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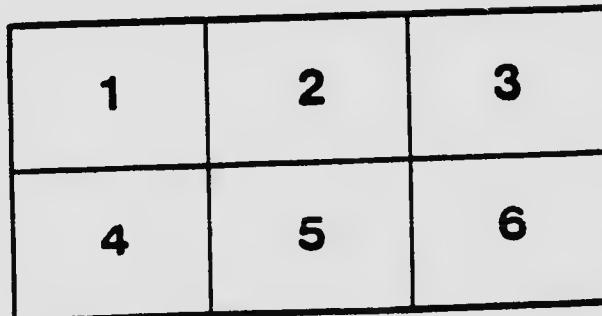
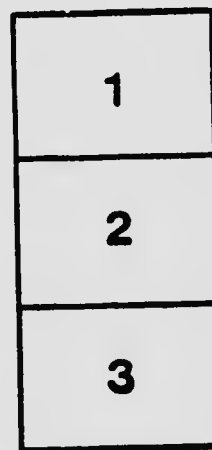
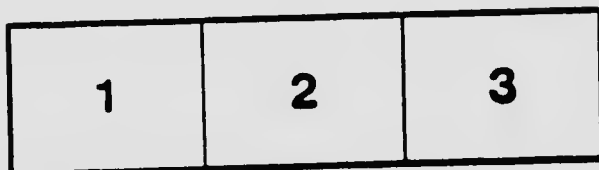
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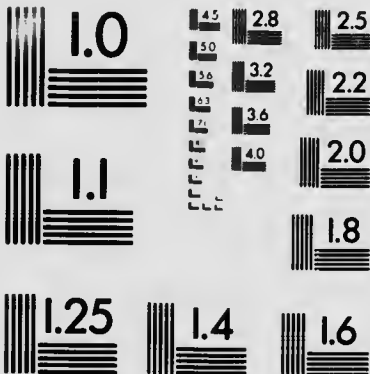
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The Dry Ores of the Slocan, B.C.

By R. C. CAMPBELL-JOHNSTON, M.I.M.M., Nelson, B.C.

In submitting a paper on this subject to the members of the Canadian Mining Institute, the author is aware of the very large scope of area in which these ores occur in Slocan, and also of the many professed and actual commercial successes in treating this character of ore used locally, in Australia for Broken Hill ores, in the United States, Mexico and South America. The object of the paper is to draw the members' attention to this existing area, to recite the experiences of those engaged in mining these ores, to relate the present attempts to treat the ore and so pay dividends to the shareholders, to suggest other treatments that may be applicable, and to gather the members' experience and ideas on the subject, so that this rich area may become another gem in Canada's diadem, and thus make us all even more proud of the country we live in.

As far as the author can ascertain there is no fixed division between the terms "dry" and "wet" ores, to limit the hard line where one ends and the other commences. For the purpose of describing the ores of this district a return of 10 per cent. and less of metallic lead to the ton is spoken of as a dry ore, and over 10 per cent. as a wet ore.

All these ores are rich in silver values, some also containing gold, and some not; in fact the ores are phenomenally rich.

The area included, especially in this district under discussion, is bounded on the north by the divide between the Lardeau and Slocan, stretching from Kootenay Lake to Arrowhead Lake; bounded on the east by Kootenay Lake, on the south by Kootenay River, and on the west by the Arrowhead Lakes and the Columbia River. This division contains an area fifty (50) miles wide from east to west, and forty (40) miles long from north to south. There are other parts in the Lardeau, East Kootenay and elsewhere containing dry ores, but the scope of this paper must be limited, and so mention must be left to another time.

This Slocan area is composed of granite rocks, certainly a broad description, but sufficient till those with more leisure than the mine

managers can make slices of the country rocks and classify them from a microscopic examination. The granite surrounds patches of slate as exhibited from Silverton to Whitewater, and south from Carpenter Creek to the village of Cody. There is a strip of other varieties of igneous rocks carrying copper, gold and silver along the north bank of the Kootenay River; and a strip of metamorphic rocks at Ainsworth. Outside of these isolated exceptions we may say broadly the country rock is granite. In the slate, as typified by the Rambler-Cariboo mine, they have followed their vein through the slate into the granite with even enhanced values occurring. The author would especially draw the members' attention to the veins on Springer, Lemon, Ten Mile, the head of Four Mile including Pennell, Cody, Kokanee and other Creeks. Among the many mines containing these ores are the Arlington, Hewett, Enterprise, Bondholder, Fisher Maiden, Republic, V. & M., Erin, Evening Star No. 8, Exchange and others.

Let us first look at the characteristics of the veins carrying these ores. So far as known there are at least four series of veins. First from Twelve Mile Creek going south across Springer to Lemon Creek are six (6) parallel veins within a zone three thousand (3,000) feet wide, known by development to traverse the country for five miles. Their strike is N 20° W, S 20° E, with an easterly dip of steep pitch, and they are strong veins varying from six to thirty (6 to 30) feet wide of vein matter between walls. They generally have a pay streak of extra rich ore on both hanging and foot wall, from a few inches to two feet wide each one; then often one or more pay streaks lie in the vein matter between the outer streaks with some values distributed throughout, so that by stoping out the whole vein from wall to wall, twelve dollars (\$12.00) and more per ton in gold and silver alone can be averaged from the mass. These mines of this series have a future of large tonnage, and that must be treated economically to pay dividends. Typical mines of this class are the Republic, Erin, Peerless, Combination and other groups.

