## THE ORE DEPOSITS OF ROSSLAND, BRITISH COLUMBIA.\*

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The Rossland Mining District began active production in 1894. Its total yield up to January 1st, 1904, is 1,620,540 tons of smelting ore, containing about \$26,000,000 gross value, or \$16.00 per ton in gold, silver and copper.

### GEOLOGICAL POSITION.

The elongated oval area of gabbro is surrounded by a border of varying width of augite and uralite porphyrites and fine-grained green diabases. The transition from the gabbro to the porphyrites is not well defined, and they are both from the same magma. Beyond the above border come alternating scries of porphyrites, tuffs and slates, and beyond these are agglomerates.

The basic coarse crystalline and plutonic gabbro thus surrounded by borders which become more acidic and finely crystalline, and finally pass into volcanic breccia and tuffs, indicates an ancient volcanic centre. The gabbro area is the main plug or neck of lava crystallized at great depths and exposed by deep erosion. Its great age is indicated by this erosion and by the numerous alterations in the rock structure and in the rock minerals.

The active mining has been carried on not within the gabbro area, but outside of it, and in the porphyrites surrounding its western end. The principal mines are all included in the small group of claims near the edge of the gabbro and located on the flank of Red Mountain above the town of Rossland. The Le Roi, Centre Star, War Eagle, Josie, Number One and Iron Mask mines aggregate some 20 miles of total workings, and the principal depths attained are those of the War Eagle, 1,615 feet measured on the vein; the Le Roi, 1,361 feet, and the Centre Star, 1,289 feet.

On the west of these claims there is a belt of finegrained eruptives, probably porphyrites, which are in a schistose condition; having been so plated by pressure as to frequently resemble shale.

## COUNTRY ROCK OF MINES.

Within the area of the claims the prevailing rock is evidently all from the same magma, but shows innumerable variations in rate of cooling and degree of metamorphism. It is mainly composed of plagioclase feldspars and pyroxene, generally in about equal proportions, but towards the gabbro area, bodies of pure pyroxenite are occasionally encountered. There is usually a small proportion of orthoclase feldspar and sometimes hornblende, and some observers have noted the fact that these appear more frequently towards the west. The rock appears to be holocrystalline and more or less porphyritic. The crystals may be either microscopic or as large as. say, five mm., while one or two mm. is a common limit. The feldspars are more or less altered to a turbid or porcelain-like appearance, while the pyroxenes are partially transformed to fibrous minerals of

\*Abstract from a paper presented at the March meeting of the Canadian Mining Institute. the uralite group. In strongly altered places, and especially within the veins, the rock is frequently colored brown from microscopic crystals of secondary biotite.

Although varying considerably in different places, specimens of this rock have generally been determine by microscopical observers as augite porphyrite, and it certainly belongs to the gabbro group, differing from the central area mainly in relative time and rate of cooling. Broadly speaking, the size of crystals tends to increase towards that area, and coarse crystalline masses are more frequently encountered, while in the other direction the structure becomes more fine grained.

#### DIKES.

This country rock is cut by immumerable dikes which require detailed comparison and determination by the microscope. Generally speaking, they appear to be either mica traps (perhaps kersantites) or altered basalts (perhaps melaphyre.) The latter are often greatly decomposed.

The general direction of the parallel fractures has been north to degrees W., with dips which are either vertical or very steep to the east. Their detailed fluctuations in strike and dip and the way in which they branch, unite and re-branch are clearly shown by the map. As explained hereafter, they probably belong to at least two periods, one before and the other after the ore deposition. Occasional belts of special crystallization in the country rock indicate dikes of an earlier date, which have since become cemented with the country rock and jointed to correspond with it.

## THE VEINS.

These are shear zone fissures consisting of a series of parallel platings of the rock produced by shearing under high compression In the Centre Star-Le Roi vein, in which the shear zone is most typically developed, this series of platings is 20 to 40 feet wide and dips about 70 degrees to the northwest. The Josie vein is parallel; but the Centre Star north vein, the War Eagle and Iron Mask veins are branches from the Centre Star-Le Roi vein.

The ore consists of country rock more or less replaced or impregnated by pyrrhotite, accompanied in places by small proportions of chalcopyrite, pyrite, arsenopyrite and quartz The pyrrhotite, when it occurs by itself even in solid masses, carries but little gold, say, from \$0.50 to \$3.00 per ton. The chalcopyrite is the principal carrier of gold, and ore of commercial value occurs only in those localities where chalcopyrite, pyrite and arsenopyrite have been deposited with the pyrrhotite. The manner in which these minerals occur within the interstices of the pyrrhotite, and the fact that continuous masses of pyrrhotite ore are impregnated in some places and barren in others, proves the later deposition of these valuable minerals. They have been introduced after most of the pyrrhotite was in place, although occassional occurrences of chalcopyrite and pyrrhotite in quartz point to the possibility of some contemporan-