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THE FAIRVIEW MINE

BRITANNIA MINES, B. C.

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THE FAIRVIEW MINE.

I. INTRODUCTION:

The Britannia Mines are situated on Howe Sound about 20 miles north of Vancouver.

S.S. "Lady Alexander" at Britannia Beach.

The whole comprises 549 crown granted claims of which only about 100 acres is being worked at present. This 100 acres is on five ore zones: Bluff, West Bluff, Victoria, Empress, and Fairview. The Fairview Mine includes the levels from 2200, at 2100 ft. above Howe Sound, to the 250 Glory Hole at the top of the mountain. It is worked from two camps; Barbara, at the 500 level, and Tunnel, or Townsite, at the 2200 level.

The mineralized zone is entirely located in a belt of metamorphosed sedimentary and igneous rocks, which forms an inclusion in the granodiorite batholith of the Coast Range. The trend of the rocks in this large inclusion,

which has an approximate width of two miles and a length of seven miles, is almost east and west, with an average dip of 70° to the south.[1.]

Chalcopyrite is the principle valuable mineral. It occurs in fairly definite ore bodies, ranging in width from one to thirty feet.

The Fairview Mine is characterized by two kinds of ore bodies, (1) a vein system which is mineralized over a distance of 1500 feet, with a width of 500 feet. The veins, 12 in number, strike N 55°W and dip 72° to the south and the ore bodies in the veins pitch 45° to the northwest. These veins from 10 - 70 feet wide are mineralized with pyrite and silicified chlorite schist. Zones of chlorite schist, usually barren, of no commercial value, occur separating the veins. (2) Large irregular replacement deposits. These ore bodies are associated with the diorite dikes which occur usually in the hanging wall of the shear zone. The dikes in the immediate vicinity of the ore bodies are silicified and partly replaced by the ore minerals, pyrite and chalcopyrite. A favorite position for the occurrence of these ore bodies is below the union of two dikes, as well as under the diorite dikes, thus making the dike the hanging wall of the deposit.[2.]

The boundaries of the veins are not sharply defined, being marked only by gradual cessation of mineralization.

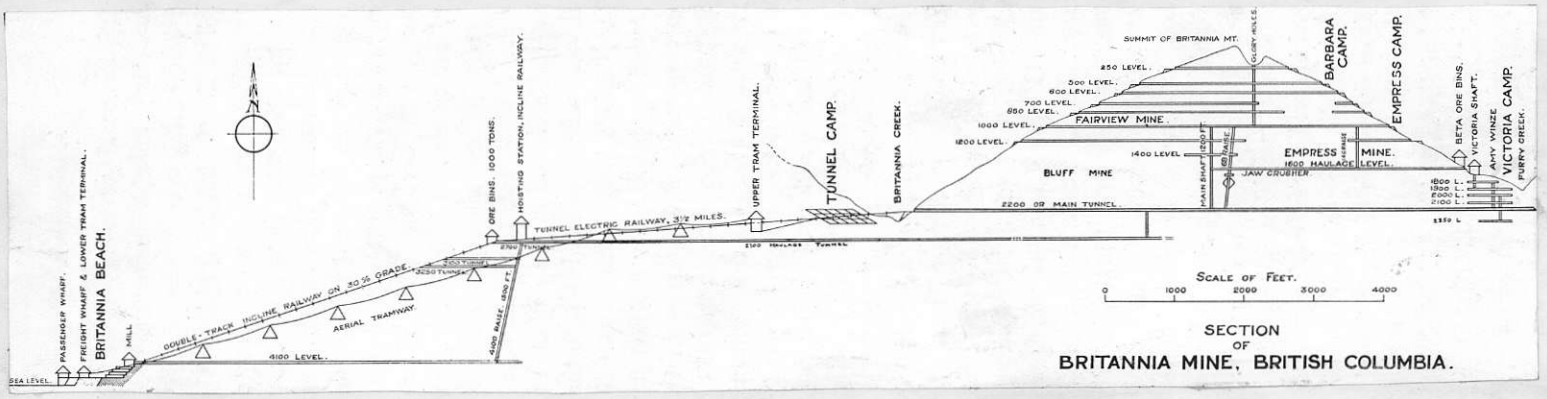
1. S.J.Schofield - The Britannia Map Area.
2. S.J.Schofield - The Britannia Mines, British Columbia.

Production for the whole of Britannia Mines in 1927 was:

Copper	34,500,000 lbs.
Gold	10,350 oz.
Silver	174,000 oz.
Pyrite containing 49% S.	37,777 tons
Copper ppr. from mine water	441,325 lbs.

