MINING

IN THE PACIFIC NORTHWEST

by
L. K. HODGES

1897

TN24
W2
H688m
1897
c. 1

CHELAN — PAGE

Lake Chelan — 125
Leavenworth — 121
Peshastin & Negro Creeks — 111
Steheken — 129
Wenatchee — 109

CLARK

Ruth Creek — 91
St. Helens — 72

COWLITZ

St. Helens — 72

KING

Cedar River — 69
Miller River — 51
Money Creek — 56
Snoqualmie — 58

KITSAP

Chico Tin Mines — 92

KITTITAS

Cle Elum — 94
Gold Creek — 93
Icicle — 102
Swauk — 103

LEWIS

Mineral Creek — 183
St. Helens — 72

OKANOGAN

Methow — 133
Okanogan Lake — 148
Palmer Mt. — 152
Salmon River — 144
Twisp — 141

PIERCE

Summit — 64

SKAGIT

Cascade — 82
Skagit Copper Belt — 79
Thunder Creek — 89

SKAMANIA

St. Helens — 72

SNOHOMISH

Bonna Vista — 63
Goat Lake — 15
Index — 46

(cont.)

Monte Cristo	9
Silver Creek	34
Silverton	19
Sultan	29
White Horse	76

STEVENS

Cedar Canyon	179
Colville	176
Colville Reservation	165
Northport	174

WHATCOM

Ruth Creek	91
Slate Creek	85

YAKIMA

Summit	64

INTRODUCTORY
(Written in the year 1897)

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 manycircumstances 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 on 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 the 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 April, rainstorms grow less frequent until they cease altogether about 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 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~~, 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 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 unbusiness-like 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 propperity 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 Wilmans'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 a nd 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 minerals 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, Wilmans Peak & Golden Cord. In the fall of that year the controlling interest in the first three companies named was sold to the Rockefeller Syndicate, which in the following 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 pro-

fits 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 cuts 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 160 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 furnished 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 Ra ilroad, 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 a n 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 is 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 watersheds, 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 ledge 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 assa ys 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 crosscut 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 cross-cut.

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. McCullock, 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 cross-cut 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 130 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 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, it 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, transporta tion 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's 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 has 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 discovery 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. Meyers 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, 26 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 Pehakacle. 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 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 Ex-

tension 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 cros s 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 the 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, 18⅓ 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. P. 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 millsites, 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 whichassay 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 quarts 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 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

The 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 head-waters 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-grarde 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 Ba sin.

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 Duepree ledge, running parallel with the divide, besides the 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 and 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 gangue 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 foot wall, 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 Sailor's 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 Horseshow 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, bolders 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 employees, 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 gangue 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 Blakelyy, 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 $30 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, 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 on 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 aneast 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 flow-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 $2.00 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 mills ite 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 aggragating 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 acros s 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 s ilver, $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 together 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 yet 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. Hohnson 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, a ssaying 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 predominate.

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 out 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 ta p 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 are19,500 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 veing about two inches wide, which a ssay 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.

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 out-crops 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 to30 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 covered 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 Olson 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 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 dis covered 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 $53.70 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 ~~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.

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. Boney, 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 which 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 Iron sides 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 1,200 x 3,000 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 blowout 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 $5 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. H. 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. Prooter, 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 ledge. 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 commence 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, dicrite, 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 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 this 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 in 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 Guyé'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 spot of a cliff on this mountain the body of magnetic iron crops to a width of sixty of 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 Bessemer 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, Hone. Thomas Burke, Hone. 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 GreenMountain 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 Tusochatchie 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. Tibbets 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.

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, through 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 pa y 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 Hamrich, 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.

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 Five, 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. Ounces Gold	Ounces Silver	Value Per Ton of 2,000 lbs.
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. The 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 Bamfino 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 furface. 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 zig-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 extensions 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 Ta oma. 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 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 coarse 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, 400 x 200 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 Sampson'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 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 Devils 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. Hoffer, 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 a 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 taloose 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 taloose 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 and 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 2000 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, 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 been 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 lied 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 westerly 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 the 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, 4⅓ 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 ~~reports on them as iron deposits~~ oxidised 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 which 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, Wm. 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 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 400 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 it 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 or 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 s haft 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 the wall of a tunnel run sixty-five feet along the ledge. The 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 Douglas Allmond, of Anacortes.

The mining regions of the Skagit Valley, for the sake of convenience, may be divided into five distinct dis tricts, 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 tidewater.

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 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 porphyry 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 out-cropping, 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 vlaue of any part of it. Pieces picked up a t 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 oxidised 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 2 3/4 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 sufface 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, wall 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 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, Kootenai, 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 head-waters 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~~ four 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 estimate 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 head-waters 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 ledge-of 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 quartz 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 aneighteen 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 s hafts 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, 39 3/4 ounces; tin, 4 3/4 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 than 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 oxideize 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.

M I N I N G

In The

PACIFIC NORTHWEST

Edited
by

L. K. Hodges

VOLUME II

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 miles, and by trail up Gold Creek, eight miles. The district can also be reached by the Seattle & International Railroad to Salla l 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 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.

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 then 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 south-east 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 all these 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. E. 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 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 a 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 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. Every 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 Chamer, 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 gangue 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 Harkins 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 porphyry 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 ledge. 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 os 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 ~~the~~ 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. DeWitt 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 estimate 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 wa y 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 Consur, 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.

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 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 coa rse 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 a 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 a- 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 used 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 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 130 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, 25 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. Ha rt'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.

Discovery 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 180 feet, which will strike the ledge at a depth of 140 feet in seventy feet more. In 1894 he built a waterpower 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 is 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 80 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 themaking 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 Squilchuch 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 $6 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 gangues 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' 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.

