis and James A. Evans and prospecting has traced the belt across to Washington and Bear Creeks. The country rock is dolomite and the ledges are in fissures in slate, running northeast and southwest, the gangue being calcite and talc.

The district is tributary to Tacoma, being fifty-four miles southeast of that city. The route is by the county road from Tacoma to Elbe, on the Nisqually river, the Lewis county road thence to the mouth of Mineral Creek and a trail for seven miles to the head of the creek.

The first discovery was the Waterfall, by Messrs. Davis and Evans, on the middle ledge of five which are cut by Mineral Creek and are almost parallel. On these the Davis & Evans Mining Company has fourteen claims, which it is developing. Nearest the mouth of the creek is the Iron Mine, which shows brown hematite, carrying gold and silver in the croppings, and is said to have sixteen feet of solid ore carrying $15 to $18 gold and silver. A thirty-foot shaft is down on the ore body. The Contact has a twenty-foot ledge with several streaks of galena aggregating four feet and assaying about $40 gold and silver. Tunnels have been driven 140 and 100 feet and connected by a winze and a shaft is down seventy feet, with several cross-cuts and drifts from it. From these workings a large quantity of ore has been taken and is ready to ship. On the Waterfall a thirty-foot shaft and tunnels twenty and forty feet have shown four feet of ore of the same grade as the Contact.

On the south fork of Mineral Creek this company has the Tacoma on a body of ore seventy feet wide, which a surface cross-cut shows to have sulphides of manganese disseminated throughout the ledge matter, while assays show it to carry $4 and more in gold.

On the Eliza, the Mineral Creek Mining Company has a twenty-foot ledge, on which a tunnel over 100 feet long shows three to four feet of galena ore. The same company has driven a tunnel forty feet on the Goldie, showing a still larger body of ore.

On the Mary Ann, Dr. C. B. Martin has three ledges, eighteen inches to four feet wide, showing good pay streaks in tunnels fifteen, twenty-five and forty feet long.

On the Mashell river, within three miles of the wagon road, the Co-operative Mining Syndicate of Seattle is developing the Jessie Harper group of nine claims. These are on a ledge of free milling quartz, which has been uncovered at several points, and is thus shown to be continuous for over 500 feet, while a twenty-foot shaft and several surface cross-cuts show eight feet of gold-bearing quartz. The surface ore averages $3 to $5 gold and assays have run as high as $52. A cross-cut, now in 165 feet, will tap the ledge thirty-five feet further at a point below the shaft. Gold has been panned out of the creek below this property and is presumed to have been washed out of the ledge.

The wagon road could be extended to the Jessie Harper and up Mineral Creek at moderate expense.

TRAIL CREEK.

The element of romance in the business of mining, which gives it a fascination for those unfamiliar with its dry technical details, is particularly strong in the history of the development of Trail Creek. It is the story of a few plucky, determined men in an almost bankrupt city engaging in a mining venture in a wild, remote section of the British Columbia mountains, and proving to be of incalculable value mineral deposits which men of long training and experience had pronounced worthless. It is the story of perseverance in the face of poverty, the incredulity of neighbors and every natural obstacle. The climax of this story is the dividends paid by the principal Trail Creek mines, the return of prosperity to Spokane, whose citizens had pinned their faith to and risked their scanty means in those mines, the growth of the city of Rossland in the mountain wilds, and the haste with which mining experts revised their theories to fit the indisputable facts. A new era of mining activity in the Pacific Northwest began with the development of Trail Creek, and to Spokane belongs the honor of having opened that era when doubt and fear paralyzed the energies of other communities.

The Trail Creek Mining District is in the Gold Range of mountains and extends six miles northward from the boundary and seven miles westward from the Columbia River, its center being Rossland, at an elevation of 3,200 feet above sea level. The trail built by the British Columbia Government on a line surveyed by Lieut. George Dewdney in 1865, in order to open a way from the Coast to the Wild Horse District during the placer mining excitement, passes through the district and gives its name to Trail Creek. The principal mines are on a line of rounded peaks north of Rossland, of which Red Mountain is the chief, with Spokane and O. K. Mountains on the west and Monte Cristo and Columbia Mountains on the east; also on Deer Park and Lake Mountains south of the town, through which runs what is known as the South Belt. Discoveries have also extended to Grouse Mountain, four miles to the south, directly on the boundary, and eastward to Lookout Mountain, overlooking the confluence of Trail Creek with the Columbia River. It is now accessible by two lines of railroad. From Spokane the Spokane Falls & Northern and Columbia & Red Mountain Railroads run trains through to Rossland, a distance of 147 miles, a ferry conveying the trains across the Columbia River pending the erection of a bridge. An alternative route is to leave the railroad at Northport and take a steamer up the Columbia River twenty-five miles to Trail, and then go by the Columbia & Western train thirteen miles to Rossland. From Vancouver one goes by the Canadian Pacific to Revelstoke, 379 miles, thence by a branch line to Arrowhead and by steamer down the Arrow Lakes and the Columbia River to Trail, whence the Columbia & Western train will take one to Rossland.

The geology of the district is described in much detail in a report by R. G. McConnell to the British Columbia department of mines on the southern half of West Kootenai. He says:

"The most notable feature in the geology of the district examined is the marked predominance of rocks of igneous origin. Two great series are represented, of which the older consists mostly of porphyrites, diabases, gabbros, tuffs and agglomerates, and the younger of granites."

Further on, he thus describes the eruptive rocks in and around Rossland:

"At Rossland, the central member of the group, is a fine to coarse-grained gabbro, apparently passing in a couple of places into a uralitic granite. The gabbros occupy an irregular-shaped area with a length of about four miles and an average width of one mile. They extend from Deer Park Mountain eastward to the westward base of Lookout Mountain. The line of junction between the gabbros and bordering porphyrites, commencing at the northwest corner of the area, runs south through the Cliff, War Eagle and Le Roi claims, then, turning to the west, circles round a spur from the main area which covers part of Deer Park Mountain and continues eastward in a sinuous line, passing about a quarter of a mile north of the Crown Point mine to the foot of the west slope of Lookout Mountain. The northern edge of the area runs from the Cliff mine eastward to Monte Cristo Mountain, then bends more to the south, skirting the southern base of the Kootenai-Columbia Mountain, continues in a southeasterly direction towards Lookout Mountain. The eastern edge of the area has not been precisely defined, owing to the absence of sufficient exposures. The gabbros are fringed with a varying width of augite and uralite porphyrites, and fine-grained diabases. The passage from the porphyrites to the gabbros is nowhere sharply defined and the two rocks have apparently originated from the same magma, but have cooled under different conditions.

"The gabbros and bordering porphyrites are important from an economic standpoint, as most of the ore bodies at present being worked are situated either on or close to their line of junction. In passing outward from the

gabbro area, a section taken at almost any point shows a bordering zone of brecciated porphyrites and diabases of varying width, but seldom exceeding a mile, beyond which comes an alternating series of porphyrites, tuffs and slates, and still farther away agglomerates, associated in places with fossiliferous limestone, make their appearance. Slates and tuffs occur with the porphyrites on Red Mountain, on Kootenai-Columbia Mountain and south of the gabbro area on Lake and Bald Mountains, and the ridges running south from them. Agglomerates make up the main mass of Sophia Mountain and occur with slates, tuffs and porphyrites on Granite, Spokane, Grouse and Lookout Mountains, and on the ridge immediately east of Sheep Creek."

Mr. McConnell believes the ore bodies to be replacement veins along lines of fissuring and gives his reasons in the following language:

"The blunt irregular outlines of some of the ore bodies and their fissure-like regularity in others, the presence in most cases of a single wall which is often meaningless as a confining line, and the occasional lack of any wall, the gradual blending of the ore with the country rock and the presence of the latter as the principal gangue, are all characters consistent with the disposition of the ore from ascending heated waters, which have eaten away portions of the country rock along lines of fracturing and replaced it by the minerals held in solution. The definite and approximately parallel direction and dip of the majority of the Rossland leads, the silicious character of many of the ores and the presence of calcspar in seams and irregular pockets, tell against the theory of original segregation, which has of late years been applied to somewhat similar deposits in different parts of the world, while the ordinary earmarks of fissure veins, as usually understood, are seldom observable."

The geological formation is described in language which will appeal more to the ordinary mind by C. C. Woodhouse, the mining engineer of Rossland. He describes it as a patch about four by two miles, in which the gabbro rock broke through the older formation and overflowed, just as water pours through a hole broken in ice. The richest ore bodies are on the line of fracture in the original formation, and other belts of gold-bearing chalcopyrite and pyrrhotite in gabbro and diorite are found where similar eruptions have occurred.

In this formation the ledges are easily located in almost every instance by the red capping of oxidized iron, varying in thickness from a few inches to twenty feet. This contains but little gold or silver and this fact caused the condemnation of the ore bodies as worthless by the experts. But when the capping is broken through, the ledges are found to contain great bodies of pyritic ores—pyrite, pyrrhotite, chalcopyrite, arsenopyrite—carrying gold in increasing quantity as depth is attained, with about 3 ounces of silver, and copper ranging from 2 to 22 per cent. Towards the west, the ores are more silicious, as in the O. K., I. X. L. and other mines, and are free milling and concentrating, pyrites occurring only in streaks. On the South Belt the silver value is much higher than on the north belt, and galena is not infrequently associated with the pyrites. The average value of the ore so far shipped is about $37, though in the deeper levels of the Le Roi and Center Star chutes have been struck which ran over $100 in value.

In his report of August, 1896, on this district, William A. Carlyle, the provincial mineralogist of British Columbia, says:

"Much prospect work has shown clearly that here is a large system of lines of fracture with an east by west and northeast by southwest trend, and a persistent northerly dip, along which more or less ore has concentrated, either as bodies of solid sulphides or sulphides scattered through the country rock. Some of these fissures can apparently be traced through several 1,500-foot claims, and along them are the large ore chutes now being mined or developed, the maximum width of pay ore so far being about thirty-five feet, and maximum length 310 feet. Many of these fissures have been or are now being prospected, and in many instances with surface indications of the most unfavorable character, the improvement has been very marked in the increase of the amount of ore and its value, and the great probability that more rich ore chutes will be found by following these fissures has made all such property valuable, and is deciding the commencement of extensive exploratory work. Again, large chutes of low-grade ore, mostly the coarse-grained magnetic iron pyrites or pyrrhotite, assaying from traces to $6 to $8 in gold, have been found and are being explored for better grade ore, and so far with some success."

Mr. Carlyle classifies the ores as follows, exclusive of the free milling quartz of the O. K. mine:

"(a) Those large deposits of coarse-grained massive pyrrhotite, locally known as the 'iron ore,' in which very little or no value in gold is carried.

"(b) The ore found in many claims on the South Belt, as the Lily May, Homestake, Mayflower, Curlew, Gopher, R. E. Lee, etc., in which the sulphides are not pyrrhotite, but iron pyrites and marcasite (white iron), with in some of these mines much arsenopyrite, and also zinc blende and even galena, in which case the silver value exceeds the gold, and the percentage of copper is very small or nothing.

"(c) The typical ore of the camp as sold by the Le Roi, War Eagle,

Iron Mask, or Josie, is divided into first-class and second-class. The first-class consists of nearly massive fine-grained pyrrhotite and copper pyrites, osmetimes with a little magnetite, or mispickel, with more or less quartz and calcite. In this class of ore, as got from the lowest workings of the Le Roi, the amount of quartz is much higher, the smelter returns giving 41 to 52.8 per cent. silica, and 20.6 to 26.8 per cent. FeO., but this is proving the best ore in the mine. The average smelter returns were on 1,200 tons, 2.6 ounces of gold, 1.8 ounces of silver, and 2.5 per cent. of copper, or $53.05 net per ton, while some shipments went as high as 4.06 ounces in gold.

"The second-class ore, and the bulk of the ore of the camp shipped will be most probably of this character and value, is a diorite with a comparatively small percentage of these sulphides, but the value is still very good; 1,800 tons of the Le Roi, second class, yielded by smelter returns, an average of 1.34 ounces of gold, 1.4 ounces of silver, and 1.6 per cent. copper, of $27.97 net per ton."

The first discovery in this district was made in 1887 by George Bowman and George Layson, who had assays made showing the ore to run high in silver. They kept their secret so well that, although others followed their trail, it was not till two years later that Oliver Bordeau and Newlin Hoover traced it to a ledge on the South Belt, on which they located the Lily May.

The first locations on Red Mountain were made on July 7, 1890, by Joseph Bourjouis and Joseph Morris, and were the Center Star, War Eagle, Idaho and Virginia. They also staked out the Le Roi and took samples for assay. These gave such low values that they readily accepted an offer of E. S. Topping, the mining recorder at Nelson, B. C., to take one of the claims in lieu of his fees. Being offered his choice, he took the Le Roi. About the same time the Josie was located by Harry Sherrin for himself and R. E. Lemon, of Nelson.

Mr. Topping obtained samples from the Le Roi and, taking them seventy miles to Colville, Wash., received assays showing as high as $500 gold. He showed his specimens to George M. Forster and Col. William Ridpath, two Spokane attorneys who were attending court, and they induced him to go to Spokane and show the ore to Oliver Durant, an experienced mining engineer. That gentleman bonded sixteen-thirtieths of the claim for six months for $30,000, and was joined in the venture by a coterie of lawyers, including Messrs. Forster and Ridpath, Senator George Turner, Col. W. W. D. Turner and Frank Graves, agreeing to do $3,000 worth of work during the six months. This was in November, 1890, and in the following spring a shaft was down thirty-five feet in ore which ran as high as $472. The bond was taken up, Mr. Topping's remaining interest was bought and the Le Roi Mining & Smelting Company was organized. In the fall of 1891 the first car load was packed out and shipped to a smelter at Butte, where it returned $86.40 in gold, silver and copper.

Despite this evidence of the possibilities before the Le Roi, the stock was long a drug on the market, and stories abound of how it was accepted at a few cents a share with much grumbling, in payment of debts to persons who have since been made rich by it. A boarding-house keeper took it in payment of a board bill hopelessly in arrears, a stenographer accepted it for arrears of salary because it was "Hobson's choice"; a tailor took it in payment for a suit of clothes. All accepted it under protest, but stored it away in the hope that "it might be worth something some day," and many have thus acquired unexpected riches.

The Le Roi is not only the bonanza but the pioneer of the camp, for it was not until 1893 that the development of other properties began, and in the summer of that year a wagon road was cut to Trail landing, and the first load of Le Roi ore was hauled out. The construction of a road down Sheep Creek to Northport, sixteen miles distant, soon followed, and the camp emerged from the prospecting to the mining and shipping stage of its career. Early in 1896 the Columbia & Western narrow gauge railroad was built from Trail, on the Columbia River, to Rossland, by F. August Heinze, who has also built a pyritic smelting plant at Trail with a capacity of 350 to 400 tons a day, and is continually enlarging it. Last year also the Columbia & Red Mountain Railroad, standard gauge, was built from Northport to Rossland, as an extension of the Spokane Falls & Northern, and thus the camp now has all-rail connections, which will receive their finishing stroke with the completion of the bridge now under construction across the Columbia at Northport.

The Le Roi property includes two claims and a fraction on Red Mountain, having a capping six to fourteen feet wide, tracable for 200 to 300 feet in a northeast and southwest direction. This capping covered a chute of pyrrhotite and some chalcopyrite for the whole distance, until at the west end the ledge branches into two or three smaller ones, which can be traced onward. A shaft was sunk on this chute, at first at a pitch of 45 degrees, but gradually increasing its pitch until at 535 feet it is nearly vertical. This shaft is all in ore, and drifts have been run from it at each fifty feet from the 150-foot level downward, showing the ore chute to widen out, its greatest width being thirty-five feet at the west end of the 450-foot level. From this level a stope is being worked up to the 350-foot level, and has all ore under-

neath. The ore chute was cut off by a fault on the west, but the drift on the 500-foot level has been extended through it, and has now advanced 125 feet through the highest grade ore yet discovered in the mine. Five assays of samples taken on January 11 from the face of the drift five feet wide gave an average of $136.64 gold, and ten assays from the bottom of the shaft on the same date gave an average of $58.96 gold. On the 450-foot level the stope averages twenty-five feet wide, but at a distance of 172 feet from the fault in the west level the ore is cut off by another fault running through the upper workings. The ore body has been again discovered beyond this fault twelve feet wide on the 450-foot and fifteen feet on the 300-foot level, and the same conditions have been found on the lower levels. The ore has been stoped for sixteen to twenty feet from the 450-foot level and is twenty-five to thirty feet wide in the roof, thirteen to fourteen feet of it being of first grade. A 300-foot diamond drill-hole has been sunk on the pitch of the ledge below this level. On the 350-foot level the stope averages twenty-five feet wide for 170 feet, and a dril-hole in the hanging wall shows twenty feet more of mixed ore. On the east side three drill-holes were put in, one showing twenty-six feet of low-grade ore beyond twenty feet of barren rock in the footwall; another forty feet straight ahead beyond a fault into a fine body of ore, in which a twenty-foot chamber has been cut. On the west this stope is in twelve feet of good ore, with ten feet of mixed ore in the hanging and five feet in the footwall. On the 300-foot level a wide body of good ore has been stoped, and much second-grade ore is now being mined.

It has been recently discovered through excavations for a 500-ton hoist that the rusty red iron-stained rock has a width of 110 feet, dipping into the mountain at an angle of 45 degrees, under a diorite dike. About 800 feet west of the old workings a tunnel known as the Peyton tunnel has been driven forty feet, and at twenty feet struck pay ore which now shows a solid face of eighteen feet. A platform and orebins are being erected, and a wagon road is in course of construction to deliver this ore to the smelter. Its value runs about $40 gold and copper, and the management believes it has here as large and good a chute of ore as in the old workings.

It was estimated on January 1, 1897, that fully 3,500 feet of work had been done in the mine, and that 6,257 cubic fathoms of ore and waste, equal to 93,654 tons, had been hoisted. The mine is now shipping 150 tons of ore daily, fifty tons going to the Trail smelter, and the remainder going to Tacoma, Everett and East Helena. A new forty-drill compressor plant is now in satisfactory operation, and before this book is published a new hoist will be in operation, capable of delivering 1,000 tons a day, this new machinery having cost $80,000.

The mine employs 160 men and pays $15,000 a month in salaries and wages, and $20,000 a month for fuel, supplies and other expenses. It has not only paid for its development and equipment, but has paid $350,000 dividends, which are being declared at the rate of $50,000 a month.

The most important recent discovery in regard to the Le Roi ore is that it is changing character at depth, and becoming susceptible of reduction by the free-milling and concentrating process. This was proved by a recent mill-test at the O. K. mill with a lot of ten and one-half tons of an assay value of $16 gold and silver. Although the ratio of concentration—6 to 1—was so low that there was not sufficient concentrator capacity to treat the pulp of all ten stamps, and closer saving could have been accomplished with five stamps, the result was satisfactory. The total value of gold and silver saved on the plates was $67.85 and in concentrates $43.82, an extraction of 65 per cent. A further test with fifty-one tons 429 pounds of ore assaying $8.93 1-3, resulted as follows:

Gold saved on plates	$200 59
Silver saved on plates	3 42
Gold saved in concentrates	127 90
Silver saved in concentrates	5 43
Copper saved in concentrates	7 91
Total value saved	$345 25

Percentage of extraction, 76.1. Ratio of concentration, 6⅜ into 1.

The next famous mine of the camp is the War Eagle, which was recently bought by the Gooderham-Blackstock syndicate for $700,000. This syndicate also bought the Crown Point group, and Richmond in the South Belt and has transferred the property to the War Eagle Consolidated Gold Mining Company.

The War Eagle was first bonded in 1893, together with the Iron Mask and Virginia, by Austin Corbin, W. J. C. Wakefield, E. J. Roberts and others, of Spokane. They started two tunnels and a shaft, but owing to a wide discrepancy in assays threw up the bond. Mr. Wakefield, however, secured another bond for the company, which had been formed under the name of War Eagle Gold Mining Company, with the result that work was resumed and an ore chute was struck forty feet long and four or five feet wide, assaying $18 to $24 gold. Negotiations were pending with Patrick Clark to take up development in return for a half-interest when the bond was again forfeited and Mr. Wakefield only held the property until these negotiations

with Mr. Clark and John A. Finch were closed, by taking a thirty days' option. Then work was resumed and in December, 1894, a great chute of ore 75 to 100 feet long and four to twelve feet wide, averaging nearly $50 a ton, was struck. From the tunnels and an upraise run on this chute the company in 1895 produced $600,000 worth of ore, out of which it paid $132,500 in dividends and paid for the mine, its development and equipment.

The original shaft was sunk over seventy feet in No. 1 chute of ore assaying $12 to $16 gold, the veins running nearly east and west. About 300 feet west a splendid ore chute, No. 2, averaging 2¼ ounces gold from the surface, was stoped to the surface from tunnel No. 1, 120 feet long and eight to twelve feet wide, with two to four and one-half feet of ore remaining in the floor. Beyond this is a fault, and then comes No. 3 chute, of lower grade, forty feet long and five feet wide, which has been stoped to the surface, with three to four feet of ore still beneath. Tunnel No. 1, 900 feet long, passed through these chutes, as well as through the ore tapped by the shaft, which averaged three and one-half feet wide for eighty feet. The second tunnel, 140 feet on the depth of the ledge below No. 1, is 1,100 feet long, and near its mouth a shaft is down thirty-five feet in a chute of good grade ore, which follows the floor of the tunnel for 160 feet as if it were the apex of another chute. In this tunnel chute No. 2 has increased to 310 feet in length, of high grade ore, and from two to fourteen feet wide, much of which averaged $57.60. About 8,000 tons of this ore has been shipped from a stope about sixty-five feet high. No. 3 chute has been struck on this level, a raise made through it to No. 1 level, and two stopes are being made on it, its average width being six feet and its length eighty feet on the upper and forty feet on the lower level. A winze has also been sunk 225 feet on No. 2 chute and drifting started east and west along it. The No. 3 tunnel is a cross-cut through the Iron Mask ground and in 1,050 feet taps the chute exposed in the mouth of No. 2 tunnel at a depth of 250 feet on the depth of the ledge, showing ore of a higher grade, of an average value of $25 gold, silver and copper. A spur has been run from the Columbia & Western Railroad by way of the War Eagle to the Le Roi and ore bins have been erected on it. At present twenty-five tons a day are being shipped, but the quantity will be increased to an average of 1,500 tons a month for the year 1897. A twenty-drill compressor, power drills, steam plant and pump are on the Iron Mask ground and are used jointly by the War Eagle and Iron Mask Companies.

On the Iron Mask, which adjoins the War Eagle and has been developed largely in connection with it, a shaft followed a narrow crevice down for twenty feet, from which point it widened to nearly the full width, with fine high-grade ore averaging 2.3 ounces gold. The shaft went down 100 feet, and then fifty feet of drift was run. A tunnel was then run from Center Star Gulch on an ore chute exposed by a road cutting, and ran for nearly 120 feet on mixed ore. After connecting with the shaft, it turned to the right under War Eagle tunnel No. 2, to which an upraise is being made on the ore body. A double compartment shaft is being sunk at the mouth of this tunnel, with three and one-half feet of ore showing.

The Virginia, owned by a sister company to the Iron Mask, has a 400-foot cross-cut, run to tap an ore body exposed in a small shaft above, and has cut a chute of low-grade ore five feet wide and forty feet long, but work at this point has been suspended for surface prospecting. The Poorman fraction, separately incorporated by the same parties, has a tunnel about 230 feet long, connecting with a ninety-two foot shaft. The latter is within five feet of the Josie line, and the Josie Company is continuing the tunnel through its own ground. Shipments aggregating 133 tons have returned about 1 ounce gold, 2¼ ounces silver and 2½ per cent. copper.

The Centre Star and Idaho, which lie east of the War Eagle and Le Roi, have the distinction of being a fully developed mine from which not a ton of ore has ever been shipped, the owners, the Centre Star Gold Mining & Smelting Company, preferring to reduce the ore on the ground by some process yet to be adopted. The ledge is exposed thirty to fifty feet wide in a diorite bluff on the east side of Centre Star Gulch, with a smaller ledge on each side of it. The main tunnel runs from this point 1,500 feet to the Le Roi end line, gaining 350 feet of depth and traversing several large bodies of low-grade ore, one of which is 147 feet long and fourteen to sixteen feet wide, while another is nearly seventy feet wide, and 200 feet from the end line a large body thirty feet wide and apparently of great length was struck. Five feet of ore in this chute carries over 20 per cent. copper and averages over $100 gold; the remainder of its width is more silicious and averages about $24 for all values. Cross-cuts are being run north and south from this tunnel to the side lines, and have cut the north ledge four to six feet wide, of good ore, running high in copper, at 280 feet, and the south ledge, of less width, at 150 feet. A double compartment shaft taps the main tunnel 410 feet from its mouth, near the intersection of the drift, and is used for ventilation. Another tunnel is being run to the gulch to intersect the north drift, and there is in all about 3,000 feet of underground work. There are over 7,000 tons of ore on the dump, and Oliver Durant, the manager, estimates that there are between 200,000 and 300,000 tons of ore in sight in the mine. It is intended to sink a three-compartment shaft on the hill near the north side line to a depth of 200 feet below the present

tunnel level. The mine has a steam engine and seven compressed air drills.

The Josie, north of the Le Roi, is being developed by the Josie Gold Mining Company, and has two ledges, the main and the north. The main tunnel began in ore, but this was soon cut off, and the tunnel ran on between smooth walls and through a fault, beyond which it cut an ore chute one to four feet wide, stoped up thirty to forty feet and ninety feet long. A 100-foot shaft here connects with the surface. In a short cross-cut, 250 feet from the tunnel mouth, a diamond drill located ore 107 feet to the north. The tunnel then runs for about 100 feet, with ore in the roof, sometimes three feet of solid pyrrhotite, with much sulphide scattered through the diorite. Then occurs another fault, where a cross-cut runs 100 feet north to connect with a shaft which has been sunk sixty feet in ore in the north ledge, and which has 100 feet more to go down. A cross-cut to the south showed ore for twelve to fifteen feet, and the tunnel, in 700 feet, showed low-grade ore for over 200 feet, which would pay to sort and ship. Considerable ore has been taken from a stope on the surface, 120 feet long and three to four feet wide. A two-compartment shaft has been sunk 120 feet in ore at the mouth of the tunnel, and 100 feet of drifts have been run at the eighty-five foot level, the ore taken out being sorted and shipped to Tacoma. A cross-cut run from the Le Roi boundary taps this shaft at 100 feet. The shaft will be sunk 500 feet, and drifts will be run at the 200-foot level. The Poorman tunnel has been continued through the Josie ground for 150 feet, striking an ore chute sixty feet from the line, which is forty feet long and averages sixteen feet wide. This tunnel is 100 feet above the main tunnel on the other side of the mountain. The first shipment of seventy tons from the Josie returned $43 at the smelter, other shipments ran $47 and one car load ran $68. The mine is equipped with seven compressed air drills, steam hoist and pump.

The St. Elmo, owned by the St. Elmo Gold Mining Company, has a large cropping of quartzose rock, containing calcite, zinc blende and iron and copper pyrites, east of which a 100-foot tunnel runs on diorite, well mineralized with pyrites. The main tunnel runs 300 feet on an east and west wall through Consolidated St. Elmo ground and for the last forty feet on St. Elmo ground, where a depth of 300 feet is attained. The ledge is then cross-cut and is twenty-two feet wide, of $10 ore.

The Monte Cristo gave its name to the Monte Cristo Mountain, and shows eight to twelve feet of solid pyrrhotite directly beneath the iron capping, on which a shaft was sunk sixty feet. Tunnel No. 2 is in 290 feet to a depth of 125 feet, and twelve feet from the mouth cut a chute of ore which continued for seventy feet, and is six feet wide, but carried only a trace to $3 gold. Striking a fault, the tunnel diverged to the northeast for fifty feet and again struck the ore chute, which it still has in the face, the value having increased to $12 to $30. Tunnel No. 1, 300 feet below No. 2, is in 300 feet, and was run north of the ledge to catch the dip, a cross-cut to the south tapping the latter and cutting the first ore chute struck in the upper tunnel. The mine, which is owned by the Monte Cristo Gold Mining Company, has an engine, seven-drill compressor and two power drills.

The California, owned by the California Gold Mining Company, has two east and west ledges and two cross ledges running north and south. A tunnel has been run 165 feet on one cross ledge, which has widened from six to thirty-six inches, with decomposed quartz giving place to solid ore, of $15 value. Another tunnel is in thirty feet on the same vein, 100 feet higher. The lower tunnel will be extended to cross-cut the east and west ledges, one of which has been opened by a fifty-foot shaft. The second north and south ledge has been stripped for 200 feet and is sixteen feet wide, a fifty-four-foot shaft showing $15 ore in it. The company is putting in pumps and power drills and continuing the main tunnel.

The Nickel Plate Mining Company is pushing development on its claim and a fraction. A shaft is being sunk on the ore with a drift at the 100-foot level, 100 feet east and 110 feet west, showing more or less ore. A cross-cut has been driven 285 feet north from this shaft, intersecting at 110 feet a chute of high-grade pyrrhotite and copper pyrites, which is two to three feet wide in a stope twenty-five feet high. An air-shaft is being sunk near another cropping and will connect with the cross-cut. A hoisting plant and power drills are being installed.

The City of Spokane, owned by the Lillooet, Fraser River & Cariboo Gold Field Company, lies across Centre Star Gulch, partly on Red Mountain and partly on Monte Cristo Mountain, and is being developed on the latter side with a three-drill plant and steam engine. A tunnel 325 feet long, with a depth of eighty feet, struck an ore chute at sixty feet which proved to be ninety feet long and thirty-four feet wide, of several forms of pyritic ore, averaging $12 to $64 gold. A cross-cut eighty feet to the north at a point 170 feet from the mouth cut several streaks of ore, one as wide as two feet, while the south cross-cut is in forty-three feet. Another ledge crops two feet wide, assaying on the surface $3 gold, 4 per cent. copper. The main tunnel will be driven 750 feet to the east, and a winze will be sunk 100 feet to it.

The Red Mountain, west of the City of Spokane, has been equipped with a seven-drill plant and steam engine by the Red Mountain Mining Company. A shaft is down sixty feet on the north ledge, with a drift forty feet west at the bottom, showing eighteen inches to four feet of ore which averages $36.40,

TRAIL CREEK

18. DETROIT.
19. CONTACT.
20. BLUE BIRD
21. BABY.
22. RABBIT'S NEST
23. KEYSTONE NO. 1
24. PUGET SOUND
25. NIGGESS
26. JIM FISK
27. VIGLA.
28. WHITE ELEPHANT
29. LINCOLN.
30. COMET NO. 2
31. CONKLIN.
32. BARBLES.
33. RAM'S HORN.
34. RIVERSIDE.
35. SAN RAFAEL
36. FRANKLIN.
37. COLUMBUS.
38. LAFAYEITE.
39. GRAND PRIZE.
40. HALF & HALF
41. UNION.
42. KING SOLOMON
43. KO-KO-MO.
44. KNOT HOLES.
45. PENOBY
46. OPHIR.
47. LOUISIANA
48. DEXTZE.
49. B. & D.
50. LINTON.
51. ISABELLA.
52. LOUISA.
53. ODETTE.
54. CRACKER JACK
55. PLOUGH BOY.
56. MORNING STAR.
57. BLUE ELEPHANT
58. DOROTHY
59. GORDON
60. EDEN.
61. NELLIE.
62. ONTARIO.
63. PITTSBURG
64. BELMONT
65. ST. LOUIS.
66. GRANITE.
67. TRENTON
68. NUGGET FTN
69. NUGGET.
70. DELAWARE
71. CRAFTON.
72. BLUE BIRD (2)
73. MOOSE.
74. FORTUNA.
75. FIRST.
76. NINST.
77. SECOND.
78. MOGUL.
79. NORTHERN BELLE
80. SNOW SHOE.
81. ATWOOD.
82. LONDONDERRY
83. IDA MAY.
84. ELANORA.
85. ERIC
86. DELACOLA.
87. IRON QUEEN
88. NORTH STAR.
89. CENTER STAR (1)
90. VIKING.
91. SILVERINE
92. EDDIE J.
93. MABEL.
94. CLIFF.
95. RED MTN
96. SURPRISE.
97. LUCKY QUEEN EDNA
98. COREY.
99. GIANT.
100. FLOSSIE.
101. ATLANTIC CABLE
102. EUREKA.
103. EVENING.
104. LITTLE DIAMOND
105. CALIFORNIA.
106. NOVELTY.
107. GREYSIDE
108. YOU KNOW
109. MONITA.
110. PILGRIM. TIGER (1) GEM
111. MUGWUMP.
112. CITY OF SPORANE.
113. PAUL BOY. LOOKOUT
114. MONTE CRISTO
115. BUCKEYE
116. EVENING STAR
117. LA BELLE.
118. GEORGIA.
119. CALEDONIA
120. PUTNAM.
121. ENOLIBE.
122. SCOTCH
123. IRISH.
124. LINCOLN
125. GRACE.
126. C. & C.
127. IRON HORSE
128. ALKI
129. IRON COLT.
130. COLUMBIA.
131. KOOTENAY.
132. TIPTOP.
133. NORTH STAR.
134. COPPER JACK.
135. WOLF.
136. NELSON
137. DRAKE.
138. ALBERT.
139. ROYAL GEORGE
140. JOSIE.
141. POORMAN
142. LE ROI.
143. LEGAL TENDER
144. PACK TRAIN.
145. PARIS BELLE.
146. GOLDEN DAWN
147. BOSTON.
148. COOLGARDIE
149. FRANKIE.
150. NOONDAY
151. REGINA.
152. BELLEVIEW
153. BUCKEYE
154. VULCAN.
155. DIAMOND DUST
156. SUPERIOR
157. SUN

WEST OF ROSSLAND

1. GOLD KING (2)
2. I. X. L.
3. O. K.
4. LOVEY.
5. JUNE BUG
6. JUNE.
7. NORWAY
8. LITTLE MAUD
9. J. D.
10. CHARMER
11. IVANHOE.
12. UNCLE TOM
13. SALT LAKE
14. RED OAK.
15. TORNADO.
16. PERMANENT
17. EMPRESS
18. RANGER
19. MATTLE
20. EUREKA.
21. MOUNTAIN TRAIL
22. GOODENOUGH.
23. SHEEP CREEK
24. SHEEP CREEK STAR
25. IRON DUKE.
26. HARD BARGAIN
27. ABRAHAM LINCOLN
28. SUNSET NO. 3.
29. POOR PROPERTY
30. GOLDEN DRIP.
31. LITTLE DALLES
32. MIDNIGHT.
33. CONCORDIA
34. MANITOBA.
35. SAN FRANCISCO
36. WHITE BEAR.
37. BLACK BEAR.
38. NICK OF TIME
39. FOOL HEN
40. RUN OVER
41. CAMP BIRD.
42. CONSOLATION.
43. GREEN CROWN
44. MUSTANG.
45. RODERICK DHU.
46. DEER PARK.
47. BLACK DIAMOND
48. HATTIE (1).
49. CLIMAX.
50. NOONDAY
51. FIREFLY.
52. FIREBURN.
53. HOMESTAKE
54. GOPHER (1)
55. MAID OF ERIN
56. BLUE BIRD (3).
57. HATTIE BROWN
58. GIRARD FT'N
59. MIGHTY DOLLAR
60. LILY MAY.
61. ZILOR.
62. FAIRVIEW.
63. LITTLE HAZEL.
64. LONE JACK.
65. NANCY LEE.
66. IBEX.
67. STOCK EXCHANGE
68. EAST ST. LOUIS
69. HOPE NO. 2.
70. WHITE IRON
71. JOSIE MAC.
72. CURLEW
73. RED EAGLE. (Between 80 and 90.)
74. VIOLA.
75. FAIRFORD.
76. GOOD HOPE.
77. B. C. PEACOCK
78. POOR BOY.
79. FIRST CLIP
80. J. & J.
81. S. C.
82. EDNA. JENNIE
83. MAYFLOWER.
84. COPPER QUEEN
85. ALF
86. LITTLE PEARL
87. MONTEREY.
88. PAYSTONE
89. A. B. C.
90. SIDNEY.
91. EARLY MORN Homestake Fork
92. DIOGENES.
93. GOPHER (2).
94. MOUNTAIN LION (1)
95. SIDNEY FCT.
96. SEA GULL
97. PHILADELPHIA
98. ROMAN EAGLE.
99. LONDON BELLE
100. ALBANY.
101. LITTLE PITTSBURG
102. MT'N LION (2)
103. FREINOA.
104. BIG FOUR.
105. SOUTH BEND
106. GOLDEN CROWN
107. ISLAND BELLE.
108. ROBERT BRUCE
109. DEADWOOD
110. OLD ABE
111. R. LEE.
112. MAMMON
113. SARAH LEE.
114. SAN JOAQUIN
115. PALO ALTO
116. FLORENCE.
117. MISPICKEL
118. R. E. LEE.
119. CELTIC QUEEN
120. LAST CHANCE
121. GEM.
122. MINNIE.
123. PRINCE OF WALES (2)
124. NANCY LEE.
125. IBEX.
126. SHILBY.
127. LITTLE BESS
128. HILLTOP
129. TULARE.
130. GREAT REPUBLIC
131. CONFIDENCE
132. ESSIE.
133. LONDON BELLE
134. STAR OF INDIA
135. DAISY.
136. HATTIE (2)
137. DREADNAUGHT
138. CHELSEA.
139. MAPLE LEAF
140. E. & E.
141. PAY GOOSE
142. DOUGLAS.
143. QUINIAULT.
144. PTARMIGAN.
145. CHANCELLOR
146. ELLA.
147. RIDGWAY
148. SENIORAGE.
149. FAIRY RING
150. BLUE JAY.
151. ELNA.
152. VIOLET.
153. BONNIE DOON
154. WOLVERINE.
155. SOUTHERN CROSS
156. TIGER (3).
157. UNCLE SAM.
158. HIDDEN TREASURE
159. WHITE STAR.
160. CROWN POINT
161. IMPERIAL.
162. STEWWINDER
163. RED POINT.
164. BLUE PEARL
165. DRUMMER
166. URAL
167. DAUPHINE.
168. ST. MARY'S FCT
169. MAGNET
170. ERIN.
171. WASHINGTON
172. SILVER STAR
173. MAGNOLIA.
174. BEECH NUT
175. LOST BOY.
176. KIWI
177. SIERRA BOUSI
178. COMPETITION
179. ORRIFLAMME
180. MOOSE.
181. FERNDALE.
182. MULTNOMAH
183. FAILURE.
184. COEUR D'ALENE BOY
185. FLEETWOOD
186. FAIRMOUNT
187. KOHINOOR.
188. VERNON VALLEY
189. ST. JEAN BAPTISTE
190. GOLDEN BAR.
191. DAN WEBSTER
192. CANUCK.
193. CURRAJON

GROUSE MOUNTAIN

1. BONANZA
2. HUGHES.
3. COMSTOCK
4. ORIZABA.
5. EXCHEQUER
6. GROUSE
7. HELEN.
8. GOLD BUG
9. PHOENIX.
10. INTERNATIONAL
11. ALICE.
12. ALPHA
13. ALTA
14. ETNA.
15. ESPERANZA
16. TIPTOP
17. MT'N HOME
18. KNIGHT TEMPLAR
19. GOLD QUEEN
20. GOLD PRINCE
21. OAKLEY
22. PRESTON
23. ACME.
24. WALTER

TRAIL CREEK,

BRITISH COLUMBIA.

Welton Brown
CIVIL AND MINING ENGINEER
SEATTLE WASH

INTERNATIONAL BOUNDARY.

NORTH OF ROSSLAND

1 SUNDOWN
2 DAILY.
3 BETTISTA.
4 BISMARCK FTN
5 FREDDY B.
6 WALLINGFORD.
7 MINNIE MOORE, NO 1
8 COLUMBIA VIEW
9 TOM-A-TO CHIEF.
10 SUPERIOR
11 ANNIE.
12 SURPRISE.
13 WILLY.
14 DAYTON.
15 WEST POINT
16 GOLD STAR
17 BIG TOE.
18 DETROIT
19 CONTACT.
20 BLUE BIRD
21 BABY.
22 RABBIT'S NEST
23 KEYSTONE NO. 1
24 POINT ROUND
25 NEGRESS.
26 JIM FISK.
27 VIOLA.
28 WHITE ELEPHANT
29 LINCOLN.
30 COMET NO. 2
31 CONKLIN.
32 RAMBLER.
33 RAM'S HORN
34 RIVERSIDE.
35 SAN RAFAEL
36 FRANKLIN.
37 COLUMBIA.
38 LAFAYETTE.
39 GRAND PRIZE
40 HALF & HALF
41 UNION.
42 KING SOLOMON
43 KO-KO-MO.
44 FIVE HOLES
45 FENORBY
46 OPHIR.
47 LOUISIANA
48 DEXTER.
49 B & B.
50 LINTON.
51 ISABELLA.
52 LOUISA.
53 ODETTE.
54 CRACKER JACK
55 FLOCCH BOY.
56 MORNING STAR.
57 BLUE ELEPHANT
58 DOROTHY
59 GORDON
60 EDEN.
61 NELLIE.
62 ONTARIO.
63 PITTSBURG
64 BELMONT
65 ST LOUIS.
66 GRANITE
67 TRENNOR.
68 NUGGET FTN
69 NUGGET
70 DELAWARE
71 CRAZED.
72 BLUE BIRD (2)
73 MOOD.
74 WABUSHA
75 FIGHT
76 FIRST
77 SECOND.
78 MOGUL

70 OLYMPIA.
80 M'T'N CHIEF
81 BLACK BIRD
82 RAYNOCK.
83 CARIBOO.
84 VICTOR.
85 GOLD HILL
86 COMET.
87 HIGH ORE.
88 JUMBO.
89 GOLD KING (1)
90 NEVADA.
91 GOOD FRIDAY
92 GOOD HOPE.
93 MOUNTAIN VIEW
94 ST ELMO.
95 CON ST. ELMO.
96 SOUTHERN BELLE
97 VIEW.
98 NORTHERN BELLE
99 SNOW SHOE.
100 ATWOOD.
101 LONDONDERRY
102 IDA MAY
103 ELAHOMA.
104 ERIC
105 DELACOLA.
106 IRON QUEEN
107 NORTH STAR.
108 CENTER STAR (1)
109 VIKING
110 SILVERINE
111 EDDIE J
112 MABEL.
113 CLIFF.
114 RED M'T'N
115 SURPRISE.
116 LUCKY QUEEN EDNA
117 COREY.
118 GIANT.
119 GLOBE.
120 ATLANTIC CABLE
121 EUREKA
122 EVENING.
123 LITTLE DIAMOND
124 CALIFORNIA
125 NOVELTY.
126 OPETTUDE
127 YOU KNOW
128 MONITA.
129 PILGRIM, TIGER (1) GEM
130 MUGWUMP.
131 CITY OF SPORANE.
132 PAUL BOY, LOOKOUT
133 MONTE CRISTO
134 BUCKEYE
135 EVENING STAR
LA BELLE
136 OP-HIR.
137 CALEDONIA
138 MONNAH.
139 ENGLISH
140 SCOTCH
141 IRISH.
142 LINCOLN
143 OMAHA.
144 C. & C.
145 IRON HORSE
ALEX
146 IRON COLT
147 COLUMBIA.
148 ROOTENAY
149 TIPTOP
150 NORTH STAR.
151 COPPER JACK
152 WOLF
153 NELSON
154 DEANE.
155 ALDERT.
156 ROYAL GEORGE

157. BLACK EAGLE
158. REBA.
159 LAMPLIGHTER
160. EL DORADO
161 MASCOT.
162 ST LAWRENCE
163. ALBERTA.
164. ENTERPRISE.
165. COPPER WORLD
166. GOLDEN CHARIOT
167. ALICE
168. NICKEL PLATE
169. CENTER STAR (2)
170 IDAHO
171. VIRGINIA.
172. IRON MASK.
173. WAR EAGLE
174 NO. 1.
175 ANNIE.
176 JOSIE.
JOSEPHAN
177. LE ROI.
178. LEGAL TENDER
179 PEN TRAIN
180 PARIS BELLE.
181 GOLDEN DAWN
182. BOSTON.
183. COOLGARDIE
184. FRANKIE
185 NOONDAY
186 BEOFNA.
187 BELLEVIEW
188 BUCKEYE
189 VOLCANO.
190. DIAMOND DUST
191 SUPERIOR
192 SUN

WEST OF ROSSLAND

GOLD KING (2)
1 L & L
3 O. K.
4 TOTTY.
5 JUNE DUO
6 JUNE
7 NORWAY
8 LITTLE MAUD
9 J. D.
10 CEARNER
11 EVANGEL
12 UNCLE TOM
13 SALT LAKE
14 RED OAK.
15 TORNADO.
16 PERMANENT
17 EMPRESS
18 RADGER
19 MAYTIE
20 EUREKA.
21 MOUNTAIN TRAIL
22 GOODENOUGH
23 SHEEP CREEK
24 SHEEP CREEK STAR
25 IRON DUKE.
26 HARD BARGAIN
27 ABRAHAM LINCOLN
28 SUNSET NO. 2
29 POOR PROPERTY
30 GOLDEN DRIP
31 LITTLE DALLES
32 MIDNIGHT.
33 CONCORDIA.
34 MANITOBA.
35 SAN FRANCISCO
36 WHITE BEAR.
37 BLACK BEAR.
38 NICK OF TIME
39 FOOL HEN
40 RUN OVER

41. MAYFLOWER NO 2
42. ST. PAUL
43. RAINY DAY
44. EAGLE.
45. BLUE BIRD.
46. SUNDAY SUN NO 2
47. GOLD HUNTER
48 BALD BUTTE.
48. ABE LINCOLN
49 PHOENIX
51. NEST EGG.
52. SUNSET NO 2
53 ALABAMA, WILD WEST AND MONO.
54. GRAND PRIZE
55 BADGER.
56 CAMP BIRD.
57 CONSOLATION.
58 GREEN CROWN
59 MUSTANG.
60 RODERICK DHU
61 DEER PARK.
62 BLACK DIAMOND
63. HATTIE (1)
64 CLIMAX.
65 NOONDAY
66 FIREFLY.
67 FREEBURN
68 HOMESTAKE
69 O-'SHEA (1)
70 MAID OF ERIN
71 BLUE BIRD (3).
72. HATTIE BROWN
72a. GIRARD FTN.
73. MIGHTY DOLLAR
74 LILY MAY.
75 ELOR.
76. FAIRVIEW.
77 LITTLE HAZEL.
78 LONE JACK.
79 NANCY LEE
80. IBEX.
81 STOCK EXCHANGE
82 EAST ST LOUIS
83 HOPE NO. 2.
84 WHITE IRON
85. JOSIE MAC.
86 CURLEW.
RED EAGLE (Between 86 and 87)
87 VIOLA.
88. FAIRFORD.
88. GOOD HOPE.
90 B. C. PEACOCK
91 FOOS BOY.
92 FIRST CLIP
93. J. & J.
94. S. C.
95. EDNA. JENNIE
96 MAYFLOWER.
97 COPPER QUEEN
98 ALF
LITTLE PEARL
99 MONTREAL
100 FAYSTOWN
101. A. B. C.
102. SIDNEY.
103. EARLY MORN Homestake Fr.
104. DIGGINS.
105 COFFEE (2).
106. MOUNTAIN LION (1)
107 SIDNEY FCT
108. SEA GULL
109 PHILADELPHIA
110 ROMAN EAGLE
111 LONDON BELLE

EAST OF ROSSLAND

1 BUTTE.
2 BROOK.
3. JO JO.
4 COMMANDER
5. LONE STAR.
6 JUNCTION
7 BOULDER
8. PRINCE
9 RED ROSE
10 QUEEN
11 HAZEL.
12. DOLUTH.
13 BAY CITY
14 NEW YORK
15 WISCONSIN
16 DAWN
17 DUKE.
18 STANDARD.
19 SMALE DOLLAR
20. ALBANY.
21 LITTLE PITTSBURG
22 M'T'N LION (2)
23 FREINGA.
24 BIG DOOR.
25 SOUTH BEND
26 GOLDEN CROWN
27 ISLAND BELLE
27a ROBERT BRUCE
28 DEADWOOD
29 OLD ADE
30 R. LEE
31 MAMMON
32 SARAH LEE
33 SAN JOAQUIN
34 PALO ALTO
35 FLORENCE
36 MISPICKEL
37 R. E. LEE.
38 CELTIC QUEEN
39 LAST CHANCE
40 OPEN
41 MINNIE.
42 PRINCE OF WALES (2)
43 TRILBY.
44 LITTLE BESS
45 HILLTOP
46 TULARE
47 GREAT REPUBLIC
48 CONFIDENCE
49 ESSIE
50 LONDON BELLE
51 STAR OF INDIA
52 DAISY.
53 HATTIE (2)
54 DREADNAUGHT
55 CHELSEA.
56 MAPLE LEAF
57 E. & E.
58 PAY GOOSE
60 DOUGLAS
61 DONNIAULT
62 PTARMIGAN
63 CHANCELLOR
64 ELLA.
65. RIDGWAY
66 HENDRAGE
67 FAIRY KING
68 BLUE JAY
69 ELBA.
70 VIOLET
71 BONNIE DOON
72 WOLVERINE
73. SOUTHERN CROSS
74 TIGER (2)
75 UNCLE SAM
76 HIDDEN TREASURE
77 WHITE M'T'N
78 CROWN POINT

79 EMPRESS
80 IRON QUEEN
81. SPOTTED
82 IDE.
83 SAN JUAN
84. WANETA.
85. ST MARY'S
86 SILENT FRIEND
87. J. A. C
88 ELIZABETH
89 CARR
90 KERN.
91 WHITE ELEPHANT
92 PRINCE OF WALES (2)
93 JOKER.
94 EMMA C
94a VALION.
95 SOUVENIOR
96 IMPERIAL
97 GLENWINDER
97a RED POINT.
98 BLUE PEARL
99. DRUMMER
100 URAL
101 DAUPHINE
102 ST MARY'S FCT
103 MAGNET
104. ERIN.
105 WASHINGTON
106 SILVER STAR
107 MAGNOLIA
108 BEECH NUT
109. LOST BOY.
110 KIWI
111 SIERRA BOUSI
112 CONFEDITION
113 ORIFLAMME
114 MOSS
115 FERNDALE.
116 MULTNOMAH
117 FAILURE
118 COEUR D'ALENY BOY
119. FLEETWOOD
120 FAIRMOUNT
121 LONDOOR.
122 VERNON VALLEY
123 ST. JEAN BAPTISTE
124 GOLDEN BAR
125 DAN WEBSTER
126 CANUCK
127 OUREAION

GROUSE MOUNTAIN

1 BONANZA
2 HUGHES.
3 COMSTOCK
4 ORIZABA
5 EXCHEQUER
6 ORIONE
7 RELEN.
8 GOLD BUG
9 PHOENIX
10. INTERNATIONAL
11 ALICE
12 ALPHA
13 ALTA
14 ETNA
15. ESPERANZA
16 TIPTOP
17. M'T'N HOME
18 KNIGHT TEMPLAR
19 GOLD QUEEN
20 GOLD PRINCE
21 OAKLEY
22 PRESTON
23 ACME
24 WALTER

carrying 10 to 12 per cent. copper. A cross-cut has been run 400 feet to cut the ledge at a depth of 250 feet, and will be connected with the shaft by a drift to the west and an upraise of 190 feet. A parallel ledge crops 220 feet to the south. Several car loads of ore from the shaft have been shipped to Tacoma.