The total production of copper up to 1927 was 299,630,207 lbs.[3.]

II. DESCRIPTION OF MINE:



SECTION
OF
BRITANNIA MINE, BRITISH COLUMBIA.

The main shaft extends from the 2200 level to the 1050 level. It is vertical and is divided in two 6' x 7½' compartments separated by a 3½' x 7½' manway. Cages are operated in the two compartments. They are double decked, and are operated in balance by a geared hoist powered, with a 350 H.P. electric motor. The hoist room is on the 1050 level.

authority

(3) Canadian Mining Journal.

An inclined shaft serves the levels from 1050 to 500. Tracks are laid in this shaft to guide a steel car hoisted by cable from an engine on the 1050 level. The incline is just sufficient to allow the car to stay on the track. It is intended,primarily,to carry drill steel, powder and supplies for Barbara Camp; but,since it forms the only connection between Barbara and the town proper, it is also used by the men. In winter it must be used by miners working on the 600 and 700 levels,since the portals to these levels are blocked by snow. A snowshed protects the camp portal on the 500 level.

The surface workings consist of two Glory Holes, (1) the 250 Glory Hole at the top of the mountain extending into the 250 level,and,(2) the 450 Glory Hole above and at some distance south of the station on the 500 level. The 250 Glory Hole is reached by an outside path from Barbara Camp. In 1925 a manway connected the 450 Glory Hole to the 500 level. It became unsafe,and was closed the following year.

There are two blacksmithing and steel sharpening shops; one on the 1050 level near No.2 hoist, the other on the surface near the 250 Glory Hole.

The levels have a rock interval of from 100 to 250 feet.

Natural ventilation is used throughout the mine.

III. EQUIPMENT:

Four types of drills are used; water Leyners, Waugh stopers, No. 60 Dreadnaught pluggers and Jackhammers. They are all driven by compressed air.

The water Leyners are used for drifting, stoping, and for driving raises. This machine consists of the drill proper, and two supporting bars. The first is about seven feet long and six inches in diameter. One end is flattened to form a circular plate and the other is threaded to receive a heavy screw having a similar plate. This bar is tightened in position against the wall rock, or, between the floor and roof. The second bar is about three feet long and five inches in diameter. It is clamped on the first bar, and supports the drill proper. The drill is pivotted on this second bar so that, within limits, any desired position may be obtained. The steel is rotated automatically and is fed into the hole by means of a screw turned by hand. The steel is $1\frac{1}{4}$" in diameter and has a cruciform head. The gauge varies with the length of steel, from $2\frac{1}{4}$" on the 2'6" starters, to $1\frac{3}{4}$" on the 9'6" steels, decreasing 1/8" for every foot increase in the length of steel. Water is forced, by the compressed air, through the machine and a hole in the centre of the steel to keep down the dust. These machines are too cumbersome to be readily moved, and the setting up requires some little time, so they are used for short jobs only if conditions do not permit the use of any of the others.

The Waugh stopers are used principally for overhead drilling. Rotation of the steel is by hand, but the feeding is automatic. The shaft of the steel is $1\frac{1}{4}$" square cross-section and the head is of the same gauge and shape as that of the water Leyner steel. These machines are much more mobile than the water Leyners. They are much lighter, and no time is needed to set them up. They are supported by a shaft extending up the centre of the machine. As drilling proceeds, the machine is gradually forced up this shaft. The release of air from the chamber allows the machine to slide back. The use of this machine is limited by the length of the shaft. There is considerable vibration, which makes it necessary to have a firm base on which to rest the drill.

The No. 60 Dreadnaught pluggers are used for sinking vertical holes, usually around the surface workings. They use the same steel as the water Leyners. Rotation of the steel is automatic.

The Jackhammers are the lightest drills. They are used for drilling rocks in chutes and grizzlies almost exclusively. Two and one half foot hexagonal steel is used.

Hauling is done by electric locomotives of both the storage-battery and trolley type. There is a charging station for the battery motors on each level. The motors are left on charge eight hours in the twenty-four. The trolley motors are supplied with 2500 volts D.C. from a

generator on the 1050 level. Their use is confined to the main transfer levels; 1050, 1600, and 2200.

The ore cars are of three types; 26 cu.in. hand tramming cars, 33 cu.ft. motor drawn cars, and, 17 ton cars for taking the ore from the mine.

