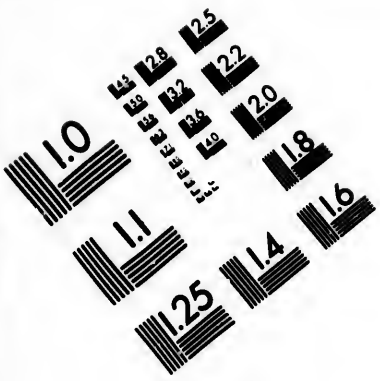

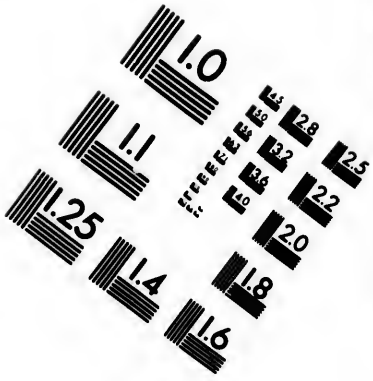

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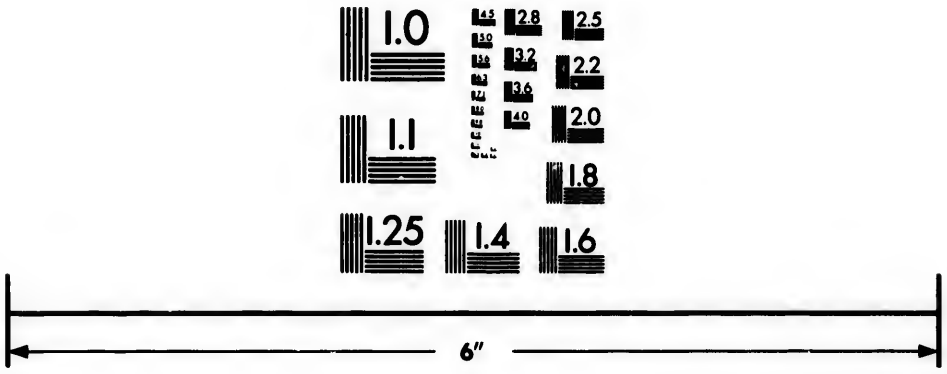

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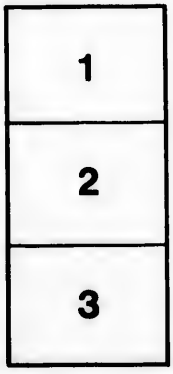

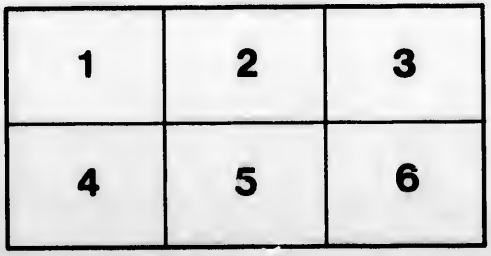

SILVER MINING IN BRITISH COLUMBIA.

By E. D. INGALL, M. E.,

Chief of Mining Division, Geological Survey of Canada.

Until a comparatively recent period the mineral production of the Province of British Columbia was almost entirely confined to coal and gold the latter chiefly obtained by washing the shallow auriferous gravels distributed widely throughout the province.

The discovery and working of veins yielding silver ores was all, with the exception of a few scattering discoveries, subsequent to 1880.

It is not the intention, in this paper, to go into any details as to the history of the silver mines of the province which are so admirably dealt with in the report of Dr. G. M. Dawson on the Mineral Wealth of British Columbia, issued with the Annual Report of the Geological Survey for 1887.

A few items may, however, not be amiss as prefacing the more immediate subject of this paper viz. the more newly discovered silver veins of the West Kootenay District.

According to Dr. Dawson the large deposit of galena now known as the Blue Bell Mine and situated on the east shore of Kootenay Lake was discovered as early as 1825 by the botanist Douglas and amongst the earlier discoveries of this class of ores is that in the Coast Range of Mountains at Hope on the Fraser River in 1871. The ore discovered there was described as "argentiferous grey copper" containing lead, copper, antimony and iron.

In 1882 a number of claims were located on discoveries at Stump Lake in Yale District, of veins, carrying ores rich in gold and silver and from that date to 1889 various camps came into greater or less prominence in that district and in those of East and West Kootenay which together constitute the S. E. corner of the Province.

At the time of the writing of Dr. Dawson's report in 1888, argentiferous ores had been reported also from various points in the Northern districts; in Cariboo, Omenica, Cassiar and further north in the Yukon country but none of these have come into any prominence so far, doubtless on account of the numerous drawbacks due to lack of good communications with the outer world.

Before passing then to the subject proper of this paper, it may be well to point out on the map here (referring to maps shewn), the various other districts in the province where veins carrying argentiferous ores have been found and more or less worked.

It is noticeable that at most of these points the ores are mixed carrying much copper sulphurets and are often antimonial and arsenical, differing in this respect from the prevalent ore of the Ainsworth, Hendryx, Slocan and Illecillewaet districts where argentiferous galenas and the products of their decomposition take precedence over all others.