The Cliff, on the east slope of Red Mountain, is owned by S. M. Wharton, George C. Wharton, John R. Cook and E. L. Tate. It has a well-defined ledge, easily traced through it, and several open cuts and a forty-five-foot shaft have shown high-grade ore. A 400-foot tunnel, with 100 feet of cross-cuts, runs for the first ninety feet through solid ore four feet wide, worth $6 to $8, then after a slip continues sixty-five feet, when it becomes broken and shows a stringer two to ten inches wide. Tunnel No. 2, 100 feet lower, is in 300 feet, and for sixty-five feet runs through low-grade ore, thirteen feet wide in places, then, beyond a fault, for ninety feet more. Some of this ore has been shipped, and returned a small profit. Below the mouth of this tunnel a shaft is down twenty-five feet in ore, and 150 feet above the tunnel is another shaft, forty feet in ore, which will be connected with the tunnel for ventilation. There are about 500 tons of $30 ore on the dump, carrying 16 per cent. copper. The mine has a three-drill compressor and an engine. The St. Elmo Consolidated, owned by Messrs. Wharton and others, is on the west extension of the Cliff ledge, and has a fifty-foot shaft with a fifteen-foot cross-cut at the bottom, showing ten feet of ore. A cross-cut is in seventy-five feet to tap the ledge. The St. Elmo Company has driven a tunnel 300 feet on the ledge, 350 feet below on this claim, to run through into its own ground.

On the View, the Red Mountain View Company had a forty-five-foot tunnel on a ledge widening from fifteen inches to nearly three feet of mixed ore, and is continuing development.

The Jumbo, on the left side of Red Mountain overlooking Sheep Creek, is owned by the Jumbo Gold Mining Company, which has bonded it for $500,000 to the London Gold Fields Syndicate. The same company has bonded the Gertrude and Maryland, adjoining, for $145,000. A thirty-five-foot shaft on a cropping showed some low-grade ore and some tellurides in streaks and bunches running $1,000 and more in gold. A tunnel was then run 260 feet, with about 300 feet of cross-cuts, showing fifty feet of sulphide ore in a quartz gangue, and cutting two of the three parallel ledges on the claim. At the end of 150 feet the tunnel entered and continued for fifty feet on ore averaging about $14. Another tunnel, about 200 feet north and 175 feet lower, is in 300 feet, and is just coming into an ore body on the ledge, the upper tunnel having passed over it. Five car loads of unsorted ore have been shipped as a test, which is pronounced satisfactory.

Near this mine, a tunnel is being run on the High Ore for the continuation of the Jumbo ore chute, and a tunnel is being run for the same purpose on the Nevada, across the creek. The Gold Hill has run a tunnel 350 feet to strike an ore chute higher up.

On the south slope of Spokane Mountain is the O. K., owned by the O. K. Gold Mining Company, on which is a true fissure ledge five to seven feet wide of quartz carrying free gold, iron and copper sulphides and galena. Three tunnels have been run, 233, 400 and 335 feet respectively, the lowest giving a depth of 375 feet, and with cross-cuts and connecting winzes the development aggregates 1,600 feet. On the footwall is one to five feet of smelting ore, worth $65 to $215, and the remainder of the ledge is milling and concentrating ore, worth $12 to $40. The concentrates range from 2 to 10 per cent. of the crude ore, and are worth $66 to $157, carrying 8 to 10 per cent. copper. The milling ore goes to a twenty-five-stamp mill, of which ten stamps are in operation, three six-foot improved Frue vanners saving the sulphides. A thirty-foot ledge, of which the croppings are visible above the ledge now worked, is regarded as the main ledge and source of the smelting ore, and will be tapped at a depth of 500 feet by the extension of the lowest level. The mine is equipped with a five-drill air compressor and a diamond drill, and a gravity car tram 800 feet long brings the ore to the mill.

The I. X. L., owned by John S. Baker, J. H. Scott, Edward Brehn and C. P. Oudin, is generally believed to be on the extension of the O. K. ledge. A 125-foot tunnel ran into it twenty feet from the mouth and showed it four feet wide, with the same characteristics as the O. K. The St. Lawrence Gold Mining Company is preparing to develop the Gold King, which adjoins the I. X. L on the same ledge.

South of the O. K., the Norway Gold Mining Company has sunk two thirty-foot shafts on a large body of low-grade sulphide ore assaying $6 to $12. Another shaft is down fifty-four feet and a cross-cut thirty-seven feet at the fifty-foot level shows only one wall. The ore is sulphides in a quartz gangue similar to the O. K., and a number of assays average $20.

Active development is being pushed on a number of properties on Red Mountain, in addition to those already described. The Monita, on the War Eagle ledge, has been equipped by the Monita Gold Mining Company with a steam hoist and two power drills, and a shaft is being sunk and a drift run on the 100-foot level, showing three feet of ore assaying from a trace up to $150, an average being $49.50.

On the west extension of one of the Le Roi ledges, G. H. Randell and others have the Mariposa, on which a fifteen-foot shaft shows the rock well mineralized. A cross-cut is being run to tap the ledge.

The White Bear, which has been equipped by the White Bear Mining & Milling Company with two power drills and a steam hoist and pump, has an eighteen-foot cropping of what is believed to be the Le Roi ledge. A shaft is down fifty-five feet on the footwall, in well mineralized rock, and a cross-cut will be run at the 100-foot level.

The Annie fraction is also believed to be on one of the Le Roi ledges, and shows good ore in a fifty-foot shaft sunk by the Kootenai-London Mining Company

The Surprise and Lucky Queen, owned by P. Porter and Peck Bros., of Chicago, adjoin the St. Elmo and Red Mountain. They have two ledges exposed, on one of which a 200-foot tunnel shows five feet of ore at a depth of seventy-five feet, and surface cuts for 600 feet up the mountain make the same showing. The other ledge is exposed for 900 feet by surface cuts, being thirty feet wide, with ten feet of ore averaging about $8 gold and 2½ per cent. copper, this ore chute showing also in a thirty-foot shaft.

The Butte, on the south slope of Red Mountain, is traversed by a strong fissure ledge from east to west, and a ninetytwo-foot shaft cut through three ore chutes assaying $8 to $22 gold, and showing eight to twenty-four inches of silicious ore on the footwall. The third chute shows three feet of solid ore. The Butte Gold-Copper Mining Company is sinking to depth and drifting on the ledge.

The Cracker Jack, owned by the Cracker Jack Mining Company, has a shaft down eighty-five feet, showing four feet of ore in the bottom, while a twenty-five-foot shaft is down on another ledge, assays ranging from $12 to $15.

The Northern Belle, owned by the Northern Belle Mining Company, is on the north slope of Red Mountain, and has a twenty-foot ledge, with two feet of solid ore and numerous lesser streaks, tapped at a depth of eighty feet by a cross-cut of 114 feet. Assays average from $12 to $15 gold. A seventeen-foot shaft shows four feet of $25 ore in a parallel ledge.

The Mabel Gold Mining Company has run a tunnel 100 feet on the Mabel, which slopes up Red Mountain from Centre Star Gulch, has sunk a winze twenty-two feet and cross-cut five feet in ore assaying $12 to $60, and has not struck the footwall. A cross-cut is in 160 feet at a further depth of 165 feet, and will also tap a smaller parallel ledge.

The Big Three Mining Company is opening up the Southern Belle and another claim, adjoining the Cliff on the north. A shaft was sunk and in thirty feet showed the pay streak, after widening from six to twenty-four inches, to split. The footwall was followed twenty feet more, and then a cross-cut encountered the other streak and showed three feet of $38 ore. Another five-foot ledge 500 feet north will be tapped by a cross-cut, now in seventy-five feet, and a third ledge is exposed.

Adjoining the California is the Giant, which the Giant Mining Company is developing steadily. Two large ledges traverse the claim, and a shaft on one of them is in shipping ore from the start, eleven assays ranging from $14.40 to $58.40 gold. A tunnel is also being driven on this ledge, and every foot of penetration shows improvement in the ore.

The Morning Star has a shaft down 100 feet on a fifty-foot ledge of ore similar to the low-grade ore of the Le Roi, and is extending it another 100 feet. A steam hoist, pump and two-drill compressor are being installed.

The Evening Star Gold Mining Company has on the Evening Star, on Monte Cristo Mountain, a large exposure of decomposed rock through which two ledges appear to run, and from one of these twenty-two tons of surface ore have been shipped to Tacoma and returned $32.80 gold. A fifty-foot tunnel on this ledge showed a small stringer carrying free gold to widen considerably, and a tunnel has been driven 300 feet from a further depth of sixty feet to strike this ore body, and to be used as a working tunnel. Work on this cross-cut was suspended until a shaft was sunk on a known chute of high-grade ore on the summit, and at thirty feet this had widened from six inches to three feet and in a drift to four feet. Shipments of 100 tons have returned $26.33, and two car loads weekly are now being shipped, making this the sixth claim in the camp to give promise of regular shipments. The shaft and drift are both being extended.

On the C. & C., south of the Evening Star, J. H. O'Leary and others have sunk a shaft thirty feet, all in low-grade mixed ore, and are pushing work vigorously.

The Northern Belle Mining Company takes its name from a claim on Red Mountain which shows three ledges on the surface. One of the three showed continuous improvement in a small shaft and has been tapped by a 100-foot cross-cut. Another ledge has a short tunnel, all in $28 ore. A cross-cut to tap all the ledges at a depth of 500 feet will be run this season.

The Georgia Gold Mining Company has on the Georgia a 100-foot tunnel running through four or five feet of mixed ore and rock, with cross-cuts to the west forty and sixteen feet.

The Iron Horse, on the south slope of Monte Cristo Mountain, has a tunnel 140 feet, from which a twenty-foot drift to the north struck an ore body, while a cross-cut to the south sixty-four feet from the surface, opened an ore chute, two car loads from which averaged $30. An upraise has been made from this tunnel to connect with a thirty-six-foot shaft sunk by the locators. A winze

has been sunk sixty-eight feet on the ore chute, and is being extended to the surface by a shaft from above and an upraise to meet it, the intention being to make this a double compartment shaft. A hoist has been placed at the shaft and power hired from the Columbia & Kootenai.

The Iron Horse fraction, the name of which has been changed to the Alki, is owned by the Alki Gold Mining Company and is on the west extension of the Columbia & Kootenai ledge on Monte Cristo Mountain, with extensions of the Evening Star and one of the Georgia ledges. A sixty-foot shaft shows five feet of solid ore, on which the shaft is being sunk another fifty feet, with the intention of then installing power drills and an air compressor and drifting. Another shaft is down twenty feet on four feet of ore in the same ledge. Assays have ranged from $10 to $40.

The Iron Colt, on the extension of the Columbia & Kootenai ledge, is owned by the Iron Colt Mining Company, which has bought two-power drills to be operated by compressed air from the Columbia & Kootenai. A shaft is down seventy-five feet, showing ore all the way down and the full width, averaging $15 gold with very little copper on the surface, but improving to about $25, with 2 per cent. copper at the bottom. This shaft is to be extended to a depth of at least 500 feet. A cross-cut is in sixty feet, and in 380 feet more will tap the ledge at a depth of 175 feet.

The La Belle, also on the west extension of the Columbia & Kootenai ledge, with four other known ledges crossing it, is owned by the Rossland La Belle Mining & Development Company. A cross-cut is in sixty feet, and will strike the Columbia ledge twenty feet further.

On the north slope of Monte Cristo Mountain is the Delacola, owned by the Delacola Gold Mining Company. A sixty-eight-foot shaft in the hanging wall is in mineralized rock for its whole width, assaying $3 to $8 gold and 4 ounces silver, at a depth of twenty feet, with two feet of pay ore, and a fifteen-foot shaft on another ledge shows a streak of magnetic iron to widen from half an inch to eight inches, carrying $2.60 gold, 4 ounces silver. Both ledges show a little peacock copper. The shaft is being extended to the 100-foot level, where drifting will begin.

The Columbia & Kootenai group of four claims is owned by the Trail Mining Company, the stock of which has recently been bonded by F. August Heinze for $500,000. Mr. Carlyle says that this property has an ore-bearing zone running northeast by southwest, with decomposed masses of sulphide ore exposed on the surface. At the north end of the Columbia is a porphyry dike that can be traced with almost a certainty for over two miles running north and south, with solid sulphide ore on both sides. The highest tunnel is 180 feet long, and at 100 feet an upraise was made thirty-nine feet to the surface and a winze sunk twelve feet, on a ledge of about two feet, from which two car loads returned $11.50 and $51.20 respectively. A second tunnel 145 feet below is in 425 feet, and at the face has fifteen inches of high-grade and thirty-three inches of mixed ore, an average assay across the face being $14. At the 125-foot mark, a winze is down twenty feet on ore assaying $40 gold, and an upraise has been made for sixty-five feet. A forty-foot cross-cut, 100 feet further in the tunnel, cuts the main ore body, two feet of which averages $40. A third tunnel, ninety-seven feet below, is in fifty-two feet on a chute carrying eight to ten inches of mixed ore assaying $23 free gold, the maximum depth attained being 300 feet. Another ledge of twenty inches of free milling quartz has been traced by a fifty-one-foot tunnel and a twenty-eight-foot shaft, on which work is being continued. Some of the ore shows nickeliferous pyrrhotite carrying about 2 per cent. nickel. The mine has a thirty-drill compressor and hoist.

On three ledges parallel with the Columbia & Kootenai, the Big Three Gold Mining Company has the Mascot. A 140-foot tunnel has been run for over eighty feet on solid ore, and a winze makes an equally good showing. A shaft is down over forty feet to connect with the tunnel 150 feet from its mouth at a depth of 250 feet. Ore from this shaft assays $33 to $48 gold. A parallel ledge shows eight feet wide in a fifteen-foot open cut, and a third ledge, to the north, crops five feet wide the whole length of the claim, showing solid pyrrhotite ore, assaying $12 on the surface, and is being opened by a shaft.

The South Belt, extending through the valley of Trail Creek below Rossland and over Deer Park and Lake Mountains along the ridge to Lookout Mountain, above the town of Trail, is declared by Mr. Carlyle to have the same system of east and west ledges, with ore of fair value. The ore on most properties carries very little pyrrhotite, but much iron and arsenopyrite, with some zinc blende and galena, the silver value exceeding the gold. The Columbia & Western Railroad runs through the heart of this belt.

The principal property is the Crown Point group of five claims, which is owned by the War Eagle Consolidated Mining & Development Company, organized by the Gooderham-Blackstock syndicate to operate this property, the War Eagle and the Richmond. On the surface a dike thirty to forty feet wide is exposed, with three to eight feet of sulphide ore on each side, which was struck at sixty feet by an inclined shaft. This shaft was sunk on seven feet of ore, which narrowed at thirty-five feet to three or four feet, and is now 130 feet. At the seventy-foot level a drift was run ninety feet along the dike, in ore for sixty feet, and at sixty feet along this drift a winze was sunk

twenty feet, having four feet of ore in the bottom. At the bottom of the shaft a drift runs 100 feet west and seventy-five feet east, each with a fifty-foot cross-cut and all in barren porphyrite. A main tunnel is now in 500 feet to tap the ore chute 150 feet west of the dike and 170 feet below the surface, and is expected to strike the ledge any day. One hundred tons of ore shipped returned an average of about $24. The supposed extension of the Crown Point ledge runs through three of the other claims, and two shafts showed some low-grade ore, while an open cut showed three to four feet of good grade, which a tunnel and cross-cut failed to strike below. A long cross-cut is now in 300 feet to tap this ledge at depth.

The R. E. Lee group of three claims is owned by the R. E. Lee Gold Mining Company, control of which has passed into the hands of a Toronto company, and is equipped with a seven-drill compressor and a steam hoist. A main shaft is being sunk to the 100-foot level, and shows three feet of ore assaying $10 to $35 gold, 4 ounces silver. A fifty-foot level runs forty-seven feet east and a cross-cut twenty-four feet north from this shaft, and a thirty-foot tunnel, with twenty-foot drift, shows two to three feet of mixed ore at another point on the ledge. Twelve tons shipped from the tunnel returned an aggregate of $458 gold. A sixty-foot shaft is down on the Gopher on similar ore, and a tunnel 5x7 feet is in 100 feet on the same ledge, all in arsenical iron and copper pyrites, carrying $18 gold and copper, with a little silver. This tunnel is being extended day and night by air drills operated by power from the Homestake, and at 800 feet will enter the Homestake, which has the same ledge. It passes under a thirty-seven-foot shaft, all in ore assaying $8 to $22.

On the Homestake, the Homestake Gold Mining Company has traced the same ledge 700 feet by open cuts, and two shafts, one of which is over 100 feet, have been sunk and connected by a drift. One of these shafts is being continued to connect at 300 feet with the main tunnel from the Gopher, which starts 1,300 feet distant. The shaft shows three and one-half feet of ore, assaying $25.54 gold, silver and copper, of which 150 tons will be shipped as soon as the railroad is extended and chutes can be built.

The Nest Egg and Firefly are being developed by the Nest Egg-Firefly Gold Mining Company, which has equipped them with a four-drill compressor, hoist and pumps. There are two ledges, on one of which are two small shafts 300 feet apart, showing pyrrhotite and copper pyrites, while a fifty-foot shaft and twenty-five-foot drift on the other are all in ore, assaying $20 to $55. This shaft is being continued to 200 feet, and drifts will be run to the 100-foot level.

The Mayflower, owned by the Mayflower Gold Mining Company, has three ledges, of which the middle one has been most developed. A 200-foot tunnel, with a seventy-two foot shaft at the portal, shows twelve inches of ore. For thirty feet along the tunnel the ledge carried carbonates, which gave place to iron pyrites with much galena, some zinc blende and calcite. A car load netted $56, viz., $40 silver, $10 gold, $6 lead, and from the bottom of the shaft twelve inches assay 160 ounces silver, $12 gold, the remaining twenty-four inches 37 ounces silver, $8 gold, the whole averaging $65 for all values. On the north ledge, thirty inches wide, a fifty-foot shaft shows eighteen inches of $50 ore. Work is being continued on the shaft and tunnel on the main ledge.

On the Phoenix, the Phoenix Gold Mining Company has three ledges, of which the center one is being developed. An eighty-foot shaft shows five and one-half feet of mixed ore; another of thirty-six feet has a ten-foot drift, all in ore, assays of which run as high as $45 gold; the third, which is now being sunk to the 100-foot level, has the ledge nearly ten feet wide.

The Blue Bird, on the west extension of the Mayflower ledge, shows two to three feet of mixed ore in a twenty-two-foot shaft. On the Curlew, beyond it, John Earle and Joseph Vogel have a forty-three-foot shaft showing six to ten inches of ore which carries $6 to $10 gold, 70 to 80 ounces silver. On the Zilor, half a mile west, E. Morrison, of Victoria, has sunk three shafts, one in barren diorite, another of thirty feet showing considerable ore, and a third of sixty feet which passed through good ore into barren rock and again into ore. The Hattie Brown, adjoining the Blue Bird, has a shaft showing pyrites and arsenopyrite half its width at the forty-five foot level.

The Trilby group of two claims is being opened by the Gold & Silver Mines Developing Company. The ledge, two to four feet wide, was first stripped for several hundred feet and defined by a twenty-five-foot shaft, all in ore. Another shaft, now seventy feet deep, ran into solid low-grade ore at the forty-foot level, carrying iron pyrites and galena. Surface assays averaged $5 to $6, but value has increased with depth. At fifty feet considerable galena came in and assays between fifty and sixty feet averaged $28, while one at sixty-five feet ran $18 silver, $22.50 gold.

The Southern Cross group of three claims, owned by the Southern Cross & Wolverine Consolidated Gold Mining Company, has a well-defined fissure ledge carrying two or three feet of solid sulphides in two tunnels, seventy-five and ninety feet long, and ten feet in the longer tunnel a winze was sunk twenty-five feet on two or three feet of low-grade ore, along what appears to be the Crown Point dike.

The Lily May, the pioneer location of the camp, is being developed by the Lily May Gold Mining Company with a ten-drill compressor plant and steam hoist. An incline shaft is down 108 feet on the ledge, and is tapped at forty

feet by an eighty-five-foot tunnel from the surface on an ore chute two to six feet wide. A thirty-five-foot drift to the northwest shows solid ore across the face assaying $22.10. A second shaft forty-five feet on a parallel ledge shows ore the full width, carrying gold, silver and copper. A third shaft struck a six-inch pay streak at a depth of ten feet, and this widened to four feet at a depth of seventy feet, with increasing gold values. The following assays were taken in the early stages of development, but those taken recently show practically th same value, gold having almost entirely replaced silver: 42 ounces silver, $4 gold, total $32.15; 96 ounces silver, $4 gold, 26 per cent. lead, total $85.18;35 ounces silver, $2.40 gold, 7 per cent. lead, total $29.80.

The Deer Park has one of the largest ore bodies inthe camp, but it was of discouragingly low grade until the Deer Park Gold Mining Company took hold of it and began sinking to depth. The surface assays ran no higher than $6 from pyrrhotite and little improvement was shown for fifty feet down the shaft, though a cross-cut showed forty-eight feet of ore with no walls in sight. But from a depth of seventy feet onward the value began to improve, the lowest assay below that point being $16, while as much as $220 has been shown, chalcopyrite having come in. A cross-cut will be run at the 120-foot level to determine the size and course of the ledge.

The Commander, which has been bonded by the Commander Mining and Smelting Company to the London Gold Fields Syndicate for $250,000, has another great ore body. A shaft sunk on a smooth wall beside a porphyry dike to a depth of 200 feet is in a continuous chute of ore and at the 100-foot level a drift for 150 feet to the southeast shows the ore body to be two to three feet wide, while a cross-cut at the bottom of the shaft shows the ledge to be at least seventy feet wide. Of this, four feet is pay ore assaying $20 to $40 gold and copper, and the balance is mixed oxidized iron, quartz and decomposed diorite, running from $3 to $7 in value. The mine has a steam engine, pump, four-drill compressor and two power drills.

A six-foot ledge has been traced east and west across the Palo Alto by the Palo Alto Gold Mining Company and a thirty-one foot shaft showed oxidized matter for the first seventeen feet and three feet of fine-grained arsenopyrite for the remainder of the distance. On the San Joaquin, the San Joaquin Gold Mining Company is sinkink on a narrow crevice, in which at a depth of eighteen feet the diorite had become much more mineralized with pyrrhotite and copper pyrites.

The St. Paul, on the north slope of Deer Park Mountain, is owned by the St. Paul Gold Mining Company, and has three known ledges, one of which has free-milling ore. On the first a shaft is down twenty-five feet, and a cross-cut both ways from the bottom shows sixteen feet of mineralized ledge matter. Two other ledges were exposed in the cuts for the Red Mountain Railroad, and one of these has been explored by a twenty-two-foot tunnel and tapped in 150 feet by a cross-cut, which will tap the first-mentioned ledge in 250 feet more, at a depth of 150 to 200 feet. The third ledge has not been explored, but shows free-milling ore similar to that of the O. K. A three-drill compressor plant is pushing the cross-cut ahead.

On the Red Eagle, the Red Eagle Gold Mining Company has tapped a two-foot ledge at a depth of fifty feet with a ninety-five-foot cross-cut, showing twelve inches of iron sulphide and galena ore, assaying $27 to $35. A forty-foot shaft on the same ledge shows six inches of solid ore on the hanging wall and ten inches on the foot wall, assaying $40 to $110 in gold, silver and copper, with three and one-half feet of mineralized quartz between. A steam hoist, pump and two steam drills have been installed. The same company has sunk fifteen feet on the Red Pole, which is on the Silver Bell ledge, showing streaks of galena and sulphides throughout, averaging $25 to $30.

The Kootenai-London Mining Company has been developing the Comet No. 2, in which a twelve-foot shaft showed ore the full width, with neither wall in sight, assays running from $8 to $12.

On the Trailhunter, the Cromwell Mining & Development Company is sinking a shaft, which at twenty feet showed sulphide ore the full width, assaying $14 to $18.

The Iron Hope group of two claims, which the Iron Hope Mining & Milling Company is developing, has four well-defined ledges, on two of which work has given good results. On one a ten-foot shaft showed four feet of ledge matter highly mineralized with iron pyrites carrying $2.50 to $3 gold. Another showed heavy arsenical iron on the surface assaying $5.40 gold and silver, and in a fifty-foot shaft this has widened to thirty inches, assaying $25 to $35 gold, besides silver. The ore follows the granite hanging wall, which is smooth and well defined, and between it and the footwall is a great dike of hornblendic rock, which at the bottom of the shaft is heavily loaded with iron pyrites and shows some copper.

The Sunset group of two claims, also on Deer Park Mountain, is being developed by the Canadian Gold Fields Syndicate, which has contracted for a five-drill compressor plant, eighty-horse power boiler, hoist and pump. The ledge exposed on the surface for 1,100 feet averages two feet, and at the mouth of the main shaft is eighteen inches. This shaft is down seventy feet, and shows it to widen to four feet of solid pyrrhotite and iron pyrites from the twenty-foot level downward. Assays range from $22 to $68 gold and 1½ ounces silver, and average about $40 gold. Another shaft, twenty feet deep, shows

ore assaying $36 gold, 3 per cent copper, 3 to 4 ounces silver, and a third, of thirty feet, is in ore carrying still higher values. A drift has been run seventy-five feet from the sixty-foot level in the main shaft, which will be continued and will connect at the 100-foot level with a tunnel driven 200 feet on the ledge.

The Black Rock, on the northwest slope of Deer Park Mountain, is half a mile from the Le Roi, and is believed to be on one of the Le Roi ledges. It is four feet on the surface, and continues that width in a 30-foot shaft, on which work is about to be resumed. Near the surface the diorite was impregnated with mineral, and at twenty feet streaks of solid pyrrhotite began to come in, so that a decided improvement may be expected on the assay of $4.20 gold, made at seventeen feet depth.

The Rossland Trail Creek Gold Mining Company has three ledges on the Golden Crown group of three claims on Lake Mountain. In one a forty-five-foot shaft shows two feet of chalcopyrite assaying $2 to $28 gold, and on another an eleven-foot shaft and a thirty-seven-foot open cut showed a body of well mineralized quartz, an assay of which from an adjoining claim showed $96.

The Grand Prize Mining Company is developing two cross ledges on the Grand Prize, which has the northeastern extension of the Deer Park ledge. The north ledge is nine feet wide, and a fourteen-foot shaft has developed streaks of ore aggregating fourteen inches and assaying $8 gold and 9 per cent. copper. The south ledge is thirty feet wide, and a thirty-foot shaft shows a ten-inch streak of mineral carrying $18 gold and 6 per cent. copper. The value and size of the Deer Park ledge are being shown up on the Deer Park property, so nothing has been on it.

On the Hill Top, a direct east extension of the Mayflower, the Hill Top Mining & Milling Company has two very large ledges running east and west. The north ledge, in a forty-foot shaft, shows an average gold value of $8. Numerous surface cross-cuts and a 220-foot tunnel have shown the south ledge to be fully fifty feet wide, of highly silicious ore, averaging about $9 gold, besides copper. This is believed to be first-class concentrating ore. Work is still in active progress.

The largest block of mining ground in the camp owned by a single company is the Fourteen group, which has been surveyed and made accessible by wagon roads by the Fourteen Gold Mines Consolidated Company. It comprises fourteen claims and seven fractions, aggregating 700 acres in area, on the north slope of Deer Park and Lake Mountains, and, while undeveloped, is surrounded by some of the most promising developed properties, the ledges from which run into this ground. Among these are the Red Eagle, Curlew, Mayflower, Homestake, R. E. Lee, Lily May, Hill Top, Gopher and Crown Point, already described. The Red Eagle ledge has been opened on one of the Fourteen claims by a thirty-foot shaft, showing high-grade shipping ore. This company is preparing for extensive development this season.

Lookout Mountain, six miles east of Trail, has during the last year become the scene of active development, large iron caps indicating the presence of great bodies of ore running northeast and southwest with a northerly dip.

The principal work so far done is on the G. R. Sovereign, which "Rocky Mountain" Ryan and Messrs. Peterson and Murphy have bonded to Gen. J. Warren and others. A shaft was first sunk, following down a body of low-grade pyrrhotite in diorite gangue, in which copper pyrites, quartz and calcite gradually came in, with rising gold value, which at fifty feet was about $50. A cross-cut is in 175 feet to tap the ledge at a depth of 250 feet, and at ninety feet struck a cross ledge carrying several feet of ore.

Adjoining the Sovereign on the southwest, the Joker Gold Mining Company has sunk fifty feet on the Joker, and is drifting from the bottom toward the ledge, on a stringer which assayed $42.

The Vinon, northwest of the Sovereign, owned by T. M. Beamish and Frank and Charles Young, of Vancouver, B. C., has a large surface showing of ore averaging $13. A cross-cut, now in twenty feet, will tap the ledge in sixty feet.

The first claim staked on Lookout Mountain was the Red Point, located in 1893, and now being developed by the Red Point Gold Mining Company. The surface ore assayed $68 gold, $10 silver, and the ledge will be tapped in twenty-five feet more at a depth of 350 feet by a cross-cut, which is in 275 feet.

The Nipissing group of three claims, owned by T. M. Beamish, has three iron-capped ledges crossing it, the first of which will be tapped in sixty or seventy feet more by a cross-cut, now in 140 feet. This cross-cut was run on a feeder one to two and one-half feet wide, assays of which ranged from a trace to $68 gold.

The Ida Queen Gold Mining Company has run a tunnel fifty feet on an eight-foot ledge on the Ida Queen, assaying $14 gold, and is extending it night and day.

On the Stemwinder group of four claims, the Rossland Columbia Gold Mining Company has sunk twenty-two feet, showing an eighteen-inch streak of copper pyrites, assaying $16 gold and copper, and widening with depth, and has tunneled forty feet from the surface.

The Bruce Gold Mining Company has also been sinking on the Bruce, and has fifty tons of free-milling ore on the dump, the lowest assay of which exceeded $60 gold.

In addition to its Deer Park Mountain claims, the Rossland Trail Creek Gold Mining Company has the Emma C. group of three claims on a series of heavy iron caps on the northwest slope of Lookout Mountain, but has not yet begun development.

The Little Giant group of four claims, owned by the Canada Mutual Mining & Development Company, has three ledges in which extensive open cuts have shown beneath the capping arsenical and sulphide ore two to three feet wide and widening with depth, average assays from the surface showing $11.75 to $1.40 gold.

Lookout Mountain has peculiar advantages for cheap transportation and reduction, for a cable tramway one and one-half miles long would take the ore from all the properties direct to the Trail smelter.

Within the last two years development work has extended to Grouse Mountain, four and one-half miles south of Rossland, through which the boundary cuts. The ore is here free milling, the ledges running northwest and southeast between walls of porphyritic syenite. Development is in progress on both the Canadian and American sides.

The most development has been done by the Helen Gold Mining Company on the Helen group of three claims, through which a ledge eighteen inches to twelve feet wide has been traced. An incline shaft is down eighty feet, which will connect with a 200-foot tunnel at a depth of 300 feet. The tunnel shows from twelve to twenty-four inches of ore, assaying about $12 gold, with a little silver and a trace of lead, though some assays have run as high as $1,200. A test shipment of two car loads will be made this spring.

The Knight Templar, owned by the Knight Templar Gold Mining Company, has a 160-foot tunnel, from which a winze goes down sixty-five feet, showing a large body of low-grade ore, assaying no higher than $26 gold. The winze will be sunk to the 100-foot level, where drifts will be run each way.

The Seattle & Grouse Mountain Mining Company has done a large amount of surface work on the Jim Blaine, seven miles south of Rossland and four miles from the Red Mountain Railroad, and has shown a well-defined fissure ledge two and one-half feet wide cropping the entire length. The Mary McCormick adjoins it on the north and has given assays of 86 ounces silver, $4 gold a few feet from the surface. The Jumbo, on the Helen extension, has a five-foot ledge of free milling ore cropping clear across the claim, and the Acme, beyond it on the same ledge, is sinking on ore which averages $30 to $35 gold.

On Sophie Mountain, seven miles southwest of Rossland, are some great bodies of gold-copper, on which development is in progress. The Victory-Triumph, the principal scene of operations, has a ledge stripped for sixty feet and defined for twenty feet between walls at another point, showing rich croppings of copper ore. A twelve-foot shaft, all in ore, gave assays 15.3 per cent. copper and a trace of gold on the surface: 22.1 per cent. copper, $3.20 gold four feet down, and 30.4 per cent. copper, $3 gold at a depth of eight feet, while the country rock carries malachite and assays 9.7 per cent. copper. A forty-foot tunnel shows nine feet of mixed ore, with streaks assaying $19.50 gold, silver and copper thirty feet from the mouth. This tunnel is now in 125 feet and shows a full breast of ore averaging $38.

The two Olga claims are being opened by the Olga Gold Mining & Milling Company and adjoin the Victory-Triumph. There are three ledges, one averaging six or seven feet, and another, which is now being opened, eight feet wide. Assays of surface ore from the latter have ranged from $2.27 gold and silver to $2 gold, $8.13 silver, 54.55 per cent. lead.

On a parallel ledge the Abe Lincoln Mining & Milling Company has the Abe Lincoln group of three claims. The ledge, striking southeast and northwest, has been traced over 1,000 feet and is defined by a cross-cut to be forty feet wide, the gangue being quartz carrying gold and galena. A fifty-foot shaft is down on the footwall and a cross-cut has been run at the bottom for forty-two feet, from which drifting has begun.

The year now opening also promises development directly north of Rossland, both sulphide and free milling ore being found there.

On the Falu, on Green Mountain, a shaft seventy feet on the hanging wall, from which a cross-cut struck the footwall in twenty feet, shows a body of pay ore assaying $38 to $48 gold.

A mile further west are the Highland and Sierra Madre, recently bonded to an Austrian company for $32,000. They have a large body of low-grade silicious ore, carrying a good percentage of copper and well adapted to concentration.

At McDonald's Camp, in the same section, Ross Thompson, John Donahue and E. W. Johnston have the three Red Cloud claims, two of which are on a forty-foot ledge running east and west, showing four feet of sulphide ore in a number of cuts, and an eight-foot ledge of similar ore, traced by surface cuts. The surface ore assays between $3 and $4 gold, and a tunnel, now being driven, shows improvement.

The annual report of Hon. James Baker, Minister of Mines for the

Province of British Columbia, gives the production of the Trail Creek District for the years 1895 and 1896 as follows:

Year—	Ore—Tons.	Gold.	Silver.	Copper.	Total Value.
1895	19,693	$ 629,940	$30,496	$42 021	$ 702,457
1896	38,075	1,104,500	59,830	79,030	1,243,360

To this may be added nearly $1,000,000 as the production from the first shipment of the Le Roi in 1891 down to January 1, 1895, for which period there is no exact record. This would bring the total close to $3,000,000, a large proportion of which was shipped to smelters in the United States. The growth of business, both import and export, is shown by the fact that the customs collections at Rossland in 1896 were $92,629.20 and at Trail (the month of December lacking) were $60,896.40.

A year ago the most sanguine mining men anticipated an even greater production for 1896 than is shown by the above figures. While the increase has been great, the returns given show only the metal extracted, and do not take into account the much larger quantity of ore taken out but not shipped to smelters. Had all this been shipped, it would have greatly swollen the total production, though it would not have borne out the extravagant predictions made.

But the shipment of this ore would have brought small profit to the mine owner in proportion to its value, and that brings up the problem which confronts the Trail companies and has prompted them to hold their low-grade ores on the dump or in the mines. That is the problem of cheap reduction of low-grade sulphide ores on the mine ground. They find that the cost of freight and treatment bears too high a ratio to the value to permit of shipment under present conditions, the capacity of the Trail smelter being unequal to their needs. The solution is that, like Butte, Rossland must become a great smelting center as well as a great mining camp, with smelters and concentrators on Sheep Creek and the Columbia River, where there is abundant water and power. On this subject Mr. Woodhouse said to the writer:

"The miners have very large quantities of low-grade ores which must be worked by the combination process, that is, smelting, milling, concentration, chlorination and cyanide. The ore carries, on an average, about half and half silica and sulphide. Those ores which are rich enough in sulphides to be smelted will not concentrate to advantage because they are already concentrated by nature. Those ores which carry about half and half sulphides and quartz should be concentrated in six sizes and the tails crushed to thirty-mesh screen, passed over gold plates and reconcentrated with Frue vanners or revolving tables. Those ores which are 10 to 15 per cent. sulphides should be crushed to thirty-mesh screen, passed over gold plates and the free gold saved, while the tails should be concentrated with Frue vanners and revolving tables. These processes will save about 40 per cent. of the gold in concentrates and 40 per cent. free on the plates. This will require large crushing and sizing mill capacities, large area of gold plates, jigs, Frue vanners and revolving tables. When the ores are worked by those processes, Rossland can turn out more ore and bullion than any camp on the Coast. In the case of ores containing no copper or other metals which interfere with the cyanide process, cyanide could be applied with advantage. The chlorination process would be adapted to high-grade ores which did not carry much copper or other metals interfering with its operation, but they could be smelted to better advantage."

SLOCAN.

Paradoxical as it may seem in these days of low prices for silver, the most productive mining district in the Pacific Northwest during the year 1896 was the Slocan, an almost exclusively silver district, with forty-seven shipping mines to its credit. Not only that, but it promises to hold the same rank with a largely increased production in 1897, for all the producing mines are increasing their output and many others are stepping forward into the ranks of the producers. The following table, taken partly from the report of W. A. Carlyle, Provincial Mineralogist, and partly from the annual report of the Minister of Mines of British Columbia, shows the rapid increase in production:

Year—	Tons.	Gold, Ounces.	Silver, Ounces.	Lead, Pounds.	Gross Value.
1894	4,417	...	613,926	5,623,621	$ 572,350
1895	9,649	6	1,137,040	9,751,464	1,057,677
1896	18,215	152	2,141,088	19,210,666	2.010,048

Some conception of the probable rate of increase for 1897 can be formed from the fact that the value of ore shipped from the West Kootenai District in January, exclusive of the last week's returns from Revelstoke, was $747,000, and that nearly all of this came from Slocan. It is estimated that there will

be fully seventy-five shipping mines in the district this year and that the original forty-seven will ship 50,000 tons, worth $5,000,000.

This district comprises the strip of mountainous country between Kootenai Lake on the east and Slocan Lake on the west, a distance of fifteen miles, and extending the whole length of the latter lake—about twenty-three miles. It is in the backbone of the Selkirk Range, which culminates in a rugged mass of snow-clad peaks, nearly 9,000 feet above sea level, between the south end of Slocan Lake and Ainsworth. The great chain of lakes and rivers makes it peculiarly accessible and an easy pass has been found for a railroad across the range from Arrow to Slocan Lake and from Slocan to Kootenai Lake.

From Spokane, which is reached by either the Northern Pacific, Great Northern or Union Pacific Railroads, the route to Slocan is by the Spokane Falls & Northern and Nelson & Fort Sheppard Railroads to Nelson, 200 miles; thence by steamer up the Kootenai River and Lake to Kaslo, with the alternative of the Columbia & Kootenai Railroad between Robson and Nelson; thence by the Kaslo & Slocan Railroad to Sandon, and by the Nakusp & Slocan Railroad to Slocan Lake. Steamers ply up and down the latter lake in connection with the trains. The other route is from Vancouver over the Canadian Pacific Railroad to Revelstoke, 379 miles, and by a short branch to Arrowhead, thirty-two miles; then by steamer down Upper Arrow Lake to Nakusp and by the Nakusp & Slocan Railroad to points on Slocan Lake and Sandon. where connection is made with the Kaslo & Slocan Railroad for Kootenai Lake points. The Canadian Pacific is now building a branch from Slocan City, at the south end of Slocan Lake, to Slocan Crossing on the Kootenai River, opposite Nelson, connecting at the latter point with the Columbia & Kootenai Railroad. The Provincial government has been very liberal in building roads and trails to the new camps and the nature of the country favors this work. The cost of roads is estimated at $1,000 a mile and of trails at $80 to $125 a mile. The steep even grades of the mountains favor the transportation of ore in rawhides over snow trails, and thus the heaviest shipments are made during the winter.

The geological formation of the district is best described in the language of Dr. George M. Dawson, of the Dominion Geological Survey, who says in his report of 1889:

"A large part of the West Kootenai District is occupied by granite and granitoid rocks, the main area of which includes the whole basin of the Lower Arrow Lake, and extends thence eastward nearly to Queen's Bay on Kootenai Lake. Besides this granite area, there are several others of smaller dimensions, as well as numerous dikes and eruptions. It is in fact probable that about one-half of the entire region here reported upon is occupied by granite and granitoid rocks. * * * The granites which are supposed to be of the greatest age were found in some places underlying the lowest beds of the gneisses and mica-schists, or Shuswap series. The granites which, however, occupy by far the largest area are of coarse texture and are characterized by black mica, with frequently much black hornblende. * * * These granites are evidently intrusive and of much later date than the stratified rocks, which are altered at contacts."

In his summary report for 1894, R. G. McConnell, also of the Dominion Geological Survey, after describing the eruptive rocks and granites, adds: "In addition to the main areas of eruptive rocks, numerous dikes, some of them connected with the main areas, others much younger, as they cut through everything, are met with in every part of the district."

In his summary report of 1895, Mr. McConnell adds that "the region between Slocan Lake and River and Kootenai Lake is covered mainly by granite fringed on the north and east by a border of slates and schists. * * * The principal geological boundary in the district is the sinuous line separating the granite area from the bordering slates."

Mr. Carlyle, writing of the whole section from Kaslo south to the boundary, says:

"It is of great interest that in all of the geolgical series represented here are veins or mineral deposits, especially of silver and silver-lead ores, and no longer are the prospectors limiting their researches to special formations or parts of these districts, but energetic prospecting is being done with successful results all over this part of West Kootenai. For a long time these men refused to enter the granite areas, until finally the discovery by some less skeptical of the silver-lead, and the gold-and-silver, or 'dry ore,' veins on the watersheds of Springer and Lemon Creeks, east of Slocan Lake, and the success of the Poorman gold mine near Nelson, led to a rush of men into the granite regions with gratifying results. * * *

"There is no reason why mineral should not be found in all of these formations here present, or in any part of this region, unless it has so happened that the conditions have prevailed by which the mineral-bearing solutions have not had openings or fractures along which to ascend and deposit their burden of precious ores, either by filling up pre-existing cavities, or by leaching into or impregnating the country rock with valuable minerals on one or both sides of the channel or crevice. The finding of rich veins of ore in either of the series, such as of silver-galena ore, points strongly to the fact that as depth is obtained in mining, the continuity of the pay chutes

is assured. The veins may be "in and out," as the miners term it, or have perfectly barren parts along the fissure, but more or less work will disclose other ore chutes if this work is pushed ahead along this fracture in the rock, which has permitted the passage of ore-bearing solutions and the formation of ore bodies along it elsewhere."

Mr. Carlyle divides the veins of the Slocan into four classes, viz:

"1. The argentiferous, galena, with zinc blende and some gray copper, in a gangue of quartz and spathic iron. These veins cut across the stratified rocks and through the dikes of eruptive rock, where, in many cases, there is a good body of ore, and they also occur in the granite area, and some have been traced for 3,000 or 4,000 feet along the strike and one for nearly two miles. In the Slocan slates, it has not yet been proven that, as the vein cuts through shales, slates, limestones or quartzites, any one of the series has been more favorable to the formation of ore bodies than another, as in the different veins it will be seen that good ore chutes may have the wall of any of the rocks mentioned. The ore has been deposited along fissures, both in the open fissure cavities and by impregnation of the country rock. * * * Most of the veins are narrow, varying from two and three inches to fifteen and twenty inches in width, with occasional widenings to three or four feet of solid ore, and even much more. The ore chutes are not persistent horizontally, as is characteristic of nearly all veins, but ore is often continuous for several hundred feet, and where it then pinches a thin streak of oxides is the index usually followed in the search for more ore, which seldom fails to reappear with more or less work. The mistake is made sometimes of following along a slip-wall or crevice that may cross the vein crevice at a flat angle and thus lead the miner astray. Besides the solid ore, some veins have associated with them two, three or more feet of mixed ore, gangue and country rock, which may be of such grade as to pay well for concentration. * * * The product, or concentrates, is silver bearing galena, but any value contained in the decomposed material that may enter the mill will in all probability not be saved, likewise that in much of the gray copper, which apparently slimes badly and escapes. * * * It might be well to be on the look-out for gold, remembering the good gold values found in the galena ores of the Monitor mine, which yield from $2 to $14 in gold per ton."

Mr. Carlyle then gives a statement of the value of ore, based on smelter returns from the principal mines, the lowest being 40 to 125 ounces silver and 15 to 73 per cent. lead, and the highest 83 to 730 ounces silver and 19 to 67 per cent. lead. He adds that in most of the veins the zinc blende carries a small silver value and is sorted or concentrated out of the ore. He then gives the three remaining classes of ore as follows:

"2. The veins of argentiferous tetrahedrite, or gray copper, and jamesonite and silver compounds in a quartz gangue.

"3. The dry ore veins on Springer and Lemon Creeks, in the granite, with a quartz gangue containing argentite, native silver and gold. These veins are now attracting much attention, as high assay returns have been secured as per smelter returns.

"4. The gold-quartz veins in the southern part of the granite."

The change from silver to gold as the predominant value occurs in going from north to south. Near Sandon there is little gold in the ore; at Eight-Mile Creek, gold is first noticeable; on Lemon Creek, the ore is almost, if not entirely, gold-bearing and of high grade, assays from different ledges ranging from $75 to $200.

The Slocan Star group, consisting of eight claims, and owned by the Byron N. White Company, is acknowledged to be the greatest mine in the district, and indeed is the greatest silver-lead mine in British Columbia. The discovery was made in September, 1891, by Bruce White and others, in the bed of Sandon Creek a mile from the present town of Sandon, of a thirteen-foot ledge of quartz and spathic iron interspersed with galena, zinc blende and slate. The croppings of the large ore chute now being worked were discovered 800 feet west. The ledge, varying from a few feet to twenty or thirty feet in width, cuts the slate, quartzite and limestone formation almost at right angles, in an east and west course, and has a large porphyry dike running parallel and at places found within it. It contains in the large chute from a few feet to twenty-five feet of mixed ore, and bodies of solid galena from two to ten feet wide have been mined. The first-class ore, which is shipped direct to the smelter, is almost pure galena, averaging 95 ounces silver, 72 to 75 per cent. lead. The concentrating ore is spathic iron, quartz gangue, with galena, a little gray copper and some silver sulphides, most of the zinc blende being sorted out. The concentrates average 80 ounces silver, 70 per cent. lead.