A hand tramming car holds about ½ ton of ore. The box is pivoted on the undercarriage and can be swung at right angles to the track. At the front is a door, hinged at the top, and released by a lever at the back of the car. When this lever is at the "closed" position it also holds the box in place by engaging a lug on the undercarriage of the car.

The motor drawn cars hold about 2 tons of ore. The two ends, one side, and the bottom of the box, is in one piece, and is set on the undercarriage so as to tilt in one direction; at right angles to the track. The other side, though fitting closely, is separate and immovable. A wheel on the tilting side engages a frame set at the opposite side of the track to the raise. This frame is inclined at the ends, and is horizontal for a sufficient distance to allow the car to empty wet ore.

The 17 ton cars dump ore through the bottom, the ends and sides being fixed.

For hand tramming, 12 lb. rails are used, and 30 lb. rails for the motors. Twenty-four inch gauge is the standard for the mine.

There is a 24 in. x 36 in. Buchanan Jaw Crusher on the 1700 level, and two gyratory crushers.on the 1800.

Settling tanks, for the recovery of copper from the mine seepage, are on the 2200 level.

IV. MINING METHODS:

Two mining methods are followed, (1) the Overhead Shrinkage method underground, and, (2) the Underhand Stoping method for the surface workings.

Overhead Shrinkage Method: The ore body is tunnelled, and, at 33 ft. intervals along the tunnel, V-shaped chute raises are driven at an angle of 70° with the dip of the formation. The chute raises are four feet wide at the tunnel. The angle of the V is such that adjacent raises join 25 feet from the tunnel. This stage having been reached, ore breaking continues upward, a sloping floor being left from the chute raises across the open stope. At 300 foot intervals 6 ft x 10 ft manways, enclosed in 10 ft x 15 ft pillars, are driven at right angles to the dip. By-passes are made in the pillars at 30 foot intervals, to afford access to the stope as the level of broken ore reaches them. As the stope is emptied from below, waste rock is dumped in from above, preventing it from becoming entirely empty and consequently from caving.

Underhand Stoping Method: At a point about 200 feet below the surface, two 6 ft x 10 ft raises are started at an angle of 50°, one east, the other west, along the strike

of the vein. Between these raises a vertical raise is driven and all three are continued to the surface. Ore is broken from the sloping raises, leaving a pillar around the vertical raise. The mining of the pillar completes the final stage. This process is repeated along the vein as far as is necessary.

250 Glory Hole, Looking West.

This method leaves a large pit at the surface called the "Glory Hole", it being sometimes referred to as the "Glory Hole" method. The Glory Hole is enlarged by drilling and blasting around its rim.

Water seepage from the mine is treated in settling tanks containing scrap tin. The copper is recovered by precipitation.

V. DRILLING and BLASTING:

To break the ore, a V-shaped cut is first made with holes 7 ft-9 ft deep. Above the V cut, parallel rows of "uppers" are drilled to the same depth and three feet apart. The V cut is blasted first, the uppers being then

loaded and fired. This work is done by experienced blasters.

To load the holes, the jacket of each stick of dynamite is slit lengthwise three times. They are pushed into the holes with a round smooth stick, and each one is pressed in tightly or "tamped". The slits in the jacket allow the powder to spread and fill all the space. The cap is placed in the second or third stick from the last, the fuse extending out from the hole two or three feet. Any remaining space is filled with firmly packed muck. The charge is now ready for firing. When there is a number of charges, a length of fuse having no cap, and equal in length to the shortest fuse used, is nicked at intervals corresponding to the number of charges. This fuse is lit and, as the spark reaches each nick, there is a spurt of flame sufficient to ignite a fuse. Thus the blaster is given a check on the time at his disposal before the first round explodes.

VI. ORE HANDLING:

On the upper levels the ore passes from the stopes into chutes or traps.

The chutes are 4 feet wide, about 4 feet deep, and are sloped just enough to allow fine muck to slide down them. A frame of four 12" x 12" uprights is first set up and wedged tightly, cross pieces being set in to give rigidity. The chute is then put in, the bottom being at the same height above the track as the top of an ore car, or just enough higher to allow it to overlap the edge of the car about an inch. The

chute is made of 4" x 12" plank, the bottom being lined with steel plate. Two steel brackets are placed on either side to hold a plank across the front. In some chutes this plank is replaced by a roller held by wire rope. This roller is not satisfactory in a chute where much fine and wet ore is drawn, since such ore will slide beneath the roller and block the track. A plank is placed across the chute near the top to prevent the larger rocks from coming through. Two men are required to handle this type of chute.