The points to which it is desired to draw special attention in this paper, are the results of studies made by the writer in 1892 when in British Columbia for the Geological Survey.

The time at disposal allowed only of the study of the Illecillewaet, Ainsworth and Slocan, sub-districts of West Kootenay where, however, a large number of claims were visited and examined with a view to getting the general features of the veins.

Illecillewaet—Beginning then with the district tributary to Illecillewaet on the Canadian Pacific Railway we have within a radius of from 5 to 10 miles, a number of claims upon which more or less work has been done, among which are the Lanark and Maple Leaf, with the Isabella, the Jumbo, the Sanquahar, the Cariboo and others all lying north of the C. P. Railway station and all within five miles of it.

* Paper read before the General Mining Association of Quebec, July 10th, 1894.

Some eight miles north-east of the same place lie the Gold Hill and Copper Hill groups of claims whilst about ten miles south-east from the headquarters of the district at Illecillewaet lie the Fish River group among which are the Dunvegan, Elizabeth, Edinboro' and Fishburn's claims. These are reached by a trail of some fifteen miles in length passing over the divide between the waters tributary to the Illecillewaet River and those of the Fish River which runs southerly into the north-west arm of the Upper Arrow Lake.

All the above mentioned groups are staked out on fissure veins which, excepting those of Gold Hill and Copper Mountain, cut a formation consisting of shaly rocks generally dark in color and often quite black and carrying a large percentage of carbonaceous matter. These are accompanied by grey bands of a calcareous nature and often of considerable width. In many places throughout the district the presence of intrusive igenous rocks is evidenced by tongues and dykes of the same cutting the sedimentary rocks and a little east of the Fish River group the main body of one of these intrusive areas is reached.

The enclosing rocks of the Gold Hill and Copper Mountain groups are in general chloritic and talcose schists, with intercalated calcareous belts which, however, are distinctly different in appearance from those of the last mentioned, effecting rather a greenish grey hue with a somewhat rusty weathered surface. The schistose rocks of the series are generally greenish and yellowish grey, so that the general color of this formation contrasts plainly with the darker greys and blacks of the last mentioned.

In the first mentioned or black shale series, the ores are mostly galena, or galena and zincblende mixed, whilst in the schistose formation galena veins are found, but others have also been located carrying rich copper sulphurets assaying well in silver, and said also to carry some gold. At Copper Hill, for instance, is a vein cutting the schists and carrying copper glance and yellow sulphuret in a gangue which is sometimes white translucent quartz, and sometimes seems to be ferruginous dolomite. The ore is said to assay 61% copper, and $20 gold and $8 silver. All the rocks of the district, as might be expected in a mountain range, are folded and contorted and the detail of their distribution would take a long time to work out.

The veins cutting the black shale series, shew very similar characteristics to those described later as occurring in the Slocan district. They carry galena as the chief ore in ribs and masses, in a gangue which is generally ferruginous. At places much zinc blende is intermixed, especially where larger bodies of ore occur in connection with the *lime belts.*

Some few veins have been located in which the gangue is quartz with galena and pyrites disseminated.

The detailed description of the Slocan district following, serves equally well for this district.

Passing south we come to the well-known Slocan camps, the position and details of which are well shewn on the map. (Map shewn.)

Late in the Fall of 1891, a party of discouraged prospectors were making their way over the mountains towards Ainsworth, and being very short of provisions, were making the best time possible, when, in descending a gulley to the east fork of Carpenter Creek, which runs into Slocan Lake, they lighted upon an extensive outcropping of ore. Without loss of time, claims were staked out and specimens secured which, when assayed, gave such encouraging returns as to cause a rush to the district in the following spring, and the consequent discovery of a large number of rich veins, covering an area about ten miles by seventeen, along the valley of the Kaslo river and between its headwaters at Bear Lake and the east shore of Slocan Lake. The rocks of this district present the same general features as those in the vicinity of Illecillewaet.

The bulk of the claims of the district have been staked out on veins cutting rocks of the black, shale series with their associated calcareous bands. They show the same variations in character, being soft and highly graphitic at places, and harder and more compact at others, generally from the proximity of intrusive igneous rocks and are thus often highly altered, showing chirstolite, etc. These intrusive rocks are found throughout the district, showing as dykes of various thicknesses. They are light in color, with a preponderance of the acidic mineral constituents, orthoclase felspar and quartz constituting, as a rule, the bulk of their substance. This association of rocks in general, occupy the southern side of the valley of the Kaslo River, and extend some miles to the south, where they are said to abut on a large area of granite.

On the north side of the valley of the same river, the schistose series of rocks is largely developed, being in many places serpentinous. In this series of rocks a number of veins have been located. They show as fissures varying in thickness from a few inches to two or three feet, carrying the ore, which is galena, in solid ribs. These ore ribs are generally imbedded in a soft ochery gangue, sometimes of a pasty consistency. The thickness of the ribs varies from a few inches up to a foot or two. Occasionally the walls of the fissure are lined with quartz crystals and the enclosing rock is rusted some few inches in from the walls of the vein.