In development, a tunnel was first run fifty feet into the croppings and a stope made thirty feet to the surface. Then a cross-cut was driven 100 feet and a drift 100 feet, from which ore was stoped to the upper tunnel eighty feet long and four to ten feet wide. The third tunnel, seventy feet below, cut a feeder at seventy feet, on which a twenty-five foot drift was run, and then cut the main ledge at 150 feet. A 150-foot drift to the west ran through low-grade ore and then entered high-grade ore, on which a 110-foot stope to the east almost connected with the short drift on the feeder, leaving a forty-foot pillar of concentrating ore. The drift is 430 feet long, mostly on con-

centrating ore, and the stope is 180 feet long, four to seven feet wide, and worked to the upper level. The fourth tunnel tapped the ledge at 575 feet, where it was ten to twelve feet wide, and a seventy-five foot drift west opened eight to ten feet of mixed ore until a fault was struck. From a drift 100 feet east an upraise was made 210 feet to the next level, in god mixed ore which was fourteen to sixteen feet at the tunnel level. A cross-cut at 150 feet in this drift showed twenty-five feet of mixed ore, with several feet of solid galena, but at 225 feet the chute narrowed to three feet. The fifth tunnel will at 800 feet tap the ledge 210 feet on the ledge below the fourth and is being driven with four air drills. An eighty-foot tunnel near the cropping in the creek showed considerable ore, but in broken ground. The ore is hauled by a 1,600-foot gravity tramway to the mill, whence a half-mile road leads to Sandon. The mill is operated by water power from a 3,000-foot flume and has a crusher, four sets of rolls, twelve jigs and two slime tables, its maximum capacity being 150 tons in twenty-four hours. The mine shipped to December 1, 1896, 11,350 tons of ore and concentrates, worth at the smelter $990,000, and during the winter shipped 1,000 tons a month. It has paid $300,000 in dividends.

The Eureka, on the extension of the Slocan Star up the mountain, is owned by Byron N. White, Bruce White, John A. Finch and Charles Chambers, who have tunneled 200 feet on it and shown the same grade of ore as the Slocan Star.

On the Slocan Star ledge, which has been traced into it through the Eureka for 2,500 feet, is the Richmond, one mile from Sandon. A fifty-foot tunnel has shown the ledge two to six feet wide, carrying galena, zinc blende, spathic iron and quartz, which assays $75 silver, 60 per cent. lead. Another tunnel will be driven 150 feet below, attaining a depth of 600 feet on the ledge.

The Ruth group of three claims and a fraction, half a mile from the Slocan Star, is owned by D. E. and W. H. McVey and by H. M. Foster, of England, who paid $166,000 for a two-thirds interest. The ledge cuts the slates northeast by southwest and ranges from three to nine feet wide, carrying coarse galena in a gangue of spathic iron and quartz, which runs from 100 to 120 ounces silver, 54 to 76 per cent. lead, and on the surface carries carbonates running 30 to 65 ounces silver. The lower tunnel follows the ledge for 350 feet, but had not reached the ore chute stoped above. The second tunnel, 740 feet long, showed little ore for the first ninety feet, then the ledge became more defined for sixty feet and after this a stope 160 feet long runs up for forty feet on an average of three to three and one-half feet, an upraise of eighty-five feet connecting with the third tunnel. Another stope fifty-five feet long and thirty feet high is in four and one-half feet of galena, spathic iron and carbonates, and a third stope 160 feet long and forty feet high has three and one-half to four feet of ore, while the tunnel beyond shows eight feet of ore for twenty-five feet and an eighty-foot upraise, at 630 feet in, is also in ore. The third tunnel, 330 feet long, is in a narrower ore body all the way, but shows three feet of galena and carbonates in the face. About 1,500 tons had been shipped up to August, 1896, sixty tons a day are being shipped and $50,000 in dividends have been paid.

The Wonderful group of three claims, a mile further west, owned by the Wonderful Group Mining Company, is well named, for it has also been called the galena hydraulic. Originally 600 feet of tunnels, with a series of cross-cuts, drifts and upraises, had been driven to define the main ledge, but without success. Ore lay scattered plentifully through the surface wash and shattered slate, and therefore, when E. J. Field took charge as superintendent for the company, he brought water by flume from both Miller and Tributary Creeks to sluice off this surface wash and expose the solid formation. Water was turned on the wash and, rushing down the mountain to Carpenter Creek, swept it clean to bedrock. It was found that pieces of galena ore were left in the bottom of the cut and periodical clean-ups resulted in the shipment of ore worth $43,690 from this hydraulic, one boulder of solid galena weighing 1,300 pounds. This ore assayed 113 to 133 ounces silver and 70 to 76 per cent. lead. The mineral-bearing wash was only 100 to 120 feet wide and the pay dirt, containing much decomposed ore which was swept away, was much narrower. This washing finally exposed a solid ledge in place near the railroad, running southwest and northeast, twelve feet wide. The longest tunnel in the old workings, 685 feet, was then extended 500 feet and a cross-cut made fifteen feet wide, showing no mineral at that point, a depth of 700 feet. A drift now being run on the ledge is in 200 feet and struck ore at 100 feet in stringers, which are becoming more abundant and give evidence of the proximity of an ore body. Two car loads have been shipped from this tunnel. Another tunnel, now in 210 feet, will strike the ledge 100 feet below the exposure in the wash. Sluicing will be resumed this spring. There are two other ledges higher up the mountain.

The Argo group of three claims is on a ledge only a few hundred feet from Sandon and was located in the summer of 1896 by William Snowden, John A. Whittier and Alexander McDonald on a ledge showing three to four feet of solid ore. A tunnel is being run to explore the ledge, and has recently struck eight inches of solid galena.

The two Monitor claims at Three Forks, owned by George Petty, are on a northeast and southwest ledge crossing the slate at right angles near a

porphyry dike. The ledge varies from a few inches to three and one-half feet of galena and carbonates. The lowest cross-cut, 161 feet, has not struck the ledge, but fifteen feet higher a tunnel runs 275 feet on the ledge, with ore for 195 feet from three to thirty inches wide. A cross-cut to the west will catch the ledge again beyond a fifty-foot fault. A fifty-foot cross-cut 100 feet higher struck the ledge again, but much broken. Another cross-cut seventy-three feet long tapped the ledge 110 feet higher and from it drifts were run both ways, with a stope seventy-five feet long and thirty-eight feet to the surface on twelve to sixteen inches of ore, besides much shattered slate cemented with galena. The ore differs from others in Slocan in carrying gold, shipments having returned $2 to $14 gold, 142 to 30 ounces silver, 37 to 55 per cent. lead. The average of eighty-eight tons of carbonate ore was $13 gold, 128.4 to 323.8 ounces silver and 19 to 33 per cent. lead. The mine has yielded an estimated profit of $15,000.

On the west extension of the two lower Wonderful ledges, which are exposed in the deep canyon of Miller Creek, the Miller Creek Mining Company has a group of two claims and a fraction aggregating 130 acres, on which 100 feet of work has been done and development is about to be resumed.

The Idler, at Three Forks, 500 feet above the Nakusp & Slocan Railroad, is being developed by the Idler Mining Company, and has unusually good surface indications. A tunnel cut the ledge twelve feet below the surface, showing it twenty inches wide, with six inches of galena, fifteen assays of which avraged $450, the balance being impregnated with carbonates of silver and lead. A cross-cut is being run to tap the ledge 125 feet deeper and, including offshoots, is over 200 feet long. Another large ledge further down the mountain will be developed this summer.

In the Alamo group of eight claims the Alamo Mining Company has, in the opinion of Mr. Carlyle, one of the largest and most productive ore chutes yet mined in the Slocan. It strikes east and west across a deep spur from the main ridge in the Alamo Basin, three and one-half miles up Howson Creek, and from the fissure eight to nine feet of solid galena, mixed with gray copper and carbonates, have been stoped, and much mixed ore has been concentrated. The lowest tunnel, 300 feet along the ledge, showed little ore, but a drift 130 feet northwest and thirty-four feet southeast apparently struck it again beyond a fault. In the next tunnel, 340 feet, and the third, a large amount of ore has been stoped from a chute four to six feet wide, with mixed ore occupying the remaining space between two smooth walls. The remaining tunnel, 240 feet below the summit, is in several hundred feet and stoping extends thirty to forty feet above this level. Another cross-cut is being run to tap the ledge in 1,000 feet at a depth of 600 feet and compressed air drills are being installed. Other good ledges are being developed in other parts of the property. A three-rail tramway 340 feet long transports the ore to bins, whence it is hauled three miles by wagons to the head of a similar tramway 7,100 feet long, which transports it to the concentrator on the railroad. The mill, owned by the Slocan Milling Company, is operated by water power from Howson and Carpenter Creeks and has a capacity of fifty tons a day, the machinery being modern and complete.

The Idaho Mining Company, under the same management, is mining the extension of the Alamo ledge by extensions of the Alamo tunnels through the Idaho and St. John ground. In the upper tunnel is a stope twenty-five to thirty feet to the surface on ten to thirty inches of ore, and a sixty-foot upraise to the surface is on twelve to fifteen inches of ore, while there are two feet of solid galena and four to five feet of mill ore in the face of the level. Another ledge runs northeast and southwest across the Idaho Basin and much good ore has been taken from the upper cuts and tunnels, but the main tunnel, 550 feet long, showed little ore, but ten to twelve feet of slate, quartz, calcite and iron pyrites. The profits of the Idaho to March 1 are estimated at $132,000.

The Cumberland Mining Company has five claims on either the Idaho ledge just mentioned, or a parallel ledge, and in its third tunnel has stoped a narrow vein of almost solid galena and blende for 350 feet, and is mining a four to ten inch streak of galena in an underhand stope. A cross-cut is in 500 feet to cut two small ledges several hundred feet lower. Ore is shipped by the Alamo road and tramway and milled at the Alamo mill.

The Alamo, Idaho and Cumberland ledges are said to extend through the Hustler and Silver Bell, on which a Victoria syndicate has done some work and will do more this summer.

The Sunshine Mining Company shipped several car loads of galena in 1894 and 1895 from the Yakima group of four claims in the next basin east of the Alamo. On the Wild Goose and Corinth, J. Gilhooley, A. J. Murphy and A. Behue have shown six to twenty-four inches of solid galena by stripping for 200 feet and are tunneling on the ledge.

Thorough exploration is in progress by John A. Finch, P. Larsen, William Glynn and J. H. Moran on the Queen Bess group of seven claims on the east slope of Howson Creek. There are four ledges within 500 feet. A 300-foot tunnel showed the east one to be small and decomposed, carrying ore forty tons of which shipped in 1893 returned 96 ounces silver and 74 per cent. lead. At 300 feet in this tunnel the ledge was cross-cut, twenty-five feet between walls, showing two feet of solid galena on the hanging wall, which carries 110

ounces silver and 65 per cent lead. Another tunnel, driven 350 feet, taps the ledge 150 feet lower and has twelve inches of ore of the same grade in the face. The west ledge runs northeast and southwest and from a sixty-foot tunnel, from which a stope was run twenty to thirty feet, produced galena ore assaying 141 ounces silver and 75 per cent. lead. A winze is down eighty feet at the face on two leaders of galena separated by four feet of slate. The third vein has been stripped for 200 feet and is a wide zone heavily iron-stained, carrying a little galena and assaying $4 to $6 gold. The fourth ledge shows on the surface six inches of carbonate ore assaying 50 to 60 ounces silver and as much as 40 per cent. lead. Shipments aggregate 180 tons, which averaged 143 ounces silver and 75 per cent. lead.

The Canadian group of five claims, owned by Mr. Adams, of Sandon, and W. H. Brandon, of Slocan City, is on the summit of the ridge between South Carpenter Creek and Four-Mile Creek and has several small galena ledges. One of these, a few inches wide, can be traced north and south for some distance. Another, carrying galena, in calcite and quartz, crops four to twelve inches wide and in the lower of two short tunnels has three to five feet of mixed ore. Another north and south ledge shows solid galena in the croppings and is traceable several hundred feet, and in a thirty-five foot tunnel on the hanging wall shows coarse calcite with some galena.

Adjoining the Canadian on the east are the Ivanhoe and Elgin, which the Minnesota Silver Company is developing. Two cross-cuts connected by a seventy-foot upraise, and with drifts from both, opened an ore chute sixty to seventy feet long and containing as much as five feet of solid and concentrating ore. A third cross-cut has been driven 150 feet below and fifteen car loads of ore were shipped last year.

The Adams group of four claims and a fraction, owned by Capt. L. C. Adams, of Montreal, and others, is on the same ridge as the Canadian group and has a number of closely parallel veins of galena. An open cut shows one to be fifteen to thirty inches wide, of mixed ore, with four to fourteen inches of solid ore on the summit and another vein crossing it. A twelve-foot tunnel has been driven on four to twelve inches of pure galena where three or four narrow veins almost unite. A twenty-foot tunnel is in on one of several small veins on the north slope, showing four feet of mixed ore, and in the croppings this ledge shows eight feet of mixed ore, with small stringers. Another ledge shows four feet of mixed ore. Tunnels have been run to tap these ledges, one of fifty feet, 150 feet below the summit, having six or seven feet of concentrating ore, and another of 245 feet, 400 feet below, following ore for the last forty feet.

The Noble Five Consolidated Mining & Milling Company has five claims on one ledge and three on another, with a possible third, three and one-half miles by trail from Sandon. The main ledge has croppings of iron rock, carrying galena, spathic iron and blende, which in the mine run in bands along each wall by turns. The ledges run northeast and southwest through slate and limestone and carry their best ore chutes where they cut porphyry dikes, the ore being galena, carbonates and oxides in spathic iron and quartz gangue. The mine was at first crudely worked by means of small drifts, but is now being thoroughly developed. A sixty-five foot tunnel and short cross-cuts first resulted in the finding of gool ore, but on account of snow-slides work was started in a new place. Tunnels have been driven aggregating 1,380 feet, opening the ledge to a depth of 600 feet, and the high-grade ore has been stoped to a width of six to eight feet, leaving seven to nine feet of concentrating ore in the drifts. A main tunnel has been driven 200 feet lower, cross-cutting the ledge where there is a strong cropping of galena, and will be connected with the upper tunnels by winzes. On the Deadman ledge three tunnels have been run and twenty-six car loads of ore taken out, the carbonates assaying 63 ounces silver and 15 per cent. lead, and the solid galena as much as 255 ounces silver and 69 per cent. lead. The amount of ore shipped up to December 1, 1896, was 2,000 tons, and between that date and May 1, 1897, it was estimated that 9,000 tons were shipped to the concentrator, producing concentrates worth $50 a ton at the smelter. The ore is transported by a cable tramway 6,100 feet long, with a capacity of twenty tons an hour, to the concentrator at Cody, which is patterned after that of the Slocan Star and has a capacity of 120 tons a day. The net profits of the mine are estimated at $50,000 to March 1, from $125,000 to $150,000 worth of ore having been taken out prior to August 1, 1896.

On the Last Chance group of four claims and a fraction the Last Chance Mining & Milling Company has two small parallel ledges running northeast and southwest, west of the Noble Five group. On one ledge is a 240-foot tunnel with cross-cuts and drifts on feeders and is tapped 100 feet below by a 180-foot cross-cut, from which drifts run 140 feet. and which has been extended to the other ledge. An incline on the ledge was extended as a drift midway between the two tunnels and ran through high grade galena a few inches to three feet wide, mostly solid but partly in quartz gangue. Near the surface the ore was rich carbonates. Shipments in 1895 aggregated nine carloads assaying 166 to 191 ounces silver and 71 to 78 per cent. lead, and in 1896, 17 carloads averaging 182 ounces silver and 62 per cent. lead. The mine, like others in the Slocan, has paid not only for its development, equipment and purchase of adjoining claims, but $50,000 in dividends.

From the American Boy, adjoining, Thomas McGuigan has shipped five carloads and from the Ajax, Matthews & Braden have shipped high grade ore, as well as from the Ruby Silver, north of the Noble Five. Dr. Hendryx, of Nelson, is cross-cutting a ledge on the Galena, which is the supposed extension of the R. E. Lee ledge.

The Reco group of five claims, immediately east of the Noble Five, which is owned by the Reco Mining & Milling Company, has two ledges, the Big and the Small. Three tunnels have been run on the former, one 650 and another 900 feet long, a 125-foot upraise connecting the two. The ledge varies from a few inches to several feet wide of decomposed ledge matter and from it were shipped in 1895 four carloads of galena averaging 179.8 ounces silver and 71 per cent. lead and nine carloads of carbonates yielding from 89.3 to 161.6 ounces silver and 23.2 to 37.1 per cent. lead. The Small, or Goodenough, ledge has yielded some of the richest ore in the district and has been mined jointly with the Goodenough by three cross-cuts, from which drifts have been run. The ledge is from two to twenty inches of solid ore, at times becoming only a narrow streak of iron-stained matter, and is richest where it crosses the porphyry dikes. The galena ore runs from 225 to 730 ounces silver and 67 per cent. lead and the carbonate ore, of which twenty carloads have been shipped, yielded 230 to 337.8 ounces silver and 19 to 28 per cent. lead. This mine, like the Last Chance, has paid for itself and adjoining claims and paid $300,000 dividends. The ore shipped up to December 1, 1896, aggregated about $200,000 in value and to this another $200,000 was added during the winter, the average value at the smelter being $200.

Below the Reco, on the same veins, is the Sovereign, on which John A. Finch has tunneled 75 and 300 feet, gaining 150 feet of depth and showing from one to twenty inches of carbonates in several chutes. He has shipped five carloads running about 100 ounces silver and 60 per cent. lead.

On the Goodenough and another claim, John A. Whittier, J. H. Thompson, J. M. Martin, A. W. Goodenough and C. F. Kent have been working in connection with the Reco. The lowest working is a cross-cut, 275 feet, from which, where it taps the small vein, an upraise for 169 feet has been made to the fourth level on several inches of high grade ore and a drift runs into the Reco ground with good ore for 110 feet above and below. The ore has been all stoped from the upper tunnels to the surface. The ore shipped ranged from 277 to 507 ounces silver and 48 to 67 per cent. lead for galena, and 168.5 to 322.5 ounces silver and 2 to 34 per cent. lead for carbonates. The mine shipped 200 tons up to December 1, 1896, and 250 tons more during the winter, worth at the smelter $400, and has paid $35,000 in dividends.

Adjoining the Reco and Goodenough, the Blue Bird Mining Company has the Blue Bird and another claim on a ledge cropping thirty feet wide with a number of spurs from both directions. In prospecting for the pay streak $40,000 worth of surface ore, carrying 135 to 138 ounces silver and 72 to 75 per cent. lead, was taken out and shipped. A shaft was sunk seventy-five feet and a drift run 150 feet on what appears to be the true ledge four feet wide, with four to eight inches of ore carrying as high as 425 ounces silver. Two carloads have been shipped carrying 175 ounces silver and 65 per cent. lead.

The Chambers group of four claims south of the Goodenough, owned by Charles Chambers and others, is on a ledge of concentrating ore forty to sixty feet wide, which runs from Carpenter Creek up the mountain. About 500 feet of development has been done and one carload was shipped in 1896 which returned 89 ounces silver and 70 per cent. lead.

The R. E. Lee, five miles by trail and road from the Kaslo & Slocan Railroad, is being developed by Lorenzo Alexander of Kaslo. The ledge is a narrow one of galena striking northeast and southwest and shows eighteen inches wide in some places. Two tunnels, one of them 500 feet long, are connected by an upraise of ninety-five feet and an incline runs down from the lower tunnel. Three carloads were shipped last year, averaging 130 ounces silver and 75 per cent. lead.

The Slocan Boy, leased by S. K. Green and others to T. M. Gibson and Lang Keith, has two ledges, one of which, small but rich, is worked by three tunnels, one 140, another 160 feet. The other is the southern extension of the Washington ledge and is tapped at 100 feet by a 200-foot shaft, from the bottom of which a drift runs 235 feet, connecting with a 170-foot tunnel, run on the ledge from the surface. Ten carloads of galena and carbonates have been shipped, of which thirty tons from the small ledge gave 332.4 ounces silver and 75.4 per cent. lead and the ore from the other ledge averaged over 100 ounces silver and 68 per cent. lead. The mine is estimated to have paid $25,000 profit.

The Payne, now the principal claim in a group of four, is the pioneer location, as well as one of the best paying mines in the district, and is now owned by W. A. McCune, of Salt Lake. Through an error as to the trend of the vein, which is northeast and southwest, the Payne is located across it. A 300-foot tunnel follows ore continuously, with a maximum width of three feet of high grade galena. Another tunnel of good length has been run lower down the mountain and a third runs in higher, with stopes to the surface, and drifts on the ore-chutes in both tunnels showed both chutes to continue for over 200 feet. Mr. McCune has begun vigorous development, and shipments up to September, 1896, aggregated $100,000, and were $86,000 in December,

$100,000 in January and $110,000 in February. The shipments in March were 1,148 tons, netting $100 a ton, and fully 1,000 tons a month will be shipped this year. The carbonates assayed 80 to 100 ounces silver and 35 to 40 per cent. lead and the galena 175 ounces silver and 70 per cent. lead. The profits up to March 1 are estimated at $250,000.

The Payne ledge almost certainly extends southwest into the Slocan-Reciprocity group of two claims, on which the Slocan-Reciprocity Mining Company is beginning work, for galena float in the bed and on one side of a gulch having the same course as the ledge extended indicates the proximity of the ledge.

The Ramsdell Mining & Milling Company has begun shipping ore from the Sapphire and Gem, two miles northeast of Sandon, adjoining the Payne group. There is a fifteen-foot ledge containing eight inches of solid galena, the rest of the ledge matter being concentrating ore. Three tunnels are in thirty, fifty and one hundred feet, all in an ore chute, and are being continued, with stopes from them. One carload returned 210 ounces silver and 76 per cent. lead and two more carloads have lately been shipped from the 100-foot tunnel, which has ore in the face. Three carloads monthly will be shipped after June 1.

The two Washington claims, with a controlling interest in three others on Payne Mountain, are owned by the Washington Mining Company, which has built a gravity tramway 1,450 feet to the concentrator of eighty tons daily capacity. Thence a three-mile road leads to McGuigan Station on the Kaslo & Slocan Railroad. The ledge strikes northeast by southwest and is three to twelve feet wide, with five to six feet of galena in a gangue of spathic iron and quartz. There are also bodies of clean galena, but little carbonates or decomposed ore. There are three tunnels, giving a depth of 330 feet on the ledge, which with connections and drifts aggregate 1,540 feet, and 20,000 tons of concentrating ore have been blocked out, reducing five into one. The crude ore assays 108 to 136 ounces silver and 62 to 66 per cent. lead and the concentrates, of which fifty to sixty carloads were shipped in 1896, yielded 96 ounces of silver and 60 per cent. lead, and the total production to date has been about $350,000. The estimated profits prior to incorporation were about $20.000.

The Best group of two claims, owned by A. W. McCune, George M. Hughes, P. Larsen and Scott McDonald, is on the ridge separating Best Basin from Dardanelles Basin and is four miles from McGuigan Station. This granite ridge is seamed with quartz ledges from a few inches to six feet wide, running northwest and southeast, and carrying tetrahedrite and jamesonite, with galena, a little blende and copper and iron pyrites in places. An incline shaft is down seventy-five feet with a drift twenty-five feet, both in ore as wide as three feet. A 312-foot tunnel 120 feet below struck six to eight inches of good ore at 100 feet and followed it for sixty-five feet, and at 215 feet a fifty-five foot upraise was in eighteen inches of galena, gray copper and blende.

Also on the Best Basin is the Rambler group of four claims and a fraction, owned by the Rambler & Caribou Consolidated Gold & Silver Mining Company. It has two distinct series of ledges, two in the granite carrying ore similar to the Best, and a small seam of galena running through the slate and porphyry close to the granite contact, which has widened to three feet in a tunnel. The ledges in the granite are traceable 400 feet at right angles to the Best ledges, one of them showing three to twenty inches wide and carrying gray coppr and jamesonite, and being continuous in a seventy-five foot tunnel with two to twenty inches of fine gray copper ore. Of this eighteen tons returned 499 ounces silver, $7.50 gold and 2 per cent. copper at the Pilot Bay smelter. On the silver lead ledges a tunnel is in 220 feet, with five feet of high grade galena and pyrites ore in the bottom for the first 165 feet, and will be continued to tap another ore-chute showing on the surface. The lower tunnel is a cross-cut for eighty feet, then runs seventy feet on the ledge, in six inches to five feet of ore, and in fifty-five feet more will tap the ore chute cut by the upper tunnel at a depth of seventy feet. A cross-cut has been started at a depth of 325 feet below the lower tunnel to tap the ledge in 425 feet. The dry ore vein which is being worked on the Best, where it has five feet of ore assaying 600 ounces silver. also extends through this property. Shipments have yielded 79.6 to 273.3 ounces silver and 31 to 64 per cent. lead from galena ore, and 166 to 173.5 ounces silver and 22½ uer cent. lead from carbonates. Dividends of $45,000 have been paid.

Active operations are also in progress on the Antoine group of three claims on the Surprise Basin, by C. H. Green, of Saginaw, Mich., and J. C. Ryan. The ledge carries three feet of ore assaying about $250 and about 650 tons have been shipped. A dividend of about $10,000 had been paid prior to March 1.

Alexander Smith, of Kaslo, is making regular shipments from the Surprise, which is understood to have paid him about $20.000 profit.

The Ruby Silver, directly north of the Noble Five, is being developed by Matthews & Braden, of Kaslo, who in 1896 shipped eleven and one-half tons assaying 198.2 ounces silver and 46 per cent. lead and thirteen and one-half tons assaying 256.4 ounces silver and 66 per cent. lead.

On the Eureka group of six claims Messrs. Green and Ryan have a four-foot ledge, from which they had shipped 300 tons of $150 ore up to December, 1896, and had 600 tons in sight.

The Dardanelles group of four claims on the Dardanelles Basin between Best and Jackson Basins is being developed by the Dardanelles Mining & Milling Company. The first work was done on a ledge cutting across the slates and porphyry dikes and consisted of a 220-foot shaft and 1,300 feet of drifts, from which shipments of over 250 tons averaged 265 ounces silver and 26 per cent. lead, and seventy-six tons of second-class ore returned over 75 ounces silver and 26 per cent. lead. Smelter returns ranged from 145.8 to 470.2 ounces silver and 15 to 56 per cent. lead. A steam hoist and pump have been put in the shaft and development is now proceeding on parallel ledges. The mine had paid considerable profit before incorporation last summer, but the amount could not be ascertained.

The Jackson group of five claims, formerly the Northern Belle, on Jackson Basin, five miles south of Whitewater Station on the Kaslo & Slocan Railroad and five miles by trail from Sandon, is being developed by George Alexander. The ledge cuts through carboniferous shales, slates and limestones and along the footwall has from a few inches to three feet of zinc blende, then galena in various forms in quartz and spathic iron gangue, including as much as eighteen inches of solid ore and several feet of milling ore. The highest tunnel, fifty feet, ran on a big outcrop of decomposed vein-matter and blende; the next, sixty feet below, runs 250 feet on the ledge and has been the source of most ore; sixty feet below, a cross-cut taps the vein; the fourth tunnel, 135 feet lower, runs 340 feet on a smooth wall, with a small amount of ore; the fifth is being run from a strong cropping on Jackson Creek, which shows two feet of black jack against the wall, then three to four feet of eruptive rock, and then twelve to twenty-four inches of steel galena, which continues to the face. The ore averages at the smelter about $80 and the six tunnels have been continued, 1,200 tons being shipped during the winter. The estimated profits to March 1 were $20,000.

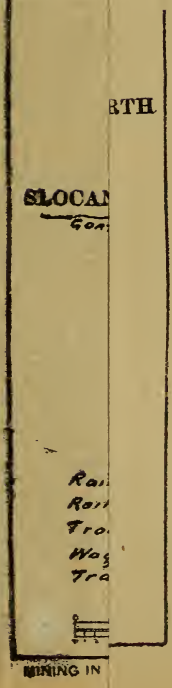
The two Whitewater claims, one and one-half miles by road from Whitewater Station on the Kaslo & Slocan Railroad, have paid for themselves and yielded about $40,000 profit to their owners, J. C. Eaton, J. L. Retallack, J. L. Montgomery and W. C. Pierce, of Kaslo. The country rock being shattered for ten to twenty-five feet from the fissure, no blasting is required, but the tunnels need thorough timbering. Along the footwall is as much as five feet of spathic iron, then a streak of galena and then carbonates or oxidized iron, often scattered through the shale for twenty feet. The ledge has been stripped for 800 feet and several carloads of iron oxides and carbonates shipped. The upper tunnel runs thirty feet along the ledge, the second, 260 feet below, follows it for 200 feet, with little ore; the third, seventy-five feet deeper, is in 400 feet, with a small stope near the mouth, from which three or four carloads have been shipped, an almost barren stretch of 340 feet following. Then the ore chute widens to six inches to six feet of solid ore. The fourth tunnel, ninety-six feet on the ledge below, was 425 feet long and had four to ten inches of ore for 200 feet, then in a cross-cut had twenty feet of barren shale with steel galena on each side. A narrow streak of carbonates was followed for forty feet near the mouth, then a fifteen-foot winze and a short tunnel followed good ore. The fifth tunnel, 104 feet lower, is in 175 feet and has two feet of spathic iron in the face and in a forty-foot stope showed six to twelve inches of steel galena, besides coarse broken galena. The first shipments from Slocan via Kaslo consisted of six lots from this mine at a time when the cost was $100 a ton for all charges. The value of carbonates ranges from 72 to 298.5 ounces silver and 11 to 30 per cent. lead, that of galena from 75 to 362.6 ounces silver and 35 to 65 per cent. lead, an average for the whole output for 1896 of 114 ounces silver and 30 per cent. lead.

In the same vicinity development is in progress on the Elkhorn, the east extension of the Whitewater; the Charleston, by J. Mitchell; the Corean, from which ore is being taken; the Lone Star, by the Hansard Mining Company; the Sunset and Colorado, on the extension of the Wellington; and the Eldon group of two by the Eldon Gold & Silver Mining Company.

The Wellington group of seven claims, two miles by road and trail from the Kaslo & Slocan Railroad, is being developed by the Kootenai & Columbia Prospecting & Mining Company. There are two ledges in slate formation, one running northeast and southwest, the other a wide crushed zone carrying stringers and pockets of quartz, spathic iron and calcspar, running east and west. A 170-foot cross-cut taps one ledge at a depth of forty feet and an 800-foot cross-cut taps the other at 550 feet at a depth of 200 feet and all the workings are connected at this level. The ground, being soft, requires no blasting, but needs thorough timbering. The ore is carbonates and galena with gray copper and zinc blende and returns 125 to 328 ounces silver and 10 to 55 per cent. lead, 400 tons having averaged 173 ounces silver and 30 per cent. lead.

On the extension of the Wellington ledges to Bear Lake, the Santa Maria Silver Mining Company has developed the Santa Maria by tapping the ledge in three cross-cuts, thirty, sixty and 120 feet long, gaining a maximum depth of eighty feet. Much of the ore is high grade, running 600 to 700 ounces silver and 60 per cent. lead and there is four feet of concentrating ore carrying about 120 ounces silver.

Also on Bear Lake, 1,300 feet south of the railroad, William Braden and E. J. Matthews are developing the Lucky Jim group with three power drills. The ledge is described as in a faulted contact, between slate and limestone,



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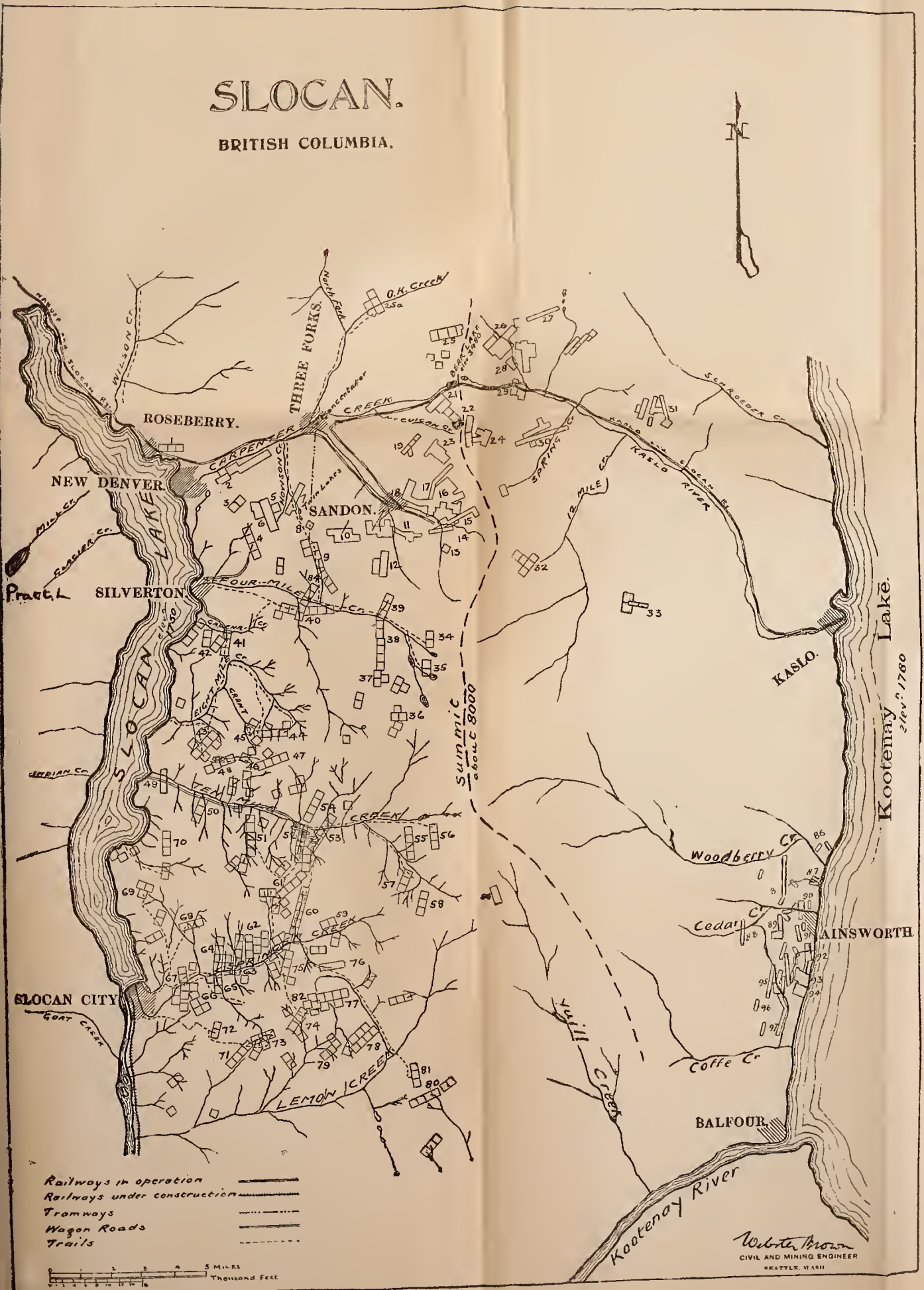
70. Scotsman.
71. Ranger-
Skylark.
72. Exchange.
73. Chaplean.
74. Howard
Fraction.
75. Almar.
76. Two
Friends.
77. Silver King
78. Crusader.
79. C. P. R.
80. Alpine.
81. Black
Prince.
82. Meteor.
83. Ocean.
84. Wakefield.
85. Retriever.
86. Pearl Lulu
87. Early Bird.
88. Skyline.
89. Sweden
Lakeview.
90. Highland.
91. Jeff Davis.
92. Potlatch.
93. Mile Point.
94. Bobtail.
95. Jennie May
96. Fourth.
97. Crescent.

SLOCAN.

BRITISH COLUMBIA.



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and galena, zinc blende, iron pyrites and carbonates occur in large pockets and side fissures penetrating the limestone. The value of 110 tons shipped was 59.2 to 75 ounces silver and 50 to 56 per cent. lead and the second grade ore will produce concentrates carrying 60 to 75 ounces silver and 55 per cent. lead.

The Nonpareil group, adjoining, which has been bonded by W. C. McLean, J. G. McLean and W. A. Flager to W. N. Rolfe, has a ledge four or five feet wide shown in a 300-foot tunnel and 100 feet of open work, with a pay streak of four to fourteen inches of galena, sample shipments of which ran from 200 to 225 ounces silver.

The London group of three claims and a fraction. three miles from the railroad, is being developed by the London Hill Development & Mining Company. A forty-foot tunnel has been driven near the summit of a ridge on a four-foot ledge carrying gray copper and silver sulphides. A cross-cut has been driven 350 feet to tap the ledge at a depth of 200 feet on the other side of the ridge and has cut several small quartz veins. Forty tons shipped returned from 150 to 267 ounces silver and there is much second grade ore which will have to be concentrated. A cable tramway will be built down the mountain this spring.

On the south slope of the ridge between South Carpenter and Four-Mile Creeks is another series of mines, the latter stream forming the boundary between the slate and granite formations.

Beginning at the west is the Mountain Chief, from which George W. Hughes shipped a large amount of galena ore in 1893 to 1895, the value averaging 130 ounces silver and 70 per cent. lead. The ledge was then lost and was caught up again only after much prospecting. Several carloads of ore were shipped last fall and a long cross-cut is being driven to tap the ledge.

On the Grady group James McNaught, Alexander McKenzie and James McKenzie have a ledge running northeast and southwest, opened by five tunnels. The highest is about 300 feet long, with three upraises, cross-cuts and an incline, and another runs fifty feet in another direction on the same level. A third tunnel, immediately below, is connected by stopes with the upper ones, and a fourth, eighty feet below, taps the ledge at 100 feet and is then a drift for 110 feet, but shows no ore. The fifth, below this one, follows another ledge running north and south for 110 feet, with several inches of iron oxides or decomposed matter on the wall. Over 1,000 tons of ore have been shipped, averaging 115 ounces silver and 70 per cent lead. A 1,200-foot gravity tramway conveys the ore to the road, two and one-half miles from Silverton.

A mile northwest of the Grady is the California, from which J. McDonald, J. Marino and B. C. Van Houten shipped a carload of ore last fall.

The Reed & Robertson group comprises a string of claims, of various ownership, along a strong ledge running north and south across the ridge six miles from Silverton. On the two Reed claims, C. W. Callahan has a tunnel 110 feet on the ledge showing ten to twelve feet of milling ore in calcite gangue and several inches of solid galena, which also crop 300 feet above. On the Jenny Lind, Paul and Charles Anderson have 800 feet of the same ledge and have cut it diagonally by a 150-foot tunnel showing irregular masses of concentrating ore and stringers of solid galena. They shipped thirty tons of galena in 1895. On the Robertson, William Robertson and others have tunneled forty feet, showing eight to ten feet of calcite with little galena. On the Wakefield group of three claims, George Fairburn and William Smith have tunneled 125 feet and at eighty feet had sixteen to twenty inches of solid galena, with calcite beyond it lying almost flat. On the Buffalo, the Buffalo Mining Company has shown by a twenty-foot shaft and several cross-cuts six to thirty inches of galena and carbonates carrying 170 to 352 ounces silver and 35 to 66 per cent. lead and is continuing development.

Seven miles east of Silverton by trail is the Fisher Maiden group, recently acquired by the Fisher Maiden Mining Company. The ledge running northeast and southwest crops in syenitic granite on both sides of a gulch and in two small tunnels was stoped to the surface one to three feet wide. Below these, a 100-foot tunnel with cross-cuts had been run on the south and four drifts aggregating 400 feet on the north, showing zinc blende and some galena, with native silver along the seams. Fifty tons shipped in 1894 returned 180 ounces silver and a later shipment of thirty tons yielded 367 ounces silver and 24 per cent. lead. A contract has been made with the Everett smelter for the entire output to May 15.

The Galena Farm, composed of five claims a mile from Slocan Lake and one and one-half miles from Silverton, was so named from the finding of ore scattered over a plateau and the subsequent discovery of a large ledge, and is now owned by the Galena Mines Company of London. The ledge runs east and west and has been traced for 1,600 feet by croppings of quartz and spathic iron carrying galena and zinc blende twelve to fourteen feet wide. From a fifty-foot shaft a cross-cut tapped the ledge in twelve feet and drifts sixty feet east and seventy feet west showed a large body of concentrating ore, with high grade galena on the hanging wall. A forty-five foot winze in the west drift was in four feet of solid galena and an open cut 500 feet west showed sixteen inches of galena on the footwall. A two-compartment shaft has been sunk sixty-five feet to strike the ledge at 130 feet and at forty-one feet cut a north and south cross ledge of concentrating ore, which it followed for ten feet. This ore concentrates five into one, the product carrying 123 ounces

silver and 62 per cent. lead. At 100 feet this shaft struck two feet of shipping ore. The shaft has been equipped with a hoist and pumps and is being sunk 500 feet with cross-cuts to the ledge at every 100 feet. The ore is milling and concentrating, though a shipment of sorted ore returned 98 ounces silver and 67 per cent. lead, and a 150-ton concentrator will be built and operated by water power.

The Noonday is believed to have the east extension of this ledge. A number of other claims surrounding the Galena Farm are being opened and the L. H. has a zone of schistose rock on the line of an east and west fissure in the slate, which is twenty to forty feet wide and is impregnated with arsenic, mispickel, pyrite and pyrrhotite, though a twenty-two foot tunnel has so far shown little mineral.

The Enterprise group of two claims, eight miles up Ten-Mile Creek, was recently sold for $300,000 by John A. Finch to David M. Hyman and others of Colorado. The ledge, though small, has been traced through the two claims and strikes northeast and southwest between granite walls. The ore is galena with much zinc blende in a quartz gangue and is generally found on the footwall. Four tunnels have been driven on the ledge, leaving the ore on the side. The lowest, 500 feet, opens a chute averaging seven inches and continuous for 400 feet. The second tunnel, 170 feet higher, is in 500 feet with ore for 300 feet, where an upraise to the surface follows over eight inches of ore for eighty feet. At 330 feet a fault was struck, but the ledge has been picked up beyond it and carries ore for 150 feet further, eight to eighteen inches wide, which is being stoped. The third tunnel, twenty-five feet higher, is 310 feet long and follows six to twelve inches of ore for 260 feet. The fourth tunnel, 400 feet, is ninety feet higher and is in six to fourteen inches of solid ore. These tunnels have thus traced a continuous ore chute for 1,000 feet along the ledge. Shipments have returned from 153.7 to 179.5 ounces silver and 18 to 30 per cent. lead and now average 250 tons a month. Shipments to date aggregate twenty-six carloads, averaging $1,900 to $2,000 a car, net.

The same ledge has been traced into the Iron Horse and United Empire on the northeast and is said to have been found on the Alexandria. The ore has been struck in an open cut on the Iron Horse, 300 feet from the Enterprise line. On the Oregon City, John Thompson, L. Parkinson and others have struck seven to eight inches of galena in a fifty-foot tunnel and F. Griffiths, G. West and others have tapped an ore body with a cross-cut on the Westmount.

The Bondholder group of four claims, owned by the Bondholder Mining Company, is near the ridge south of Ten-Mile Creek and is reached by the Ten-Mile Creek road and a trail, or by the trail from Slocan City. The ledge is supposed to be the extension of the Enterprise, running northeast by southwest, and has been traced by cuts and croppings for 4,000 feet, showing twelve to sixteen inches of quartz, iron oxides and galena. It has been defined by 600 feet of tunnels and drifts and a sixty-foot shaft to be four feet wide, with seven to twenty-one inches of high grade ore carrying argentite, galena and antimonial silver, assaying 63 ounces from average samples of one claim and 316 ounces from another. The shaft shows four feet of ore averaging 213 ounces silver.

The Kalispell, on Ten-Mile Creek, one mile from Slocan Lake, has a north and south ledge in quartzite and is owned by William Lardner, of Deadwood, S. D. A seventy-five foot tunnel shows galena, ruby silver and other silver minerals and some ore has been stoped, eight tons returning 289 ounces and three tons returning 212 ounces silver.

Great activity is promised for the coming season on Twelve-Mile, Springer and Lemon Creeks, up which trails branch off from Slocan City and Brandon. It is in this region that dry ore begins to take the place of galena, the formation being granite.

The Two Friends, seven or eight miles from Slocan City on the divide between Springer and Lemon Creeks, owned by the Two Friends Mine Company, has a ledge of high grade galena striking northeast by southwest. A twenty-three foot cross-cut taps the ledge at a depth of twenty feet and shows it four feet wide with a twelve-inch pay streak. A drift fifty feet east shows galena next the footwall and zinc blende on the hanging wall, the width varying from a narrow streak to twelve or fourteen inches of solid ore, and a winze proved the permanence of the ledge. A 206-foot cross-cut then tapped the ledge at a depth of 100 feet, here three feet wide with ten to twelve inches of high grade zinc blende, but in an upraise of twenty-five feet it changed to high grade galena. A drift was run eighty feet east from this cross-cut and the ore, after pinching out at twenty feet, was coming in again at seventy feet. Thirty-nine tons shipped to Tacoma returned $154 to $237 net and thirty-eight carloads were shipped during the winter.

The Arlington and Burlington, on the north slope of Springer Creek, are owned by the Arlington Consolidated Mining & Smelting Company and have a ledge of mineralized granite four to six feet wide striking northeast by southwest through both claims. This ledge is full of stringers of fine-grained galena and zinc blende, in which are rich specimens of native silver. A shaft is down seventy feet on ore, with drifts seventy feet at a depth of thirty-five feet, and thirty-five feet at greater depth, both in ore. An average of four

assays from different parts of the mine was 154 ounces silver and 22½ per cent. lead.

The Howard group of four claims and two fractions on the divide between Springer and Lemon Creeks, is being developed by A. G. Teeter, William Price, V. T. Ratcliffe and others. The ledge runs east and west through the granite, dipping 10 to 15 degrees north. An incline follows it down 115 feet, except where faults have occurred, and shows twelve to twenty inches of honeycombed quartz carrying argentite. Considerable ore has been stoped, sorted and shipped to Pilot Bay, returning 163 ounces silver and $16 gold up to 206 ounces silver and $26 gold.

Another dry ore property which is now being rapidly developed is the Old Glory group of seven claims, on the west slope of the foothills from Slocan Lake, two and one-half miles from Slocan City, the owner being the Old Glory Mining Company. Between quartzite hanging and granite footwalls, four well-defined parallel ledges of great strength, from three to sixty feet wide, ran the full length of the group, 5,100 feet. The ledge matter is hornblendic schist, highly impregnated with cube iron, and the pay streak is capped with quartz carrying arsenical iron and white iron sulphurets—a good indication of large ore bodies. Assays of six samples from the surface ran from 8.22 to 114 ounces silver and $1.50 to $22 gold and an average sample of forty pounds gave 130 ounces silver, $9 gold. Three shafts, twelve, eighteen and forty-four feet, have been sunk on the several ledges and a cross-cut, for which a contract was let in November, 1896, to be run 200 feet, and which was in fifty feet on January 1, 1897, will cut all four ledges at depths ranging from 40 to 150 feet.

A number of other properties in this section of the district are being opened. On the Meteor John A. Finch and John Sheran have shown a twenty-inch ledge of high grade dry ore by surface work. Mr. Sheran has sold his interest to C. L. Hoffman for $4,000 and work is to begin as soon as weather permits. On the Silver King, C. Faas and M. Heckman have run a cross-cut 120 feet to tap the ledge. On the Crusader group of three claims, C. Faas, R. N. Clay and others uncovered a ledge of two and one-half feet of quartz carrying silver glance, iron pyrites, some native silver and gold, and then sank thirty-three feet on it. They afterwards sold a half interest for $12,500 to W. H. Hellyar and W. H. Smith. The Alpine group of four claims, on the mountain above Summit Creek, has a strong gold-bearing ledge two to three feet wide, very flat and traceable through three basins, and has been bonded by C. Faas and others to A. B. McKenzie and A. Dick, of Rossland. The Ocean group of three claims three and one-half miles northeast of the Crusader group, has a dike mineralized with silver glance and galena and a three-fourths interest has been bonded by W. R. Young, W. R. Richmond and others to Alexander Dick, of Rossland. The Republic group of three claims, bonded for $25.000 to W. L. Parrish and W. J. Lindsay, has a ledge eighteen to thirty inches wide, carrying galena, iron pyrites and gold, on which a shaft is being sunk. The Esmeralda group of four claims has been sold to J. A. Thompson, of Northwest Territory, for $20,000.