Then intersecting these first veins are others with strike E 5° N and W 5° S (all points of the compass are described magnetically), dipping south with wide vein-matter carrying mostly silver values, most

often in streaks. Typical of this series are the Rainbow, Wavertree, Evening Star No. 9, Golden West, and others. The Howard Fraction is reported to have the same strike with a northerly dip.

Another type the author has not examined is represented to the east of Republic Mountain by the Myrtle Group, where a vein occurs traversing also the Rainbow, I. X. L. and Morning Star on Springer Creek. The strike is reported N 10° E and S 10° W with dip west, and the ore is high grade in silver values. Farther east we come to the type of small high-grade veins represented by the Enterprise, Bondholder, Mabou, Missing Link, Premier and Evening Star No. 8. These veins traverse the country for six miles with average strike N 28° E and S 28° W, and dip east, carrying high silver values, but no gold to speak of.

This Enterprise series intersects the Republic series apparently on the Premier and Evening Star No. 8 groups, near Dayton Creek.

Intersecting the Enterprise series again is another series, viz.: the Arlington one. Here we have large veins striking N 10° E and S 10° W with dip east contrary to the Myrtle type.

This series is represented by the Arlington, Speculator, Mabou, Neepawa, Enterprise, Bondholder and others with parallel veins. These have streaks of pay ore like the Republic series, carry gold and silver values, represent large tonnage, and require economical treatment.

There is much more yet to be found out about the characteristics of the dry ore series in question. Though some development has been accomplished, a large amount more is still desirable, executed by skilled engineers who realise what they are learning, and who form their judgment from facts before them, sifting out fact from theory. This curt account of the series, however, is given in the hope of obtaining others' ideas.

Next has to be considered the mode of occurrence and constituents of the pay ore. Where gold occurs, as a rule it is not free, but alloyed or mechanically mixed with iron pyrites, a long disputed difference. The silver is sometimes alloyed with galena, zinc-blende, copper sulphide, or antimony sulphide, not in masses but dispersed through quartz gangue. At other times the silver is native, or as

argentite (sulphide of silver), and in a few cases apparently chloride (horn silver). In all cases there are base metallic values with the precious metals in the gangue of the veins.

Now comes the crux of the whole matter. Nature has put the minerals in the veins with lavish hand to be extracted by the ingenuity of man.

The ores having been wrought, how are they to be treated on a commercial scale to secure an extraction of at least ninety per cent. of the values, and also bring the profits to the shareholders?

At present profits are given away to such vampires as railways and custom smelters, who suck the life-blood out of the mining industry, by exorbitant overcharges, though bonused by the country, just when expenditure of working capital promises success. If possible, any transportation expenses from the mine to the railway, and so to the smelters, must be saved on an average grade of ore; therefore, what is wanted is a process to treat the ore at the mine.

The present general teaming charges are \$3 per ton. Freight and treatment on railway and at smelter are charged from \$8 to \$12 on dry ores (cheap compared with the wet ore charges), the two vampires do not make separate contracts for each division of labor, but combine against the hapless mines. Put mining charges on to the above cost, then masses of \$12.00 ore are useless to the mine owners. Under present circumstances hand sorting is resorted to, or in other words, the eyes of the mine are picked out, leaving a lower second grade class of ore than if the mass was shipped. The owners fondly hope that in some dim future the vampires will lower their charges to allow this second grade ore to be shipped, but will they?

Another kind of sorting is introduced, viz.: Wet concentration by roll crushing and jigs with settling tanks for the silver slimes.

This reckless method, as proved in all mining districts where this class of ore occurs, may save seventy (70) per cent. of the values, hopelessly losing for all time the balance.

This is only picking out the eyes of the mine in another way, for the silver as argentite, antimonial, etc., will not settle effectually enough to permit its recovery. These facts all show that the mine to pay as its

values warrant must have its ore treated in bulk by some smelting or chemical process.

Transportation charges of coke and coal and the necessary fluxes up to the mine to counteract the zinc contents, or want of sufficient lead, in most cases prohibit a smelting process.

We can only then begin where Broken Hill has left off in their costly experiments lasting over many years, having in our favour over them cheaper power from our creeks to generate electricity, abundant timber for all purposes, cheaper fuel in coal and coke, and possible fluxes in the district.

Their hope is in the Phoenix process of bessemerizing with chlorine gas, and using a cycling chemical reaction also making marketable zinc. Rumours are rife of other processes there. Magnetic separation of blende from galena will not help us where the silver is unalloyed with lead and zinc. Would this system of treatment aid us, viz. : Dry crushing, dry concentration with sizers and Clarkson-Stanfield's centrifugal machines, or with pneumatic blowers; then treating the product, briquetted or sintered if necessary, by the Phoenix process?

We have to put our heads together to think out, and spend money in trying to solve successful extraction, that will add millions to the world's wealth, and many dividends to the lucky shareholders interested in these Slocan mines. Let us remember that the big tonnage of average grade ore, when effectually treated, make larger and more permanent mines than shipments only of rich picked material.