Veins of solid quartz also occur occasionally, but those seen carried very little mineral. The veins in this schistose series of rocks are apt to be free from some of the irregularities occasionally shown by those in the black shale series. The veins in the shale series present similar features to those already described, as occurring in the same series in the Illecillewaet district. Whilst they frequently run for long distances with the formation, they are also constantly found cutting across it.

Where a vein is found cutting across, or in the proximity of one of the calcareous bands previously mentioned, they are apt to show some interesting features, widening out or forming large pockets of ore in connection with the vein. Some of the big shows of the district have been of this nature and have proved very disappointing, their pockety nature being shown on development. When, however, the parent vein has been located, it has been found to be persistent, which will be found to be true for most of the fissures proper. Where they cut the slates, the veins at places show a considerable width of brecciated vein stone, angular pieces of the enclosing rock being cemented together by quartz and other gangue and ore minerals. The commonest occurrence, however, is to find veins of from a few inches to two or three feet in width, carrying galena in solid ribs, nuggets, and boulders in a rusty ochreous and sometimes clayey filling.

The galena varies in grain, from large cube down to that with a fine steely fracture as shewn by these specimens. It is sometimes enriched by the presence of ruby silver and the richer silver minerals scattered through it. What is known as "carbonate" ore occurs with the galena, but this is not really carbonate of lead, as one might suppose, but is the ochreous gangue material in which the silver occurs disseminated in the metallic or native condition and in the condition of the richer silver minerals with doubtless some carbonate of lead. The whole probably results from the decomposition of the gangue and of the silver-bearing galena of the vein.

Other minerals are associated with the galena in places and in varying quantities. Of these, zinc-blende is the most prominent; iron pyrites occurring in fair quantity, and other metallic minerals being only occasional.

The pure galena in solid ribs seem to affect more particularly the narrower veins, cutting the shales, whereas the big developments in the calcareous parts carry generally a large proportion of zinc blende which lessens ther value, this mineral being objected to by the smelters, when its percentage is large. Another class of the veins found, show various rich arsenical and antimonial silver minerals in a gangue composed principally of quartz.

Development work on these veins has in a number of cases opened up most promising exposures of ore. In one case a tunnel was seen on a new prospect where for all its length of about 75 feet, it was estimated that the ground broken had been from 50 to 60 per cent., pure galena assaying 125 ounces, to the ton. Or again, at another place, a prospect pit was seen showing a 2 foot rib of absolutely pure steel galena with ruby silver, the ore assaying 860 ounces to the ton. When one sees such exposures of ore as these, at a number of places in the district as the result of merely preliminary development work by the prospectors themselves, and taking into account the many other veins found in the district, having good, if not quite so extensive, shows of ore, one cannot help feeling that the district has a very hopeful future before it.

These ores are rich in silver as shown by the results of some 50 assays made in the chemical branch of the Geological Survey, of specimens of galena collected by myself which run from 50 ounces to 360 ounces, the majority from the black shale series in the Slocan district averaging perhaps 100 to 125 ounces per ton. Some specimens of so-called "carbonate" gave little or no silver, whilst two specimens of this class of ore from different claims gave 700 ounces and 1630 ounces, respectively The galena from the veins on the schistose formation seems to average lower in silver than that occurring in the shale formation.

The other districts of West Kootenay now prominent in respect of their silver ores are Ainsworth, Hendryx and Toad Mountain districts, all of which have been well described by Dr. G. M. Dawson, of the Survey, in his report of West Kootenay. The ores of the latter district, however, are more mixed, copper and the richer silver minerals occurring with the galena. They also carry a little gold. Other camps which have come into prominent notice of late are those of Goat River and Trail Creek.

Three smelters have been erected in the district, one at Golden, one at Revelstoke (now washed away by floods), and one at Pilot Bay on Kootenay Lake. The latter, however, has not been completed owing to some disagreement amongst the capitalists concerned.

The two former works consisted each of a single water jacket furnace with roaster and appurtenances, but the Pilot Bay works have been projected upon a more extensive scale. The plan includes:

Concentrator Building	85 x 100
Sampling Works	100 x 108
Roaster	100 x 170
Smelter	58 x 98
Refinery	120 x 245
Assay Office	20 x 80
Boiler House	40 x 48
Blacksmith Shop	20 x 40
Machine Shop	20 x 40
Office	30 x 45
Boarding House	25 x 60

As none of these works have so far been running all the ore produced has been shipped to smelters in the United States at Tacoma and San Francisco.

Pack trails traverse the country and some few wagon roads connect the chief camps with steamer navigation on the lakes and rivers, whereby connection can be made with the Canadian Pacific Railway and the American railways to the south, whilst other projected connecting railways now being built will give a still better chance of success.

To a certain extent the mines are waiting the completion of these better means of communication, which are rendered the more necessary by the present low price of silver, but notwithstanding this discouraging feature and the existing commercial depression, the amount of discovery and development work prosecuted has been quite considerable, and we can, I think, still feel very hopeful for the future of silver mining in British Columbia.