The most active new development has been made with gratifying results on the Montezuma group of four claims on the south fork of Kaslo Creek, eight miles from Kaslo, by the Kaslo Montezuma Mining & Milling Company, of Seattle. Several open cuts were first made and the ledge uncovered for a distance of seventy feet, showing fifteen to thirty feet of spathic iron and other gangue with zinc blende and galena disseminated through the entire width. The first tunnel, 115 feet long, shows a large body of concentrating ore, estimated at 4,000 tons, for the entire distance. A tunnel was then driven along the hanging wall for about forty feet and connecting with the main tunnel by a cross-cut of thirty-two feet, showing the ore body to be that width. Another tunnel, 100 feet below, was driven 256 feet on a parallel ledge and at 200 feet a cross-cut was run to the main ledge, which was struck in thirty feet, proving to be twenty-three feet between walls. A winze was then sunk in ore all the way to connect the two levels, showing the ore body to be continuous, and drifting has since been extended north and south, showing an ore chute 140 feet long, with ore in both breasts. The average width of the ore body in the upper tunnel is six feet, in the lower tunnel, 100 feet deeper, it is fifteen feet. Assuming it to be no more than 140 feet long, this gives 20,000 tons of ore in sight, averaging 23 ounces silver and 18 per cent lead. This will concentrate four into one, giving 5,000 tons of concentrates, which, allowing for loss in milling, will average 80 ounces silver and 65 per cent. lead, a value of $92.90 a ton, in addition to $3 gold in each ton of crude ore—sufficient to pay for mining, milling and tramming. A shipment of thirty tons of sorted ore returned 67½ ounces silver, 63½ per cent. lead, and there are 1,000 tons on the dump, worth, when concentrated, at least $20,000. The winze is being continued below the lower tunnel and drifting continues both ways on the ledge. As soon as the snow is off another tunnel will be started 200 feet lower, which will tap the ore body in 500 feet. The character of the ground permits of tunneling to a vertical depth of fully 1,800 feet. Plans are being prepared for a cable tramway one and one-quarter miles long, from the mine to the south fork of Kaslo Creek and for a mill which will cost $40,000 to $50,000.

The Jennie, eight miles from Kaslo and half a mile from the railroad, is

being opened by the Canadian Gold Fields Syndicate. In a forty-foot shaft the ledge widens from four to seven feet of concentrating ore, which assays on an average 100 ounces silver, $6 gold and 3 per cent. lead. A cross-cut will be run to tap the ledge at a depth of 100 feet.

The Silver Bear, on the south fork of Kaslo Creek, was recently bought by the Reddin-Jackson Company, of Rossland, for $25,000 and has three ledges shown by two cross-cuts. One cross-cut shows the first ledge fifteen feet wide, carrying seven inches of high grade carbonates and five to six feet of talc carrying kidneys of galena which assay 200 ounces silver. The second ledge carries three feet of pyritic iron, galena and spar and two feet of talc, and the third has three feet of spar and four inches of carbonates carrying 100 ounces silver. The second cross-cut is forty feet and has cut the first ledge, which carries eighteen inches of carbonates assaying 200 to 300 ounces silver. A twenty-foot shaft shows fourteen to sixteen inches of carbonates in the first ledge, the remainder of which averages 19 ounces silver. Shipments are now being made.

The two Gibson claims, owned by the Gibson Mining & Milling Company, are on South Kaslo Creek, eleven miles from Kaslo and reached by six miles of trail from the railroad. Three parallel ledges will be tapped by a 250-foot cross-cut, which has already cut the first at thirty-five feet and will strike the second at fifty and the third at 250 feet. A tunnel eighty feet on the third ledge shows it four feet six inches wide. Assays of the pay ore range from 112 to 149 ounces silver and 63 to 75 per cent. lead and the ledge matter in general assays 48 to 80 ounces silver and 35 to 75 per cent lead.

The Briggs group, nine miles from Kaslo and four miles from the railroad, has recently been sold by Briggs Bros. to E. J. Kelly, D. Holzman and R. N. McLean for $20,000. A 235-foot cross-cut taps a four and one-half foot ledge 260 feet deep and drifts in both directions show galena ore assaying 130 ounces silver and 70 per cent. lead. Two parallel ledges have been defined by open cuts, one of them, capped with iron and carrying galena, being six feet wide.

The Black Prince group of three claims has a four-foot ledge of rose quartz traced through it, carrying high grade galena which has a high gold value. From a twenty-foot shaft and a drift from a fifty-foot crosscut ore has been taken assaying $76 to $232 gold, silver and lead, 82 per cent. of the value being free milling and only $3 of the highest assay being silver.

On the Iron Crown and San Bernardino John A. Finch has tunneled 300 feet showing as much as three feet of ore in places, carrying 80 ounces silver. Two shafts of about fifty feet each are down on the ledge.

On the two Phoenix claims, the Phoenix Consolidated Mining Company is stoping out ore from a ledge four to seven feet wide, which is worth $140 at the smelter and has shipped about 300 tons during the winter.

On the Echo group of three claims J. M. Martin and Whitaker Lynch have tunneled 170 feet and sunk twelve feet on a ledge eight to sixteen feet wide, which has four to fourteen inches of pay ore carrying 165 ounces silver and 76 per cent. lead.

Discoveries were made in the fall of 1896 on Kokanee Creek, which appears on the map as Yuill Creek, and this will be the scene of much work this year. The Mollie Gibson group of four claims, in contest among several claimants, has a ledge showing four feet of high grade galena and sulphides. On the north extension, the Smuggler and U. S., bonded for $30,000 by Charles Faas, C. W. Greenlee and N. K. Franklin to William Glynn, this ledge has been uncovered by open cuts at intervals for 400 feet, showing eight to twenty-four inches of galena and sulphides, and is traceable for 1,000 feet.

Prospecting has about covered all the territory between Slocan and Kootenai Lakes and has extended to the country on the west between the Slocan and Arrow Lakes. It has already revealed on this divide and in the basin of Cariboo Creek, which flows into the narrows of the Columbia between the two Arrow Lakes, a great gold basin, where the ore carries $1 gold to each ounce of silver, though there are exceptions where the ore is almost exclusively silver and is very rich. Ore can be shipped in considerable quantity which will carry $100 gold and 100 ounces silver; also ore which carries 100 ounces silver with only $2 to $3 gold. There is also quite an area of gold placer ground on the tributaries of the Cariboo, which is too low grade for the pan and rocker, but will pay well for sluicing. On Six-Mile Creek, almost directly across Slocan Lake from New Denver, discoveries have recently been made of sulphide ore carrying gold and silver, and many prospectors are waiting for spring to make locations.

A steamer 245 feet long has been built by the Canadian Pacific to ply on Slocan Lake between Roseberry and Slocan City, and will be launched about May 1. The same company is building wharves at New Denver, Slocan City and Roseberry, which will greatly improve the facilities.

AINSWORTH.

Though outstripped in development and production by its younger neighbors, Ainsworth holds its own and will this year be the scene of renewed activity. Mr. Carlyle attributes its comparatively slow progress to the attractions offered by the high grade ores of Slocan, to the waiting policy of men who have crown granted low grade properties and were discouraged by lack of transportation and smelting facilities, to disastrous forest fires which destroyed several good plants, and to an unwarranted lack of confidence in the probable permanence of these veins and ore bodies, especially of those in the limestones, which have been considered as "merely pockets and local." On this point he continues: "To one who has worked in silver ore bodies in limestone, as in Colorado, this pocket theory is not so alarming a bugbear, as the general experience is that, when one ore-chute is found, others are almost invariably discovered on prospecting further along the line of break."

The geological formation is the same as that of the Slocan district, some of the ledges running with the stratification and others cutting across it in true fissures, while others again are formed by the impregnation and replacement of the country rock by ore and quartz, and sometimes calcite. The ores vary from a solid galena with zinc blende, though not often enough to exceed the smelter limit, through quartz and calcite carrying sulphides with little galena and zinc blende; quartz and lime carrying silver in other compounds; galena with gold disseminated through the quartz; tetrahedrite in quartz with galena; to a low grade ore carrying galena, iron and copper pyrites and pyrrhotite.

From the south, the district is reached by the Spokane Falls & Northern system from Spokane to Nelson, 200 miles, and the Columbia & Kootenai Navigation Company's steamers up the Kootenai River and Lake to Ainsworth; or the train may be left at Northport and the steamer taken up the Columbia and Kootenai rivers, at a greater expenditure of time. From the west and north the Canadian Pacific carries one from Vancouver to Revelstoke, 379 miles, the Arrow Lake branch thence to Arrowhead, twenty-eight miles, the steamer to Nakusp and the Nakusp & Slocan and Kaslo & Slocan Railroads thence to Ainsworth. The mines are at comparatively short distances from Kootenai Lake, on which steamers ply, and many of them can tram ore down to the lake shore.

The Number One group of two claims, an interest in three others and a millsite, has been developed by the Britannia Mining Company, of Windsor, N. S., and is four and one-half miles by road from Ainsworth. The ore body is developed by stopes nearly 300 feet long and four to twelve feet wide, is enclosed by limestones, shales and slates and in places lies almost flat, its dip being changed by faults. A crosscut taps the ore body in 375 feet and from it a drift follows a fault wall 157 feet with a thirty-five foot winze to the stopes above. This drift is being continued and in 100 to 120 feet is expected to tap the ore body. An incline from the stope is now down thirty-five feet to connect with it. A mill of eighteen to twenty tons daily capacity is run by water power from a small stream and by steam at low water. Some first-class ore is shipped, but most of the product is reduced eight tons into one of concentrates, which carry 295 to 300 ounces silver and four to eight per cent. lead. This mill will concentrate fifteen to twenty-ounce ore at a profit. About 1,000 tons of ore and concentrates have been shipped.

A mile from the Number One is the Dellie, on which S. S. Bailey is running a 300-foot tunnel to connect with a 100-foot shaft. From the Lilly May on the Dellie ledge, under bond to Max Stevenson and T. J. Lendrum, a shipment of twelve tons returned 160 ounces silver. The United, with a galena ledge in schist formation, on which a 190-foot shaft is down, adjoins. The Krao, owned by A. W. McCune, has a shaft down on a galena ledge between walls of limestone. On the Neosha a tunnel is being run to connect with a shaft, from which 100-ounce dry ore has been taken.

The Skyline group of three claims, six miles by road from Nelson, is owned by A. W. McCune, of Salt Lake City. The ledge is in a slate and limestone formation and runs almost north and south and occupies fractured zones impregnated with ore. The ore bodies are flattened and ten to twelve feet thick, often crossing nearly horizontally from foot to hanging wall. An incline has been sunk eighty-seven feet on the ledge and a shaft 200 feet, the two being connected by 120 feet of drift and an upraise forty feet to the incline. The ore is argentite, native silver and galena, with some gray copper and iron and copper pyrites, and averages forty to fifty ounces silver. The output is ten to fifteen tons a day and is shipped to the Pilot Bay and other smelters. Over 2,000 tons shipped in 1895-6 averaged 54 ounces silver and less than 5 per cent. lead.

The Tariff, three-quarters of a mile by wagon road from the lake and one mile south of Ainsworth, is owned by William Braden, of Helena, who is thoroughly exploring with a view to systematic development. The ledge runs

north and south between schist and quartzite and has been traced by cuts and stripping into adjoining claims. From one of these cuts forty-five tons were shipped and yielded 30 ounces silver and 55 per cent. lead. From this cut an incline is down 100 feet and for eighty feet followed twelve to thirty inches of solid galena, which continues in a forty-five foot drift to the north. A bed of quartzite twenty-five to thirty feet thick, which forms the footwall, shows galena in an open cut and is thought to carry enough mineral for concentration.

From the Mile Point, on the lake south of Ainsworth, A. Stalberg is shipping ore which carries 106 ounces silver and 4 per cent. lead.

The Highlander, owned by Max Stevenson, of Philadelphia, is on a bluff one and one-quarter miles southwest of Ainsworth and 1,000 feet above the lake and has two ledges between schist and quartzite walls. A cross-cut taps one of these at eighty feet, and drifts twenty and ten feet show four to eighteen inches of galena, zinc blende and a little arseno-pyrite in it. The main ledge is tapped at 120 feet and a drift 270 feet, now being extended, shows concentrating ore carrying galena and blende. From a sixty-seven foot winze, twenty-seven feet from the tunnel, a crosscut strikes the first ledge in fifty-two feet, showing five to six feet of low grade concentrating ore. An upraise of ninety-one feet from the drift to the surface shows eight to ten inches of good ore and two to four feet of concentrating ore. Twelve tons shipped to Everett returned 70 ounces silver, with very little lead.

The Little Phil fraction, one and one-third miles on the main wagon road from Ainsworth, has been bonded for $20,000 by I. McGovern and Capt. Hayward, of Ainsworth, to Hon. N. Clark Wallace, of Ontario. The ledge cuts the schists northwest and southeast and is cut at seventy-two feet by a cross-cut 442 feet long, and a drift 200 feet shows six to twenty-four inches of galena, with some carbonates, averaging 30 ounces silver, while a short upraise shows three feet of solid ore. The cross-cut taps another ledge 282 feet further in, which has been followed 100 feet and carries a small amount of mixed galena and considerable concentrating ore.

Considerable work has been done by John F. Stevens, of St. Paul, on the Black Diamond and Little Donald, the south extension of the Little Phil, and 250 tons of ore were shipped in 1895 which yielded 33 ounces silver and 66 to 70 per cent. lead.

The Highland group of four claims, one and one-half miles north of Ainsworth, owned by E. D. Carter and others, has a tunnel 680 feet along a well-defined fissure ledge, showing ten feet of concentrating galena ore in the face. There is some ore for fifty feet towards the mouth and an upraise 120 feet shows six to twenty-four inches of almost solid galena for 105 feet, as also does a ninety-foot shaft connecting with it. There is more or less ore for 285 feet more along the tunnel, where an upraise is made 160 feet to the surface. A few tons of the best ore returned 40 ounces silver and 75 per cent. lead at the smelter. Surveys have been made for a cable tramway to a millsite at the mouth of Cedar Creek.

The Amazon group of four claims at the mouth of Woodbury Creek, three and one-half miles north of Ainsworth, is owned by the Canadian Pacific Mining & Milling Company, of Minneapolis, which is developing with machine drills. The property has several well-defined fissure ledges striking east and west across the gneiss formation in which the creek flows. The ledges carry four inches to four feet of galena and zinc blende in quartz and calcite gangue, and in places there is six to sixteen inches of solid galena. Almost at right angles to these ledges is a cross ledge, which will be cut at depth by two tunnels being driven on the main ledges. One tunnel runs sixty-five feet on rock seamed with small quartz veins, carrying a little iron and copper pyrites and some galena, with $3 to $5 gold. This ledge and another crop twenty-five feet apart and the intervening rock carries a small percentage of sulphides and is believed to be concentrating ore. Another tunnels runs sixty feet through surface wash, from which boulders have been taken carrying 30 to 40 ounces silver in galena, and a forty-five foot tunnel follows a small galena vein. A 120-foot tunnel follows another ledge carrying eight to fourteen inches of solid galena and zinc blend in quartz and calcite and is being extended to where the ledge crops four feet wide on the cliff, and carries pyrrhotite. On another ledge, fourteen to twenty inches wide, tunnels have been driven 140 feet on one side and 120 feet on the other side of the creek. A shaft is down 140 feet on another vein of mixed galena ore, four to twenty-four inches wide, carrying a good gold value. A concentrator with seventy-five tons daily capacity stands one-quarter mile from the lake, water power for it and the twelve-drill compressor being furnished by 1,200 feet of flume from the creek. A tramway 1,400 feet long carries ore and concentrates to steamers on the lake.

The Silver Glance, two miles up Woodbury Creek, is on an east and west ledge discovered in August, 1896, by William Franklin, Alexander McLeod and F. L. Fitch. A tunnel is being driven on the ledge, which carries four to sixteen inches of galena, iron pyrites and marcasite in quartz gangue, with two to three feet of mineralized country rock. Assays range from 50 to 232 ounces silver and $18 to $20 gold.

The Blue Bell group at Hendryx on the east shore of the lake, consists of four claims owned by the Kootenai Mining & Smelting Company. The mine

is on a band of crystalline limestone in the schists and the ore is mostly low grade galena and pyrrhotite, with some blende, iron and copper pyrites. It occupies irregular chambers, often of great size, in the limestone, the ore body now being worked measuring 200 feet long, seventy feet wide and 150 feet high. In the year 1895, 40,000 tons were shipped to the Pilot Bay smelter, eight miles down the lake, and there are vast quantities in sight.

The Pilot Bay plant, which is owned by the same company, consists of a fully equipped concentrator with a capacity of 200 tons in twenty-four hours, four reverberatory furnaces of twelve tons capacity each in twenty-four hours, and one 100-ton water jacket blast furnace. A 150 horse-power engine runs the concentrator and sampling works, an eighty-five horse-power engine runs the blower and a thirty horse-power engine the dynamo, which lights the works. The plant employs 200 men.

At the head of Hooker Creek, on the divide between Kootenai Lake and St. Mary's River, ten or twelve miles from the lake, is the Commonwealth group of three claims, under bond to the London & British Columbia Gold Fields Company. A tunnel runs 150 feet on a ledge of quartz four to sixteen feet wide, carrying galena, gray copper, silver sulphides and some gold. On the Express, adjoining, a cross-cut has been driven ninety feet to cut two ledges, two to two and one-half feet wide, carrying galena and gray copper.

After a period of litigation, due to its location on the townsite of Ainsworth, the title to the Jeff Davis has been cleared and development has been taken up by the Jeff Davis Mining & Milling Company. It has two parallel ledges running north and south through lime, shale and slate, one of them showing two feet of galena in a thirty-foot cross-cut and being defined by many open cuts. Assays show 19 ounces silver and 78.9 per cent. lead. The west ledge is only twenty feet distant and has been defined by open cuts, small shafts and tunnels for a width of sixteen to forty feet and a length of 400 feet. It carries sulphide ore assaying $2.75 gold, 94.2 ounces silver, 9.1 per cent. copper. A contract has been let for a 100-foot cross-cut to tap both ledges at a depth of seventy-five feet and hoisting machinery has been ordered.

Development has also been resumed by the Ellen Silver Mining Company on the Ellen, on which a seventy-five foot tunnel has gained a depth of seventy-five feet on a six-foot ledge. The whole width averages fifty ounces silver and 48 per cent. lead and will pay to concentrate, but eighteen inches is clean shipping ore, assaying 80 ounces silver and 75 per cent. lead.

Adjoining the Ellen is the Bonanza King, on which C. F. Clough & Co. have sunk sixty feet, showing four feet of galena ore, of which ten assays average $92.20 silver and lead.

NELSON.

Including the territory drained by the Kootenai River between its outlet from Kootenai Lake and its confluence with the Columbia River, also the watershed of Salmon River as far south as the boundary, this district has both gold-copper and silver-copper ore bodies of great size, as proved in the Hall mines on Toad Mountain and in the Poorman group. After being outstripped in the amount of production by the newer districts of Trail and Slocan, it has recently awakened revived interest by the extensive discoveries along the Salmon River and its tributaries.

The Nelson & Fort Sheppard Railroad runs through its center along Salmon River to Nelson, 200 miles from Spokane. From Vancouver, B. C., the route is by the Canadian Pacific to Revelstoke, 379 miles, by a branch railroad to Arrowhead, twenty-eight miles, by the Arrow Lake steamer to Robson and by the Columbia & Kootenai Railroad to Nelson.

The greatest mine of this district is the Hall, or Silver King, on Toad Mountain, eight and one-half miles by wagon road south of Nelson, owned by the Hall Mines Company, of London. The property consists of eighteen claims, of which the original four are on the silver-copper belt and the remainder on the gold belt. The silver-copper lode strikes east and west through the diabases and has no distinct walls, the ore-bearing solutions having probably impregnated the country rock on each side of the fissure. The development is on the main ore-chute, 200 to 225 feet long, but smaller ones are now being explored. The ledge has been traced almost continuously for nearly 3,000 feet and appears to have branched on the east, one fork running southeast.

The present company has been extending the workings of the old company, consisting of 1,100 feet of tunnels, 345 feet of cross-cuts and several winzes, and has continued exploration by means of 22,000 feet of diamond drill-holes. The highest tunnel, near the summit, is eighty-five feet long and showed good ore, particularly in short winzes. The second tunnel, 132 feet, is a short distance below and is connected by two winzes with the lower workings. It has produced much high grade and considerable medium grade ore. In the main tunnel, 270 feet below the surface and extending 912 feet

east along the ledge, a small amount of mixed ore was struck at eighty-five feet and continued until, at 175 feet, three to four feet of good ore was followed down for seventy feet by a winze, which showed two to three feet of good ore, also encountered in a 100-foot drift and believed to be in a second chute. A compressed air hoist is used in sinking this winze to a connection with No. 5 tunnel, 210 feet below. At 345 feet the main tunnel enters a great ore chute and cuts it for over 200 feet. At first six to nine feet of very high grade ore was mined, but lower grade ore is also taken out now from a stope thirty-five to fifty feet wide and thirty-five to forty feet high, showing fifteen to thirty feet of medium ore in the roof, the chute narrowing at each end to a few feet. Half way along this stope another winze has been sunk on the hanging wall, 135 feet, and from it two levels extend, one at thirty feet with 170 feet of drifts and sixty feet of crosscut and another at sixty feet, with seventy-five feet of drift and 110 feet of crosscut, both being connected by another winze. Considerable high grade ore has been stoped from these levels, with twelve to fifteen feet of lower grade remaining. Another body of good ore ten to twelve feet thick, is struck at thirty feet in a cross-cut fifty feet beyond the stope in the main tunnel and is again tapped, six feet thick, by a diamond drill-hole from a cross-cut 100 feet east. The new tunnel, 300 feet west, shows two to three feet of mixed ore, carrying more galena than is found in the other workings. A sixty-five foot shaft with 120 feet of cross-cuts on the Kootenai Bonanza claim shows considerable good ore, believed to be in the extension of the Silver King ledge.

Mr. Carlyle grades the ore into two classes: That carrying a high percentage of value-bearing sulphides and lower grade country rock impregnated with a smaller amount. There is a rich zone in the chute, shown in the upper workings, consisting of bornite, some tetrahedrite, copper and iron pyrites and a little galena and zinc blende, and of this ore 200 tons averaged 190.9 ounces silver, 18.17 per cent. copper, and 1,160 tons shipped by the present company averaged 119 ounces silver, 12.9 per cent. copper. When the smelter, to be described further, was built, 5,000 tons of ore on the dump assayed 46.44 ounces silver, 5.92 per cent. copper. The grade of ore since produced has been lower, because it has become profitable to mine lower grade ore and because the bulk of the high grade ore in the present chute has been mined out. Thus the average value of 15,000 tons mined in 1896 was 20.52 ounces silver, 3.64 per cent. copper.

The mine is equipped with a steam engine, twelve power drills and two compressors, and a sawmill and planer. From the bins below the sorting floor, the ore is carried 700 feet down a three-rail gravity tramway to the cable tramway which makes a descent of 3,750 feet vertically in a distance of four and four-tenth miles and has a capacity of 145 tons in ten hours. This tramway extends from the mines to the smelter at Nelson.

The smelting plant consists of one water-jacket blast furnace, to which is being added another with a capacity of over 200 tons a day, while the building has room for five stacks, brick dust chamber and stack; a sampling works, consisting of crushers and rolls; a refinery, consisting of reverberatory calcining furnace and reverberatory smelting furnace, in the latter of which the calcined matte will be reduced to blister copper; an eighty horse power engine; and a masonry reservoir, with a capacity of 150,000 gallons. This smelter was in blast for 255½ days from January 14, 1896, to January 1, 1897, and smelted 30,131 tons of ore, producing 632,960 ounces silver, 578.1 ounces gold, 2,262,921 pounds copper. Of this quantity 271 tons was customs ore and the average value of the remainder is shown to be 21 ounces silver, 3.7 per cent. copper. This smelter was blown in on March 1 and will go into the customs business for the treatment of Trail Creek ores, while the new stack will be equipped for the treatment of silver- lead ores from Slocan.

On the west extension of the Silver King ledge A. H. Kelly has been developing the Dandy. A seventy-five foot tunnel shows the ledge three and one-half to four feet wide, carrying copper pyrites, bornite, galena and spathic iron. A cross-cut of sixty-five feet taps the ledge at another point and a drift of 170 feet shows copper ores and galena, as in the other. A fifty-foot open cut exposes the vein three or four feet wide and a 170-foot tunnel follows it for 100 feet.

The Iroquois, owned by J. E. Boss, of Spokane, appears to have a parallel ledge of the same character, which has been explored by means of tunnels, open cuts and diamond drill-holes.

On the Grizzly Bear the Stadacona Silver-Copper Mining Company has traced the east extension of the Silver King ledge and has shown good ore in a shaft, but in 300 feet of tunnels and cross-cuts has failed to tap the ledge.

The Silver Queen Mining Company, of Victoria, has resumed prospecting with the diamond drill on the Silver Queen, which is believed to have one of the branches of the Silver King ledge. There are good indications in several open cuts and silver-copper ore has been struck in a shaft.

The Poorman group of six claims on Eagle Creek, six miles west of Nelson and two miles from the Kootenai River, is owned by N. L. Davenport and others, and has two ledges of free milling and concentrating ore striking about north and south through hornblendic granite. The main ledge, which varies in width from a few inches to five or six feet, is tapped by a ninety-foot cross-cut, from which drifts run 180 feet south and 325 feet north. In the

south drift the ore varies from a stringer to five or six feet, with six to eight inches in the face, and has been stoped practically to the surface. In the north drift is a stope seventy to eighty feet long and averaging two feet wide. A second cross-cut to tap the ledge in 450 feet at a depth of 300 feet, is in 140 feet and has cut a small ledge from which fifty tons of ore have been mined in a forty-foot drift. A tunnel has been driven 140 feet on the other ledge, showing in one place two to three feet of ore and in others only two small veins, carrying iron and copper pyrites and galena. About eighty tons of this ore have been milled, giving somewhat higher returns than the other. The mine is equipped with a three-drill compressor, a ten-stamp mill and three vanners, run by water power, the water being brought by flume and pipe from Eagle Creek. Water is only sufficient from April to July inclusive, but Sandy Creek would furnish more by two miles of fluming and the Kootenai River would give ample power. About $100,000 has been taken from the main ledge, the ore averaging about $16 and concentrating about ten into one. As depth is gained, the value goes more into sulphides.

The Royal Canadian group of three claims, a mile west of the Poorman, has two quartz ledges in granite, on one of which a 205-foot tunnel shows six to forty-two inches, with an average of sixteen inches, carrying $12 to $14 gold, while eight assays ranged from $8 to $51. This ore carries 8 to 12 per cent. iron pyrites and some copper pyrites. Another tunnel, fifty feet above, is in sixty-six feet, showing the same ledge four to twelve inches wide. On the other ledge a short tunnel shows the parallel ledge two to twelve inchs wide, carrying some iron and copper pyrites and fifteen tons of this ore yielded $14.50 free gold at the Poorman mill.

On the south extension of the Royal Canadian is the Muldoon, on which M. Monahan has shown a small stringer in a tunnel.

The Majestic, owned by John Miles, shows eight to thirty-six inches of quartz, carrying little pyrites, in a 120-foot tunnel. A parallel ledge twelve to sixteen inches, carrying free gold, shows in an open cut.

The Starlight group of six claims, 4,000 feet above the Kootenai River, has two auriferous schistose bands. One of these is shown by a tunnel 209 feet to be 148 feet wide between two porphyry dikes and assays $3, of which 35 per cent. is free. At 158 feet a drift was run fifty-nine feet east and seventy-two feet west on a parallel ledge of quartz, six to thirty-six inches wide, assaying $2.50 to $32 gold, which can be traced 700 or 800 feet on the surface, ninety feet above. The other band of schistose ore is opened by a fifty-foot tunnel.

The Fern group of three claims and two fractions, under bond by Frank Fletcher and Capt. Duncan to the Montreal & British Columbia Development Company, is four and one-half miles by trail from Hall's Siding on the Nelson & Fort Sheppard Railroad and has a ledge averaging about two feet and carrying iron and copper pyrites, between walls of porphyry and schist. The lowest working is a twenty-foot cross-cut, from which a drift runs twenty-five feet on the ledge, in two to three feet of decomposed quartz carrying free gold, and a winze is down twenty-two feet. The ledge is shown above this by an open cut and fifty feet higher by a fifteen-foot shaft in which it is twenty-one inches wide; fifty feet higher still, it is eighteen to twenty-four inches in an open cut. The longest tunnel is 350 feet. driven 200 feet above the lowest tunnel, and shows the ledge four inches to three and one-half feet, while an ore chute thirty inches wide has just been entered, which is said to assay 12 ounces gold. A third tunnel, sixty feet higher, runs 160 feet on the ledge, which widens from three inches to three and one-half feet. A two-stamp prospecting mill has been erected, but is not running. A shipment of twenty-five tons to the Pilot Bay smelter returned $39 gross.

The Athabasca group of four claims on Morning Mountain, two miles from Nelson, has been acquired by the Athabasca Gold Mining Company. Seven ledges have been opened, ranging from one to eight feet wide, all showing free gold with some iron and copper pyrites. The company has begun development and intends to erect a stamp mill.

The more recent discoveries have shown the mountains through which Salmon River flows southward into the Pend d'Oreille from the same ridge, which drains northward into the Kootenai, to be equally well veined with mineral. Here the sulphide ores are found in some instances to be equally rich in gold and silver and to have galena and native silver associated with them. There are also great bodies of iron-capped sulphide ore in a diorite formation, similar to those in Trail Creek on the west.

Development is in progress by the Dundee Gold Mining Company on the Parker group of three claims between Wild Horse and Porcupine Creeks, three-quarters of a mile from the Nelson & Fort Sheppard Railroad. The ledge crops fifteen feet wide between a granite footwall and a hanging wall of black augitic rock, and an eighty-five foot shaft on the hanging wall shows six feet of quartz carrying iron sulphurets and a little galena and assaying $22 gold and two ounces silver. The shaft is being extended to the 100-foot level, when a cross-cut will be made.

A property which has attracted much attention by its rich surface showings is the Elsie, five miles by trail from the railroad, which is being developed by the Elise Gold Mining Company. The ledge is six feet wide between slate walls and carries two to three feet of pay ore, the mineral being iron

and copper sulphides, galena, black sulphurets and native silver. Three samples across the pay streak at places ten feet apart assayed: Gold $60.80, silver 116 ounces; gold $80.80, silver 37 ounces; gold $88, silver 17 ounces. Ten assays from various parts of the ledge ranged from $7.20 gold and 1 ounce silver up to $1,046 gold and 234 ounces silver, an eleventh assay having shown only a trace of gold and 6½ ounces silver.

The Cromwell, on the north fork of Salmon River, fifteen miles from the railroad, with a wagon road within three miles, is being developed by the Cromwell Mining & Development Company. A twelve-foot shaft shows three feet of quartz carrying pyrites, which assays $80 to $140, mostly in gold.

The Salmon River Gold Mining Company has the Swinker group of three claims twenty-eight miles east of Waneta Station. They are on the south slope of a high, rounded mountain and in a diorite formation have four wide iron-capped ledges running east and west. A number of open cuts have shown their character and in one is almost four feet of solid pyrrhotite, assaying 50 cents to $3 gold on the surface, such values as have been shown on the surface of similar ledges in Trail Creek.

The Bear Creek Mining Company is developing the Portland group of four claims on the divide between Bear and Beaver Creeks and many other properties in the same district are making good showings in the course of development.

BOUNDARY CREEK.

This district, occupying the middle ground between the Okanogan River and the Trail Creek mining district, and including an area of 1,900 square miles immediately north of the boundary, has risen into prominence during the last few years and is now the scene of as much activity as Trail Creek when the latter's wealth had been proved but had not been poured forth in the form of dividends. Its development has been retarded by its remoteness from transportation, but this defect is likely to be soon repaired by the extension of the Columbia& Western Railroad from Rossland through the heart of this country to a connection at Penticton with the Canadian Pacific steamer on Okanogan Lake, which connects with the Sicamous branch of that railroad. The road is now under construction up the Columbia River from Trail to Robson, a distance of twenty-five miles, and $1,500,000 has been raised for the further extension across the mountains, down Christina Lake and the North Kettle River, up Kettle and Okanogan Rivers to Penticton. The Spokane Falls & Northern has also made surveys for a line from Marcus up Kettle River to run partly through Washington and partly through British Columbia.

The present routes into this country are from Vancouver, B. C., by the Canadian Pacific Railroad to Sicamous Junction, 331 miles; thence by the Sicamous branch to Okanogan Landing, fifty-one miles; from there by the steamer Aberdeen to Penticton, eighty miles; then by stage to Midway, eighty-five miles; Boundary Falls, eighty-nine miles; Anaconda, ninety-two miles; Greenwood, ninety-three miles; Carson, 105 miles; Grand Forks, 110 miles, in each instance from Penticton. The other route is from Spokane by the Spokane Falls & Northern Railroad to Marcus, 102 miles, or Bossburg, 110 miles, thence by stage to Grand Forks, forty-five miles, the distances to other points being obtained by reckoning along the first-named route in the opposite direction. Robert Wood, of Greenwood, has built a wagon road from that town to Greenwood and Wellington Camps at a cost of $5,000 and has also extended the road from Deadwood Camp as far as Copper Camp. Another road has been built from Midway to White's, or Central, Camp, shortening the distance to five miles, and the British Columbia Prospecting Synidcate has made one up Boundary Creek to Long Lake Camp. Extensions are being continually made, and trails lead to the remaining camps.

The Boundary Creek district comprises the area between the mouth of Rock Creek on the west and the north fork of Kettle River on the east, between the boundary on the south and the source of Boundary Creek, twelve miles north.

The geology and mineral formation of this district are best described by Samuel S. Fowler, a mining engineer of Chicago, in a report prepared for W. T. Thompson, of Midway, after an examination extending over nearly a year. He said:

"The basal rocks of the district are quartzites, mica and hydro-mica schists, some clay slates and bands of limestone. I have assumed these to be of the Cambrian or pre-Cambrian age. They are highly tilted and altered and extend from just west of Boundary Creek eastward. From this western limit we find more recent, probably Devonian or lower carboniferous limestones, and further west again cretaceous sandstones, shales, etc., appear.

"All these stratified rocks are penetrated and disturbed by an extensive series of eruptive rocks of different ages and nature. These include granite, syenite, trachyte, porphyry and diorite. These eruptives are more or less ultimately connected with almost all the mineral deposits examined. No

systematic geological survey has been undertaken here and until it has been it will be impracticable to interpret the gelogical evidence intelligently.

"In a general way, however, I may say that the granites along Boundary Creek seem to be accompanied by the dry silver and gold ores shown in Providence and Skylark Camps, etc., while the diorite belts running nearly east and west are accompanied by the basic sulphides in considerable bodies along contacts. In this respect the district is somewhat similar to Trail Creek, although there the diorites are found to penetrate the granite rocks rather than the metamorphic series.

"As a whole the ores of Boundary Creek may be classed as gold. They consist largely of mixtures of various iron sulphides, with small amounts of copper pyrites, all more or less auriferous. There are exceptions, which will be noted.

"In Copper Camp we find an essentially straight copper ore. It consists principally of copper glance in quartz, with more or less red oxide or native copper near the surface. In Deadwood Camp the most prominent feature is a large body of magnetic iron (often polaric), through which is disseminated auriferous copper pyrites. Passing east over the Boundary Creek valley to Greenwood Camp, we find again large bodies of magnetite on some claims; in others, at less elevation, quartz accompanied by specular iron and calcite. In each case copper pyrites is present, with more or less gold. White's Camp and Wellington both show considerable amounts of iron and copper sulphides, gold-bearing in all cases. In the north part of the district the Long Lake Camp is found in a granite and schist belt with radically different ores. These are quartz, carrying free gold at the surface. Below we find silver glance, tellurides of gold and silver, native tellurium, along with blende, and small amounts of galena in some of the veins. Again in Providence and Skylark Camps, on both sides of Boundary Creek, quartz veins in the schists or granite or in the contacts, carrying the dry ores of silver, are found; also occasionally small amounts of galena, etc., are present. Graham Camp exhibits purely copper ores; here, however, these are almost entirely copper pyrites instead of glance, as in the Copper Camp.

"The great number of claims located within three or four months have been principally on ground in or near the largest of the diorite belts. The great majority of these are practically as they were found, and I have seen but few of them. There is much ground that has yet never even been walked over; much of it is covered by dense forest; in many places the 'wash' is heavy, and yet mineral in place continues to be found. Whether or not lead ores will be found in any more than the limited quantity shown at present is doubtful, but from what is already seen the district is essentially one of copper and gold, and in which more or less dry silver ores are incidental."

Mr. Fowler goes on to discuss the principal claims in detail, and then summarizes his facts, as follows:

"From the foregoing we find: One camp producing copper ore, as such, with little precious metal. Again, in and near the Boundary Creek valley, a belt of dry silicious silver-gold ores, carrying practically no copper. East of this many groups of claims with mixed pyritous ores, containing gold and copper. These in many cases are not in need of preliminary concentration; in others again they are. Roughly speaking, they average 4 to 5 per cent. copper and carry $2 to $3 gold to the unit of copper."

Prospecting extended gradually eastward from the placers on Rock Creek, which are described in another chapter. L. M. McLarren, of Boundary Falls, worked placers on Boundary Creek in 1884 and in 1885, on a mountain overlooking his home located the Tunnel claim on a two-foot ledge of quartz, carrying iron sulphurets, gold and galena. He ran a tunnel sixty feet on it and got various assays, running about $12 gold and 28 ounces silver, in one place finding a little nickel. The lack of transportation caused him to abandon the claim in 1890, but meanwhile in 1887 W. T. Smith had located the Nonsuch on the same mountain and gave the place the name Smith's Camp. On the surface he found three feet of slate, carrying galena, iron, gold and a little gray copper. He has run two tunnels seventy-five feet apart, one eighty feet and the other 200 feet long, giving a depth of 500 feet and showing a ledge of free milling ore two to three feet wide, which on a milling test gave $20 gold, but at depth changes to iron sulphurets. The Last Chance, the north extension of the Nonsuch, has a shaft about sevnty-five feet deep showing two to three feet of iron pyrites, with galena near the surface and in places, as depth was gained, carrying native silver in sheets, this ore being worth as high as $75. The Republic, a northwest extension of the Nonsuch, had twelve inches of $40 gold and silver ore showing in a twenty-foot shaft. These three claims have been incorporated by Mr. Smith and his partners.

The Northern Chief, located in 1892 by James Atwood, showed twelve inches of free milling ore in a ten-foot shaft. The Spokane & Great Northern Mining Company bought it, erected a two-stamp mill and milled the ore until at forty feet of depth it changed to sulphurets. The claim was then abandoned and the mill removed. In 1895 John Winters and others relocated it as the Boundary Falls and, sinking the shaft six feet further, ran into $50 free milling ore.

On the Great Hesper and Hecla, J. C. Haas, of Greenwood, and James McNicol, of Midway, have shown by a twenty-five foot tunnel a four-foot

ledge carrying copper and iron pyrites and galena, assaying $3 to $8 gold, 10 to 50 ounces silver. On the Golconda, a twenty-foot shaft shows a fifteen-foot ledge, in which the pay ore assays $3 to $15 gold.

On the opposite side of Boundary Creek the Ruby, owned by Messrs. Cook and McMahon, has a forty-foot shaft with a good showing of ore, which has assayed as high as $3 to $5 gold and 23 per cent. copper. The American Boy, adjoining, owned by R. Louis Rutter, of Spokane, has a ledge sixteen to seventeen inches wide on which a shaft has been sunk seventy-five feet. Two or three tons have been shipped to the smelter and ran about 200 ounces in silver and $20 in gold.

Traveling up Boundary Creek, one comes next to the section called Providence Camp, which extends from the confines of Anaconda northward one mile beyond Greenwood and to the crest of the ridge on each side of the canyon, and contains small ledges of very high grade ore. The first discovery was the Providence, made in 1892, by F. A. Bartholomew, and now owned by the Spokane & Great Northern Mining Company. There is a series of rich streaks of gold-bearing galena, one of which shows twelve to eighteen inches thick in a sixty-five foot shaft. Several carloads of ore were shipped to the Tacoma smelter and yielded from 5½ ounces gold and 238 ounces silver to ½ ounce gold and 438 ounces silver. The same company also owns the Defiance, the vein on which carries rich sulphides of silver, and made two shipments in 1893, yielding respectively 380 and 680 ounces silver and 1.8 and 3 ounces gold.

The Texas, owned by J. L. Wiseman and Charles Vanness, of Grand Forks, has three prospect holes on a ledge of pyrites, so far shown to be twenty feet against a trap footwall, with the hanging wall not in sight, and traced on the surface for 800 feet. The ore assays from 4 per cent. copper, $1 gold and 2 ounces silver to 3 per cent. copper, $11 gold and 4 ounces silver, and ore has been struck carrying native silver. The Master Mason, owned by F. A. and C. E. Bartholomew, has a three-foot ledge of galena and pyrites between walls of slate and quartzite. A fifty-foot shaft has been sunk with a fourteen-foot drift from the bottom, showing the vein to hold its width and improve in quality. It assays $10 to $38 gold and 75 to 125 ounces silver. F. A. Bartholomew also owns the Combination, on which there is a two-foot ledge between slate and quartzite with a six-inch pay streak of very rich ore, carrying native silver, galena and free gold, and assaying 100 ounces silver, $25 gold. A shaft has been sunk twenty-five feet, showing the native silver to increase with depth.

A parallel ledge runs north and south on the east side of Boundary Creek below Greenwood and two miles on the west side, being cut by the creek. The original location was the Black Bess, by Mr. Dickman, in 1892, on a twelve-inch ledge abutting on Anaconda town, and it was relocated in 1894 by A. N. Symons and Joseph Wallace, who shipped eleven tons of unsorted ore. It returned 1½ ounces gold, 29 ounces silver and 8½ per cent. lead. Extensions were then located north and south.

On the south the Capital Prize, owned by Thomas Humphrey, has a shaft six feet deep on a four-foot ledge of galena carrying about $100 gold and silver.

The Lead King, owned by A. N. Symons, has a nine-foot ledge traced for 1,000 feet on the surface, the High Kicker, by J. Wilbur, being a south extension. The Coming Man, by Harry Morgan, has fifteen feet between walls on a parallel lead to the Lead King.

To the north is the Mammoth, owned by Fred Dittmer, who sank a shaft twenty-five feet and ran a tunnel thirty feet on a twelve-inch ledge which assayed 107 ounces silver and $22 gold.

On the Dundee, next to the north, Robert Wood and James Sutherland have sunk a shaft thirty-five or forty feet on a twelve-inch ledge of quartz.

The G. A. R. group of eight claims to the north, on the west of the creek, is owned by the Boundary Creek Mining Company, and are all supposed to be on the same ledge, as they have similar white quartz carrying galena between walls of diorite and occasionally lime, wherever walls have been found. One claim shows eleven inches of galena in a twenty-foot shaft and carries $20 gold, 8 ounces silver. A parallel ledge twenty-five feet wide has only been uncovered and not assayed, and another ledge ten feet wide is undeveloped. On another ledge a shaft is down thirty-five feet showing it four to twelve feet wide, with an eight-inch pay streak carrying galena, native silver and free gold. A shipment of four and one-half tons to Tacoma returned about $100 and assays have ranged from $30 to $100. Another ledge shows twelve inches of galena and wire silver in a small shaft, assays ranging from 50 ounces silver and $8 gold upwards.

The Anaconda, owned by Thomas McDonald and W. G. McMynn, and the J. A. C., owned by D. A. Holbrook, adjoining the G. A. R., are both copper properties, carrying gold and silver, and show surface indications of a large ledge.

A tour of the district naturally takes one next to Deadwood Camp, two and one-half miles west of Greenwood. The discovery claim was the Mother Lode, one of the greatest in the district, and dates from 1891, being found by William McCormick, M. K. Ingram, W. T. Thompson and W. W. Gibbs. It has been bonded through W. T. Thompson, of Midway, to Col. John Weir, of New York, who is now developing it. It has a contact ledge between

walls of lime and syenite, capped with magnetic iron (often polaric), and has been traced for 1,200 feet and to a width of over 100 feet by croppings. The surface ore assayed $1.50 to $12 gold (rarely the latter), but as depth was attained in a 190-foot cross-cut, of which 150 feet is in ore, the magnetic iron gave place to pyrrhotite richer in gold, and this to pyrrhotite, with quartz and zinc blende, with still higher gold values. Beyond the walls, the surface country rock is slightly mineralized for a width of 600 feet.

The Crown Silver and Sunset, on two parallel ledges of the same character, have been bonded by W. W. Gibbs and James Schofield to a Montreal syndicate for $16,000. The Sunset ledge is 750 feet between walls of porphyry and quartzite, and has been traced for 400 feet; the Crown Silver has a cropping fifty feet wide and has been traced the same distance. The Sunset has a tunnel in twenty-five feet, a shaft eighteen feet and an open cut forty feet across the vein, all in ore of the same character, and though the vein has not been cross-cut both walls have been found. The Crown Silver has a twelve-foot shaft and a twenty-foot tunnel, showing a still better grade of ore and well-defined walls. The Sunset ore is copper sulphides assaying $6 to $10 gold and 10 per cent. copper.

The Great Hopes, bonded by J. P. Harlan and others to the Great Hopes Mining Company for $12,000, has a vein of arsenical iron, which can be traced for nearly the whole length of the claim. The ore chute is three and one-half feet wide, traced for 400 feet and assays an ounce of gold. Numerous open cuts have been made, a shaft is down twenty-five feet and a tunnel on the vein forty feet, all showing the same width and quality of ore. The Gem, owned by W. McCormick and John Dunn, who have bonded a half interest to Garland & Hayes, of Portage la Prairie; the Iron Top and Gold Drop, by John Dunn and Samuel Larsen, also have good showings.

The Morrison, owned by George T. Crane and others, of Spokane, has a ledge carrying arsenical iron and copper pyrites and assaying $6 to $20 gold and as high as 40 per cent. copper. A shaft has been sunk about fifty feet to the ledge showing a large body of ore, but its width has not been defined by a cross-cut.

The real beginning of the movement into this district was the discovery of Copper Camp, three and one-half miles further west than Deadwood along the same road from Greenwood, on the divide between Copper and Ingram Creeks. Locations had been made as early as 1880, but local historians date discoveries from 1887, when George Bowman and George Layson found a great contact ledge carrying red oxide of copper, black oxide of copper, some copper carbonates and pyrrhic oxide of iron, carrying gold and silver, native copper and copper glance. They located the Blue Bird on it in the following year, but lost it through not doing assessment work, and in 1889 Austin Hammer and John Moran located the Copper Mine, including half the Blue Bird, and William Austin located the Last Chance, including the other half. The King Solomon is owned by the Spokane & Great Northern Mining Company. The Last Chance, Enterprise, by T. Humphrey, Ewing Keightley and Scott McRae, and Honolulu are extensions of the King Solomon lead; the Yucatan, by George Riter, on the Copper Mine extension; the Copperopolis, by Mr. Riter; the Jumbo, by T. L. Savage; the Cuprite, by Scott McRae and others; the Paramatta, by Robert Burrows, and the Harquehla, by Martin Griffin. All these claims are on the northeast extension of the Copper Mine lead, tracing it for over 13,000 feet in that direction, while six or seven other claims beyond are supposed extensions southwest from the Copper Mine, and adjoining its south side is the Last Chance, from which the lead extends to the Sycamore, located by Frank Beauchene, other locations stretching miles to the southwest. The King Solomon and Copper Queen are on parallel ledges east of the Copper Mine, and the Copper Bottom, by George Riter, is on the same side.

The Copper has been bonded for $27,000 to Col. John Weir, of the American Metal Company, who sank a fifty-foot shaft in lime on the footwall and a ninety-foot cross-cut run to the porphyry hanging wall, showing twenty-seven feet of ore between walls, continually improving with depth. Above this ledge are others of similar ore, which can be cross-cut at a depth of over 500 feet from the bottom of the shaft. Assays show 5 per cent. and upwards in copper. The main ledge is nowhere less than twenty feet wide, on the Copper Mine is fifty feet at least, on the Enterprise forty feet, widening at one point to 100 feet, and on the Last Chance thirty-five feet. The King Solomon ledge has been defined to a width of fourteen feet, and the Copper Queen of twelve feet. The pitch of the Copper Mine lead is from flat to 20 degrees and the course is east northeast. No average assays of the whole ledge are possible till both walls are shown up, but those so far obtained run from $5 to $125 gold, silver and copper.

Returning to Greenwood and climbing the mountain to the east, one comes in two miles to Skylark Camp on the divide between Twin and Lind Creeks, where large pyrites ledges are found in close association with galena. The first discovery, made in 1893, was a three-inch streak of galena, on which Samuel Bloyer and James Atwood located the Skylark and Last Chance and Thomas Wake the Denver. It widened with depth, and assayed 200 to 1,200 ounces silver 2½ to 4 ounces gold. The Skylark was bonded to H. C. Walters for $5,000, and he leased it to others, who sank forty-four feet and

made a shipment which returned $158 gold and silver. Then the Spokane & Great Northern Mining Company took it and shipped sixty-two tons via Marcus, which yielded 1,892 ounces silver, 15 ounces gold per ton, freight being $30. The mine had so far paid for its development, but the ledge being broken, it was returned to the owners. They sank seventy-five feet further, struck it again thirty-two inches wide and sold to the Lexington Mining Company. It carries gray copper, steel galena, ruby silver and about 7 per cent. lead, assaying from 50 to 2,000 ounces silver, $10 to $50 gold. Development is being continued and shows increasing value. On the Denver, also sold to the same company, a thirty-foot shaft and a cross-cut showed thirty feet of iron pyrite, also running through the Skylark.