In 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 has 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 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 crosscuts 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 located by means of his instrument a four and one-half foot ledge for James Smith, who struck it with a forty foot crosscut; a five foot ledge for James Gilmore, who struck it in a tunnel driven to its face; and a third for McDonald and 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 quartzite 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 crosscut 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 Gucin, 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 crosscut 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 crosscut 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. Castelbury. 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 Moriarity, 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 plate 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 bed 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.

The Red Mountain Mining Company also owns ten claims on the two main ledges, but has not 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 Breston; 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 crosscut 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 Christiansen 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 crosscut 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 crosscut 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 blowout of oxidized iron, carrying gold and silver, and one streak of ore assayed 444 ounces silver. A crosscut 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 secteion 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 groups. 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 crosscut 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 crosscut 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 Hough, 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 the 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 crosscut and tunnel were run on the ledge for seventy-two feet, giving a depth of fifty feet, and crosscuts 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, 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 $6 gold, 11 ounces silver, 7 to 11 per cent copper. The whole ledge ismineralized 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.H. 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.A. 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 small 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, $10 gold.

The Railroad Creek discoveries show ledges of galena on the summit of the Entiat Range, where this district adjoins Red Mill 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 Passand includes the whole watershed of Stehekin River. Discoveries began on Doubtful Lake, north of the pass, then extended to Horseshoe Basin, then along each sie 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 preceeded 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 andcopper 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 sawtooth 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 Horeshoe 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. ~~[illegible]~~ 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 ~~[illegible]~~ 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, ~~[illegible]~~ 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. Adjoiningthis 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 of Horseshoe Basin have 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.C. 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, 38 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 Dahlberg.

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 paralled ledges.

Seven of these claims on the 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.

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 ~~showing~~ 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 arefound 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 wasmade in 1887 by J.M. Burns on ~~Polpick~~ 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 wi~~ 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 extendion 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 Ledge 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 Wms 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 Klomme 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 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 ~~mk~~ 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 in 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 Bethow 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 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. Sensel, on a well-defined ledge three and one-half feet wide with talc gangue 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 sunk inclines fifty feet and eighteen feet, showing the ledge to be at least six feet wide, and making a shipment, which returned $37; on the Crown Point, owned by A. McKinnon; on the Badger and its extension, where Lloyd Marshall and others have run a fifty foot tunnel and sunk twenty feet. The ledge was then traced across the river and Messrs. Johnson and Drea 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 $30.60 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 H 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 H 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 assayed $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 forty inches 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. Shomafelt and R. P. Dolson 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 D. 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 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 $660 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 wa s 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 leaching plant, but, after expending about $130,000 on this and other work, discovered that no water could be 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 has 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 invalue. 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 on Concomully 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 Concomully, 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 Ore. 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 ~~Co~~ 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 Buna, 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 Steeh, 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 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 carload 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 Concomully 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 Concomully, 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.

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 Monashee, on the north side of Monashee Mountain, about fifty miles southeast of this town and overlooking 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 and 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 $15 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 places 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 An 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 $8 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 B. 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 s uccession 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.

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 ores 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, 150 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 Small 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 norther portion this is intersected by dikes of black slate and serpentine. The eastern

portion consists of slate capped with dolomite, which forms high white peaks, 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 Ellenmeham 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 Chapaos. Palmer Mountain shows surface disturbances which account for the breaking 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 scar ed 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 and 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 pros-

pecting 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 mid-winter. 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 Hodge 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 skillful 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 in phenomenally rich, one assay running over 9,000 ounces silver and 5 ounces gold, and the pay ore generally running from 500 to 1,000 ounces silver. A drift has 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 $8 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 335 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 lbs. 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 180 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, a nd 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 carrying 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 M. 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 shows 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 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 sulphide 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 ~~between granite~~ 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. D. 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 carryingpetzite. 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. Alt ogether, 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 Beiste have the Golden Zone and an extension on a ledge which a 150 foot tunnel shows tobe 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 Touts 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 $10 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. Plubibus 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 Sinlahekin 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 Kulcahy and E. 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. M. 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 Sinlahekin from Mount Douglas and Gold Hill is Aeneas Moun-

tain, 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 one 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 $30 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 300 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 obiquitous 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 ingold 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-milling 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 spring 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 os 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 fee t 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. Jane and Ledgerwood Bros. have the Lafayette group of four claims 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 River, 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 $47.60 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. B. 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 Koos 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 extensively 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.

from the face has been started.

On the cross ledge the Safe Deposit Mining & Milling Company has the Mountain Boy, with an iron cap cropping 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.

MYERS CREEK

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. Calbert, 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 ~~in~~ 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 Bi-metallic 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 or 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.

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. Galloger, H. J. Blaine, William Stoll and others to English capitalists 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

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 Rossburg. The part of this 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 ~~14~~ 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 ~~feet~~ 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 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 development, 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 is 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 spoken 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 they 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 b 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 whohave 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 100 feet drift connects the two. Several thousand tons of ore have been shipped, its character making it desirable for fluxing, and three or four ~~dee loads~~ 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 lead 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 ever 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. Menahan, King and McAuley. 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 $30 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 ran 100 feet into the mountain from this point showed the ore in a vein one to six feet thick, ~~and~~ 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 ~~one~~ 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.

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 proved 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 5000,000 ounces. In addition there is a vein of sand in the mine fourteen inches wide above and below the main ore body, ~~when~~ which contains about 20 ounces silver per ton and which has not yet been disturbed. ~~Negotiations~~ 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. Small. 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. F. 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. F. 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 $35 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 the 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 Marshall river, within three miles of the wagon road, the Cooperative 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.