A trap is a platform erected beneath the opening to a chute. An indentation is made at the open end into which the ore car is run. Its dimensions are such that three sides of the car are overlapped about an inch. Fine ore is allowed to accumulate on the platform so as to form an incline from the stope to the car. There is no door at the stope mouth, the stopping of the flow being left to the ingenuity of the operators. The gravity method of transportation is used wherever possible. The ore from the chutes and traps is hand-trammed to grizzlies. It passes through the raises to transfer chutes on the lower levels. A grizzly consists of iron bars, spaced 20 inches apart, resting on twelve - by-twelves, across the mouth of the raise. A railing is put around three sides for safety.

The transfer chutes differ, from the above mentioned, mainly in the type of door used. The ore handled in these chutes is of smaller size, and the doors must be constructed

accordingly. They are of two types, (1) hand door and sandboard, (2) air door.

The hand door is made of steel plate, bent in the arc of a circle. It is operated by a lever at the side. The sandboard is an emergency measure, for use when the door sticks, and also to stop the flow of fine wet ore which slides under the door. It consists of a 2 inch by 12 inch by 4 foot plank with a handle attached at right angles to its plane.

The air door is an automatic one-man device. Four to six wooden fingers with steel wearing surfaces are attached to a horizontal bar. A link chain connects the horizontal bar to an air piston. When the air is turned on, the fingers rise, allowing the ore to flow; shutting off the air causes the fingers to fall back in place. They are attached to the horizontal bar by hooks in such a manner that any desired pair can be lifted.

All the ore finds its way eventually to No. 68 rock raise. From this raise it passes to the jaw-crusher on the 1700 level, and, from there, to the gyratory crushers on the 1800. It is then by-passed back to No. 68 raise, dropping down to the 2200 level where it is transferred to the 17 ton cars, and taken from the mine.

All transportation from the transfer chutes is by motor drawn trains.

VII. LABOR:

The mine is operated by three shifts, each working eight hours. The surface workings are mined by the day shift only. The day and afternoon shifts do the drilling and blasting as well as ore drawing, while the night, or "graveyard" shift, looks after the transportation of supplies to the various camps and further ore drawing.

The skilled labor consists of miners, timbermen and trackmen. The miners are responsible for all drilling and blasting, the timbermen build the traps and chutes and timber unsafe ground, the trackmen look after the transportation facilities. The semi-skilled or unskilled labourers are the nippers and muckers. Each miner has one, and occassionly two, nippers, whose duties are to keep him provided with sharp steel, to remove used steel and to assist him in sundry ways he may designate. The shovelling and ore-drawing from hand-tramming chutes are done by the muckers. They also operate the underground ore trains, in which case they are called "trammers", and are only expected to do such shovelling, or "mucking", as is incidental to the operation of the train.

Nationalities are predominantly Slavic and Latin, with a sprinkling of English and Scotch miners. Many have a very rudimentary knowledge of the language, and a few new arrivals cannot speak it at all. This difficulty is overcome by pairing these men with compatriots who understand

English.

Individual bungalows are provided for men with families at the Tunnel Camp, or Townsite.

Tunnel Camp.

There are also well equipped bunkhouses, with "dry rooms" below for the storing of working clothes. The camp is provided with a library, from which books are circulated to the outlying camps, a billiard and pool room, a gymnasium and a bi-weekly "movie". A large mess-house provides the meals. The Company operates a general store.

Bunkhouses, Tunnel Camp.

Barbara Camp has three bunkhouses, two of which also contain the kitchen and dining room and the recreation room.

Barbara Camp.

Books, periodicals and newspapers are provided; other wants are supplied by a small store in a room opening off the recreation room. This store is run by the Company on a co-operative basis.

Bunkhouse, Barbara.

A "Safety Committee" receives suggestions from the men through their representatives, relative to conditions underground. There are two or more representatives from each camp, representatives being divided equally between miners and muckers. These are taken on an inspection tour through that part of the mine worked by their respective camps, and are expected to draw the attention of the Committee to unsafe ground, dangerously defective equipment and practices likely to lead to accidents.

VIII. CONCLUSION:

The Britannia Mines are the largest single-operated low-grade copper mines in the British Empire. Increasing refinement of the methods used is constantly reducing operating costs and allowing greater production. Recently markets have been found for the pyrite concentrates of which about 6000 tons a month are produced. New ore bodies, together with those in reserve, indicate that the mines will continue to operate for many years.