The Silver King, owned by Thomas Wake and James Atwood, has several parallel ledges of pyrrhotite with streaks of galena one to four inches wide, and a cross-cut fifty feet from the footwall has not reached the hanging wall. Assays of the pyrrhotite show $4.25 to $5.25 gold, besides copper. On the same ledges are the Santa Anna and T. & B.

The Last Chance, owned by George Cook and Messrs. Reed and Cole, of Spokane, had two to six inches of galena on the surface, which widened to twenty-four inches in an eighty-foot shaft.

The Golden Crown and Lookout, owned by Richard Watson, both have ten inches of galena, assaying $5 gold and 9 ounces silver, and a ten-foot shaft on the Golden Crown shows it to maintain its width.

East of the Skylark are the Lulu, Nellie Cotton, Blue Jay, Smuggler, Red Rock and Skyline, all with good surface showings of quartz, carrying $11 gold. The Nellie Cotton has a thirty-foot shaft showing the ledge thirty inches wide.

The Crescent, owned by William Dittmer and Robert Mack, has twelve to eighteen inches of galena, on which there is a twenty-foot shaft. Assays have run from 116 to 1,126 ounces silver and $22 to $54 gold. The Mexico, the west extension of the Crescent, owned by Scott McRae and others, has a ten-foot shaft on the same ledge.

The Nightingale and Mayflower, owned by C. Christy, have a capping of magnetic iron sixty feet wide, which has assayed $8 gold, 7 per cent. copper and some silver, but only surface prospecting has been done.

The Trilby, bonded by W. H. Norris and Randolph Stuart to W. Nelson, of Boundary Falls, has a twenty-foot shaft, a twenty-five-foot cross-cut on the Mayflower extension.

Two and a half miles further east, on the divide between Lind and Fourth of July Creeks, is Greenwood Camp, noted for its ledges of pyritic ore, equal in size to those of Deadwood. The Stemwinder, located by Robert Denzler and James Atwood, and sold for $12,000 to the Pyrite Smelting Company, of Butte, has two parallel ledges, twenty feet and seven or eight feet wide, of iron and copper pyrites, which has given assays ranging from $5 to $60 gold, 5 to 6 per cent. copper and 1 to 8 ounces silver. The owners have sunk a double compartment shaft sixty feet between the two ledges, drifted twenty-five feet from that point eastward, cross-cutting the small vein and then sunk. They have also sunk a shaft fifty feet on the larger vein.

On the same ledges are the Gray Eagle, owned by James Schofield and John Stevens; the Knob Hill, owned by H. P. Palmerston, Henry White, C. J. Lundy, John Stevens, John Hotter and A. B. Jones, of Spokane, who have given a bond for $30,000; the Old Ironsides, recently sold by the Old Ironsides Mining Company for $15,000; the Phoenix, owned by Thomas Tighe, James Schofield and Thomas McDonald; the Montezuma, owned by Ewen Keightley. On these claims the ledge shows up fifty to 100 feet wide, and development on a large scale is in progress on the Old Ironsides. On the Montezuma are two shafts, twenty and twelve feet deep respectively, and the ledge has been traced to a width of sixty-six feet. Assays show $4 to $38 gold and 11 per cent copper.

The greatest development has been done by the Montreal & Vancouver Prospecting & Development Company on the Snowshoe group of three claims, which were bonded for $58,500. There are three distinct ledges, running nearly north and south, ranging from fifty to 200 feet wide, of iron and copper pyrites, carrying gold and silver, between walls of diorite. About 225 feet of development work has been done, one shaft being down 110 feet, another seventy-five feet and a number of prospect holes six to twelve feet, the ledge cropping out 100 feet wide and assaying $6 to $53 gold and 13 per cent. copper. The company ran a number of diamond drill holes, sank shafts forty and seventy-five feet, and cross-cut fifty to sixty feet from the footwall towards the hanging wall, showing ore which carried $15 to $25 gold, 3 to 10 per cent. copper. The cross-cuts showed 122 feet of ore of various grades in the Gold Drop, and some of the diamond drill cores assayed $50 gold. The company took up its bond on this claim and dropped that on the Snowshoe and Monarch. The Monarch was bonded to R. E. Brown, of South Africa, who also bought the Tamarack for $4,000 cash and bonded the Dandy for $10,000, and is preparing for development.

Adjoining the Stemwinder on the west is the Brooklyn, owned by Joseph Taylor, George Rumberger and Stephen Mangitt, who have cross-cut eighty or ninety feet from the lime footwall, and not yet found the hanging wall.

West of the Monarch is the War Eagle, owned by Robert Denzler and

Thomas Johnson, which is locally known as the mineral ranch, every stake being in mineral. A shaft has been sunk twenty feet in one ledge of unknown width and an open cut runs across another ledge, which it shows to be twenty-five feet wide, with no hanging wall yet discovered. The ore assays $2 to $6 gold and 3 to 11 per cent. copper.

The Vitoria, owned by John Stevens, adjoins the Old Ironsides on the east, and has a ledge fifty feet wide, on which a shaft is down fifteen feet, and a number of cross-cuts have been made to find the walls.

To the south of this is the Etna, owned by George Rumberger, and between the Etna, Monarch and War Eagle is the Missing Link, owned by George Rumberger and Harry Morgan, who have run a cross-cut on the ledge, but have only one wall.

In 1895 prospecting was extended up Boundary Creek to Long Lake, one of its sources, by Louis Bosshart, Fred Dittman, C. Thomet and Spencer Benerman, and they discovered a series of gold and silver-bearing ledges on both shores, running northeast and southwest through schists, quartzite and dikes of diorite. The ledges carry iron and copper pyrites and galena, with occasional tellurides of lead and silver. On the Gold Drop, Messrs. Bosshart and Dittmer have sunk twenty feet on three to four feet of ore, giving very high assays. The North Star, on the north extension, owned by Robert Wood and J. W. H. Wood, by C. Thomet, shows a ledge three to five feet in a thirty-five-foot shaft, assaying from $30 upward, and the shaft has been extended seventy-five feet and a tunnel run 100 feet. Beyond this is the Golden Eagle, by Messrs. Benerman and Peterson, and Mr. Benerman has the Silent Friend, in which a small shaft shows thirty inches of $50 ore. The Jewel was located on a parallel ledge by Messrs. Bosshart and Dittmer, who have shown $26 ore in four small shafts, while a lower cropping shows $46 ore.

On the extension of this ledge are the Anchor, Ethiopia, Robert Emmet and Enterprise fraction, and beyond these is the Dinero Grande, on which Messrs. McArthur and Shonquest have a five-foot ledge well mineralized, shown in a shaft and cross-cut. The Jewel and Dinero Grande have been bonded for $60,000 to Leslie Hill, for the British Columbia Prospecting Syndicate, who has erected a steam hoist, pump and power drills and is sinking a shaft.

On the north end of the lake, C. Thomet, Robert Wood and J. W. H. Wood have run a tunnel over 100 feet on a ledge on the Lakeview, which widens to three and one-half feet and carries hessite, native, leafy and wire copper, surface specimens having assayed $60 gold.

On the west side of the lake, A. B. Jones, of Spokane, John Powell and Mrs. Robert Wood, of Greenwood, have the Roderick Dhu on two ledges twelve and forty-eight inches wide. On the smaller, a fifty-foot shaft showed galena which assayed $80 gold and 80 ounces silver, and on the wider vein two cross-cuts showed antimonial silver, somewhat lower in value. On the Samson, Mr. Galloway, of Vancouver, B. C., has two to three feet of ore running $20 in gold

In traveling from Greenwood to Grand Forks, one comes to Wellington Camp, nine miles from the former place, the characteristic ores being pyrrhotite and copper pyrites. The first discovery here was the Oro in 1892 by Joseph Taylor on a three-foot ledge of silver-bearing quartz. Then W. J. Peter and Thomas Russell located the Golden Crown on a ledge of free-milling ore three or four feet wide, which a sixty-foot shaft and several open cuts show to widen, the ore assaying from $7 to $200 gold, and averaging $60 gold at forty feet deep. This is under bond to the Golden Crown & Brantford Mining Company for $30,000. This company has also bonded the Calumet for $18,000, on which is a twelve-foot ledge carrying pyrrhotite, assaying $4 to $32 gold, besides copper.

The Winnipeg, adjoining the Golden Crown, is owned by Duncan McIntosh and has a ledge seventeen feet wide, on which shafts have been sunk thirty-five and sixty feet with a drift of thirty feet at the fifty-foot level, on ore averaging $50 gold. One shipment of eight tons has been made. The Calumet, adjoining the Winnipeg, is owned by R. F. McCarren and has a twelve-foot ledge carying pyrrhotite, which assays $4 to $32 gold and a little copper.

On the Keystone group Joseph Taylor has sunk shafts twelve to fifteen feet and run several cross-cuts, showing sixteen feet from the footwall with no hanging wall in sight. assays running $4 to $5 gold and 5 per cent. copper. On the northeast extension Taylor & Co. have sunk twenty-five and fourteen feet on two ledges assaying $8 gold. John Myer and Daniel McLean have shown a four-foot ledge carrying galena in a twenty-five foot shaft on the Keno, assays running 2 to 3 ounces gold, 45 to 55 ounces silver. John Myer and Ben Burgunder have a ledge of pyrites on the Colorado, where a twenty-foot cross-cut has failed to find either wall, and also have an eighteen-inch streak of galena assaying $45 gold and silver. On the Buttercup John Farrell has shown eight feet of pyritic ore in a small shaft and several surface cuts. George Cook is sinking on the Jim to show up a ledge of pyrites at least fifty feet wide, assaying 18 to 20 per cent copper and $10 gold. The Outburst, owned by W. A. Glover, has a true fissure vein of white quartz about twelve inches wide, which assays ½ ounce gold, 3 per cent. copper and 45 ounces silver. On extensions of this vein are the St. Charles, owned by George M. Miller and the St. James, by W. A. Glover and James E. Walker.

In the newer part of Wellington Camp, development has made some of the largest and most valuable showings in the district. The most prominent of these has been found by George Cook on the Jim, which has fifty to seventy-five feet of solid ore in a contact between lime and diorite. The surface ore is pyrrhotite and chalcopyrite, carrying large gold and copper values, which increase with depth. Mr. Cook is actively developing.

On the divide between Single and Douglas Creeks, nine miles from Grand Forks and five miles from Midway and extending to the boundary, is White's, or Central, Camp, of which the ores are mainly high grade gold and silver. James Atwood made the first discovery on the Lexington, now owned by Joseph Taylor and others, and on the City of Paris. On the former a 100-foot cross-cut, giving a depth of 100 feet, has been run to tap an eight-foot ledge of pyrites between walls of dolomite and serpentine, assays of which show $26 gold, 12 ounces silver, 6 per cent. copper.

The City of Paris, bonded by an English company, has a parallel ledge, shown to a width of sixteen feet by a fifty-six foot shaft and several cross-cuts, assays running $18 gold, 5 to 20 ounces silver, 7½ per cent. copper. The City of Lincoln, bonded by the same company, has an eight-foot ledge tapped by a 100-foot cross-cut, a shaft seventy feet and a tunnel 150 feet, and a shipment of a few tons to the Omaha smelter returned $21 gold, 3 ounces silver, 8 per cent. copper. A small shaft and some surface cuts have shown a ten-foot ledge carrying pyrites on the No. 4, owned by H. P. Pelmerston and Henry White, assays showing $12 gold and 8 per cent. copper. The Gold Dollar, owned by James Atwood and John Douglas, has a ledge of white quartz four to twelve inches wide, carrying free gold, between walls of diorite and blue lime. Considerable work has been done during the winter and has made a good showing. Assays run all the way from $10 to $300.

The Mabel has three shafts down on what are supposed to be three distinct ledges of free milling and copper sulphuret ore, showing ore in two of them which carries $40 to $100 gold and 5 ounces silver, and in the third from $10 upwards in gold and 5 to 300 ounces silver. The Oro, the south extension of the Mabel, has had much development done, showing good gold values and rapidly increasing copper value in an easily mined gangue.

Col. John Weir, representing the American Metal Company, has been vigorously pushing work on the No. 7 group of three claims, which have two parallel ledges running their full length and carrying gray copper and galena. One of these is two feet wide on the surface and a continuous ore chute has been traced in the croppings for 800 feet. A shaft has been sunk 150 feet showing ore which steadily improved in quality and quantity as depth was gained and a 200-foot drift at the 150-foot level is in ore the whole distance, assaying about $80 gold, 75 ounces silver. A cross-cut is being run from the shaft to tap the parallel six-foot ledge, in which shafts twenty and thirty feet have shown even richer ore. This property, which cost $20,000, now has over $70,000 worth of ore in sight.

On the New York, owned by Douglas & Co., this ledge is shown up in 200 feet of tunnel and shaft.

On the Jack of Spades group of three claims, a French company represented by M. Gire has a ledge at least fifteen feet wide with neither wall shown in two thirty-foot shafts. The ore carries streaks of gray copper assaying $60 gold, besides silver, and development is showing a fine body of ore. A five-foot ledge containing similar ore shows in a thirty-two foot tunnel and a thirty-foot shaft, a small shipment having returned $300 gold, 4 ounces silver.

The Golden Rod, which has been sold to the Pyrite Smelting Company, shows a large body of pyrites and gray copper ore in an eighty-foot shaft and a seventy-foot drift.

The Cornucopia has a strong iron-capped ledge plainly traceable for 700 feet, on which a forty-foot shaft shows a strong body of mineral.

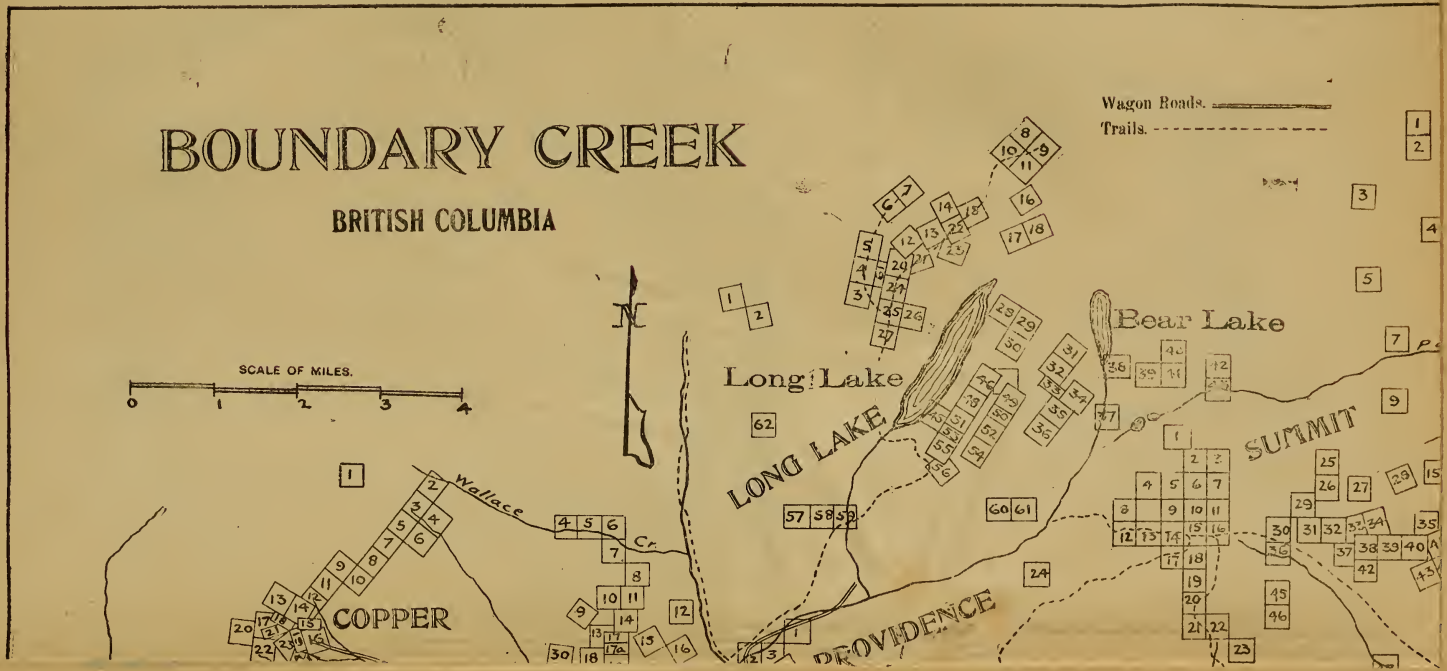
An evidence of his faith in this camp is the fact that Prof. Fowler has bought the Norfolk and No. 9, adjoining the No. 7, for spot cash.

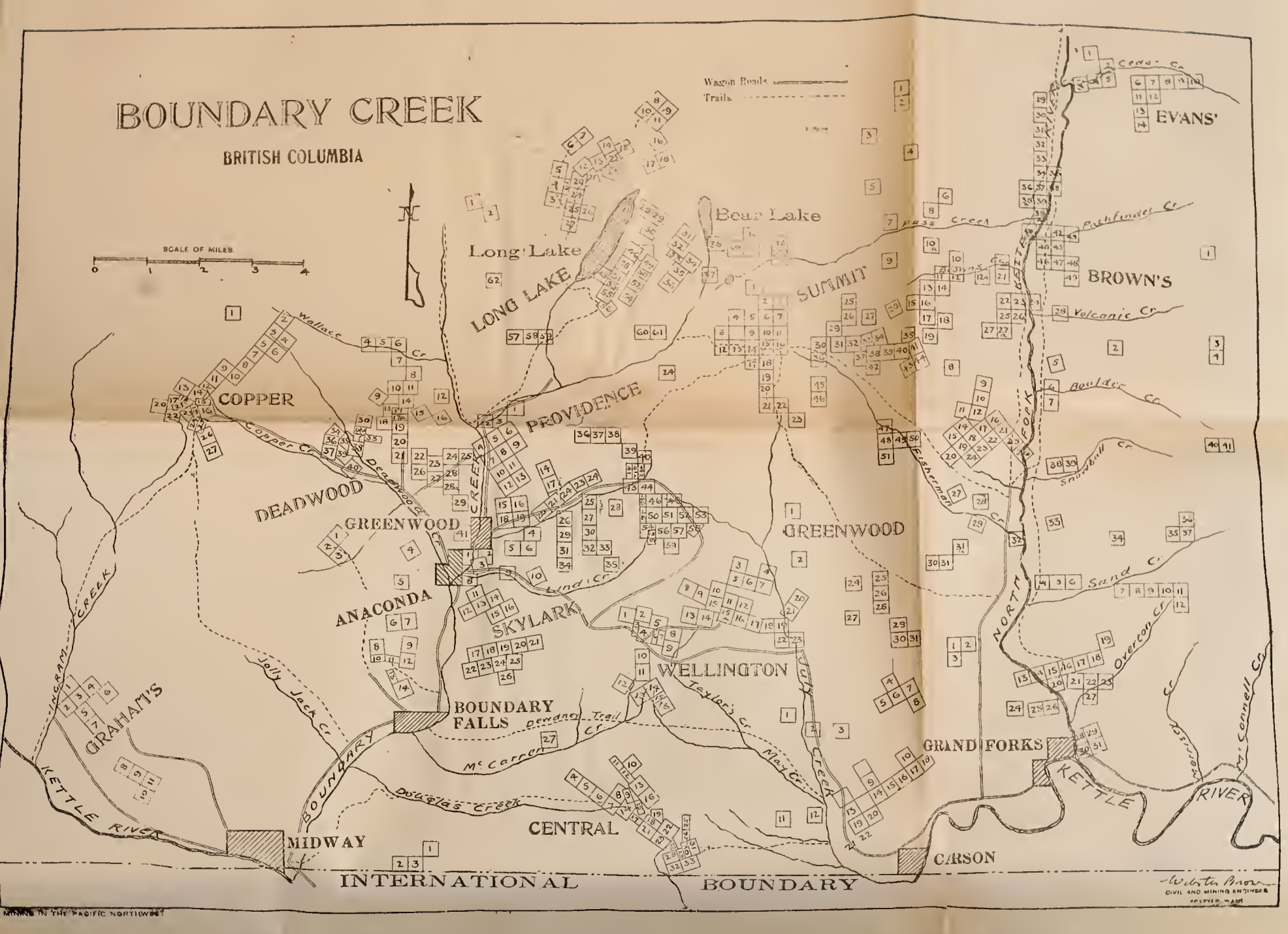
On the divide between Fisherman and Eholt Creeks, three miles north of Greenwood, W. A. Corbett in 1891 discovered two parallel ledges of pyrites twelve and fifty feet wide, on which he located the Oro Dinoro and thus founded Summit Camp. He sank a shaft fifteen feet and made a cross-cut sixty feet, showing large bodies of copper sulphurets which average $10 gold and 12 per cent. copper. John M. Burke has bought this claim for $30,000 and is sinking on the ledge, showing richer ore with depth.

On these ledges also the Pyrite Smelting Company owns the Emma, on which a shaft is down over 160 feet, with cross-cuts of thirty feet each at the fifty and one hundred-foot levels.

Adjoining the Oro Dinoro, John H. Manly and C. A. Cummings, of Grand Forks, and E. W. Johnston, of Seattle, have the Mary L., on which they have stripped a forty-foot ledge assaying $12 gold on the surface. On the Mountain Rose the Pyrite Smelting Company has a parallel ledge, of which the walls did not appear in a thirty-foot cross-cut.

The R. Bell group of three claims, bought by J. E. Bamberger, of Salt Lake, has an eighty-foot shaft showing six feet between walls, with $80 ore and increasing value. Capt. Adams, of Montreal, has sunk thirty feet on a forty-foot ledge on the Cordick, showing up ore worth $45 gold, besides silver


BOUNDARY CREEK
BRITISH COLUMBIA
Wagon Roads.
Trails.
SCALE OF MILES.
0 1 2 3 4
N
Bear Lake
Long Lake
LONG LAKE
SUMMIT
Wallace
Cr
COPPER
PROVIDENCE


BOUNDARY CREEK
BRITISH COLUMBIA
Wagon Roads
Trails
SCALE OF MILES.
0 1 2 3 4
N
Bear Lake
Long Lake
LONG LAKE
SUMMIT
Pass Creek
Eastern
Rathtrevor Cr
EVANS'
BROWN'S
Volcanic Cr
Boulder Cr
Snowball Cr
Sand Cr
Overcon Cr
McConnell Cr
Wallace
Cr
COPPER
Copper Cr
PROVIDENCE
Deadwood Cr
DEADWOOD
GREENWOOD
Greenwood Cr
Wind Cr
ANACONDA
SKYLARK
Jolly Jack Cr
Ingram Creek
GRAHAMS
WELLINGTON
Texter's Cr
Mary Creek
Fisherman Cr
North Fork
BOUNDARY FALLS
Pengano Trail
McCarren Cr
Boundary
Douglas Creek
Kettle River
MIDWAY
CENTRAL
GRAND FORKS
Kettle
River
CARSON
INTERNATIONAL BOUNDARY
Wilson Brow
CIVIL AND MINING ENGINEER
SPOKANE, WASH.
MINING IN THE PACIFIC NORTHWEST

Index to Numbered Claims, Map of Boundary Creek.

Skylark Camp.

1. Dundee.
2. Dandy.
3. Mammoth.
4. Nightingale.
5. Alhambra.
6. Tipton.
7. Helen.
8. Capital Prize.
9. Big Deluth.
10. Trilby.
11. Maple Leaf.
12. Coming Man.
13. Olympia.
14. Livingstone.
15. High Kicker.
16. Jim Crow.
17. Vancouver.
18. Lead King.
19. Iron Gold.
20. Clover.
21. Vera.
22. Herbert Spencer.
23. Mt. Elgin.
24. Independent.
25. Ruby.
26. American Boy.
27. Sue.

Central Camp.

1. Copper Star.
2. Snow Drop.
3. Deer Trail.
4. Gold Dollar.
5. Stanly.
6. Minto.
7. Boston.
8. Stanton.
9. Mabel.
10. Souvenir.
11. New York.
12. No. 7.
13. Rob Roy.
14. Cornucopia.
15. Oro.
16. Falcon.
17. Gold Rod.
18. Puyallup.
19. St. Lawrence.
21. Excelsior.
22. Jack of Spades.
23. Queen of Spades.
25. City of London.
26. City of Paris.
27. Lemington.
28. Martin.
29. No. 4.
30. Lincoln.
31. Cuba.
32. St. Maurice.
33. Orphan.

Providence Camp.

1. Big Window.
2. Combination.
3. Texas.
4. May Scott.
5. Master Mason.
6. Twin Brothers.
7. Elk Horn.
8. Providence.
9. S. F.
10. L. B.
11. Uncle Sam.
12. San Bernard.
13. Defiance.
14. La Cruz.
15. Swiss Boy.
16. Lake.
17. Crescent.
18. Key Stone.
19. Last Chance.
20. Old Mexico.
21. Mountain View.
22. Silver Cloud.
23. Premier.
24. Chancellor.
25. Hope No. 2.
26. Silver King.
27. Denver.
28. Morning Star.
29. Iron Duke.
30. Skylark.
31. Santa Anna.
32. Meadow Lark.
33. Ottawa.
34. T. & B.
35. Climax.
36. Prince Albert.
37. Contract.
38. St. Genevieve.
39. Holyoke.
40. Montezuma.
41. Brooklyn.
41a. Standard.
42. Stem-winder.
43. Idaho.
44. Phoenix.
45. Old Ironsides.
46. Victoria.
47. Fourth of July.
48. Nugget.
49. Knob Hill.
50. Aetna.
51. Gold Drop.
52. Snow Shoe.
53. Pheasant.
54. Gray Eagle.
55. War Eagle.
56. Monarch.
57. Rawhide.
58. Curlew.
59. Tamarack.

Deadwood Camp.

4. Sunset No. 2.
5. Monster.
6. Washington.
7. White Star.
8. Christmas.
9. Kildee.
10. Kootenay.
11. Anaconda.
12. Sentinel.
13. Lancaster.
14. Columbia.
15. Anaconda No. 2.
16. G. A. R.
17. Eagle.
17a. Marguerite.
18. Last Chance.
19. Plutonion.
20. Great Hopes.
21. Butte City.
22. Greyhound.
23. C. E. R.
24. D. A.
25. Gold Bug.
26. Little Britan.
27. December.
28. Big Ledge.
28a. O. B.
29. Fred D.
30. C. O. D.
31. Mother Lode.
32. Crown Silver.
33. Sunset.
34. Hidden Treasure.
35. Principal.
36. B. C. Central.
37. Primrose.
38. Morrison.
39. Gold Bug.
40. Gem.
41. Spotted Horse.

Summit Camp.

1. Body.
2. Chickaman.
3. Homestake No. 2.
4. 21.
5. Advance.
6. Minnie Moor.
7. Brayfogle.
8. Red Girl.
9. Copper Queen.
10. Jumbo.
11. Mountain Rose.
12. Idaho Trinket.
13. Swamp Angel.
14. Homestake.
15. Emma.
16. Aspen.
17. Silver Plume.
18. Oro Denoro.
19. Mattie Davis.
20. Lancashire Lass.
21. Last.
22. Iron Dollar.
23. Prens.
24. Goldfinch.
25. Topeka.
26. Gibraltar.
27. Park.
28. 35.
29. Mammoth.
30. Blue Bell.
31. Lansing.
32. Elma.
33. Shaw.
34. 34.
35. Maple Leaf.
36. Remington.
37. Duplicate.
38. Cordick.
39. Erwall.
40. Jennie Dean.
41. Redcoat.
42. R. Bell.
43. Red Mountain.
44. Piastre.
45. Stanly.
46. Boulder.
47. Mountain View.
48. Ingersol.
49. Cumberland.
50. Alexandria.
51. Elsie.

Evans Camp.

1. Black Tartar.
2. Ontario Boy.
3. Gibraltar.
4. Horse Fly.
5. Path-Finder.
6. Era.
7. Standard.
8. Wellington.
9. Lost Horse.
10. Q.
11. Tiger.
12. Standard Extension.
13. Pumpkin Seed.
14. Nellie.

Greenwood Camp.

1. Uncle Tom.
2. The Dumphy.
3. Mineral Hill.
4. Jumbo.
5. Golden Star.
6. Jim M.
7. Big 6.
8. Reminerator.
9. Hard Cash.
10. Golden Crown.
11. Beaver.
12. Wellington.
13. Hill-Top.
14. Hecla.
15. Winnipeg.
15a. Calumet.
16. Davenport.
17. Iron Clad.
18. Diorite.
19. Monday.
20. Iron Chief.
21. Rabbit Paw.
22. Algiers.
23. Iron Sheet.
24. McKinney.
25. Broken Hill.
26. Famous.
27. Krih.
28. Valley.
29. Orphans Home.
30. Blue Grouse.
31. Fool Hen.

Wellington Camp.

1. Vancouver.
2. Columbia.
3. Little Giant.
4. Silver Wave.
5. Keno.
6. Montana.
7. Keystone.
8. Ophir.
9. Oro.
10. The Queen.
11. Jim.
12. Union.
13. Prince Albert.
14. Lone Star.
15. Emma.
16. Crown Point.

North Fork Camp.

1. Wolford.
2. Fawn.
3. Trapper.
4. Tiptop.
5. Iron Mountain.
6. Sunset.
7. Stray Colt.
8. Pilgrim.
9. Mt. Monarch.
10. Belle of Ottawa.
11. Winchester.
12. Spokane.
13. Beetle.
14. Lee Metford.
15. Rouge-et-Noir.
16. Butte.
17. Tacoma.
18. Seattle.
19. Standard No. 2.
20. Bismarck.
21. Golden Butterfly.
22. I. X. L.
23. Montana.
24. Everett.
25. Drum, Lummond.
26. Iron Horse.
27. Wellington Sq.
28. Snow Bird.
29. Morning Star.
30. Webfoot.
31. River Elbow.
31 a. Glasgow.
32. Granite Mountain
33. Grub Stake.
34. September.
35. Bijou.
36. Morning.
37. Rattler.
38. Log Cabin.
39. Free Coinage.
40. Galena.
41. Coin.

Long Lake Camp.

1. Mountain View.
2. Cumberland.
3. Amand.
4. Alice.
5. Robin.
6. Lydia.
7. La Belle.
8. Mammoth.
9. La Belle.
10. Iron Mask.
11. Magnet.
12. Queen Bess.
13. Snow Slide.
14. Trade Dollar.
15. Pauper.
16. C. O. D.
17. Lion.
18. Monarch.
19. Beatrice.
20. Roderick Dhu.
21. Uncle.
22. Lake View.
23. Rising Sun.
24. Lady of the Lake.
25. Agnes.
26. Electric.
27. Sabbath Day.
28. Abner.
29. Sanson.
30. Mortimer.
31. The Smiler.
32. Black Diamond.
33. Mazie.
34. Gold Dust.
35. Silent Friend.
36. Fortuna.
37. Gold Condy.
38. Maud S.
39. Prospector's D'm.
40. Idaho.
41. Black Prince.
42. Last Chance.
43. Boulder.
44. Fisher.
45. Lakeside Fract'n.
46. Robert Emmet.
47. Idaho.
48. Ethlopia.
49. Golden Eagle.
50. North Star.
51. Anchor.
52. Gold Drop.
53. Enterprise.
54. Laura.
55. Jewel.
56. Denero Grand.
57. Cleopatra.
58. Nap. Bonaparte.
59. The Boys.
60. Twin Mountain.
61. Great Lacey.
62. Fisher.

Brown's Camp.

1. Yale.
2. Amazon.
3. Bunch Grass.
4. Blue Monday.
5. Original.
6. Mona.
7. Daisy.
8. Strawberry.
9. Buckeye.
10 a. Little Maggie.
10. The Oriental.
11. Thursday.
12. Little Gem.
12 a. Jenny May.
13. Wolverine.
14. Bay State.
15. The Chief.
16. Hoosier.
17. Western Star.
18. Sailor Boy.
19. Robinson Crusoe.
20. Echo.
21. Mary L.
22. O. K.
23. Humming Bird.
24. Black Bear.
25. Acorn.
26. Rising Sun.
27. Gem.
27 a. North Star.
28. Netta.
29. Acme.
30. Hilda.
31. Bertha.
32. Highland Chief.
33. Cock Robin.
34. Black Monday.
35. Trilby.
36. Dandy.
37. Marjorie.
38. Francis.
38 a. King Bird.
39. Diamond Hitch.
39 a. The 31.
40. Criterion.
42. Le Rol.
43. Summit.
44. Volcanic.
45. Prince of Wales.
46. Iron Cap.
47. Jumbo.
48. Moss Rose.
49. Red Rose.

Carson Camp.

1. Alhambra.
2. St. Charles.
3. The Copper.
4. Canyon.
5. Copper Girl.
6. Eagle.
7. May Queen.
8. Lay Over.
9. Slocan.
10. Last Chance.
11. Bay State.
12. Gladstone.
13. The E. E.
14. Yankee Boy.
15. Yankee Girl.
16. Birdina.
17. Lady Franklin.
18. Bunch Grass.
19. Possum.
20. Grandma's Bustle.
21. Coon.
22. Park.

Grand Forks Camp.

1. Lavita.
2. Boneta.
3. Cook.
4. Dolly.
5. Vermont.
6. Daisy.
7. Iron Chief.
8. Sunny Side.
9. Mammoth.
10. Mountain View.
11. Yellow Metal.
12. Blue-eyed Nellie.
13. R. H. R.
14. Saratoga.
15. Iron King.
16. Lily.
17. Double Standard.
18. Bonanza Lode.
19. Sovereign.
20. Silver Con.
21. Riverside.
22. Lincoln.
23. Stanford.
24. Celtic.
25. Grand Forks.
26. Grey Eagle.
27. Whaleback.
28. Little Bell.
29. Blue and Gray.
30. Jack Knife.
31. Montana.

Copper Camp.

1. Bro. Jonathan.
2. Milburn.
3. The Sydney.
4. Dinner Bucket.
5. Paramatta.
6. Virginia.
7. Harqua Halo.
8. Curlta.
9. Lucy.
10. Calumet.
11. Jumbo.
12. Copperopolis.
13. Honduras.
14. Yucatan.
15. Enterprise.
16. Copper King.
17. White Horse.
18. Copper Mine.
19. King Solomon.
20. Oxide.
21. Last Chance.
22. Sycamore.
23. Honolulu.
24. Copper Queen.
25. Can Sarez.
26. Treasurer.
27. Winning Card.

Graham Camp.

1. Bank of England.
2. Paymaster.
3. Potter Palmer.
4. Virginia.
5. Texas.
6. Boston.
7. Bovine.
8. Laldlaw.
9. Bruce.
10. Magnetite.
11. Will-o-the-Wisp.

Smith's Camp.

1. Magnitite.
2. Grizzly Bear.
3. Iva Lenore.
4. Surveyor General.
5. Highland Queen.
6. Great Hesper.
7. Hecla.
8. Last Chance.
9. Gold Bed.
10. Republic.
11. Non-Such.
12. Hidden Treasure.
13. Tunnel.
14. Mountain Chief.

[Illegible] to Interstate Stream Commission

and copper. The Swamp Angel, owned by Robert Taylor and Carson Manly, has parallel ledges forty and eight feet, on the latter of which a shaft is down twenty-five feet, showing up ore carrying $6.95 gold, 5 to 6 per cent. copper, 5 ounces silver.

On Ingram Mountain, three miles west of Midway and close to the boundary, Joseph Wallace in 1894 found copper deposits and created Graham's Camp. The ledges are gash veins in metamorphic rocks and carry bornite and chalcocite in bunches, besides being mineralized throughout. On the west side of the mountain E. S. Graham has the Potter Palmer group of eight claims, on one of which he has opened a small vein with two tunnels and has done some prospecting with diamond drills. The ore is very high in copper and is worth about $175. On the Bruce claim on the east side of the mountain Mr. Wallace has a large deposit of copper pyrites showing good ore in several places, which averages 10 per cent. copper and a little gold.

Since June, 1896, Kimberly Camp has been established sixteen miles above the mouth of Boundary Creek, on the ridge between that stream and Long Lake, some fine showings of chalcopyrite and pyrrhotite, carrying $3 to $50 gold, having been made. A shaft on one of two parallel ledges on the Adirondack showed six feet of clean ore and no footwall, while several crosscuts showed each ledge from ten to fourteen feet wide of solid ore. A similar showing has been made on the Big Four on the other side of Boundary Creek and on other claims, work having generally been prosecuted throughout the winter.

Another new camp is the Crown Point, on James Creek, seven miles up Kettle River from Rock Creek, where the Crown Point was discovered late in July, 1896. An ore chute of galena and iron pyrites twenty to fifty-five feet wide and traced for 200 feet in length has been discovered, the value ranging from 50 to 600 ounces silver and $4 to $7 gold. This claim, with two others making similar showings, has been bonded to the Prospecting Syndicate of British Columbia, which is about to develop them.

NORTH KETTLE RIVER.

On the mountains at each side of the North Kettle River, which flows due south to join the main stream at Grand Forks, are a series of ledges of pyritic ore which eclipse even those of Greenwood and Deadwool Camps, and which cannot be even prospected without the resources of a capitalist.

This district is reached from Spokane by the Spokane Falls & Northern Railroad to Marcus, 102 miles, or Bossburg, 110 miles, and by stage to Grand Forks, forty-five miles; or by the Central Washington Railroad to Wilbur, ninety-one miles, and by a wagon road now under construction up the Sans Poel River to connect with that already built down Curlew Creek and Kettle River to Grand Forks, about eighty-six miles. From the west, it is reached by the Canadian Pacific Railroad from Vancouver to Okanogan Landing, 332 miles, steamer down Okanogan Lake to Penticton, eighty miles, and stage to Grand Forks, 110 miles. Trails lead up both banks of the North Kettle River almost to the headwaters and the wagon road is now being extended over that line.

The greatest showing in this district is on Volcanic Mountain, twelve miles above Grand Forks, a peak jutting out into the valley from the east and towering abruptly 1,500 feet above the river. The summit of this peak is a great red iron cap, which makes it a clearly distinguishable landmark for miles down the valley. Around the sides, below this cap, the pyrites crops, cut by dikes of blue lime and bounded by walls of trap and porphyry. On this peak R. A. Brown, locally known as "Crazy" Brown, has the Volcanic and Iron Cap claims. The discovery was made in 1884 by James McConnell, but five years later the claims came into the possession of Mr. Brown. He has made several deals at different times and has continuously worked on a long cross-cut tunnel to tap the ore bodies at a depth of 1,300 feet. This had penetrated 345 feet when he and R. L. Causton, of Keremeos, B. C., who had become interested with him, leased the property in 1896 to Edward Blewett and Niels Larsen. They have done a large amount of prospecting on the croppings and last summer joined with Messrs. Brown and Causton and a number of Chicago capitalists in organizing the Olive Mining & Smelting Company to develop the property. They have made a number of prospect holes on the croppings all around the mountain and shown up the ore in such quantities that they feel justified in erecting a smelter on the ground whenever the construction of a railroad makes it practicable. Mr. Larsen says there are three great ore chutes runnig through the mountain, one of them 600 feet wide, and the value of the ore is about $13 in gold, silver and copper.

On the other side of the canyon, two and one-half miles to the southwest, Mr. Brown has the Wolverine, on which he says one of the Volcanic ledges shows up 500 feet wide in places.

The supposed extension of the Volcanic ledge has been located for three miles up Kettle River. The Thirty-one, owned by Robert Burrows, is on a

small spur running from Volcanic Mountain, and has a ledge fifteen to twenty feet wide, which has been stripped. Then come the Dandy Marjorie, Black Monday, Cock Robin, Highland Chief, owned by John Fox, showing silicates of copper; the Bertha, owned by O. C. Gunderson, Fred Farquhar and William Ketchum.

To the southwest of the Iron Cap about three miles is the Seattle, owned by Robert Clark, a former Seattle bricklayer, who has bonded it to a corporation organized by Charles A. Cummings and John H. Manly, of Grand Forks. It has a surface showing 200 to 300 feet wide, which has been traced for 1,200 feet. Assays have given all the way from $1.80 copper and a trace of gold up to $20 gold and 56 per cent. copper, from two feet below the surface. The new company is sinking a shaft on each wall to define the ledge and the ore is showing up well.

The north extension of the Seattle is the Accidental, owned by E. W. Johnston, of Seattle, George P. Mims, of Grand Forks, and Mrs. Robert Clark, and believed to be an extension of the Seattle ledge. A cross-cut is being run to tap the ledge. The same parties also own the Monte Carlo at the head of Hardy Creek, on which several prospect holes have shown twelve feet of ore carrying iron sulphides throughout and assaying as high as $12 gold and copper.

The Seattle ledge has been traced through a long string of claims, in each direction, cropping strongly at frequent intervals.

Brown's Camp had also been extended west along Pass Creek, on the north of which stream Con Cosgrove and Pat Burns have the Mono group of three claims. On the Mono are five leads of iron pyrites—forty, fifteen, eight, six and three feet wide, respectively, some of which have been traced across the claim and on to the adjoining Strawberry claim. A tunnel has been run fifteen feet on the fifteen-foot ledge, and the highest assays obtained are $10 to $18 gold, 7 ounces silver and 6 per cent. copper. On another claim are two ledges twenty and fourteen feet wide, which assay about the same as the Mono. Two and one-half miles northwest of the Volcanic, on Pass Creek, is the Iron Cap No. 1, owned by W. A. Glover, on five parallel ledges, which extend over a width of 500 feet and have been traced the full length of the claim. The surface ore is iron and copper pyrites. Mr. Glover has also the Bunchgrass, one mile further south, on which a ledge has been traced 250 feet wide and for a length of 300 feet. On the south side of Pass Creek James E. Walker has the King Bee, on which there is a blowout ten or twelve feet wide, and the Garnet, on which there is one of twenty to thirty feet.

The Strawberry is owned by Jake Ritter, Thomas Stevenson and Mr. Cody, all of Rossland, and has a twenty-foot ledge of pyrites, assaying $4 to $7 gold and 3 per cent. copper on the surface. A shaft is being sunk on each wall.

The great showings at Brown's Camp led, in July, 1895, to discoveries three miles further up the north fork, where Evans' Camp was established, named after Evan Evans, the pioneer, who located the Standard. The mineral is of the same character, the ledges being supposed extensions of those branching out from Volcanic Mountain. The Standard has a ledge of iron pyrites seventy-five feet wide, which has been traced for 500 feet, and the ore assays as high as $13 from the surface. On the Pathfinder Thomas Parkinson and William Pfeifer have stripped the ledge for 500 feet in length, and in one spot for twenty-five feet in width, and it appears to be 100 feet wide. They have made a number of cuts, and sunk shafts from ten to twenty feet. They have assays of $51 gold and 2½ per cent. copper, and have had as high as 23 per cent. copper. On the Nellie, owned by George T. Crane and F. C. Loring, of Spokane, there is an iron cap of great size, and the surface ore assays $12 gold and as high as three ounces silver. On the Ontario Boy, adjoining the Pathfinder on the north, M. F. Folger has a twenty-foot ledge of quartz traced clear across the claim, which assays $11 to $17 gold from a ten-foot cut. The Hidden Treasure, by Messrs. Parkinson and Pfeifer, adjoins the Standard on the south, and has a big ledge which has not yet been defined, though three holes have been sunk eight to ten feet on it.

The same belt has been traced southward to Grand Forks, where it shows on Observation Mountain and other peaks overlooking the town. A mile and a half northeast of the town D. P. Mitchell, Con Cosgrove and G. Miller have the Iron King and the Lily on a forty-foot ledge of copper pyrites. They have made several cross-cuts and obtained assays of $9 to $15 gold and 2 to 3 ounces silver. On another mountain to the east of the town "Cap" Rogers has the Lincoln on an eighteen-foot ledge carrying arsenical iron and copper, assaying $13 to $45 gold and 12 per cent. copper, and on the same ledge Stephen Sanford has the Sanford. On another ledge only one-fourth of a mile from town Charles Stewart has the Blue and Gray, with six feet of ore assaying $17 gold and a trace of copper, and Stephen Sanford has the Old Steve, on which he has not found the walls and which assays $12 gold and silver. The Last Chance, an extension of the Blue and Gray and Old Steve, owned by W. W. Whitbeck, has been cross-cut seven feet without showing walls and assays $23 in gold, silver and copper. The Eagle, owned by James McConnell and Frank Richter, has a ledge forty to fifty feet wide carrying galena, on which four shafts assay 86 ounces silver and 72 per cent. lead. The Bonita, on Observation Mountain, which is owned by a company of school teachers, has shown up solid peacock copper and iron pyrites assaying $30 gold, 11 per cent.

copper, in a tunnel which is being run 100 feet. On the Empire, which is the extension of the Bonita ledge, H. A. Shiel and others are sinking a shaft, which is down fifty feet.

CAMP M'KINNEY.

In the extension westward of the geological formation characteristic of the Boundary Creek district is the mineral belt cut by Rock Creek. The country rock is granite cut by dikes of porpryritic slate and in these occur ledges of quartz carrying free gold and sulphurets in close proximity to others capped with iron and carrying pyritic ores. Camp McKinney, the headquarters, is on the headwaters of that creek and is the center of quartz mining operations, but placer camps extend all along its banks to its mouth on Kettle River. The route from Vancouver is by the Canadian Pacific Railroad, 335 miles to Sicamous Junction, and fifty-one miles to Okanogan Landing, by steamer on Okanogan Lake to Penticton and by stage thence to Camp McKinney, fifty-five miles. Another route from Seattle is by the Great Northern Railroad to Wenatchee, 174 miles, by steamer Ellensburg in summer to Johnson's Landing on the Okanogan River, about 120 miles, thence by stage, eighty-four miles.

Mining on Rock Creek began in 1861, when the placers at the mouth attracted nearly 3,000 people and was revived in 1886, when H. White, J. Cooper, C. Dietz and F. Dietz took about $2,000 from White's bar and next year took out $25,000, employing twelve men who averaged $20 a day each. In the meantime, F. Goericke, of Conconnully, had made the first discovery of quartz on the Victoria, four miles east of Camp McKinney, on a ledge of free milling ore in a talcose schist formation. Associating the late Judge Haines, of Osoyoos, B. C., and C. B. Bash, of Port Townsend, with him, he sank a shaft 110 feet and made a shipment of 1,000 pounds, which returned $167 gold and silver, and another of 1,200 pounds, which gave $187, while a third, containing tellurides, yielded $480 gold and 50 ounces silver. This property, which is crown granted, has recently been sold, with two other claims, to the Rock Creek Gold Mines, Limited, which has resumed development. A cross-cut, which will be used for a main working tunnel, taps the eight-foot ledge in 267 feet at a depth of 150 feet and an upraise is being made from it to connect with a seventy-foot inclined shaft, while another cross-cut 150 feet long taps the ledge 750 feet distant. The shaft shows eighteen inches of smelting ore carrying $85 gold and the remainder of the ledge is milling and concentrating ore, which will reduce in the proportion of eight to one into concentrates worth $83.

Adjoining this on the north, Henry Nicholson and Edward James have the Old England on a twenty-two foot ledge between walls of porphyritic slate, on which they have sunk eighty feet. Southeast of the Victoria, Thomas Elliot and Edward James have two ledges on the Snowdon, one four feet wide carrying $22 gold, which has been cross-cut at a depth of 120 feet.

The discovery which brought the camp into permanent life was that of the Cariboo and Amelia in May, 1887, by Al McKinney, Fred Rice, William Burnham and Edmund Lefevre. This has a ledge two feet wide in a dike of porphyritic slate, the ore carrying free gold and sulphurets. It is owned by the Cariboo Mining & Smelting Company, which has erected a ten-stamp mill with four Woodbury concentrators and a steam hoist and has developed the mine to considerable depth. Beginning with a tunnel at a depth of 100 feet, above which the ore was stoped, the company now has a shaft down 200 feet with drifts every fifty feet, the one at the 200-foot level extending 300 feet each way and showing the ledge to have widened to eight feet. The ore carries $15 to $25 a ton free gold and produces concentrates worth $90 a ton. The monthly product is about $10,000 in bullion and $1,800 concentrates and the mine has paid $40,000 in dividends.

West of the Cariboo are the Alice and Emma, owned by the Alice and Emma Consolidated Mining Company. The ledge is shown seven feet wide in a sixty-three foot shaft and averages $10 to $12 gold. On the Maple Leaf, James Lynch has a forty-five foot shaft showing four or five feet of similar ore. Adjoining this is the Eureka, owned by a New York syndicate, on which a shaft is down 153 feet, with a seventy-five foot drift at the 100-foot level, from which 800 tons of ore are on the dump. The Fontenoy, owned by D. A. Cameron, has a shaft down eighty-three feet, showing a six-foot ledge which carries galena ore assaying $24 gold and silver. The Anarchist, two miles west of the Cariboo, has been bonded by Richard Sidley to Charles R. Ballard, of Conconully, and shows a ledge widening from three to six feet in a sixty-foot shaft, assays running $9 gold, 5 ounces silver. On the Sailor Boy, three miles to the southeast, Charles Dietz has a ledge five or six feet wide in a sixty-foot shaft, shown up also by a number of open cuts. It carries some free gold, besides sulphurets containing gold, silver and copper and assays as high as $60. The Highland Chief, owned by Messrs. Edwards, Bennett, Sutter and Smith, shows a four-foot ledge carrying sulphurets on

the surface and a cross-cut is in ninety feet towards the ledge. On the Vancouver group of two claims Capt. John Irving, of Victoria, sank a shaft in the year 1888 and obtained a crown grant, after which he stopped operations. William Younkin, James Copeland and George Cook have a forty-foot shaft on a stringer six to twenty-four inches wide carrying galena and assaying $7 gold in sulphurets, and are running a cross-cut to tap the main ledge.

The first discovery of pyritic ore under iron capping was made on the Dolphin, west of the Eureka, owned by William Edwards and C. A. R. Lambly. The ledge is four or five feet wide on the surface, where it carries some free gold and assays $30 to $40, and will be tapped by a cross-cut, which is in sixty feet. In May, 1896, William Younkin and James Copeland discovered a big blow-out of the same kind, 150 feet each way, on the ridge between the forks of Rock Creek, on which they have the Le Roi and War Eagle. Their first shot brought out ore assaying $26 gold, silver and copper, the proportion of copper being 9½ per cent.

The placer ground is still being worked at intervals the whole length of the creek, where gold is found in the bars, but the bed is virgin soil to the miner. Many attempts have been made to reach bed rock, but the miners were poor men with only such primitive appliances as wooden pumps and wheels, and water and quick sand have always foiled them, though with modern appliances they would have reached bottom long ago.

Extending one and one-half miles above the mouth of the creek is a tract of placer ground on which the Laura Hydraulic Company erected a hydraulic plant, two miles of flume and piping, and a sawmill. Some good clean-ups were made, but the cost of removing large boulders without proper facilities eliminated the profit. The property is now held by Messrs. Monaghan, King and McAulay, who have put in a larger plant and are working on an extensive scale.

Seven miles above the mouth James Copeland and William Younkin, who have a claim 2,000 feet wide and 1,000 feet along the stream, are running a bed-rock drain tunnel under the bed of the south fork to tap the bedrock. The great trouble hitherto has been with quicksand and water, and they are seeking to overcome this by tunneling at water grade. Their observation is that the surface dirt on the benches is secondary wash and carries fine quartz gold, the best pay being heavy coarse gold in the old wash, patches of which were left behind in crevices when the secondary wash came down, most of it being swept into the bed of the stream. They have made 100 feet of open drain and 200 feet of tunnel and are now thirty feet below the bed, having passed through eleven feet of quicksand and having three feet more to penetrate.

On the north fork, about eight miles from the mouth, is Dietz's bar, from the surface of which from $75,000 to $100,000 has been taken. Donohue & Co. are sluicing down to bedrock at this point and two or three other parties are working the benches and some Chinamen are using the cradle and rocker on abandoned claims.

The construction of D. C. Corbin's projected railroad up Kettle River and over the range to the Okanogan River would give this district such improved transportation facilities as to greatly stimulate development. Hitherto the only producing property has been the Cariboo, but this has served to show the possibilities which await development.

FAIRVIEW AND KEREMEOS.

One of the first camps to feel the effect of the revival of the mining industry has been Fairview, in the mountains west the Okanagon River, eighteen miles north of the boundary. It is a free gold and sulphuret district of great promise and its development has only languished on account of the blunders of the early investors and the general depression prevalent for several years past. The prospectors who made the discoveries have never lost faith in it and have continued development on their own resources, making test shipments and mill-runs which have given ample proof that their confidence is not misplaced.

The most expeditious route to Fairview is by the Canadian Pacific from Vancouver to Sicamous Junction, 331 miles and by the Sicamous branch to Okanogan Landing, fifty-one miles. A steamer there connects with the train and runs down Okanogan Lake, eighty miles, to Penticton, whence a stage runs twenty-eight miles to Fairview. From points in central Washington the route is from Wenatchee by the steamer City of Ellensburg up the Columbia River to Brewster's Landing, eighty-five miles, or during high water to Johnson Creek, 130 miles, and thence by stage, 108 miles from Brewsters, or sixty-four miles from Johnson Creek.

The Fairview belt of ledges in in a formation of granite, mica schist and quartz schist, through which a small stream flows down Reed's Gulch to the Okanogan. The ledges crop on the hills on each side of this gulch for a distance of about three miles and strike northwest by southeast, the belt having a known width of about two miles. The ore is free milling quartz, carrying

a little silver and showing iron sulphurets, which will probably increase in proportion as greater depth is gained. The first discovery, the Stemwinder, was made in September, 1889, by George Sheehan and Fred Gwatkins, on three parallel ledges six to twelve feet wide, all within sixty feet, known as the mother lode of the district, which runs along the hill between the gulch and the Okanogan valley. Parallel with it on the northeast, along another line of hills is another ledge, traced through locations for three miles, and on the opposite, or southwest, side of the gulch is the Smuggler ledge traced through four claims, with several claims on supposed parallel ledges.

The largest investment until recent years was made by the Strathyre Mining Company, which bought the Brown Bear group of five claims and built a ten-stamp mill and concentrator. This company sank 150 feet on one ledge and tunneled 100 feet to tap it. A shaft was sunk sixty feet on the east ledge and a tunnel driven 300 feet on it. Some of the ore was milled, but the company then began doing a customs business and suspended operations at its own mines.

The best and largest results so far obtained have been from the Morning Star by Stephen Mangitt and Daniel McEachern. They sank a perpendicular shaft seventy feet, striking the west ledge at a depth of 150 feet and showing it to be twelve feet wide, while they made an open cut 200 feet long where this ledge crops in a blanket along the gulch, the hanging wall having been washed off. They also sank a 140-foot shaft on the east ledge and ran a 100-foot drift at the bottom. After having some small lots of ore milled by the Strathyre Company, they leased the mill and reduced in all about 3,000 tons of ore, which paid them an aggregate of $64,000. They gave up the lease early in 1895, but have since shipped two carloads of sorted ore to Tacoma, obtaining returns of about $100 gold and silver, mostly the former. This claim and an adjoining one on a parallel ledge, showing four and one-half feet of ore in a thirty-five foot shaft, have been bonded by W. B. Powell, of Vernon, British Columbia, who contemplates erecting a stamp mill on them.

The Stemwinder, the pioneer claim, has been sold for $20,000 to Capt. Mitchell, of Victoria, and is being developed. An eighty-foot cross-cut taps all three ledges, while a tunnel is in 150 feet on one of them and a shaft down fifty feet on another. This work shows all to be well defined, carrying ore which assays $10 to $15 gold and 1 or 2 ounces silver.

The Silver Crown, on the mother lode, owned by Edward Blewett and E. H. Ammidown, has a 300-foot cross-cut tapping all three main ledges.

Another property on which much development is being done is the Tin Horn group of two claims, owned by the Tin Horn Quartz Mining Company, which is erecting a twenty-stamp mill. A ninety-foot cross-cut taps the ledge two and one-half to four feet wide and a sixty-foot shaft shows it four feet wide. Thirty-eight assays show an average value of $112.30.

The Silver Bow is also being developed, having been acquired by the Silver Bow Quartz Mining Company from William Dalrymple, and has a good showing.

The Joe Dandy and Atlas have been purchased by Lord Sudley, having proved good value by mint returns. From shafts seventy and sixty feet, from which seventy feet of tunnel and cross-cuts run, about 400 tons of ore were milled, averaging $25.

The Gold Hill, on the three main ledges, has been taken up by the Gold Hill Quartz Mining Company and has given assays of $7 on the surface, $43 to $80 at a depth of four feet and $123 at ten feet.

The Western Hill, owned by William Dalrymple, has an open cut showing the mother lode nine feet wide, with pay ore assaying $49 gold, 29 ounces silver. From the Susie George A. Guess and J. J. White took eight tons of ore which netted over $60 at the smelter, their ledge being seven feet wide.

The Smuggler is the most promising property on the southwest side of the gulch, with the possible exception of the Tin Horn. The locater, Thomas Elliott, sank 110 feet on it, showing seven feet of quartz with only one wall and made a test shipment of thre tons to Tacoma, which returned $175 gross per ton. He sold the claim a year ago to Capt. Mitchell, of Victoria, for $20,000 and it is now being developed.

The Mayflower group of three claims owned by the Occidental Mining Company has a shaft on one ledge, from which four tons of ore returned $60 gold. On another claim a thirty-foot shaft shows a five-foot ledge carrying free gold and assaying from $30 to $50 on an average.

The development of this camp has been taken up by Victoria and Vancouver people, who have bought up or bonded some forty promising prospects and are putting large forces at work on them.

Free milling ore has also been discovered on Keremeos Creek, eight miles west of Fairview and twenty-one miles southwest of Penticton, and though the discoveries are too recent to allow time for much work to define the size and character of the ledges, development is in progress on several properties. The course is generally northeast by southwest and the country formation is gray diorite.

The Sunset, owned by the Gold Belt Mining Company, is on a blanket ledge of free milling and concentrating ore sixteen feet wide, showing heavy copper stains and carry $7 to $34 gold.

The Sunrise, which has been bought from C. J. Jordan by a Spokane com-

pany, has two feet of free milling ore shown by a thirty-foot tunnel at the foot of a mountain and 180 feet above, a shaft is down twenty feet on it, the average assays being about $44 gold.

The Dominion group consists of one claim on the Sunset and two on the Sunrise ledge. The former crops two to six feet wide, carrying copper and iron sulphides and carrying 5 per cent. copper on the surface. The other two claims have a similar showing to the Sunrise, that ledge being traceable by croppings for two miles, although undeveloped.

A party of Montana men has begun sinking on the Buckeus, which they have bonded from John Buckeus and which has a ledge of sulphide ore covered by an iron cap twelve to fifteen feet wide.

On the Dolphin J. M. Pitman has a sixteen-foot ledge of the same kind cropping at three points and assaying $31 gold on the surface, and has sunk twenty feet on it.

THE COAST DISTRICT.

By John R. Wolcott, Seattle.

The Coast mining region of British Columbia extends in a northwesterly direction from Vancouver Harbor (Burrard Inlet) to the Alaskan boundary and includes the western slope of the Coast Range Mountains, together with the adjacent islands, comprising a territory over 800 miles in length and varying from 25 to 130 miles in width.

The physical features are unlike those of any other known mining district. The region may be fairly described as a mining camp set in the ocean; a few of its characteristics being a succession of islands ranging from a few acres to many square miles in extent, with bold shore lines and usually deep water close to shore. The channels are deep and have strong tides, in places becoming dangerous at certain stages of the tide. Many of the islands are deeply indented by bays or inlets, in some instances almost cutting the island in two. The mainland is also indented by inlets and arms, ranging from two to sixty-five miles in length and usually having a northerly direction. These greatly facilitate the exploration of the country; for cutting so deeply into the mountains, and usually across the formation, they offer exceptional opportunities to the prospector. There is practically no level land in the district, the entire region, both islands and mainland, being very rugged, the mountains rising from the shore at from 20 degrees to vertical. Frequently forty fathoms depth is obtainable within 100 feet of shore. The country possesses an ample supply of timber for mining purposes and fresh water is abundant. There are many fine water powers in the district. Exploration has so far been confined to the 140 miles between Vancouver and Loughborough Inlet, and has been of the most cursory nature, but little thorough systematic work having been done. Prospecting has been done with canoes and the examination confined (with but few exceptions) to the mineral outcropping at the water's edge.

The surface rocks of the district consist chiefly of gray granite and granitoid material, some genisses and other schists being occasionally associated, with at times a belt of slate or lime showing.

On Jervis, Toba and Bute Inlets are places where the underlying rocks are exposed, showing slates, diorite and porphyry overlaid with granite; while the channels and inlets indicate serious seismic disturbances. The rocks show both lateral and longitudinal foldings to have occurred, and are as a rule more or less base, frequently being so far off their description in geological works as to give the prospector ample reason to believe that the maker of the rocks and the writers of the books seriously disagreed.

The district contains large and numerous bodies of quartz containing gold, copper and silver. The ores, as far as known, are smelting, many of them being concentrating. Copper will unquestionably be produced in large quantities. Generally, the ores may be classed as low grade, i. e., there are large bodies of ore that range from $5 to $20 per ton and will concentrate from three to fifteen tons into one. There are other properties sufficiently developed to demonstrate that they will produce shipping ore. The Van Anda, Raven, Victoria and Silver Top properties on Texada Island are producing ore that averages over $40 per ton. The Phillips Arm Mines Company has both shipping and concentrating ore; the Queen Bee on Valdez Island assays from $20 to $150 per ton in gold. The big vein back of Estero Basin is both shipping and concentrating.

It has been known for a number of years that iron and copper existed; also that there were strong veins of quartz, but it was not "free milling," and base ores were not in demand. The men traversing the district were chiefly loggers and were not interested in mining. Surface samples only were brought in and the assays were low, and until the establishment of smelters at Tacoma and Everett, base ore propositions would not be entertained—hence the few men who attempted to interest capital in Coast mining were unsuccessful.

C. R. Graves, of Vancouver, a Provincial surveyor possessed with a fair knowledge of geology, made numerous attempts to interest parties in some of the mineral propositions which he had discovered, but without success. C. E. Priest, of Nanaimo, also a surveyor, in 1889, succeeded in forming a syndicate to purchase a tract of land on Texada Island for its deposits of copper, but was unable to secure capital for its development. C. R. Miller has persistently held to the Golden Slipper and other claims on Texada Island for ten years past; the expenses of his family, and cost of development on his claims being defrayed by the gold he had washed out of the decomposed surface vein matter of the Golden Slipper claim. A. Raper held to the Victoria on Texada Island over seven years; the Comox syndicate, a party of prospectors who pooled interests, have also held on for fully seven years, and are now developing one of their claims—the Surprise—into a mine. The late Prof. Bredemeyer, of Tacoma, in 1892 and 1893, made an extended examination of the deposits on Texada Island and reported favorably thereon and attempted to interest capital. In 1893, J. J. Chambers located the Tilly on Phillips Arm, now being developed by the Phillips Arm Mines Company, and also made other locations. His enthusiasm regarding the mineral resources of the Coast District gained him the name of "Crazy Chambers"—a title he is far prouder of now than in 1893.

The first development work in the district was during 1896, and as a whole, has proven so satisfactory that the attention of capital is being strongly directed to the district; this region presents the unusual feature of English capital taking hold of undeveloped properties in a district in which but a comparatively small amount of development work has been done. A number of English mining engineers, most of them with a South African and Australian mining experience, have inspected the district during the past year with the result that five or more English companies have acquired holdings and are arrangng for development during 1897; some already being at work.

The indications for paying properties and prosperous camps at a number of points are excellent. Several properties are already sufficiently advanced to warrant the belief that they will become dividend paying mines. The large bodies of ore, much of it capable of being concentrated and situated for economical handling, combined with the certainty of low freight rates, all tend to make this a most inviting field for capital. Freight rates on ore to Everett or Tacoma are $1.25 per ton in fifty-ton lots; freight on camp supplies is moderate.

The country is practically unprospected, and to the practical prospector is a most inviting field.

Howe Sound—Twelve miles from Vancouver, is from two to seven miles wide and projects into the mainland in a northerly direction over twenty-five miles. Near the entrance are Bowen, Gambier and Anvil Islands. On Bowen Island there is a group of thirteen claims, the property of a syndicate represented by Cowan & Shaw, of Vancouver. Several veins are included in the property; the principal one being some eight or nine feet wide, carrying gold and silver. The property is now being developed, there being at present a forty-foot shaft and sundry open cuts. This is considered to be a valuable property.

A number of other claims have been located on the island, a Tacoma company owning a group on which some development work has been done. On Gambier Island, Stokes and Hartley own the Gold Standard, which has a four-foot vein between slate and granite walls. The ore assays from $50 to $80 per ton gold. G. S. Logan, of Seattle, owns the Nulla Secunda; Dr. S. F. Martin and John R. Foster, of Seattle, the Wall Street, these being extensions of the Gold Standard. Near by Messrs. Stokes, Hartley, Martin and Foster own the Vancouver, Thorley, Ecclefechan and Westminster, on a well defined vein eight to ten feet wide of rose quartz, assaying from $8 to $15 gold. The Croesus, owned by Dr. Martin, of Toronto, is a fine property, surface assays being $5 to $8 in gold.

Near Gibson's Landing, in an iron-capped formation, are the Li Hung and Sir John, owned by Messrs. Foster, Logan, Martin and Somes, who are working on them. Assays run from $7 to $12, chiefly gold. On the westerly side of the Sound opposite Gambier Island, Dr. S. F. Martin and John R. Foster, both of Seattle, have three claims on a vein six to eight feet in width in granite formation and assaying $8 to $13 gold. Near these are the Sanilac, Big Bonanza, Toronto, Montreal and Seattle, the first four belonging to Dr. Martin, John R. Foster, Dr. R. M. Eames and other Seattle gentlemen. Surface assays are $4 to $8, from a strong ledge. The Seattle is under the management of G. S. Logan, of Seattle, and is owned by a Scotch syndicate who are developing it.

The syndicate group of six claims, further up the Sound, has several strong well defined veins, assaying $7 to $12 gold, and is owned by Messrs. Martin, Foster, Logan, William Chisholm and Dr. Wotherspoon, all of Seattle.

Stokes and Hartley, of Gibson's Landing, own near the Syndicate group the Emma, Silver King and Silver Queen, of which assays are $6 to $12 gold.

J. C. Griffith, of Seattle, prospected the Howe Sound region in 1895, and then interested other Seattle parties in the district. A number of other claims have been located in the district, some of which make an excellent showing.

Jervis Inlet.—The entrance is fifty-five miles from Vancouver, the inlet

being over sixty miles in length. Some seventy claims have been located, chiefly in the neighborhood of Prince of Wales Reach, and at the head of the inlet. The best known property in the district is a group of five claims known as the Fitzsimmons group, and recently incorporated as the Treasure Mountain Mines. This property is on the east side of Prince of Wales Reach, three miles south of Vancouver Bay and seventeen miles from the entrance to the inlet. The property is thus described by Col. T. H. Tracy, of Vancouver:

The vein is a chalcopyrite carrying copper, silver and gold. It runs in a northwesterly direction along the face of the hill, the highest point being about 1,300 feet above sea level; the average distance from the shore is about 2,000 feet. The ore shows in the bed of a small stream, also in numerous boulders which have been broken off and rolled down a short distance, and in other places almost continuously for about a mile. In places, the iron capping, which resembles that met with in Kootenai, has slipped down, owing to the steepness of the hill and to partial decomposition. It is impossible to say what the width of the vein is without first doing considerable surface work, but it appears to be from ten to twenty feet wide.

G. F. Monckton, member of the North of England Institute of Mining Engineers, made an examination in January, 1897, and states that he found a very large body of rock carrying pyrites and extending over 3,000 feet, at its greatest width 100 feet. The ore body lies in a belt of diorite between granite and slate. The ore bears a strong resemblance to Rossland ore. Assays have ranged from two to sixteen and one-half per cent. copper; 1 to 15 ounces silver, and from a trace to 3-pennyweight gold. A crew of seven men has recently been started at work on this property and it is expected that development work will be actively pushed.

C. W. Davidson, J. R. Seymour, H. Darling and other Vancouver gentlemen, comprise a syndicate owning some fifteen claims in Jervis Inlet. They have the Vulcan group of seven near Vancouver Bay in a diorite, slate and granite formation. Outcrops indicate an ore quite similar in character to that of the Fitzsimmons group. The vein is eight feet or over, well defined though no work has been done. On the opposite side of the inlet they have one claim, the Wideawake. At Deserted Bay they have three claims on a large body of white quartz in granite and slate.

Opposite Princess Louise Inlet they have three claims on a ten-foot ledge of quartz carrying gold and silver. At the head of the inlet they have the Victoria, a large body of quartz; some work was done on this property four or five years ago by Mr. Davidson, and it is understood to assay high.

On Nelson Island, near the entrance to Jervis Inlet, twenty-five or thirty claims have been located during the past sixty days, several of them showing free gold.

Texada Island lies in the Gulf of Georgia, the southern end being forty miles from Vancouver; it is five miles from the mainland and twelve from Vancouver Island. It is thirty miles in length by five in breadth, and is apparently an upheaval. On the southern half the mountains are very steep, on the northern half they are more rolling. Commencing at the southern end and going northerly along the western side, the formation first shows an amygdaloid which changes to an igneous conglomerate; next comes several miles of Vancouverite, a sort of trap rock having a greenish color on a fresh fracture; next is a belt of black limestone containing large quantities of fossils; near Gillies Bay there is a small intrusion of the coal measures, both the shale and sand-stone appearing. From Gillies Bay to the northern end of the island is crystaline limestone with porphyry showing in places and several rich mineralized diorite dikes projecting through the limestone. Development work at the Van Anda, Kirk Lake, Silver Tip and Surprise mines indicates that the limestone is a surface rock overlying diorite and porphyry in place.

The known mineral belt occupies the extreme northerly end of the island, embracing about twenty-five square miles of territory. The steamers land at the Van Anda mine, as the principal work so far done is easily accessible from this point.

Commencing at the steamer landing at the Van Anda mine, the land rises at the rate of about twenty degrees, attaining an elevation of sixteen to eighteen hundred feet. Near the water on the easterly side, the formation is very much out of place on the surface. On the westerly side the rise from the water to the highest elevation is very sharp, the full elevation on this side being attained within a mile from the shore.

There are no developed mines on the island, the largest amount of work having been done at the Van Anda. This property embraces fifteen or sixteen claims, and has several known veins; work, however, having been done on only one and the work to date having been largely of an exploring nature. A shaft has been sunk 125 feet, partly on the vein and partly through the adjacent lime, ore having been developed to a depth of sixty feet. It is expected the shaft will again strike the vein in about thirty feet. The ore taken from this vein has ranged in value from $2 to $3 at the surface to over $1,000 assays on picked samples. A recent shipment of forty tons to the Everett smelter gave returns of: Copper, 18½ per cent; gold, $18.60; silver, 11 ounces.

At the date of my visit, January 18, 1897, there were about thirty tons of

ore on the dump that would average fully 25 per cent. copper. Edward Blewett, the manager, informed me it would run much better in gold than the shipment above alluded to. While I was at the mine, between four and five tons of ore were hoisted that would average fully 40 per cent. copper (being largely bornite). The vein, as far as developed, has shown from one to four feet of shipping ore, commencing about twenty feet below the surface and the ore increasing in value and depth, as well as in quantity. A drift has been run 180 feet at the sixty-foot level, and the bornite ore above alluded to came from this drift. Preparations are being made for pushing the work actively and in a systematic manner—it being the opinion of Mr. Blewett that they will be in permanent formation by the time the 200 foot level is reached. It is the intention to make regular shipments once in two weeks for the present; one shipment being made of 550 sacks, March 3 and one of 330 sacks March 20. At the 125 foot level the cross-cut fortyfive feet struck the ore body and at the time Mr. Blewett left on March 19 there was three and one-half feet of ore in the face of the cross-cut with the drills still working in ore.

The Raven group of five claims lies southerly from the Van Anda one and a half miles. A shaft is contracted and work commenced by the Raven Mining Company. A tunnel has been run over 100 feet cutting the vein about seventy feet below the surface. The ore from this property is quite similar in general appearance to that from the Van Anda.

Situated about one and one-half miles westerly from the Van Anda is the property of the Texada Kirk Lake Gold Mines, consisting of over 200 acres, with the Kirk Lake water power, estimated at 500 horsepower. A number of promising veins show on the property. A shaft has been sunk on a fine vein that shows free gold and assays from $40 to $200. Paralleling this vein and within a distance of 200 feet, are numerous veins, so many and of such a character that the general impression is that the entire 200 feet will pay to work. Development will be pushed this season.

F. W. McRady, who has supervision of the development of this property, also manages a group about a mile distant controlled by W. L. Challoner, of Victoria. also property in the Kootenay country owned by the syndicate controlling the Kirk Lake mines.

The Nut Cracker corners on the Kirk Lake Company's group to the southeast. A well defined vein shows running north of west. Work consists of a fourteen-foot shaft which has developed a vein of about four feet. The same vein is found in the Yellow Jacket, where about the same amount of work has been done, showing a similar class of ore.

The Lorindale adjoins the Nut Cracker and has a well defined vein. Work has been done on this property, which, had it been done in a legitimate manner, would have meant at least a 150-foot shaft. The property, however, has been badly "gophered," every effort, evidently, having been directed to an attempt to obtain samples of free gold, with apparently no intention towards the systematic development of the property. The property merits very different treatment from what it has received.

The Surprise presents some peculiar featues. The shaft is down seventy-two feet and a drift run sixty-five feet. The vein is well mineralized its full width, five feet, and has both walls well defined. This property is owned by a party of men from Comox, who are developing it on the co-operative plan. The result of their work shows what men of limimted means, but with a disposition to develop their property, can do.

The Golden Slipper is on the westerly side of the island and about a mile northerly from the iron mines and is now controlled by C. S. Douglas, of Vancouver. Mr. Miller has done a good deal of general prospecting work on this property and has uncovered the vein at several points. At one place he has a shaft about fifteen feet deep, showing the vein to be a strong one nine feet in width. This property lies on a steep hillside and in a position to be developed economically, and there is every indication that with development it will prove most valuable. Mr. Miller has taken free gold from the surface for years.

The Tip Top adjoins the Golden Slipper on the northerly side, the Golden Slipper vein extending through it and being readily traceable the length of the claim. There are two other veins on the property nearly parallel to it, and a cross-vein extends across this and also across the Copper King and Nigger Baby.

The Copper King adjoins the Tip Top on the northeast. There are two strong, well defined veins bearing northwesterly, and the one referred to as cross-cutting this and other property, which bears southwesterly. A shaft fifteen feet deep on this vein has developed nearly five feet of good looking ore.

The Silver Tip adjoins the Surprise on the northwest and is crossed by two veins. On one a shaft has been sunk sixty-four feet with between four and five feet of ore in the bottom, worth about $40. This ore is most peculiar, as it looks as though it was rapidly changing to gray copper, but numerous assays show the value to be chiefly gold. The ore has steadily improved with depth. The Silver Tip has recently been taken over by the Texada Proprietary Gold Mines, Limited. This company is arranging to push development work

energetically, and is acquiring other properties on the island, and proposes to develop its holdings into paying mines.

A St. John's, New Brunswick, syndicate, managed by J. C. Keith, of Vancouver, is operating in the Coast District and more particularly on Texada Island. The syndicate is operating on lines of great advantage to a mining camp, viz: It bonds promising looking prospects, puts on the development work necessary to show the property, and then sells the claim to parties who will continue the work. It took hold of the Silver Tip; sank a sixty-four foot shaft, and did other exploring work—then sold the property to the Texada Proprietary Company. The syndicate controls some fifteen claims on the island and is just closing contracts for development work on the Summit, Rino and Marguerite claims.

The Tip Top, Copper King, Volunteer group of six claims and several adjacent properties, have recently passed under control of Thomas H. Fraser, Mining Engineer of London, and arrangements are being made for active development.

A large number of claims have been located in this mineral belt on which little or no work has been done. It can safely be said that there is not a claim on the island that has been fairly prospected and it is doubtful if the number of veins actually existing in any of the claims is known to the owners. The formation is of such a nature that, if situated near the famous Cripple Creek, Colorado, camp, there would be a rush on the part of capitalists to get men and machinery on the ground for a thorough exploitation of the territory. It is not a poor man's camp, but one that requires capital to put properties on a paying basis.

While the formation is readily traceable through a claim and from one claim to another, well defined walls are rarely encountered until some depth is reached. One can travel along a vein and can dig through the decomposed vein matter, which is usually three to five feet, and can take the material so excavated and wash out from a few colors to a dollar or more of gold. This is true of various claims and at almost any point on the vein where oxidation has occurred to any extent.

The camp presents an inviting field for capital and indications are such as to warrant a liberal expenditure in exploration and development, but the work should be under the direction of mining men backed with capital sufficient to properly develop a property.

During the past summer considerable prospecting was done along the Coast and the various inlets between Jervis Inlet and the Phillips Arm District; while a number of claims were staked, some with very promising surface showings, but little work has been done on them.

Monckton and Colquhoon, Mining Engineers of Vancouver, are developing a property on the southern end of Redonda Island that is making an excellent showing, having a three-foot vein, assaying from $25 to $134 in silver, with some lead and copper. On the same claim they have a fine looking copper ledge. A claim owned by D. Carmichel and situated near the above, assayed $13.90 in silver and gold surface outcrops.

A number of claims have been located on Redonda Islands, Cortes, Reed and in the vicinity of the "Hole-in-the-Wall" on Valdez Island.

Bute Inlet, 110 miles northwest from Vancouver, is two to three miles wide and sixty-five miles long, the general direction being northeasterly. It cuts the Coast Range at nearly a right angle, is very mountainous, some of the peaks rising to a height of 8,000 feet; extremely precipitous and cut by deep ravines and gullies filled with slide matter from the heights above. These intersect the line of direction of the inlet, generally having an easterly and westerly direction. Volcanic disruption is evident in many places.

At the entrance to the inlet on the northwestern shore, at Arran Rapids, is a small belt of broken slate with several small veins of quartz containing iron pyrites and some sulphides of copper. This belt crosses to Stewart Island, which lies across the entrance to the inlet and is cut by a well defined vein running in a nortneast and southwest direction through about the center of the island. This vein carries a large per cent. of copper, and assays in gold and silver.

On the first ledge are several claims owned by Charles and Fred Thulin of Lund, and the Gulf of Georgia Prospecting Company. On the island are four claims located by Fred Buker, J. A. Robertson, O. W. Rafuse and C. R. Graves, of Vancouver. The Buker property has recently been purchased by John Cobeldick, of London, who has, during the last few months, acquired extensive holdings in the Coast district for English parties. Assays on the four claims range from $12 to $20 in copper and gold.

Passing north along the inlet, the formation is granitic, cut in all directions by slate dikes for some four miles, when the formation becomes more regular and more defined granite, in which are within the next two miles two ledges of gneiss highly mineralized, and showing strong copper stains. About three miles further on there is a narrow strip of low land separating Bute Inlet from the Estero Basin, formed by slide matter, and it is evident that at one time Bute Inlet and Frederic Arm were connected by what is now known as Estero Basin, a body of water some two miles wide by five in length. For a mile and three-quarters from this point the formatiin is

gray granite; then it is cut by a belt of fine slate having an easterly and westerly direction across the inlet, and is about a quarter of a mile in width. This belt is traceable through to the other inlets, both to the north and south, and contains several strong, well mineralized veins of quartz traceable for a mile on either side of the inlet, through claims controlled by C. R. Graves, of Vancouver. Next to the slate lies a belt of porphyry thirty to forty feet wide and about half a mile long, in contact with a volcanic conglomerate, with which is found some lava. Next to this is a small belt of silicious rock; then diorite and granite, which extend seven miles up the inlet and contain several unprospected veins; above this is an unbroken stretch of gray slab slate for nearly seven miles, then the character of the slate changes to a finely laminated green slate, containing numerous large pockets of quartz; then gradually changes to an almost black slate containing a large quantity of iron and looks like a mass of iron rust clear to the summit. There are three claims on this owned by S. Harlon. Next comes porphyry considerably mineralized. In this is a vein of dark bluish gray quartz about six feet wide, well defined and traceable for a considerable distance, which contains iron and copper sulphides. About 100 feet farther on the south side is a strong vein some twenty feet wide, of pale bluish quartz, showing much iron on the surface. There are four claims on this vein owned by C. R. Graves and others. About a mile farther up the inlet E. D. Blanchfield, C. R. Graves and others have four claims containing a three-foot vein carrying galena and gray copper, which runs into a mountain 6,000 feet in height. Just north of this the formation changes to granite, which continues to the head of the inlet. Two large rivers enter the head of the inlet through valleys that extend back to the Chilcotin country, a region from which Indians have brought out specimens of coarse placer gold; also quartz containing free gold. But little prospecting has been done on Bute Inlet, the claims herein referred to having been located within the past few months.

The Phillips Arm District extends from Bute Inlet northwesterly to Loughborough Inlet thirty miles and includes Valdez, Thurlow and other islands and the adjacent mainland. Between this district and Vancouver Island is Johnstone's Strait, the route of the Seattle-Alaska steamers; while between the islands and the mainland is Cardero Channel, with sundry channels connecting it with Johnstone's Strait; while the mainland is intersected by Phillips Arm and Frederic Arm, each four or five miles long. The district affords exceptional facilities for the economical handling of ore.

The mountains rise sharply from the waters' edge, attaining elevation of 2,500 to 6,500 feet, with navigable water close to shore. Surface rocks are chiefly granite and syenite, with occasionally some diorite. Two slate belts are prominent, also a body of limestone. More prospecting and exploration work has been done in this district than in any other portion of the coast region.

The chief prospecting to date has been by canoe, the quartz showing at the water's edge, and to a large extent the veins are capped over, the quartz breaking through in places. The veins are strong, well defined and readily traceable; the more the country is explored, the more thoroughly it is found to be mineralized. The character of the ore varies with the locality, the westerly side of the belt being quartz, heavily charged with sulphurets carrying gold, silver and usually a little copper—the latter increasing with depth, while the easterly or mainland part of the district shows more copper at the surface. Iron is present in all ore so far found.

In June, 1893, J. J. Chambers located the Tilly, now known as the Alexandria, on the mainland on the west side of Phillips Arm; during 1894 and 1895, more particularly in the fall of 1895, Dan Leahey, Dan McCallum, P. J. Smith, George Howard, Mr. Archibald, Mr. McNerheny, Walter Moore, Tom O'Brien, A. J. Smith and a few other pioneers in the district made a number of locations, chiefly on Valdez Island, abutting Cardero Channel, on what is locally termed the "black slate:" this is located for over five miles, but the claims have never been carefully prospected. Within a few months assessment work has been done on a number, in some instances developing promising working leads. In the fall of 1895 J. C. Griffith, of Seattle, made a number of locations in the district and interested G. W. Willis, of Vancouver, in them. The Channe Mining Company, of Vancouver, B. C., was formed, acquiring the Griffith and some other properties and the company did, during 1896, a large amount of development work.

The Alexandria and adjoining claims, extending over a mile on the vein, having passed under control of H. Rhodes, of Vancouver, development was started about January 1, 1896, and has continued steadily, except for an interruption in the spring of 1896, the Phillips Arm Mines Company being formed in January, 1897. This was the first property in the district on which development work was done. The mineralized formation shows at the water a width of sixty-eight feet. A tunnel has been run on the pay streak over 200 feet straight back from tide water, the pay streak ranging from fifteen inches to over four feet in width. At 100 feet from the surface a cross-cut was run across the formation. Fully 50 per cent. of the entire sixty-eight feet would undoubtedly pay to concentrate. The pay streak is shipping ore, averaging about $30 per ton. This property has shipped about 100 tons, and is making

small regular shipments. An air compressor plant will be established early in the spring and the development of the property pushed actively.

The Channe Mining Company was the next to commence operations and has done more development work than any other company in the district, having at one time owned some twenty claims. On the Bobby Burns group, on Valdez Island, the development to date is:

Bobby Burns—Tunnel 80 feet, open cross-cut 36 feet, open cut 40 feet. Tunnel 12 feet, open cut 33 feet.

Hetty Green—Tunnel 50 feet, shaft 30 feet; tunnel on second level 38 feet.

Daniel Webster—Shaft 32 feet.

The Poodle Dog, owned by this company and situated on Channe Island, has an eighty-foot tunnel. The Ingersoll, also owned by the same company and situated on the easterly side of Phillips Arm. shows a good body of chalcopyrite ore carrying gold. Development work is being pushed, there being several open cuts and over 100 feet of tunnel work.

The British Columbia Development Company, in which Lord Sudley is a large shareholder, has acquired holdings on which it has run about 150 feet of tunnel.

In September last Ernest Grant-Govan, of London, visited the district and arranged the purchase of a number of properties from the Channe Mining Company, by the Gold Fields of British Columbia Company. Mr. Grant-Govan is managing director of this company and is understood to be en route from London, the head office of the company, and upon his arrival a thorough system of development of the company's holdings will be inaugurated.

J. Cobeldick, of London, representing parties whose investments in mines in South Africa, Australia and New Zealand amount to several million pounds sterling, has purchased several properties in the district, the most important being the Mountain Sheep and Portage on the copepr belt back of Estero Basin. The ore body shows on the Portage over 100 feet wide, and in the canyon is exposed over 200 feet high. This vein was discovered by Fred Buker, of Thurlow, B. C., late last fall, and snow fell before there was time for a thorough examination. Mr. Cobeldick, however, has had five or six men on the Portage for the past six weeks and, although having bad weather to overcome, they have made a very thorough examination of the ore in the canyon. This ore body consists of two veins. Next to the diorite foot wall is a quartz vein twenty to twenty-five feet wide, assaying $4.50 to $10 per ton, and concentrating more than twelve to one; then about fifty feet of granite; then ninety-six feet of copper ore, a few feet of this being a handsome chalco-pyrite and a shipping ore. The balance is lower grade and will concentrate from eight to fourteen into one, according to tests made. Mr. Cobeldick has started a tunnel to cross-cut the vein matter about 200 feet below the outcrop. He leaves soon for England to confer with his associates as to method of developing this property, which he says is the largest body of ore he ever saw. He also considers that to work it to the best advantage requires systematic opening of the property and erection of an extensive plant, it being the purpose to treat the ore on the ground.

R. C. Forsyth, of Chicago, has two claims on the same vein and is preparing to open them. North of the Cobeldick property C. S. Douglas, of Vancouver, controls two claims; next to these are three claims owned by P. J. Smith and Dan McCallum, of Thurlow, B. C., considered to be fully equal to the Cobeldick property.

The formation, as shown in the canyon on the Portage, is a footwall of diorite, slate hanging wall and back of the slate, granite; on the surface the granite overlies the vein matter and accompanying rock. Ore only shows occasionally on the surface, except in gulches or other places where erosion has occurred.

The copper properties located on Jervis Inlet, Toba Inlet, Estero Basin and Loughborough Inlet are practically in a line, although covering a distance of over seventy miles. Before the close of 1897 it is probable that the Estero Basin property will be sufficiently developed to give an idea of its great value.

On Valdez Island, near the Bobby Burns group, the Bully Boy and Queen Bee, both very promising properties, are being developed by Costello & McMorran, the cannerymen, associated with whom are Mr. Crean, Dr. Carroll and G. B. Harris, prominent Vancouver capitalists.

There is a fifty-foot shaft on the Queen Bee; the vein is a strong one three and one-half feet wide and assays from $15 to $150 in gold.

The Channe Mining Company is opening the White Pine on Thurlow Island. A tunnel has been run 140 feet, cross-cutting a thirty-eight inch vein, and is expected to soon reach a second vein of six feet.

The Northern Belle Mining Company, of Seattle, owns the Electric and Union claims on Thurlow Island. A twenty-foot shaft has been sunk on the Electric in an eight-foot vein of quartz that three or four feet from the surface assayed over $27.

The Beaver Mining Company is opening the All Up and has driven a tunnel over 100 feet.

Considerable work has been done on the Coon near Fanny Bay, the Coon group of six or seven claims being the property of the Fanny Bay Mining Company, of Vancouver. This company owns a number of other claims in the district, on which more or less development work has been done.

A number of claims were located on Loughborough Inlet late in the fall, but no work has been done. Very fine samples of copper were brought in from some of these claims.

Work will be done on a large number of claims throughout this district during 1897, in some instances on an extensive scale.

There is a steamer service from Vancouver to Phillips Arm twice a week, S. S. Comox of the Union Steamship Company, of Vancouver, leaving Vancouver Tuesdays and Fridays.

The entire Coast District affords an excellent field for the prospector, while to the capitalist seeking a safe investment in mining, it offers the inducement of large bodies of low grade ores that will pay a good profit and situated where transportation charges are so light as to be merely nominal. With development, the district is showing that, in addition to its low grade ores, it also possesses high grade ore in quantity and that, while the assay value as a rule is low on the surface, the ores increase in value as depth is attained. On Texada Island, where a half dozen shafts are down sixty feet or over, the "run of the vein" is over $40 per ton.

HARRISON LAKE.

This beautiful body of water, which empties into the Fraser through Harrison River near Agassiz Station on the Canadian Pacific Railroad, has until recently been known only as a pleasure and health resort, the mineral springs near its south end being the chief attraction. But during the last summer gold and silver-bearing ore was found on the steep mountains rising from its shores and it is now attracting many prospectors. It is quite accessible, for the Canadian Pacific will take one from Vancouver to Agassiz, seventy-one miles, and a daily stage runs thence to the Hot Springs, five miles. From Seattle the route is by the Seattle & International and Canadian Pacific Railroads to Agassiz, 163 miles, and thence by stage. The lake is navigable for steamers and during high water steamers can run down Harrison River into Fraser River and thence to the ocean, so that water transportation can be used to the smelters at Everett and Tacoma.

The discoveries were only made last summer, but already development is in progress with a view to shipping this summer from one property. This is the Providence and Silver Bell, on the west shore of the lake, twenty-three miles from Hot Springs. An accidental discovery of silver in a piece of float by James Trethewey led his father, Joseph O. Trethewey, to have it assayed and it was found to carry $134.74 gold and silver. Prospecting caused the discovery of a ledge of gray quartzite, traced up the mountain through three claims. A carload of surface ore was shipped last fall to the Everett smelter and returned $28 gold and silver, being found particularly acceptable, as it contained considerable lime. The two claims named are now owned by the Providence Mining & Developing Company, which proposes to sink fifty feet on the ledge and drift 300 feet into the mountain, thus gaining 150 feet in depth. Much higher assays have been obtained a few feet below the surface and a parallel ledge twenty feet wide has been discovered, assaying from a few dollars to $155, chiefly in gold.

The Star, on the extension up the mountain, has been acquired by the Harrison Lake Star Mining Company and will also be developed this year.

THE SMELTERS.

The distance of the Pacific Northwest from the smelting centers and the comparatively low grade of the bulk of the ores have combined to induce the erection of smelters in this section, within easy distance of the mines. The smelters at Pilot Bay and Nelson, British Columbia, were erected more particularly to treat the ores produced from the mines of the companies which own them, although they also do some amount of customs business. These smelters have been briefly described in connection with the mines of which they are an adjunct. There are also three large smelters, which do a mainly customs business, at Everett and Tacoma, Wash., and Trail, B. C.

The Everett smelter was erected by the Puget Sound Reduction Company at a cost of nearly $250,000, and stands on the south bank of the Snohomish River near the point at Everett. In addition to the usual crushing and sampling mill, it has two roasting furnaces of a combined capacity of eighty tons in twenty-four hours, and a third is under construction, of seventy-five tons daily capacity. Ore is also roasted in heaps in the open air, when necessity requires. The smelting is done in three forty-two inch water-jacket blast furnaces, to which the blast is furnished by No. 7 Root blowers. Only two furnaces are now in operation, for lack of sufficient roasting capacity, and the amount of crude ore treated daily is slightly under 200 tons. This

would be greater if more oxidized ores could be procured and will be increased to 300 tons as soon as the completion of the new roaster permits the third furnace to be blown in. The two sampling mills have a combined daily capacity of 400 tons, so that they can supply a much larger roasting and furnace plant. The smelter is now treating sulphide ore from the Le Roi mine in Trail Creek, galena ore from the Slocan district, concentrates from Monte Cristo and low grade silver ore from the Broken Hill mine in Australia, besides miscellaneous shipments from various parts of Washington, British Columbia and Alaska.

The Tacoma smelting works, owned by the Tacoma Smelting & Refining Company, are on the water front between Tacoma and Point Defiance park. It has a large crushing and sampling works, a roasting furnace for treating sulphide ores and two furnaces with a capacity of 160 tons a day, while the building has capacity for three more stacks. The product of this plant, like that of the Everett works, is lead bullion and copper matte, in which gold and silver are carried by the baser metals.

The smelter of the British Columbia Smelting & Refining Company is situated on a bluff overlooking the Columbia River at the mouth of Trail Creek. It has a sampling mill of 150 to 200 tons daily capacity, an automatic calcining furnace of fifty tons daily capacity and six circular calciners, a dust chamber 180 feet long, four reverberatory furnaces with a capacity of forty tons each in twenty-four hours, a circular water-jacket furnace of forty-five to fifty-five tons capacity, and a 200-ton rectangular blast furnace. Two engines of sixty-five and forty horse-power operate the machinery. Additions made recently and now under construction will increase the capacity to 350 to 400 tons a day and a refinery is also being erected.

All these three smelters have both rail and water transportation. The Everett smelter is on deep water near Puget Sound and is reached by the Great Northern and Everett & Monte Cristo Railroads, the latter connecting with the Northern Pacific and Canadian Pacific through the Seattle & International. The Tacoma smelter is on deep water on Puget Sound and the Northern Pacific tracks enter the plant. The Trail smelter is entered by the Columbia & Western narrow gauge railroad from Rossland, and has the navigable Columbia River at its front, with the Nelson & Fort Sheppard Railroad on the opposite bank, by which connection is obtained with the Northern Pacific, Great Northern and Union Pacific Railroads. The Columbia River steamers give connection with the Canadian Pacific system.

The erection of smelters at Northport, Wash., and Vancouver, B. C., is also projected, the former being designed to treat both silver-lead and pyritic ore. Construction is delayed however, pending the action of Congress on the duty on silver-lead ores, of which the chief supply, for the present at least, would come from the Slocan district.

DIGEST OF THE MINING LAWS OF THE UNITED STATES, WASHINGTON AND BRITISH COLUMBIA.

By Melvin G. Winstock, Attorney, Seattle, Wash.

Whenever a doubt arises concerning any questions relative to an interest consult a responsible attorney. If his advice is worth having, he will charge you a fee, but in the end this will prove an economy. Don't attempt to draw your own legal contracts. Many a fortune has been lost in the attempt of the mining man to be his own lawyer.

Definitions.

Ore.—Certain minerals in their natural condition.

Mineral.—That which is secured from a mine, from working in the ground, and legally it includes salt, coal and similar substances.

Lode or Vein.—A flattened mass of metallic or earthy matter, a fissure in the earth's crust filled with mineral matter.

A Mine.—A way or passage under ground.

Vein or Tunnel.—The first working vein found in the tunnel.

Location.—The act of appropriating a parcel of land according to certain established rules. A mining claim may contain one or more locations.

LAWS OF THE UNITED STATES.

Who May Locate.

Mineral lands are open to exploration and purchase by all citizens of the United States without regard to sex and those who have declared their intention to embrace citizenship. All persons born or naturalized in the United States and subject to the jurisdiction thereof, and none others, are citizens.

What Lands May Be Located.

The right to mine can be given only in public lands, and said lands must contain valuable mineral deposits.

Extent of Ground Open to Location.

No claim located shall exceed 1,500 feet along the vein nor shall it exceed 300 feet on each side of the middle of the vein at the surface.

It is not necessary that the locator should be present on the ground. One may locate as agent for another.

Description.

The location must be along the vein or lode, it must be distinctly marked on the ground so that its boundaries can be correctly traced, that the record contain reference to some natural object or permanent monument to identify the claim and that all the lines shall be parallel. Remaining details are governed by rules and regulations established by the miners of each district not inconsistent with national or state laws.

Extent of Work Necessary.

One hundred dollars' worth of labor shall be performed on improvements made each year. Where there are several owners and one or more fails to do his share, he must be served with a personal notice or by publication in a newspaper published nearest the claim, once a week for ninety days. If at the expiration of such time said delinquent shall fail to do or perform his share, then his interest becomes the property of such of his co-owners as have performed the amount of work required by law.

How to Obtain a Patent.

Applicant must file in the proper Land Office an application for a patent under oath, showing a compliance with the law. He must file also a plat and field notes of the claim or claims in common, made by or under the direction of the Surveyor General, showing accurately the boundaries, which shall be distinctly marked by monuments on the ground, and shall post a copy of such plat, together with a notice of such application for a patent, in a conspicuous place on the land or claim in question. This posting must be done prior to the filing of the application for a patent. He must also file, when he applies for his patent, the affidavit of at least two persons that such notice has been duly posted together with an exact copy of such notice.

The Register of the Land Office then causes to be published in a news-

paper, by him designated as the nearest to the claim, for sixty days, a notice that such application for a patent has been made. He must for the same period also post such notice in his office.

At the time of filing his application, or within sixty days, claimant must file with the register a certificate of the surveyor general that $500 worth of labor has been expended on improvements made upon the claim by himself or grantors, that the plat is correct and shall give such other description as is necessary for identification, to be incorporated in the patent. At the end of sixty days claimant must file his affidavit showing that plat and notice have been posted in a conspicuous place on claim during the period of publication. If no adverse claim is filed within said sixty days, the law assumes the applicant to be entitled to his patent upon payment to the proper officer of $5 per acre, for the land embraced within the claim.

How to Make an Adverse Claim.

When an adverse claim is made during the sixty days period of publication, it must be under oath of the person or persons making the same and shall show the nature, boundaries and extent of such adverse claim and all proceedings, except publication of notice and filing affidavits thereof, are stayed until the controversy is settled by a court of competent jurisdiction or the adverse claim is waived. Within thirty days after filing adverse claim, contesting party shall begin proceedings to determine the question of right of possession and shall prosecute the same with reasonable diligence to final judgment. Failure so to do operates as a waiver. After such judgment, the party entitled to possession may file with the register a certified copy of the judgment roll, together with a certificate from the surveyor general that the requisite amount of labor has been done on the claim and the description required in other cases, shall pay to the register $5 per acre of such claim, whereupon the whole proceedings and judgment roll shall be certified by the register to the general land commissioner and the patent issues.

Before Whom Oaths May Be Taken.

All affidavits required under the mining laws of the United States may be made before any officer authorized to administer oaths within the land district where the claim may be situated, and all proofs may be taken before any such officer.

Miscellaneous.

The owner of a quartz mill or reduction works not owning a mine in connection therewith may also receive a patent for his mill site, at $5 per acre.

No one individual can enter or locate upon more than 160 acres nor can an association enter upon more than 320 acres.

The government before patent issues requires payment for mining land at the rate of $10 per acre where claim is situated more than fifteen miles from a railroad, and $20 per acre where such claim is located less than fifteen miles from such railroad.

WASHINGTON MINING LAWS.

In the State of Washington there is a mining board consisting of the governor, lieutenant governor and the state treasurer, the object of which is to collect information concerning the production of all precious and useful minerals of the state, and to perform such other duties as will advance the mineral interests.

Mining Claim Governed by Law in Force at Time of Location.

All mining claims upon veins or lodes of quartz or other rock in place, bearing gold, silver or other valuable mineral deposits heretofore located, shall be governed as to length along the vein or lode by the customs, regulations and laws in force at the date of such location.

Form and Extent of Mining Claim Limited.

A mining claim located upon any vein or lode of quartz or other rock in place, bearing gold, silver or other valuable mineral deposits, after the approval of this act by the governor, whether located by one or more persons, may equal, but shall not exceed, 1,500 feet in length along the vein or lode; but no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claims located. No claim shall extend more than 300 feet on each side of the middle of the vein at the surface, nor shall any claim be limited by any mining regulation to less than fifty feet of surface on each side of the middle of such vein or lode, at the surface, excepting where adverse rights, existing at the date of the approval of this act, shall make such limitation necessary. The end lines of such claim shall be parallel to each other.

Right of Possession of Mining Claims.

The locators of all mining locations heretofore made, or hereafter made under the provisions of this chapter, on any mineral vein, lode, or ledge on the public domain, and their heirs and assigns, so long as they comply with the laws of the United States and the state and local laws relating thereto, shall have the exclusive right to the possession and enjoyment of all surface included within the lines of their location, and of all veins, lodes and ledges throughout their entire depth and the top or apex of which lies within the surface lines of such location, extending downward vertically, although such veins, lodes or ledges may so far depart from the perpendicular in their course downward as to extend outside of the vertical side line of said surface location.

Work Required on Mining Claims—Local Regulations.

The miners of each mining district may make any rules and regulations governing this (the) location and amount of work necessary to hold possession of a mining claim, not in conflict with the laws of the United States or of this state; but on each claim it shall be necessary to do at least $100 worth of work each year and the first year shall date from the date of location of such claim. A failure to comply with this requirement shall work a forfeiture of the claimant's right to such claim, and the same shall become subject to relocation.

Recorder of Mining Districts—Records of.

The miners of each mining district may elect a recorder of the said district. When so elected, such recorder shall provide books of record, in which it shall be his duty to record all notices of locations or transfers, bonds, conveyances or assignments of mining claims within his district when the same shall be presented to him for record. Such records are public records, open to inspection, and shall have the same force and effect, so far as notice is concerned, as the record of deeds and mortgages.

Election, Powers and Duties of Recorder.

When a recorder shall be elected, he shall hold his office for a term of one year from the date of his election, and until his successor is elected and qualified. He shall, immediately after his election, file with the county auditor of the county in which his district is situated, an oath to the effect that he will faithfully discharge the duties of his office. He shall be a certifying officer, and certified copies of his records shall have the same force and effect as similar papers certified by other officers of this state. His fees shall be the same as those of the county auditor for similar work, and should the office of recorder of any mining district at any time become vacant, it shall be the duty of the person last holding said office, and of any person into whose possession the same may come, to forthwith transmit all records, papers and files of said office to the auditor of the county in which said district is located, and such auditor shall thereafter keep the same as part of the records and files of his office.

Location Notices, Etc., to Be Recorded by County Auditor.

All location notices, bonds, assignments and transfers of mining claims shall be recorded in the office of the county auditor of the county where the same is situated, within thirty days after the execution thereof; provided, that all records of mining claims and of assignments, deeds, bonds and transfers heretofore made (that is prior to 1888) by any recorder of any mining district, or by any county auditor, are valid.

Aliens.

Aliens are not prohibited from acquiring mineral lands.

Water for Mining.

The use of the waters of this state for irrigation, mining, and manufacturing purposes is deemed a public use.

Boring for Salt, Oil, Coal.

Boring for salt, oil and coal may be done by the county commissioners by special tax levy, on presentment of proper petition and after election in favor of the same.

Taxation of Mines and Mining Property.

Quarries and fossils in and under the same, are subject to taxation.

Improvements on land the fee of which is in the state or in the United States are subject to taxation.

Mineral lands are included in the tax list.

Mining ground, quarries, etc., and the improvements thereon shall be assessed at the price at which the same would sell at a fair voluntary sale for cash.

Miner's Lien.

All persons doing work upon or furnishing materials for mines or mining claims have a lien upon the same for the work done or materials furnished.

Contractors and builders are deemed agents of owners.

The claim of lien must be filed with the county auditor within ninety days from the time of last work done or last materials furnished.

A lien binds property for eight months unless proceedings be commenced or time be extended.

Evidence.

Certified copies of recorded instruments are received in evidence the same as the originals.

Mining recorders and county auditors may certify copies of instruments of record concerning mines and the same may be used in evidence.

Crimes.

The fraudulent sale of mines, or salting or misrepresenting to accomplish the sale, is a felony.

Fraudulently changing samples or assays with intent to defraud, is felony.

Making or giving a false assay or sample with intent to defraud is felony.

Robbing a vein, sluice-box, quartz-mill, etc., or trespassing upon a mining claim with intent to commit a felony, is felony.

Deed of Mining Claim, United States.

THIS INDENTURE, Made the..... day of..... in the year of our Lord one thousand eight hundred and ninety..... BETWEEN ....

.....

.....the part.... of the first part, and

.....

.....

the part..... of the second part, WITNESSETH: That the said part.... of the first part, for and in consideration of the sum of .... DOLLARS, ... of the United States of America, to ..... in hand paid by the said part..... of the second part, the receipt whereof is hereby acknowledged, ha..... granted, bargained, sold, remised, released and forever quit claimed, and by these presents do.... grant, bargain, sell, remise, release and forever quit-claim unto the said part..... of the second part, and ..... heirs and assigns,

.....

TOGETHER with all the dips, spurs and angles, and also all the metals, ores, gold and silver-bearing quartz, rock and earth therein; and all the rights, privileges and franchises thereto incident, appendant and appurtenant, or therewith usually had and enjoyed; and, also, all and singular the tenements, hereditaments and appurtenances thereunto belonging or in anywise appertaining, and the rents, issues and profits thereof; and, also, all the estate, right, title, interest, property, possession, claim and demand whatsoever, as well in law as in equity, of the said part..... of the first part, of, in or to the said premises, and every part and parcel thereof, with the appurtenances.

.....

TO HAVE AND TO HOLD, all and singular, the said premises, together with the appurtenances and privileges thereunto incident, unto the said part..... of the second part, ... heirs and assigns forever.

IN WITNESS WHEREOF, the said part..... of the first part ha.....

.....

hereunto set ..... hand .... and seal.... the day and year first above written.

Signed, Sealed and Delivered in the Presence of

.....

.....

.....(Seal.)
.....(Seal.)
.....(Seal.)
.....(Seal.)
.....(Seal.)

Location Certificate—Lode Claim.

Know all men by these presents, that I, ... of the county of ....., State of ....., claim by right of discovery and location ..... feet, linear and horizontal measurement, on the ..... lode, along the vein thereof, with all its dips, variations and angles; together with ..... feet in width on each side of the middle of said vein at the surface, and all veins, lodes, ledges, deposits and surface ground within the lines of said claim; ..... feet on said lode running ..... from the center of the discovery shaft, and ..... feet running ..... from said center of discovery shaft.

Said claim is situated in the ..... of ....., in ..... mining district, county of ....., State of ....., and is bounded and described as follows: .....

Date of discovery, ..., 189.. Staked and located, ..., 189.. Date of certificate, ..., 189..

Attest: ....

As a part of this form, and in addition to the data therein given, the claimant is required to state the names of adjoining claims, and if none adjoin, the relative positions of those nearest, or show by affidavit or otherwise why this is not done. This is an essential requirement.

This notice must be recorded in the office of the mining recorder and in the office of the auditor of the county in which claim is situate.

Location Certificate—Placer Claim.

Know all men by these presents, that I, ... the undersigned citizen of the United States, resident of the county of ....., and State of ....., having complied with the provisions of chapter 6, title 32 of the Revised Statutes of the United States, and with local customs, laws and regulations, claim by right of discovery and location, as a placer claim, the following premises situate, lying and being in ..... mining district (or county), county of ....., and State of ....., to wit: (Description.)

To be known as : (Name.)

Located ....., 189... Date of Certificate. ....., 189...

Contract to Sell and to Buy.

I, ..., vendor, hereby agree to sell to ...., and I, ..., purchaser, agree to buy of the said ....., the ..... lode mining claim, situate, etc., ...

The agreed consideration of said sale is $..... cash in hand paid, the receipt whereof is hereby acknowledged; $..... to be paid within ..... days from the date hereof, and $..... within ..... days from such date, making a total consideration of $.....

Said vendor, within ..... days from date, will deliver to purchaser or his attorney an abstract of title duly certified by the clerk and recorder of said county, or by some reputable abstract office together with all the original title papers which are in his possession or within his power to produce.

And within said time will place in escrow in ..... a good and sufficient warranty deed conveying to said ....., or such person as he shall nominate, the said premises, clear of encumbrances, to be by such ..... held in escrow until final payment be made under this contract, or default is made under the same. Deposit with said ..... to the credit of vendor shall be equivalent to payment of any said installment.

Time is the essence of this contract as to each and every installment, and if any installment or installments be not paid within the time or times hereby limited therefor, all previous installments shall be and remain the property of said vendor, the deed in escrow shall be returned to him for cancellation, and the property shall remain his own, unaffected and unencumbered by this contract. But if he fail to deliver abstract witnin said period, or to deposit said deed in escrow, or if his title prove encumbered or otherwise not marketable, vendee may recover any and all installments paid, or may sue for specific performance and for a perfect title, or for damages, or otherwise as he may be advised.

Witness the hands and seals of said parties this ..... day of ....., A. D. .....

.....(Seal.)

.....(Seal.)

Bond and Agreement for Sale.

This agreement made and entered into this ..... day of ....., 189.., by and between ...., of the county of ....., State of ....., part.... of the first part, and ...., of the county of ....., State of ....., part.... of the second part:

Witnesseth, that the said part.... of the first part hereby agree.. that if the said part.... of the second part shall, on or before the expiration of ..... from the date hereof, pay or cause to be paid to the said part.... of the first part the sum of ..... ($....) dollars in gold coin, he will, upon such payment being made, make, execute and deliver to said part.... of the

second part the title to all of th.. certain lot, piece or parcel of land situate, lying and being in the county of ....., State of ....., bounded and particularly described as follows, to wit: .....

The said part.. of the first part further agree.. that the said part.... of the second part, ... agents, employes or assigns may at any time during said period of ..... enter upon said premises and work, mine and prospect the same in such manner as ..... may deem best, and mill any ore that may be taken therefrom (provided all work done thereon shall be done in a good, workmanlike manner), and may place thereon (and remove at ..... pleasure) such machinery and fixtures as may be necessary for the convenient working thereof.

The said part.... of the second part hereby agree.. that in the working, mining or prospecting of said premises ..... will not suffer or permit any lien to attach thereto for or in consequence of any indebtedness ..... may incur for labor, materials or improvements ..... may employ, purchase or place upon said premises during the said period of .....; and that in case ..... they shall fail to pay or cause to be paid to said part.... of the first part the said sum of $..... within said period of ....., ... will, at the expiration of said period of time, quit and surrender to said part ..... of the first part the said premises, and will within ..... days thereafter remove any machinery and fixtures that ..... may have placed thereon.

It is mutually understood and agreed that the stipulations and agreements herein contained shall apply to and bind the heirs, executors, administrators and assigns of the respective parties hereto.

In witness whereof, the said parties have hereunto set their hands and seals the day and year first above written.

.....(Seal.)
.....(Seal.)
.....(Seal.)

How to Incorporate a Company.

Under the laws of the State of Washington any two or more persons may make and subscribe written articles of incorporation in triplicate, and acknowledge the same before any officer authorized to take acknowledgement of deeds. One copy must be filed in the office of the secretary of state, one in the office of the auditor of the county in which the principal place of business of the corporation is to be located, the other remaining in the possession of the corporation. Said articles shall state the corporate name of the company, the object for which the same shall be formed, the amount of its capital stock, the time of its existence, not to exceed fifty years, the number of shares of which the capital stock shall consist, the number of trustees and their names, who shall manage the concerns of the company for such length of time (not less than two nor more than six months) as may be designated in such certificate, and the name of the city, town or locality and county in which the principal place of business of the company is to be located. No corporation shall commence business or institute proceedings to condemn land for corporate purposes until the whole amount of its capital stock shall have been subscribed for. Stock of corporations is deemed personal property.

BRITISH COLUMBIA.

The greatest particularity is required under the mining laws of British Columbia. The act concerning mines at present in force through British Columbia was passed April 17, 1896.

Interpretation of Terms.

The following is the interpretation of terms used in the construction of the mineral act:

"Mine" shall mean any land in which any vein or lode, or rock in place, shall be mined for gold or other minerals, precious or base, except coal.

"Mineral" shall mean all valuable deposits of gold, silver, platinum, iridium, or any of the platinum group of metals, mercury, lead, copper, iron, tin, zinc, nickel, aluminum, antimony, arsenic, barium, bismuth, boron, bromine, cadmium, chromium, cobalt, iodine, magnesum, manganese, molybdenum, phosphorus, plumbago, potassium, sodium, strontrium, sulphur or any combination of the aforementioned elements with themselves or with any other elements, asbestos, emery, mica and mineral pigments.

"Limestone, marble, clay or any building stone, when mined for building purposes," shall not be considered as mineral within the meaning of the act.

"Rock in place" shall mean all rock in place bearing valuable deposits of mineral within the meaning of the act.

"Vein" or "lode"—Whenever either of these terms is used in the act, "rock in place" shall be deemed to be included.

"Mineral claim" shall mean the personal right of property or interest in any mine.

"Mining property" shall include every mineral claim, ditch, mill-site or water right used for mining purposes, and all other things belonging to a mine or used in the working thereof.

"Legal post" shall mean a stake standing not less than four feet above the ground, and square or faced on four sides for at least one foot from the top, and each side so squared or faced shall measure at least four inches on its face so far as squared or faced, and any stump or tree cut off and squared or faced to the above height and size.

"Mill site" shall mean a plat of ground located as defined by the act for the purpose of erecting thereon any machinery or other works for transporting, crushing, reducing or sampling ores, or for the transmission of power for working mines.

"Streams" shall include all natural water courses, whether usually containing water or not, and all rivers, creeks and gulches.

"Ditch" shall include a flume, pipe or race, or other artificial means for conducting water by its own weight, to be used for mining purposes.

"Ditch-head" shall mean the point in a natural water course, or lake or other source, where water is first taken into a ditch.

"Free miner" shall mean a person, or joint stock company, or foreign company named in, and lawfully possessed of, a valid existing free miner's certificate, and no other.

"Record," register" and "registration" shall have the same meaning, and shall mean an entry in some official book kept for that purpose.

"Full interest" shall mean any mineral claim of the full size, or one of several shares into which a mineral claim shall be equally divided.

"Cause" shall include any suit or action.

"Judgment" shall include "order" or "decree."

"Real estate" shall mean any mineral land in fee simple under any act relating to gold mines or to minerals other than coal.

"Joint stock company" shall mean any company duly incorporated for mining purposes under the "Companies Act," "Companies Act, 1890," and any company duly incorporated in British Columbia for mining purposes under the "Companies Act, 1862," (Imperial), and shall include all companies, whether foreign or local, registered or incorporated under the "Companies Act," 1894, C. 32, S. 2.

Free Miners and Their Privileges.

Every person over 18 years of age and every joint stock company may become a free miner by taking out a miner's certificate, the cost of which is $5 per annum.

Minors who take the benefit of this act are regarded as of full age in all mining transactions.

Miner's certificate to a joint stock company must be issued in its corporate name. Such a certificate may be issued for one or more years and cannot be transferred.

A fine of $25 is provided as a penalty for such as work at mining without first obtaining the necessary certificate.

Every owner of a mine or contractor for the performance of work upon a mine must take out a license certificate for each and every employee or upon conviction pay a penalty of one hundred dollars, in addition to the unpaid license fees.

A free miner may kill game for his own use.

A free miner may obtain a new certificate for one lost on paying $1.

Should co-owner fail to pay for his free miner's certificate, his interest goes to his co-owners pro rata according to their former interests.

A shareholder in a joint stock company need not be a free holder.

A free miner may claim 1,500 by 1,500 feet. But all angles must be right angles and all measurements must be horizontally.

A free miner may cut timber on Crown lands.

A free miner may obtain a five-acre mill-site upon Crown lands in the form of a square.

A claim may be held from year to year by work being done to the value of one hundred dollars.

Two claims in each mining division, not on the same vein or lode, may be held, and more than one on the same vein, if held by a purchaser.

A claim must be marked by two legal posts, each four inches square and not less than four feet above the ground. They must be numbered 1 and 2.

A legal post marked "Discovery Post" must also be placed on the lode where it was discovered.

On No. 1 post must be written: (1) Initial Post. (2) The name of the claim. (3) The name of the locator. (4) The date of location. (5) Approximate bearing of No. 2 post. (6) Length and breadth of the claim. (7) The number of feet to the right and the number of feet to the left of the location line.

On No. 2 post must be written: (1) The name of the claim. (2) The name of the locator. (3) The date of location.

The line from No. 1 to No. 2 must be distinctly marked by blazing trees or planting posts.

Locations made on Sunday or public holidays are not for that reason invalid.

Lodes discovered in tunnel may be held if recorded in fifteen days.

A free miner may, on the payment of $500 in lieu of expenditure on claim, obtain a Crown grant.

Any miner may, at the discretion of the gold commissioner, obtain a water right for a term of twenty years.

No transfer of any mineral claim or interest shall be enforcable unless in writing, signed and recorded.

No miner shall suffer from any act of omission or commission, or delays on the part of government officials.

No claim shall be open to location during the last illness of the holder, nor within twelve months after his death, unless by permission of the gold commissioner.

A mineral claim must be recorded within fifteen days after location, if within ten miles of office of the mining recorder. One additional day is allowed for every additional ten miles or fraction thereof.

Partnerships, unless otherwise specified, will be deemed to be annual. The business shall pertain to mining and to mining only. Partnerships can locate and record one claim for each partner.

If any partner should fail to keep up his free miner's certificate, his property in the partnership shall revert to his partners pro rata according to their former interests. A partner owning any part of a share is entitled to a vote, but the result of the vote shall be determined by the full interests voted upon. A majority can make assessments. Assessments must be paid within thirty days. Any partner failing to pay assessment will be permanently liable to the partnership and his interest may be sold to satisfy the assessment. But a partner may, by proper notice to the foreman or manager, abandon his interest, after which he will not be liable for assessments.

Limited partnerships may be entered into; but "Limited" must become a part of the partnership name.

Necessary Labor to Be Done.

Work on each mining claim to the value of one hundred dollars must be done every year from the date of record of the mineral claim. An affidavit made by the holder, or his agent, setting out a detailed statement of the work done must be filed with the gold commissioner or mining recorder, and a certificate of the work obtained and recorded before the expiration of each year from the date of record of said claim. A free miner holding adjoining claims may, subject to filing notice of his intention with the gold commissioner or mining recorder, perform on any one or more of such claims, all the work required to entitle him to a certificate of work for each claim. The same provision applies to two or more free miners holding adjoining claims in partnership. In lieu of the above work the miner must pay one hundred dollars and get a receipt and record the same.

Law Concerning Placer Mines.

Placer claims shall be divided into creek diggings, bar diggings, dry diggings, bench diggings and hill diggings.

Every free miner shall be entitled to locate and record a placer claim on each separate creek, ravine or hill, but not more than two claims in the same locality, only one of which shall be a creek claim. He shall be allowed to hold any number of placer claims by purchase.

A "creek claim" shall be 100 feet long, measuring the direction of the general course of the stream, and shall extend in width from base to base of the hill or bench on each side, but when the hills or benches are less than 100 feet apart the claim shall be 100 feet square.

In "bar diggings" a claim shall be a strip of land 100 feet long at high water mark, and in width extending from high water mark in the river to its lowest water level. Dry diggings, 100 feet square.

In "bench diggings" a claim shall be 100 feet square; provided, that the gold commissioner has authority, where a bench is narrow, to extend the limits of a claim beyond the limits of the bench, but not to exceed 100 feet square.

In "hill diggings" a claim shall have a base line or frontage of 100 feet, drawn parallel to the main direction of the stream or ravine on which it fronts. Parallel lines drawn from each end to the line at right angles thereto, and running to the summit of the hill, shall constitute the side lines thereof. Legal posts shall be placed 100 feet apart on both the base line and the side lines, and no claim shall extend beyond the posts so placed.

If any free miner, or party of free miners, discover a new mine, placer claims of the following sizes, in dry, bar, bench, creek or hill diggings shall be allowed, viz: to one discoverer, one claim 300 feet in length; to a party of two discoverers, two claims, amounting together to 600 feet in length; to a party of three discoverers, three claims, amounting to 800 feet in length; to a party of four discoverers, four claims, amounting together to 1,000 feet in length; and to each member of a party beyond four in number, a claim of the ordinary size only. A creek discovery claim shall extend on each side of the

center of the creek as far as the summit of the hill, but not exceeding 1,000 feet.

A new stratum of auriferous earth, gravel, or cement, situated in a locality where all placer claims are abandoned, shall be deemed a new mine.

In defining the size of placer claims, they shall be measured horizontally, irrespective of inequalities on the surface of the ground.

Any location made on Sunday or any public holiday shall not for that reason be invalid, any law or statute to the contrary notwithstanding.

How to Locate Placer Claims.

A placer claim must be as nearly as possible rectangular, and marked by four legal posts at the corners. The posts must be at least four inches square. One post must be marked "Initial Post," and on that post a written notice must be placed stating: The name of the claim, the length of the claim in feet, its general direction; the date of notice and name of locator. If any side line extends 100 feet in length, legal posts must be placed on such line not exceeding 100 feet apart.

What Must Be Recorded.

Placer claims must be recorded within three days after location, if within ten miles of the mining recorder's office, and one additional day is allowed for each additional ten miles or fraction thereof.

Placer claims may be recorded for one or more years on payment of fees —$2.50 for each year.

Transfers must be in writing signed by the transferer and recorded in the mining recorder's office, and within the time required for recording placer claims.

The holder of a placer claim has no right to any vein or lode within its limits, except by location and record under the mining act.

Taxes on Mines.

An annual tax of 25 cents for every acre and fractional part of an acre of land conveyed by the crown must be paid on the 30th day of June and said tax becomes a charge upon the claim and in default of payment said claim may be sold. Such taxes are remitted if the owner proves to have done $200 worth of work on the claim for the year during which said taxes are assessed.

Legal Forms.

Under the law of British Columbia the government has prescribed certain forms and these must be followed absolutely: Such as Location Notice, Record of Mineral Claim, Record of Partnership Mineral Claim, Application for Certificate of Work, Certificate of Work, Certificate of Improvements, Application for Certificate of Improvements, Certificate of Improvements, Mining Recorder's Certificate, Mill Site (notice), Mill Site (affidavit of applicant prior to lease), Lease of Mill Site, Mill Site (affidavit of applicant prior to Crown grant), Mill Site (certificate of improvements), Tunnel or Drain License, Mill Site (application for Crown Grant), Water Notice, Water (grant of water right), For a Full Claim. For a Fractional Claim. These may be found in the act relating to gold and other minerals excepting coal. Passed April 17, 1896.

Scale of Fees to Be Charged.

For every free miners' certificate (for each year)	$5.00
Every substituted certificate	1.00
Recording any claim	2.50
Recording every certificate of work	2.50
Recording any "lay over" or every other record required to be made in the "Record Book"	2.50
Recording every abandonment, including the memorandum to be written on the record	2.50
For any other record made in the "Record of Abandonments"	2.50
For recording every affidavit, where the same does not exceed three folios of 100 words	2.50
For every folio over three, per folio	.30

The above rate shall be charged for all records made in the "Record of Affidavits."

For all records made in the "Record of Conveyances," where the same do not exceed three folios	2.50

For every folio, over three, a further charge of 30 cents per folio.

For all copies or extracts from any record in any of the above-named books, where such a copy or extract shall not exceed three folios, per copy	2.50

Where such copies or extracts exceed three folios, 30 cents per folio for every folio over three.

For filing any document	.25
For a Crown grant	5.00

MINERAL OFFICERS OF BRITISH COLUMBIA.

Minister of Mines—Hon. Col. James Baker.
Provincial Mineralogist—W. A. Carlyle.
Public Assayer—H. Carmichael.

Mining Recorders.

Nanaimo—M. Bray, Nanaimo.
New Westminster—D. Robson, New Westminster.
East Kootenay—J. Stirret, Donald; F. C. Lang, Golden; G. Goldie, Windermere; C. M. Edwards, Fort Steele; M. Phillips, Tobacco Plains.
West Kootenay—J. H. Graham, Revelstoke; Corry Minhennick, Lardeau; A. Sproat, New Denver; John Keen, Kaslo; W. J. Goepel, Nelson; J. Kirkup, Rossland; J. C. Rykert, Rykert's; T. Taylor, Trout Lake; R. J. Scott, Illecillewaet.
Cariboo—W. Stephenson, Quesnelle Forks; J. Bowren, Barkerville.
Yale—W. Dodd, Yale; L. Norris, Vernon; C. A. R. Lambly, Osoyoos; W. McMynn, Midway; H. Hunter, Granite Creek; G. C. Tunstall, Kamloops.
Lillooet—C. A. Phair, Lillooet; F. Soues, Clinton.
Cassiar—Ezra Evans, Manson Creek Omineca; Jas. Porter, Laketon.
Alberni—Thos. Fletcher, Alberni.
Victoria—W. S. Gore, Victoria.

Gold Commissioners.

For the Province—W. S. Gore.
Alberni—Thos. Fletcher, Alberni.
Cariboo—John Bowren, Richfield.
Cassiar District—James Porter, Laketon, Cassiar.
Lillooet District—Frederick Soues, Clinton.
East Kootenay District—J. F. Armstrong, Donald.
West Kootenay District—N. Fitzstubbs, Nelson; J. D. Graham, Revelstoke.
Yale District—Charles Lambly, Osoyoos; G. C. Tunstall, Kamloops.

Assayers.

Public Assayer, H. Carmichael, Victoria; W. Pellew Harvey, Vancouver; J. A. MacFarlane, Vancouver; Robbins & Long, Rossland.

THE REDUCTION OF ORES.

By C. E. Bogardus, of Seattle.

In treating this subject, it is undertaken with some misgivings, as the scope is broad to place in a short article; to give a clear idea of the proper items. No doubt some readers will miss what to them are important points, but when we stop to consider the vastness of the field and that large volumes are written upon one single process the indulgent reader is asked to overlook the lacking features.

The use of the metals by man dates into ancient history, and necessarily the separation from the ores has, since their first use, always been a problem. At first it was how to get the metal, now it is how to cheapen the process; either by modification of the present systems or by entering new paths of research.

In the commercial world the metals are divided into precious and base. There are only three of the precious metals, gold, silver and platinum, while the list of base metals includes the balance, lead, iron, copper, zinc, antimony, etc.

Space will permit only a synopsis as to how gold and silver are separated from the ores. In connection with them lead and copper are of necessity joined. With the copper also come nickel and cobalt.

Gold and silver occur in nature free and combined. The free metal or native is when it is in the form as used in commerce, the metallic state, as placer gold or as pieces of "the real stuff" in quartz. In combination, they are united chemically with some other element and must undergo a treatment. Gold and silver ores are in general treated alike, as they occur in the same ore and consequently both must be extracted together, although there are some gold ores and some silver ores each having special processes to obtain the value.

Platinum is so extremely rare in ores, the most being obtained from placers and then usually in connection with gold, that its metallurgy will not be dealt with here.

Silver occurs to a limited degree native, but usually in chemical combination, the most common being chloride, bromide, sulphide, telluride, antimonial sulphide (ruby silver and brittle silver), argentiferous galenas and argentiferous gray coppers, all of which must be separated by one of the many processes.

Gold is found as native and in chemical combination with tellurium, called tellurides, which are extremely rich. It is also associated with sulphurets, known as iron pyrite, pyrites, sulphurets and iron sulphurets, being a chemical combination of iron and sulphur. The gold in this case is not chemically combined but mechanically held.

Free gold or free silver ores are treated by a variety of mills, each working with the same end in view, to separate the gold or silver from the rock by amalgamating them with mercury. There is a long list of them, but I shall put them into two divisions. First, stamp mills, which work by a large weight, 500 to 1,000 pounds, called the stamp, dropping rapidly into an inclosed mortar. The pulp, when about the size to pass through a forty-mesh screen, splashes through the screen onto a copper plate, the plate having first been coated with mercury. The gold and silver are held by the mercury, while the balance of the material washes on off the plates. There are gravity stamps, spring stamps and steam stamps. The second division of mills includes all the balance, Huntington, Crawford, Merrill, etc., each differing from the other in the manner of pulverizing the ore, some accomplishing it by large wheels, some by centrifugal revolving weights, others by revolving balls, each having its merits and being adapted for special ores, while the gravity stamps are the most successful with general ores and are usually preferred. The mercury on the plates, when it contains considerable gold, is scraped off and placed in a chamois or buckskin sack and squeezed dry, the excess of mercury passing through the chamois. The residue, dry amalgam, consisting of the gold and some mercury, is put in an iron retort, from which the mercury can all be distilled at a low red heat, caught in water and used again, while the retort contains the gold. This is melted in a black lead or clay crucible, run into bricks, and is ready for market.

At this point it might be added that there is quite a mistaken idea of what a mill test is. A mill test is a test made on a sample of ore to see how much free gold it contains and the percentage that can be saved by amalgamating with mercury. A large sample, 100 to 1,000 pounds, is often shipped to a smelter for a mill test. No smelter will smelt a single shipment by itself. The ore is sampled and an assay made, all shipments being treated alike in that respect. The smelters do not test for free gold nor make mill tests, excepting the same as any competent assayer can do in his laboratory.

Few ores occur in which the total value is free gold; part is as a rule associated with the sulphurets. This gold is not caught by the mercury, but is

carried off of the plates. In a free gold ore the sulphurets are usually a small percentage of the ore, running from 2 to 30 per cent. When less than 2 per cent., it does not as a rule pay to save them unless quite rich. When above 30 per cent. the sulphurets interfere with the amalgamation and there is too great a chance of loss in concentration besides.

To save this value the pulp is carried over concentrators, which are machines arranged for separating, by gravity, the use of water and a shaking motion, the heavy mineral from the light gangue, which is worthless, the quartz, porphyry, etc. In handling an ore carrying about 10 per cent. sulphurets, for every ten tons of ore crushed and run over the concentrators, there will be one ton of concentrates carrying the value. There is always some loss, varying with the nature of the ore; in future treatment there is the cost of working only one ton in place of ten. The concentrates from a gold ore will yield their value by the following methods, pan amalgamation, cyanide, chlorination, bromination, smelting or some of the new processes, the means used to be determined by two points, cost of treatment and percentage of value saved. Some ores take one, others another.

For pan amalgamation the concentrates are thoroughly roasted, then placed in large pans with mercury, stirred and ground until the gold is amalgamated; steam heat is often used, while occasionally salt and bluestone are added, especially when silver is present. The pulp is washed away and the mercury handled the same as when taken from the plates of the stamp mill.

I would state here that no one process, except smelting, will treat all ores and any process needs some modification for each ore treated. They often treat one ore to perfection and are worthless for another. Ores are individual in character, no two alike.

Chlorination depends upon the fact that gold is soluble in chlorine gas, forming a chloride of gold, acting when the ore is roasted perfectly, but inert on the raw pyrites; roasting is burning off the sulphur, changing the iron from a bisulphide to a sesquioxide, whereby the gold is freed. The roasted pulp is placed in a perfectly airtight chlorination barrel or false bottom vat, moistened and a current of chlorine, generated by using salt, sulphuric acid and dioxide of manganese, passed through it. When the action is complete, the gold chloride, being soluble in water, is leached out of the pulp, and precipitated with ferrous sulphate. After being allowed to settle, the liquor is drawn off, the gold collected, usually by the filter press, melted and cast into bars.

Bromination is on the same principle, forming bromide of gold instead of the chloride. It is used by a few companies, the claim being that it is cheaper and simpler than chlorination.

Smelting will be taken up in connection with general ores.

Cyanide process, by which concentrates are often treated, is given in full in another chapter in this book.

When an ore carries no free metal, the ore as a whole is considered and the best means will depend upon its nature.

The gold and silver in Washington are usually associated together, and the ore must be treated to save both metals. When there is no silver of value, the ore is handled the same as the concentrates from the stamp mill. It is concentrated when it will permit. In such cases the ore is pulverized by the stamps or Cornish rolls; rolls seem to be preferred as the product is in a more even and better condition for concentration.

We now come to the treatment of the general ores carrying gold and silver mixed with iron sulphurets, copper sulphurets or galena.

Smelting or matting will handle all ores. But by this means the object in view is only half accomplished; the precious metals do not come out of the furnace pure and ready for use, but are associated with some base metal as carrier, from which they must be separated. The aim in smelting is to make the gangue melt and be thin enough for the valuable metals to collect and settle to the bottom. The ore will not melt by itself without such extreme heat as to endanger loss of value by volatilization, so the proper ingredients are added to obtain a fusion at a moderate temperature; this is called fluxing, the materials added being called fluxes.

Smelting is classified according to the carrier used to collect the gold and silver, being lead smelting, copper matting and iron matting or pyritic. Lead and copper smelting methods merge into each other, for now at many places they are both accomplished in the same furnace at the same time, while on the other hand copper and pyritic smelting pass imperceptibly from one into the other.

Lead smelting or the use of lead as a carrier is the old reliable and today is in most general use. It is the one place where all ores are taken excepting possibly some high grade copper oxide or carbonates, and they can be handled by other means, although they can be used in small quantities at a time at the lead smelter. It was not many years ago when the lead furnace superintendent would refuse a great many so-called base ores. This term has a different meaning when used in the various branches of mining. A free gold man, in speaking of a base ore, means one from which he cannot extract the gold by mercury. To the smelter foreman it is the ore containing metals which interfere with his saving value. Zinc and antimony are base

ores for the lead furnace. Ores which were refused a few years ago are today readily taken. Before long the term base ores will not be in use. There is now a company in the field claiming that by the use of their furnace zinc is an aid instead of a detriment.

We will now start with an ore at the mine and carry it through the lead smelter.

At the mine the owner has three grades of ore, shipping, concentrating and refuse. His shipping ore is either the pay streak, which breaks down clean without any poor material being mixed with it, or is separated by sorting, which is selecting the high grade for shipping, using the hammer for breaking when necessary, placing the balance with the second grade or throwing it over the dump down the ravine as refuse.

This seemingly simple point is in fact one of the important ones about a mine. A well-trained man is necessary for the position. He must have a quick perception and be one who studies his ores. Every variety of ore should be tested for him. He should not only know that a certain appearing piece carries value, but how that value is there, whether as ruby silver, in the gray copper, with the lead, carried with one of the sulphurets or some of the dozen more combinations possible. Many a mine has had thousands of dollars thrown down the ravine from careless sorting by men who "knew ore."

While at the mine, the second grade had better be treated, if low grade, but with a small percentage of mineral, it can be concentrated the same as the sulphurets of a gold ore as mentioned. In concentrating, the ore must be thoroughly understood as to where the value lies to know what to save and how to crush. Some minerals of high value are brittle, pulverizing easily and if not correctly handled the value will be lost. An ore high in sulphurets but of low value can only be treated by some of the cheap processes of the future; it cannot be concentrated by mechanical means. Ore that cannot be put three or more into one is not worth doing anything with, as the loss and cost equal the gain. Galena, iron and copper sulphurets handle nicely.

The concentrates are sacked and shipped with the regular ore to the smelter. Upon arrival, it is weighed and the ore shoveled into an ore breaker. Coming from this, it is shoveled into cars or conveyors, every tenth shovelful being thrown aside as a sample. If the concentrates are a large shipment, every tenth sack is set aside as a sample. The ore sample is crushed again and taken to a sampling floor, thoroughly mixed and cut into quarters, the two diagonal quarters taken, the other two thrown away. The part saved is remixed and quartered again and this process is continued until there is about 100 pounds, when it is quartered and the two halves sacked. One half is labeled and put away for future reference in case of a dispute. The balance is taken to the sampling room, crushed finer and quartered down to between one and two pounds, when it is dried, pulverized to pass an eighty-mesh screen and sent on to the assay room, where, after thorough mixing, it is divided into three samples, one for the smelter, one for the seller and the third to be sent to a reliable assayer as umpire in case of a disagreement. The assays usually check (agree) but sometimes a shipment will have to be resampled and it occasionally takes a year to settle satisfactorily to both parties.

All samples are tested by the smelter for gold, silver, lead, copper, iron, lime, zinc, silica and antimony when present. The ore is not put in the furnace and the seller paid for the ounces of gold and silver extracted, but he is paid entirely upon the assay of sample taken. Part of a shipment may not be smelted for two or three months after receipt and then never smelted in the furnace alone. As stated, each ore must be fluxed. In lead smelting this is the proper combination of silica, iron and lime. To the superintendent the ore has four parts, precious metals, valuable base metals, worthless base metals and the gangue. Saving the highest percentage of value at the least cost is his aim. Ores are bought which can be mixed and the proper combination of silica, iron and lime obtained if possible, for by so doing so much ore is being melted instead of the same amount of dead flux, which must be added in case of a deficiency; iron ore for the lack of iron, limestone for the lime, and quartz for silica. In most cases there is an excess of silica, which necessitates the purchase of iron and lime. The smelting charges are made accordingly. A fixed rate is made on a neutral basis: when the silica equals the iron and lime. When the silica is in excess a charge of 15 cents per each unit in excess is made, but 15 cents is paid for each unit the iron and lime are in excess of the silica. In regard to the detrimental metals, zinc and antimony, a limit is established, in the amount allowed in an ore (at present in Washington this limit is 10 per cent.). Below this limit the ore is treated without extra cost, but above that an additional charge of 50 cents for each per cent. in excess—a 12 per cent. zinc ore would cost $1 extra.

In making up his mix, the metallurgist adds a certain per cent. of galena for a carrier to save the gold and silver. About 12 per cent. is used now.

Most of the iron occurs in the ores as sulphurets. The sulphur in a lead smelter is out of place and must be eliminated by roasting. In roasting, what it takes nature years to do man accomplishes in a few hours. When she finishes, there is left the red streak of iron stain on the mountain side, by which the prospector spots his ledge.

All parts of the charge, ore, flux and fuel, which is usually coke, are weighed and fed in regularly at the top of the furnace, a force draft being used to keep up the combustion. The process is continuous, the slag being drawn off from one point at regular intervals, while the lead is taken out at a lower point when necessary. From January to January, it stops not except for an accident, which, if it stops the furnace, is quite expensive. The lead bullion is now ready for the refinery, where the gold, silver and lead are separated.

When there is copper in an ore that goes to a lead smelter, sufficient sulphur is left in the charge to form a copper sulphide or matte and the copper saved in the same form as in copper smelting. As all lead smelters buy ores carrying more or less copper, they save it in this way, putting them in with the regular ores, but ores without copper are preferred. This matte is drawn out with the slag, from which it separates on standing, for, being heavier, it settles to the bottom, and when cold it is broken off and saved.

In smelting there is a small loss, in the slag, from volatilization and in the dust. The last is mostly regained when good dust chambers are used, but the first and second, especially the first, it is the object of the superintendent to make as low as possible. They vary with the fluxing and the manipulation of the furnace.

One method of refining the lead bullion will be given. The bullion is melted in a large iron kettle with a certain percentage of zinc, the zinc having a greater affinity for the gold and silver than the lead. They liquate on cooling. The zinc with the gold and silver is taken off, and the lead again treated. When the lead has given up all the precious metal, it will contain some zinc, from which it is freed in a cupel furnace, and is then ready for market. The zinc is separated from the gold and silver in the cupel furnace by distillation and oxidation. The precious metals are placed in a sulphuric acid bath and heated, the silver passes into solution as silver sulphate, while the gold remains undissolved.

The silver solution is decanted, the gold washed, dried, melted and cast into bars. Pure copper sheets are suspended in the silver sulphate and by metathesis we obtain metallic silver and copper sulphate. When all of the silver is deposited it is washed, dried and melted and run into bars. The sulphate of copper solution is evaporated and crystallized. This is a large source of the blue vitriol of commerce.

The other forms of smelting are copper smelting and pyritic, alike in their products, both being mattes, a sulphide product having the precious metals dissolved in them. In consequence they need more of a subsequent treatment to yield a finished product. They verge into each other, varying from a matte high in copper with but little iron, to one mostly iron and a small amount of copper. A strictly iron matte can be made and is made at Deadwood, North Dakota, but as a rule a small amount of copper is desirable.

Pyritic smelting is designed to concentrate the value of pyritic or sulphide ores, by heat, using the sulphur as a part, if not all, of the fuel, fluxing away the gangue and the metals of no value. Part of the iron forms a sulphide, making with the copper sulphide the matte carrying the gold and silver with them. The process is in successful operation at a number of places, but it is not an easy plant to conduct. In fluxing, the range is greater than in lead smelting and theoretically it is quite simple, but practically it takes an experienced man to obtain good results. No preliminary roasting is needed, as the sulphur is used for the fuel.

The matte product will yield its value by three different treatments. A straight iron matte can be roasted and pan amalgamated the same as gold sulphurets are often treated. When there is sufficient copper to pay to save it is shipped to a lead smelter, roasted and treated the same as a sulphuret ore, the iron acting as a flux. The copper forms a copper matte, while the gold and silver are taken up by the lead. The arsenic and antimony are made use of in pyritic smelting, whereas in lead and copper furnaces they are obnoxious. They pass into the iron matte, forming arsenides, antimonides, sulpharsenides and sulphantimonides with the iron taking place of so much sulphur which may be used for fuel.

As the copper increases, we pass into copper smelting, which, though it in turn verges into lead smelting, the iron on one side and the lead on the other, still has its own necessities and is distinct.

Copper smelting is used to treat all copper ores and is simply one step in the concentration process which is taken, step by step, until metallic copper is obtained.

Copper occurs as native in a few places. This ore is treated quite simply, being crushed, concentrated, melted and cast into ingots. This copper ranked higher than that from other ores until electricity was introduced for refining.

Copper smelting, or matting, as it is usually called, because the product in most cases is a matte, has within the last few years made a great advance, the Americans being far in the lead.

The sulphuret ore must be roasted, as the extra sulphur is not used as fuel, but a small amount is necessary to unite with the copper and iron to make the matte. Roasting is conducted in a variety of ways, from the

cheap crude method of heap roast, known from antiquity, to the modern automatic reverberatory furnace.

The heap roast is made by properly piling the ore in heaps 24x46x6 upon a bed of fuel with correctly arranged draft holes and chimneys. Only sufficient fuel is used to get it under way, when the burning sulphur keeps it going. From sixty to seventy-five days are needed to burn a heap of this size. The product is an oxide of iron, oxide of copper, some copper sulphate with a small amount of unroasted material. When cool enough to handle, the mixture goes direct to the furnace. In the reverberatory furnace of today, the ore is pulverized and fed at one end, where a flame plays over it. The sulphur immediately begins to burn, and the material is now slowly moved along the furnace, getting hotter and hotter as it approaches the fire. Unless the melting is done in this furnace, it is withdrawn in the form of a powder, the sulphur all gone and the metals in the form of oxides. The most improved furnaces now have automatic stirrers and automatic dischargers.

In copper smelting it is not the object to get as high grade matte as possible, for two reasons—subsequent treatment can be conducted better and the precious metal saved closer. About a 40 per cent. matte is the first product. The fluxing is different from lead smelting in having a wider range as to slag, not being bound down to a fixed limit. The aim is to have a slag fluid enough for the matte to settle through and not too thin, or the matting will not be perfect.

The furnaces used are water jacket shells of copper, cast or wrought iron. Some brick ones are in use, but they are losing ground. The charge is fed continuously at the top and like the lead smelter there is not a stop except for accidents. During fusion the copper unites with the sulphur, making copper sulphide, the balance of the sulphur combines with iron and the two sulphides form the matte. The percentage of iron sulphide determines the grade of the matte and that is fixed by the amount of sulphur. When an excess of sulphur is allowed, it takes too much iron into the matte and robs the slag of necessary iron; if sulphur is deficient, the grade of the matte is too high and the slag gets the iron, making it too thin.

In the old style furnace the matte was allowed to settle to the bottom and was drawn off at intervals, as was also the slag, the matte being then refined by roasting and resmelting, slowly raising the grade by eliminating the sulphur and the iron until pig copper was obtained.

Today at the most advanced works the separating of the slag and matte is done in another furnace, a reverberatory hearth, where they are allowed to run in a molten state and kept so. The slag is tapped off and the matte maintained in a fluid state. As needed, it is conveyed to the large Bessemer converters, where the purification into metallic copper is accomplished in one operation, by burning out the impurities, the iron being carried into the slag. The copper is cast into large plates ready for electrolytic treatment for separating the gold, silver and the small traces of other metals. These large plates are suspended in a sulphuric acid bath as the anode, and a thin sheet of pure copper is the cathode. As the current is turned on the impure anode dissolves and perfectly pure copper deposits at the cathode. The gold, silver and impurities drop to the bottom of the tank.

In treating oxide and carbonate ores the product is black copper instead of matte. At times the raw sulphuret ores are smelted without roasting owing to certain conditions, but roasting is the rule. Nickel and cobalt, when in an ore, are saved in the copper matte.

Coming back to silver, there are two processes for treating exclusively silver ores which deserve mention. One, known as the Russell process, is used when the silver is as a chloride or bromide, soluble in a hypotyposulphite of soda solution. The silver is precipitated as a sulphide, which is washed, dried, melted and run into bricks. Some of the ores, such as sulphides, etc., can be converted into a chloride by roasting with salt or salt and copper sulphate. Then there is the old Mexican or Patio method of amalgamation, for the ores that are chlorides or can be converted into chlorides by roasting, as in the Russell process. The ground pulp in the form of a mud is placed in a Patio with mercury. In America a large amalgamating pan or barrel is used. The mixture is stirred and ground until the amalgamation is complete. The silver chloride is changed to metallic silver, which amalgamates. This silver amalgam is treated the same as gold amalgam. As worked in Mexico the process is crude, but it is used with great success there.

As to the new methods, it might be added, they are becoming as numerous as patent car couplers. Hundreds of mining and smelter men, electricians and inventors are working to solve the problem of a cheap means of extraction of the value from ores. Some are branching onto new lines, others trying to improve the old, bringing to their aid electricity; chlorine, bromine, cyanide and other chemical solvents together with new ideas in furnaces and heat producers, combining different methods with various results. The goal is a means by which a small plant can be placed, on the property, in the mountains, treat the ore there and treat it cheap. This would solve the problem for camps which today are at a standstill—ore, where lack of transportation facilities prohibits development; another having the railroad, but where the freight rate takes all the profit on the low grade ores. It would do away with trying to concentrate low grade material, where value is lost.

Only a very small amount of microcosmic salt is needed, not more than

and also treat ores of low value, but too high in sulphurets to be concentrated.

There are now in the West, to my knowledge, about a dozen of the revolutionizing processes, most of them claiming to extract the value for $1.50 a ton at the mine. Many of the same pass into history each year. Some one will solve the problem and for the man who does it there is an unlimited fortune awaiting him locked up in a stronger vault than any bank. Who will find the magic key?

At this writing no one has proven that he has such a process. Before this is with the reader, some one may achieve this end. If so, it will be a boon to the mining man of small means. It means wonders for Washington.

CYANIDE TREATMENT OF ORES.

By S. G. Dewsnap, Methow, Wash.

In the onward march of science and art, there is no branch which has made greater advancement within the past quarter of a century than the reduction of ores. This advance has been made in the improvement of old processes and the finding and adoption of new ones.

In the old processes the advance has been in machinery which rendered the processes more efficient in extracting a greater percentage of the value and in reducing the cost of treatment.

Among the new processes the treatment of ore by cyanide has made most rapid progress.

The cyanide process is based on the fact that gold and silver are soluble in a solution of cyanide of potassium or sodium in water.

"The discovery of this fact has been attributed to Hagen in 1806. Dr. Wright, of Birmingham, England, used cyanide of gold solution for electroplating in 1840."—Dr. Scheidel.

Since that time numerous experiments have been carried on with the idea of extracting gold and silver from ores by the use of cyanides, with other chemicals, electricity, etc., but it remained for John S. McArthur and Robert W. Forest to complete the process and adapt it to successful metallurgical operation. For this they received patents in the United States in 1889 and about the same time patents were taken out in nearly all other countries.

The scope of the process is a broad one, but by no means universal. Its application is limited to ores (by ores is meant native rock, bearing precious metals, whether in their natural state or as concentrates or tailings from other processes) which either have no decomposing action on the cyanide solution or can by a preliminary treatment be rendered inactive to the cyanide solution. Gold and silver exist in ores in many different forms and combinations. From some of these combinations cyanide solution will dissolve the gold and silver and from others it will not. There are in some cases mechanical difficulties in the way of treatment of an ore by this process, as a tendency to slime, rendering it almost impossible to pass the liquid solution through the ore mass. This renders the operation so slow as to require the plant to be of such large proportions that it would become unprofitable, even when a very high percentage of the value is extractable by the solutions.

However, ores that are adapted to the process can be treated by it at a much less cost than by any other known process. Ores in which gold exists as metalics, but in such a state of division that it is impossible to amalgamate it, yield excellent results from cyanide treatment. Many sulphide and arsenide ores give up their gold and silver to cyanide solution without changing the sulphides in any way.

The principal chemical reaction upon which the process rests is the formation of double cyanides of gold or silver and the alkaline metal. These double salts are soluble in water and when formed can be washed out of the ore. The following formulae represent the reactions in their simplest forms:

2 Au	+	4 K C N	+	O	+	H_2O	=	2 Au K $(CN)_2$	+	2 K O H
Gold		Potassium cyanide		Oxygen		Water		Cyanide of gold and potassium		Caustic Potash
2 Ag	+	4 K C N	+	O	+	H_2O	=	2 Ag K $(CN)_2$	+	2 K O H
Silver		Potassium cyanide		Oxygen		Water		Cyanide of silver and potassium		Caustic Potash

While these reactions are taking place, there are many more reactions going on with the other metals and minerals of the ore, which complicate the result. According to this equation, 15.12 parts of gold should be dissolved for each ten parts of cyanide decomposed, while in the best works by actual test from forty to forty-five parts of cyanide are decomposed for one part of gold extracted. This difference is to be accounted for by many reactions which take place between the cyanide solution and the ingredients of the ore, the water and the air. Some salts of iron, alumina, manganese, magnesium and

copper, which are found in all precious metal ores to a greater or less extent, have some decomposing action on the cyanide solution.

The solution of cyanide in passing from a very dilute to a strong solution passes a point at which it has its maximum power to dissolve gold. This is probably due to the fact that a strong solution has no power to dissolve oxygen gas from the air, which is essential to the reaction between the cyanide and the gold. The strength found most efficient differs with different ores from one-tenth to six-tenths of 1 per cent., i. e., from one pound to six pounds of cyanide of potassium to 1,000 pounds of water. When the value of the ore is in silver, the solution has to be stronger than when the ore value is in gold.

The solutions are separated from the ore by percolation or filtration, and the precious metals recovered from the solutions by precipitation by metallic zinc or alumina. The following formula will illustrate the chemical reaction:

$2\,Au\,K\,(C\,N)_2$	+	Zu	=	$Zn\,K_2\,(C\,N)_4$	+	2 Au
Cyanide of gold and potassium		Zinc		Cyanide of zinc and potassium		Gold

According to this formula, one ounce of zinc should precipitate about six ounces of gold, but in practice it requires six to twelve ounces of zinc to precipitate one ounce of gold. This solution of zinc is due to the caustic potash generated in the solution, as indicated by previous reaction, and also by other reaction due to other ore ingredients. The gold precipitated is never pure, but contains impurities carried into the solution by the cyanide and by the caustic potash and which are precipitated along with the gold and silver. When zinc is used as a precipitant, some of this always remains with the gold, as well as some slimes which are mechanically carried along with current of solution. The precipitated gold is treated with acid to remove zinc or other soluble impurities; is dried, roasted and smelted with the proper fluxes, and cast into bars.

As no two ores are treated in exactly the same way to yield best results, so the methods of procedure differ at different works. In general, the ore must be in a sufficient state of division for the solution to come in contact with the gold. The coarser the ore can be ground and attain this end the better, because the easier it can be percolated. Ores differ greatly in the grinding necessary; the proper fineness can only be determined by careful laboratory experiment.

The ground ore is treated either by agitation or by percolation.

In the agitation process, the ore is placed with the necessary solution, either in a vat with a power stirring apparatus, or in a revolving cylinder or movable box, and kept in motion for some hours until the cyanide solution has dissolved all the precious metal that the ore will yield to it. The charge is then transferred to a filter and filtered and washed, first with a weaker solution of cyanide and lastly with water. The filtrate and first washings are passed through the zinc boxes for the precipitation of the gold and silver they contain, and then passed to the storage tanks to be renewed by adding enough fresh cyanide to bring them to the proper strength. The quantities of ore operated on are small and the time required much shorter than with the percolation process. Agitation is adapted to the treatment of high grade concentrates and rich slimes.

In the percolation process the pulverized ore or tailings is charged into vats with filtering bottoms, care being taken to distribute the ore as uniformly as possible. The cyanide solution is run on in sufficient quantity to cover the ore and it slowly filters through the charge and passes to the precipitation boxes and the storage tank to be renewed and again passed through the charge. It is usual to use comparatively strong solution for the first percolation and to follow by weaker solutions until they are finally washed once or twice with water to remove any of the solutions remaining in the ore. Much time is needed for the slow passage of these solutions, so that economy requires that the vats be large. The rapidity with which a solution will penetrate depends entirely on the character and condition of the ore. If the ore be coarse ground and free from slimes, thirty to fifty hours will suffice to work off a vat of ore, but ordinarily the time required will be from three days to two weeks. The size of the vats depends on the amount of ore to be treated and the time required for the treatment of any given ore. In many instances the ore has to undergo a previous treatment to remove substances which have a decomposing influence on cyanide. Ordinarily tailings which have been exposed to the weather are acid, due to the action of the oxygen of the air on the sulphur of the ore. This is removed by a washing with water or treatment with lime or soda. An excess of alkali added invariably causes a loss of zinc in the precipitation boxes.

The size of vats used in different parts of the world varies from 30 to 600 tons capacity and they are constructed of wood, brick, stone and cement or concrete. They are charged with ore from the top, ordinarily from cars dumping from overhead tracks. The vats are emptied either from a side or bottom opening, the tailings being shoveled into cars on a track below or where water is available, the tailings are sluiced or hydraulicked out. At the larger plants at the Rand (Witwatersrand) in South Africa, the tailings are handled by steam shovels or machine cranes and loaded into railway cars to

be discharged some distance from the mills. In this district over forty cyanide plants are at work on the tailings from the stamp mills, from which, during the first six months of 1894 317,950 ounces of gold, worth $4,769,250, was realized. Further, only about 60 per cent. of the tailings are treated by the cyanide process; the balance is slimes, which, owing to the difficulty of percolation, are allowed to run to waste.

The number of plants for the treatment of ore by this process is increasing in the United States and will increase more rapidly as more is known of the process. Many different devices have been tried for the recovery of the gold from the solution, but the greater part of it is now recovered by the use of zinc. The metallic zinc is shaved into very thin, loose shavings and these are placed on a perforated iron plate, two or three inches from the bottom of a box, which is twelve or fourteen inches square and about the same depth, and a series of twenty or more of these boxes are so arranged that the solution flows upward through each of them, i. e., the solution passes from the top of one box to the bottom of the next. The zinc is renewed as fast as dissolved by passing forward and putting new zinc in the last box. The precious metal comes down as a brown or black slimy precipitate. This precipitate is removed from time to time by changing the flow of the solution to another set of boxes, while the one set is cleaned up, and the precipitated bullion washed, dried, refined and melted into bars. These boxes are usually made of wood, but sometimes of iron.

The refining is done by placing the dried precipitate on the smooth hearth of a small reverberatory furnace and giving it a thorough roasting. It is then charged with a mixture of borax, soda and nitre into black lead crucibles, where it melts down and the base metals are oxidized and removed by the slag. By proper treatment bullion from 850 to 950 fine is obtained. Ordinarily the bullion is about 780 fine.

The causes of loss of gold in treatment by this process are many and too careful management of the plant cannot be had. These losses occur by leakage of solution, by imperfect washing of the tailings, loss of cyanide by decomposing action of the ore or the water, loss of zinc by alkaline solutions, loss of fine particles of the precipitated gold by being carried away by air currents during the process of drying, refining and smelting.

The cost of the process is variable within certain limits. For ore in which the value is principally gold, treated at American works, it ranges from $1 to $5 per ton. The average of twenty-three lots of ore handled by different works gives the cost as $2.30½ per ton.

The cost of a plant is given by Dr. A. Scheidel, in Bulletin No. 5, published by the California State Mining Bureau, as: "For a plant of fifty tons per day capacity, $25,000; a 100-ton plant, about $40,000. At Johannesburg, South Africa, at $6.25 for each ton of ore it is intended to treat per month."

"The general arrangement of the plant may be of different kinds. The most convenient method is to have solution vats, leaching vats, extractors, and dumps in four tiers, so that each series may be completely drained into that next below it. By this means sufficient solution can be stored in the solution vats, and sufficient room left in the dumps to enable work to proceed for from twelve to twenty-four hours without pumping. Many plants, however, have the solution vats and dumps on the same level as the leaching vats. In this case the solution issuing from the leaching vats is passed through the precipitation boxes into a small tank and is continually pumped back as required." See "Notes on Gold Extraction by Means of Cyanide of Potassium, as Carried Out on the Witwatersrand Gold Fields," by W. R. Feldmann.

Laboratory Work.—The most important part, viz., the determination of the fitness of an ore for cyanide treatment, is left till last, while in actual practice it is the beginning. The reasons why some ores will give up their precious metals to cyanide solutions while others will not have never been satisfactorily learned. The fact remains that under favorable circumstances some ores will give up all their gold and silver to the cyanide solution, others a part and others again none at all. The only way to determine whether they will yield their metal or not is to make careful laboratory tests on well selected samples. The writer first makes a preliminary test to determine if the ore is acted on by cyanide solution; if no solution of precious metal takes place, it is useless to go farther. If such solution takes place, then a number of experiments are made to determine if there are substances in the ore which decompose the cyanide solution, and, if so, the cheapest method of getting rid of them—washing them out or neutralizing them. Then follows the determination of the proper strength of solution to give most economic results as related to time required and to the fineness of crushing necessary.

The treatment of cyanide is a chemical process and to undertake the process without chemical knowledge of it is sure of failure. In the operation of a cyanide plant there is constant employment for a good chemist. Careful analysis should be constantly made to insure uniform good results. There is no other process in which so great an advancement is likely to result from patient investigation.

That a very considerable number of the ores of Washington can be treated by this process to advantage the near future will demonstrate. Many ores which cannot now be treated by this process will yield their metal when the conditions which operate in the treatment and the reactions which take place are better understood.

BLOWPIPE ANALYSIS.

By Charles H. Bebb, of Seattle.

The ever-increasing development of the mineral resources of the state of Washington and adjacent territory has naturally attracted a number of men who are daily exploring unknown ground in search of the precious metals. Many of them are old prospectors, but many more are enterprising adventurers to whom the prizes to be won in the gold fields are always an attraction.

It is for the latter class that this article is primarily intended, and its scope does not pretend to be more than enough to enable a man of average intelligence, with the fewest and simplest of appliances, to determine the presence or absence in a sample of ore under examination of gold, silver, copper or lead. He should also be able to determine, by comparing the result of his assays with the whole amount tested, the comparative richness of the ore. He should remember, however, that for anything like exact quantitative work with the blow-pipe months of study and laboratory work are necessary.

The common blowpipe is a curved conical tube of metal, usually brass, terminating in an orifice as large as a fine needle; simple as it is, if well made, it will be found to answer fairly well, as far as the purposes of this article are concerned.

The ordinary form of blowpipe is shown in figure 1, although the danger of moisture collecting in the tube and being thence blown into the flame is materially lessened by cutting the pipe in two at the point marked (a), fitting a perforated cork over the small end and inserting it firmly in the wider as shown in (b) figure 1.

The chemical blowpipe is similar to the common blowpipe in principle, except that it has a chamber near the end which collects the condensed moisture. This chamber is shown at A in figure 2. It also has movable jets, shown in figure B, that fit on the arm at C, which can readily be taken off and cleaned.

Where possible, one should have the chemical blowpipe, but where it cannot be obtained, or becomes injured in any manner, a contrivance similar to that shown in figure 1 affords a fair substitute.

After obtaining a blowpipe, the beginner must spend a few hours in learning the proper method of blowing. His object will be to maintain a steady or uninterrupted stream of air from the jet for several minutes at a time. This is not so difficult as would appear at first. Distend the cheeks and breathe slowly through the nose for some time, keeping the cheeks inflated and the mouth shut. When one can accomplish this readily, the mouth piece may be applied to the lips, and the operation repeated, without attempting to blow, or do more than keep the mouth full of air. As the air flows out through the blowpipe, the cheeks fall together and must be again distended without interrupting the flow of air through the tube. To accomplish this, shut the communication between the mouth and lungs by the palate and inhale through the nose. No energy should be wasted in hard blowing, for the beginner will soon see that the stream of air may be maintained with scarcely more force than is supplied by the natural tendency of the inflated cheeks to collapse.

Where obtainable, gas is the most convenient combustible for the blowpipe flame, but rape seed oil in a lamp (figure 3) is the best for general use, as it can be packed in small compass and weighs but little. Candles may also be used when no better material is at hand, and of these high grade stearine are the best, for paraffine candles, although giving a higher heat, are apt to soften in warm weather. In some instances even tallow candles will answer, but they require constant snuffing.

In an ordinary flame, as from a lamp or candle, the combustion only takes place on the outer rim of the flame. When a stream of air is blown into it from a blowpipe, however, the combustion takes place in the interior, is more complete, and an intense heat is produced. When the beginner can maintain a steady stream of air for several minutes he should seat himself at a table with his arm resting on the edge, and the lamp lighted and trimmed, so as to produce a full, steady, but not a smoky, flame, slightly to the left of his face. He should then hold the blowpipe lightly between the thumb and first and second fingers of his right hand, and direct the jet or small end to the edge of the flame just above the wick. By regulating the blowing a steady flame should be produced which will be regular and conical if the jet be well shaped.

When the lamp burns, the oil is sucked up by the wick and vaporized. These vapors unite with the oxygen in the air and burn on the outer edge of the flame, forming a hot coat—a, b, c in figure 4.

As the oxygen does not penetrate inside this coat, the vapors within are highly heated out of contact with the air, and any metallic oxide placed

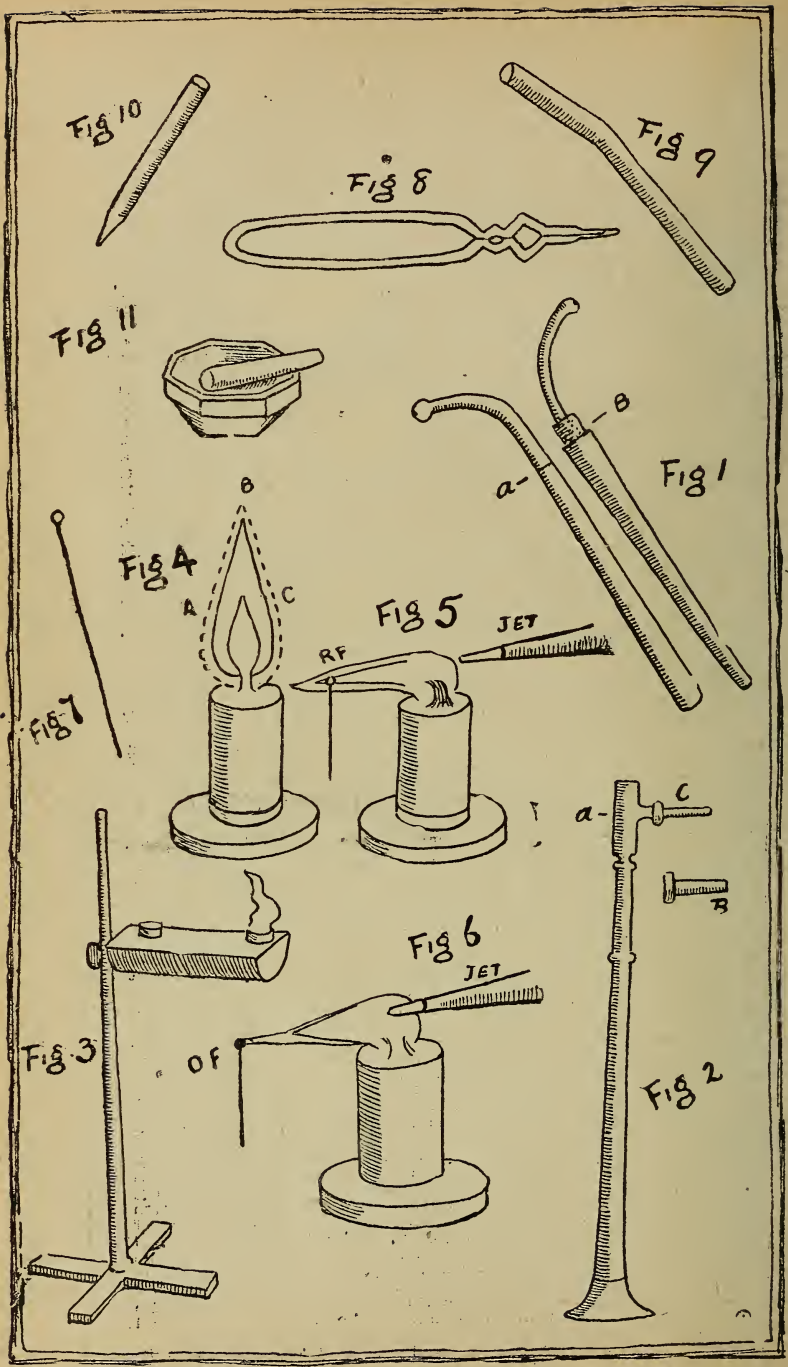


Fig 10
Fig 9
Fig 8
Fig 11
B
a
Fig 1
B
A
C
Fig 4
Fig 5
JET
RF
Fig 7
a
C
B
Fig 6
JET
OF
Fig 3
Fig 2

within it will, when hot, tend to part with its oxygen to the carbon and hydrocarbons of the flame. This flame is known in blowpipe analysis as the "reducing flame," abbreviated to "R. F." Figure 5 shows how it is produced with the blowpipe, the whole flame being deflected by a gentle blast so regulated that it maintains its yellow color and is luminous. As shown in figure 5, the jet is outside of the flame. No soot should be deposited on the assay and only the extremity of the luminous part should envelop it.

The other flame used in blowpipe analysis is known as the oxidizing flame abbreviated to "O. F.," and the manner of producing it with the blowpipe is shown in figure 6. As is there shown, the jet is thrust somewhat into the flame, the blast made a little stronger, and the carbon more completely consumed. The inner blue cone of the flame is sharply defined and is surrounded by a nearly colorless envelope, corresponding to the coating a, b, c, in figure 4, at the extremity of which metals may be intensely heated in contact with the air, and rapidly oxidized. No luminous streaks should be allowed to appear in the flame, and assay should be kept as far from the blue point of the flame as is consistent with a temperature high enough for rapid oxidation.

Before passing from the subject of the flame, it must be remembered that the heat is most intense at the tip of the blue cone just referred to and this is used to test the fusibility of substances without regard to chemical action.

For the purposes of this article but five methods of supporting the assay, or "supports," as they are technically termed, may be considered—charcoal, platinum, wire and forceps and open and closed glass tubes. Charcoal should be made from basswood, pine or willow and should be of even texture and cut into rectangular blocks from one to three inches in width, the same in thickness and not to exceed six inches in length. The assay should be placed either on a flat surface, or in a cavity prepared for it at right angles to the rings of growth.

When an excavation is made for the reception of the assay, it should be cup-shaped, shallow, smooth and regular. This may be effected by picking a hole in the charcoal with a knife, and revolving in it the rounded end of the agate pestle.

Platinum wire is used for supporting beads made from fluxes. The size known as No. 27 Jewellers' hole 12½ is best. It should be cut in pieces three inches long and a loop made in one end similar to that shown in figure 7. Care should be taken that the loop is no larger than the actual size shown in the figure when an oil lamp is used, although it should be not more than half the size when a candle is employed. After using, the looped ends should be thrust in a bottle of sulphuric acid, and before use they should be rinsed with water and thoroughly cleansed.

Platinum forceps of a shape shown in figure 8 can be readily made by any jeweller from elastic brass wire, the tips being made of platinum wire hammered, or soldered, or riveted on for holding splinters of substances in the flame to ascertain their fusibility and the color imparted to the flame.

Open Tubes.—A piece of straight glass tubing not exceeding one-quarter of an inch in diameter and slightly bent as shown in figure 9, about one inch from the end. This slight angle helps to prevent the assay from falling out.

Closed Tubes.—A closed tube may be readily made by heating an open tube (six inches long) in the middle and drawing it out. Thus two closed tubes three inches in length are formed. The ordinary shape is shown in figure 13.

In addition to the above-named articles a certain amount of accessory apparatus is necessary, including:

An agate pestle and mortar, to be used for reducing ores to a fine powder, but it should be used for grinding only, never for pounding hard bodies. Its shape is given in figure 11.

A four-ounce hammer.

A small retangular block of hardened steel to be used as an anvil. On this, after first wrapping them in stout paper, the harder ores may be pounded into pieces of suitable size for grinding in the agate mortar.

A dozen test tubes of hard glass of standard size.

Substances used to produce chemical changes in bodies by which they are recognized are known as blowpipe re-agents or fluxes. But small quantities are needed and it is best to purchase them from responsible druggists so as to be sure of their purity. Those most commonly employed and the only ones necessary to be mentioned in this article are sodium carbonate, hereafter spoken of as soda, biborate of soda, or borax and phosphate of soda, and ammonia or microcosmic salt.

Two ounces of soda will be ample to have on hand at a time and it should be kept in a glass-stoppered bottle, so as not to absorb moisture from the air.

The same quantity of ordinary commercial borax is sufficient and is ordinarily pure enough, but it is always best to heat a loop of platinum wire, dip it in the borax and fuse it to a bead in R. F. and then heat it in O. F., examine the bead when hot and when cold, after heating in each flame, and if the bead remains perfectly colorless and transparent, the borax is pure.

half an ounce, and it, like soda and borax, should be kept in a tightly stoppered bottle and labelled.

Pure or "test lead" must also be purchased. Eight ounces will be sufficient.

Finely pulverized bone ash for making cupels, as will be hereafter explained, must be bought; eight ounces will be sufficient.

The beginner's list of apparatus may be concluded with a two-ounce glass stoppered bottle of fuming hydrochloric acid, one of concentrated sulphuric acid and one of pure nitric acid.

Let us suppose that the beginner has procured the articles already enumerated, and has obtained a measure of proficiency in the use of the blowpipe. He has found, or there has been given him, a piece of rock which by its weight or by the appearance of minerals with metallic lustre contained in it, he suspects to be rich in valuable metals. How shall he proceed to determine whether it contains gold, silver, copper or lead, or all, or none of these elements? Also which ones, if any, are present in sufficient quantities to constitute rich ore. Where possible, a sample of ore weighing at least two pounds should be taken and cracked into fragments the size of a hickory nut. Three of these should be taken at random, and further crushed into particles the size of an apple seed. Half of this should be taken, wrapped in clean paper, labelled and laid aside. The remaining half should be wrapped in stout paper and further crushed on the steel anvil, after which it should be finely pulverized in the agate mortar, and also wrapped, labelled, and laid aside.

Suppose, for example, that it is desired to test the fragment under examination for gold and silver. A piece of charcoal is slightly bored, as described before, and a small portion of the pulverized mineral is placed in the bottom of the cavity. The lamp and stand are placed in front of the operator slightly to the left. The lamp is inclined downward to the left so that the O. F. envelopes the assay, which is held below and to the left of the lamp.

The assay, after roasting, as described hereafter, should be kept in the O. F. for several minutes, when if none but volatile metals are associated with the gold, the former will be driven off, and on examination with a magnifying glass a minute malleable gold colored globule will be found at the bottom of the cavity. While being heated, the gold assumes a peculiar greenish hue resembling melted copper. It is a good plan to add a small portion of borax and continue the flame for a few minutes to remove traces of oxidizing metals and brighten the globule. A little soda may also be added, as it hastens the elimination of sulphur and arsenic, if present in small quantities.

When gold is present, but associated with reducible metals, such as silver or copper, the gold must be reduced by a process known as cupellation.

Prepare a piece of charcoal as before described, except that the cavity should be slightly deeper. Place a small portion of the assay in the bottom of the cavity together with six or seven parts of test lead, and one to two parts of powdered borax glass (in proportion to the amount of the assay). Raise the wick of the lamp so that the flame smokes slightly, and turn upon the assay a moderate R. F. As soon as the globules of lead begin to run together, the whole assay should be covered with a hot R. F. The object of the operation is to collect the gold and silver, if any be present, together with all the reducible metals, into one globule with the lead, and volatilize or slag off any others. It is readily seen that the top of the assay may be easily heated, but in order to properly heat the bottom the assay must be turned over. This cannot be done if any lead is oxidized and dissolved in the melted body, for the latter will then stick to the charcoal. It is thus apparent that great care must be exercised, particularly in the beginning of the process, to keep the assay always under R. F. After about two minutes in the reducing flame, the gold and reducible metals are collected into a "button" with the lead, and the flame is then changed to a pointed O. F. and directed upon the button. The latter bubbles and boils actively under the flame for another two minutes, during which time all sulphur, antimony or arsenic present in the original ore is removed. The lead button is then poured out on the anvil, freed from slag, if any adheres, and is ready for cupellation.

For cupelling, a smooth cavity is bored in the charcoal a quarter of an inch in depth and five-eighths of an inch in diameter at the top, gradually decreasing towards the bottom so as to render it cup-shaped. A small amount of bone ash is then mixed into a paste with water and pressed into the cavity with the broad end of the agate pestle, so as to leave the bone-ash surface slightly concave and nearly even with the coal. The bone ash is then heated slowly to redness in the O. F. to remove any trace of moisture, and the lead button is placed in the cupel so formed, the O. F. directed upon it. When the lead button has become fused, the coal cavity is brought nearly vertical, and the O. F. is directed on the bone ash, just in front of the button, rather than on the button itself, so that the ash may be hot enough to absorb the fused litharge, none of which must remain on the surface of the cupel. By a proper direction of the flame and turning of the charcoal, the button is slowly driven about until a considerable amount of silver is shown by a play of colors

due to the film of litharge. In the course of the next few seconds the lead button, previously red hot but not very lustrous, becomes bright and fixed in the cupel. This fixing should occur on a portion of the cupel on which the button has not previously rested, and the brightening is more effectual if at the last moment the button is almost touched with the tip of the R. F. to remove any trace of litharge. After it becomes bright, the button is slowly removed from the flame and examined with the magnifying glass to detect any film of litharge which would give the silver-white lustrous button a yellowish tinge. Gold, if present in sufficient quantity, would give a yellowish hue to the button. This should not be confounded, however, with the yellow due to the film of oxide of lead, which latter is at once removed by treating the assay for a few seconds in the R. F. If on the contrary the color is due to gold, it will remain unchanged in the R. F. A large button should not be cooled rapidly, as it is apt to "sprout" or throw out branch-like projections, thus losing silver. If heated too strongly after brightening, the button loses silver by a combination with lead oxide, forming a rose-colored coating on the cupel. This latter, however, must not be mistaken for the bright orange red coating frequently formed by the litharge alone near the rim of the cupel. Should the button have a pure deep gold color it may, for the purposes of this article, be considered pure gold, as 2 per cent. of silver will give gold a brass yellow color, and a comparatively white globule may contain as large a percentage of gold, as 40 per cent. It is therefore necessary to separate the silver from the gold.

When gold is present in an amount not to exceed the proportion of one part of gold to two and one-half parts of silver, it is separated by a process known as "parting." The globule is heated with moderately strong nitric acid, and all the silver is dissolved, leaving the gold a dark residue. Even if the button, after fixing and brightening, is silver-white and lustrous, it may still contain 4 per cent. of gold, and therefore all globules obtained from cupel action should be parted, and in order to be on the safe side an amount of pure silver should be added and fused with borax glass on charcoal along with the globule, varying from two and one-half times the weight of the button in cases of a brass-yellow globule to half the weight in that of a silver-white globule. In this fusion a moderate R. F. should be used and directed upon the glass until the metals are well fused and thoroughly mixed.

The resulting globule should be gently heated in a test tube with diluted (three-quarter strength) nitric acid and the silver dissolved out, leaving the gold in a dark brown or black spongy mass or in separate particles.

The cessation of bubbles indicates that the silver has been dissolved and the acid should then be boiled a short time, the solution poured off and the proportion of gold present estimated from the amount left in the test tube in comparison with the whole amount tested.

After a portion of the ore under examination has been tested as described in the preceding sections for gold and silver, take in the platinum forceps a small part of the rock that has been put aside and labeled, moisten it with hydrochloric acid, and heat it in the flame. The latter should be colored a beautiful blue if copper be present.

If this reaction is not obtained, a small amount of the powder should be used to saturate a bead of microcosmic salt on platinum wire and adding chloride of sodium (salt), when the blue flame should result if copper be present in appreciable quantities.

When the presence of copper is ascertained, a small portion of the fine powder is mixed with three times its volume of soda and a little water into a stiff paste. A moderately deep cavity is then made in a piece of charcoal and the bottom covered with this paste. After two or three minutes treatment with a strong R. F., if the substance is not readily fused the assay may be cooled and powdered and a little more soda added. On a second treatment one or more metallic buttons should have been collected, which can be separated by a knife-blade from any slag or fused soda that has not sunk into the coal.

The metallic globules so reduced are either pure copper or an alloy with other reducible metals.

Where the globule is pure copper, the surface is often darkened, but may be brightened and a copper color obtained. If rubbing fails to show the true color of copper or one of its alloys, the globule should be heated for a minute or two in the inner edge of the O. F. and, when cooled, hammered out and rubbed.

If then the true color is not obtained, but the globule is still dark, add a small portion of borax and treat it again in the O. F. to brighten and remove traces of sulphur. Too short a treatment of soda in the beginning is often a cause of failure to beginners in this test.

Although copper and most of its compounds are easily reducible by the above process, if the presence of copper is ascertained by coloration of the flame in the platinum forceps, or with microcosmic salt, but cannot be reduced to a metallic globule, the ore is probably a sulphide, arsenide, or selenide of copper and should be first roasted. To roast the powder, make a wide, shallow cavity in a piece of charcoal and spread over it a layer of the powdered substance, pressing it down gently with the end of the agate pestle.

Heat gently at first with the O. F. to avoid fusing and then bring it to a low red heat until the garlic fumes of arsenic or sulphur fumes are no longer perceptible. Then treat alternately in the O. F. and R. F. until no fumes escape. The powder will then usually form a crust, which should be carefully turned with a knife-blade and the bottom treated in the same manner.

After portions of the ore under examination have been tested for silver, gold and copper, as before described, a small portion of the powder is placed in a shallow cavity on charcoal and the lamp turned downward, so that the flame can be directed downward upon it. In the O. F. lead is volatile and in the R. F. is is also volatile and colors the flame an azure blue.

Near the assay a dark yellow lemon coat is left on the charcoal, while at a distance the coating is sulphur yellow. Lead fuses easily, and when sulphide or chloride are heated before the blowpipe on charcoal, they fuse and deposit a white coating outside of the yellow coat above described. The white coat is volatile in R. F. and tinges it blue.

Lead in metallic globules may be readily obtained from its oxides and most of its salts by the reduction tests before described. The globule is a light bluish gray in color, malleable and soft. The characteristic reactions are the coatings it gives the coal and the azure blue tinge it imparts to the R. F. Lead is easily volatilized and very fusible, yielding a metallic globule very readily, so that care must be taken to continue the heating no longer than necessary to obtain the metal. When lead is reduced on charcoal, it may safely be said that the first globule to appear is lead, and the assay may be cooled and the globule or globules may be detached from the slag and unfused portions with the knife blade. Their weight compared to that of the assay will determine the proportion of lead in the ore.

LIST OF APPARATUS.

1 common blowpipe (brass).
1 blowpipe lamp and stand.
1 pint rape seed oil.
½ dozen wicks to fit lamp.
1 mortar and pestle.
1 dozen standard size blowpipe charcoal.
3 pieces platinum wire 3 inches long, jewelers' No. 12½ hole.
1 pair brass wire forceps, platinum tips.
1 4 ounce hammer.
1 piece 1½x1½x3-inch hardened steel.
1 dozen ¼ test tubes, 6 inches long, of hardened glass.
1 magnifying glass, double lens.
1 roll stout wrapping paper (5 yds).

CHEMICALS.

2 ounces biborate soda.
2 ounces bicarbonate soda.
1 ounce microsmic salts.
2 ounces concentrated sulphuric acid.
2 ounces concentrated nitric acid.
2 ounces concentrated hydrochloric acid.
(All in glass-stoppered bottles.)
8 ounces pure test lead.
2 ounces pure silver.
8 ounces finely powdered bone ash.

[THE END.]

In submitting for your consideration the plan of The Co-operative Mining Syndicate, I desire to call your attention to its economical, safe and popular methods of accumulating money for the development of mining property, and the equitable division of the profits derived from its successful investment.

"When men of small means found out that a business enterprise which no one of them could conduct alone, was possible for them by uniting their labor and their capital, they discovered the secret of co-operation."

The plan is neither new nor untried, and is based upon the soundest business principles. No mining company can be safer or sounder. No obligations are assumed beyond such as can be absolutely met. The Syndicate is purely co-operative, and each member is interested in all the assets in proportion to the number of shares of stock he holds.

OBJECT.—The Co-operative Mining Syndicate is organized with the object in view:

First—To furnish a convenient and economical method of accumulating, and a safe, scientific and profitable method of investing the funds intrusted to it, in the development of the wonderfully rich mining resources of the state of Washington and British Columbia.

Second—To arrange its plan of operation so that the golden opportunity to realize handsome profits is within the reach of all, the poor and the rich alike.

Third—To keep the wealth of our mines at home rather than see it go to foreign countries.

Fourth—To buy and develop as many mines as can be economically worked, and thus entirely eliminate the uncertainty attendant on the development of one mine. In other words, by scattering our investments we are certain to secure one or more rich mines.

Fifth—To get the values out of the ground, instead of from fluctuations of stock, by which unwise plan Peter is so often robbed to pay Paul.

Sixth—To divide the profits among the people who furnish the money and the labor for the work, instead of giving the lion's share to so-called promoters.

PLAN OF OPERATION.—Members are all stockholders in The Syndicate, on an equitable basis, and pay for their stock by installments in small sums each month. Thus the capital is gathered together for investment. Each share of stock has a par value of $50. When The Syndicate has received from installments, and the pro rata share of profits due a share, a sufficient amount to equal its par value, the share is fully paid, and thereafter non-assessable, and entitled to its full pro rata share of the profits in cash.

All the investments of The Syndicate are made only after a thorough inspection by reliable experts, and the work of development done under the supervision of and by experienced miners. To do mining successfully requires experience. The mere finding of a piece of mineral-bearing rock does not prove that you have a mine, even if it does assay well. Without the knowledge and experience, the finder's own money and the money of his friends may be squandered without results, and his falsely raised hopes vanish.

EXPENSES.—The expenses of this Syndicate are paid out of the profits. No portion of the payments of the members can be used to pay office rent, or office expenses, or salaries to the officers or employes of The Syndicate, either directly or indirectly. Every cent must go to pay for property bought or to the employes engaged in developing that property, and their supplies. The officers are conservative and economical in the management of the affairs of the Syndicate. Large expenses mean small profits; but low expenses mean increased profits and satisfied members.

QUARTERLY EXAMINATION OF THE BOOKS OF THE SYNDICATE.—It is the duty of the advisory board to meet in January, April, July and October each year. They shall at each meeting appoint an auditing committee of three to examine the investments, books and accounts of the Syndicate and make a full sworn report of their investigation to all the members. This advisory board consists of twenty members, none of whom can be trustees. The board also will advise with the trustees as to purchase or sale of all properties.

WHO MAY BECOME MEMBERS.—Any person, upon subscribing for or in any way becoming the owner of a fraction of a share, or one or more shares of the stock of this Syndicate, shall become a member thereof, and as such shall be entitled to all the benefits and profits as prescribed by the articles of incorporation and by-laws. Provided that minors or corporations may become members and hold stock in the name of a trustee. Each stockholder or trustee, on receiving his certificate of stock, shall be considered as binding himself, in all respects, to comply with the articles of incorporation and by-laws, and all regulations adopted under them. Applications for stock must be made on a blank form furnished by The Syndicate.

PAYMENTS OF STOCK.—The stock of The Co-operative Mining Syndicate is divided into shares of $50 each, payable in installments. When the installments paid and profits credited amount to $50, the share is fully paid. No more installments will be required, and the share will receive its dividends thereafter in cash. The installments are:

Either $25.00 per share a year; or $12.50 per share every six months; or $6.25 per share every three months; or $2.00 per share every month.

The profits are credited on contributing stock only. The non-contributing stock is held in trust by three trustees for the benefit of all fully paid and contributing members. The terms of the trust agreement are such that the trustees shall divide all the profits accruing from premiums derived from the sale of this stock and all the dividends apportioned to this stock, share and share alike, among the members. Thus the unsold stock is pooled not for the benefit of all the promoters, but for the benefit of all the members who get all the dividends that accrue to it, as well as its advance in value.

All shares earn pro-rata dividends or profits, and all dividends are divided share and share alike.

PAYMENTS ON CONTRACTS NON-FORFEITABLE.

The payments made on a contract to purchase stock in the Co-operative Mining Syndicate cannot be forfeited.

The smallest amount received $2, buys a full paid, non-assessable certificate of stock for 1-25 of a share, or a like proportion, no matter if the purchaser is paying on one share or more.

TRANSFERS.—The regular fee of twenty-five cents is charged for each certificate of stock transferred. No transfer is valid unless made on the books of The Syndicate.

METHOD OF INVESTING MONEY.—First—It is an iron-clad rule of our Board of Trustees to never purchase a "prospect" for cash; and it is our plan to always arrange for a certain portion of development work as a first payment on any property we bond, demanding in the "bond" ample time to discover values before making a payment of any material sum.

Second—The expenditures are limited to development work only, until a property shall show up sufficient "pay ore" to guarantee the investment in machinery for operating it. Each property is handled on its own merit and expense stopped as soon as we have reason to doubt its value.

Third—A number of our best miners carry stock, and are interested in making a dollar go as far as possible. Knowing that we are continually opening properties, they do not hesitate to recommend the stoppage of work on any given property, if they have reason to do so, as they are sure of employment.

EXPENSES OF INVESTMENT.—Our expenses are limited to inspections of new properties, and the superintendence of those under development. Each property is inspected semi-monthly by our experts, and every care is taken to avoid wasting a dollar. Situated as we are, in close contact to the properties we are operating, we have ready access to them, as a Board of Trustees and Officers, and by our personal attention can have perfect knowledge of all the details, in which we have great advantages over many syndicates and corporations who conduct such matters through agents, often thousands of miles distant.

HOW MONEY IS HANDLED.—Every protection possible has been given to the funds of The Syndicate. All officers who handle money are placed under ample bonds or furnish Fidelity Insurance in some reliable company. The receipts collected by the Treasurer and his agents are deposited daily to the credit of The Syndicate in the Scandinavian-American Bank. The Treasurer can not check them out. This money can only be paid out on checks signed by both the Secretary and President of The Syndicate. Money is not allowed to accumulate in banks, but is invested as rapidly as it can safely be, after careful examination justifies its investment.

BOARD OF TRUSTEES AND ADVISORY BOARD.—The Syndicate has a Board of seven Trustees and an Advisory Board of twenty, all of whom must be members of The Syndicate. They are elected at the annual meeting of the stockholders, on the second Tuesday in February of each year.

Members who have one paid-up share or more have one vote. Members who are not able to be present at the annual meeting may vote by proxy. No prescribed form of proxy shall be necessary, but any written authority signed by a member, substantially delegating his authority to vote, shall be sufficient. The officers will take pleasure in explaining everything connected with their methods of doing business to shareholders or others desiring to become members. The Board of Trustees is made up of business men, whose records all who intend becoming members are invited to investigate.

BRANCH SYNDICATES.—Branches of THE CO-OPERATIVE MINING SYNDICATE may be established in towns where sufficient business is done to warrant it, by five or more shareholders associating themselves together and electing a president, vice president, secretary, treasurer and not more than seven trustees. These officers shall be deemed the agents of such members, and not of The Syndicate. Syndicates from their nature cannot be successful in small towns; accumulations are too slow. This chief objection is removed by a large and general business. The officers of these branches should consider themselves, in some sense, representative of the interests of the members in the locality, and should correspond freely with the central office of The Syndicate, and examine the books, papers and records. The Syndicate looks to its branches for great assistance in the sale of stock, and their services will be fully appreciated.

THE CO-OPERATIVE MINING SYNDICATE, 112 Columbia Street, Seattle.

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Abbreviations: gr., group; cr., creek; r., river; mt., mount; mtn., mountain; l., lake; C., camp; pl., placer; ext., extension.

45 Consolidated Mining Company,

EVERETT, WASH.

Incorporated under the laws of the State of Washington.

Capital stock $2,000,000, fully paid and non-assessable.

Preferred stock, 149,999 shares; common stock, 50,001 shares; par value, $10.00 per share.

W. C. Cox, President.
L. A. Dyer, Vice President.
Wm. F. Brown, General Manager.
Louis Henry Legg, Secretary.
S. M. Kennedy, Treasurer.
Everett National Bank, Depository.

TRUSTEES:
W. C. Cox,
L. A. Dyer,
Wm. F. Brown,
Mark Swinnerton,
W. H. Ward.

Chas. K. Jenner, Attorney.

The mines comprise a group of twenty-five claims located in Snohomish County, in the Cascade Mountains, at the head of a branch of the Sultan Basin, two and one-half miles from Silverton, and are at an elevation of 4,500 feet above sea level. Development work has been in progress for over a year, tunnels and shafts driven opening up a true fissure vein extending through the group of claims 7,500 feet, that varies in width from six to eighteen feet, on the hanging wall of which there is a chute of high-grade ore averaging eighteen inches in width, from which two car-load shipments have been made to the Everett Smelter, the first returning $105.96 and the second $109.02 per ton. These figures speak better than assays, of which we have a great variety, ranging from $2,000 per ton down. The rich ore chute values lie in brittle silver, gray copper, ruby silver, gold and galena. There is an unlimited quantity of low-grade ore that will run from $8.00 to $30.00 per ton. This is good concentrating ore and is being stored on the dump, awaiting the erection of a concentrator, when it can be handled at a great profit. Two hundred and fifty feet of Tunnel No. 2 has just been completed, tapping the ore vein 175 feet below Tunnel No. 1, which runs 181 feet on ore. One thousand feet east a seventy-two foot tunnel has been driven, and 1,000 feet farther east a 163-foot tunnel. These are on ore all the way.

A tram is under construction from Tunnel No. 2 to the millsite, the common converging point for the different workings, from which ore will be packed by horses until such a time as the large tram can be constructed to Silverton. The company has an abundant supply of excellent timber on the premises for all mining and building purposes, and also has two water powers with a fall of over 700 feet each, which are utilized in furnishing all power required for the operation of electric light, saw mill and other plants.

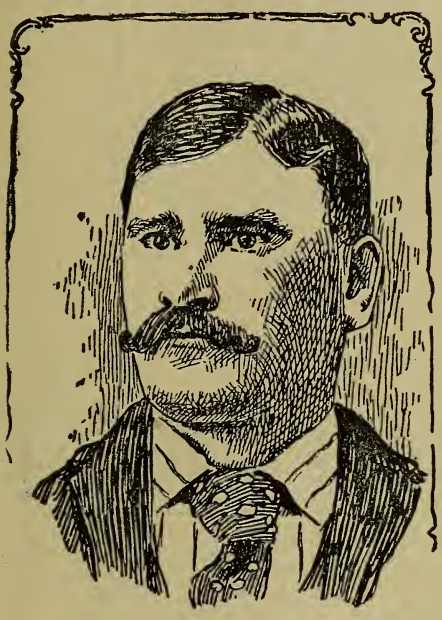
This is the only Mining Company in the Cascades that has been running all winter without missing a shift, and they will commence the shipment of ore in May, when the packtrains can be regularly run.

THE CITY OF ROSSLAND.

Four years ago it was a tract of wild mountain land, covered with pines, and a log cabin, built two years previously, was the first human habitation. This cabin was the home of the founder, Ross Thompson, whose foresight and endurance have been rewarded by the growth of a thriving, bustling mining city of 7,000 people on the site he selected.

The founder of Rossland, Ross Thompson, is yet a young man and has had an experience similar to that of many another successful Western man. Coming west from Brant county, Ontario, during the construction of the Canadian Pacific Railroad, he had the usual ups and downs until, in 1890, he left Seattle without a dollar and got a fresh start by working as foreman of Charles Crossman's sawmill at Bonner's Ferry. Moving to the embryo camp on Trail Creek, he did his first work as a miner in the Centre Star Mine, under Mr. Oliver Durant. Seeing the opportunity for a town to grow up under the shadow of Red Mountain, he located a pre-emption claim of 320 acres and built a cabin where the city now stands.

Two years later he obtained title to his claim, platted it as a townsite and, with the aid of all the men employed in the camp, proceeded to build the Clifton House, the first hotel. Among those who helped him as carpenters was Philip Aspinwall, who took in payment of $40 wages a lot which he could now sell for $5,000 cash. The town was at first named Thompson, but there being another town of the same name in British Columbia, the present name of Rossland was finally adopted.



ROSS THOMPSON.

Wagon roads were cut in in 1891 to Trail Landing on the Columbia River and in 1892 to Northport, all communication having previously been by trail. The population grew to about 300 in the summer of 1894, but not until December of that year, when the great ore-chute in the War Eagle Mine was struck, did the people make up their minds that the camp would live. In 1894 John R. Cook, Frederick Ritchie, Elling Johnson and James Anderson became interested with Mr. Thompson in the townsite and a year later the interests were segregated.

By the spring of 1895 the population had grown to about 500 and from that time it increased rapidly. Then regular shipments from the principal mines began, dividends were declared by the Le Roi and War Eagle, and population increased faster than buildings could be erected, so that in March, 1896, it was fully 3,000. The construction of the Columbia & Western Railroad to Trail was completed in May, making large regular shipments possible. Last winter the Columbia River & Red Mountain Railroad was completed as an extension of the Spokane Falls & Northern from Northport, giving standard gauge connection with three transcontinental lines at Spokane. The Columbia & Western is now being extended to Robson, where it will connect with the Arrow Lake steamers of the Canadian Pacific Railroad, and will be extended this summer through the Boundary Creek country to a connection with the Canadian Pacific steamers on Okanogan Lake. This will make Rossland not only a mining center for the immediate vicinity, but a great railroad center.

Rossland is now a full-fledged city, having flung off the swaddling clothes of a mining camp, and has all the resources of civilization—railroads, telegraphs, telephones, churches, banks and first-class hotels. It has from the first been an orderly town, for the law is rigidly—but not too rigidly—enforced. All reasonable recreations can be enjoyed, but deeds of violence are severely punished. It marks the beginning of a new era of mining on the North American continent, in which the "bad man with a gun" is promptly put where he is harmless.

PAUL GASTON,
ROSSLAND, B. C.

E. W. JOHNSTON,
SEATTLE

SILVERTON

SITUATED on the Everett & Monte Cristo Railroad, in the center of the Stillaguamish Mining District, is the distributing point for the Deer Creek, Silver Gulch, Anacortes Gulch, Coal Creek, Wisconsin Gulch, Bender Creek, Perry Creek and Marion Creek Mines, some of which have become famous in the past few months—namely, the Forty-five, Bonanza Queen, St. Louis, Helena Group, New Seattle, and Independent, with a hundred of others too numerous to name.

Spokane and Rossland parties are directing their attention to this district, which their experts have told them will rival Cripple Creek and Trail Creek districts in the next few months.

SPECIAL INDUCEMENTS TO PARTIES SEEKING
...BUSINESS LOCATIONS...

Over 15 Buildings in Course of Construction Upon the Property

For further information address

GASTON & JOHNSTON

MINING AGENTS

Silverton - - - - Washington

Or H. S. TUTTLE, Room C Bailey Bldg, Seattle Agent