Gold, if present in workable amounts, is, to a great extent, "free milling" and it may be taken as an axiom in this district that if an ore does not show gold in the pan it is economically valueless.

As to associated minerals, it may be noted that *Iron Pyrites* occurs in every gold ore in the district, and that as an indicative mineral, it is valueless.

The same is true of Pyrrhotite, which is commonly abundant in the pyritous schists. When an ore contains "free" gold the iron pyrite invariably contains gold, the pyrrhotite almost never.

Copper Pyrites in the ores of the Black Jack, Wendigo, Mikado and Black Eagle is invariably associated with high values in gold, while in the ores of most of the other veins of the district its presence means nothing favorable or otherwise.

Galena is invariably associated with high values in gold in the Sultana, Mikado, Golden Horn, Golden Star, Olive, Foley, Champion, Treasure and Big Master mines.

Zinc Blende is of the highest value as an indicative mineral in the veins of this district and wherever quartz is found with disseminated zinc blende, it is safe to say it is rich in gold. The richest ore in the Foley, Golden Star, Olive, Sultana, Champion, Golden Horn, Sakoose and Big Master, as well as in the veins in Eagle Lake, is invariably associated with the sulphides of zinc and lead, although these minerals in most cases carry little or no gold *per se.*

The rare sulphide of Bismuth, Bismuthinite is abundant in the ore from the Mikado vein and is sparingly found in the other veins of the vicinity. It is invariably associated with high gold values in the Mikado vein, and possesses no significance in any of the other veins in which it occurs.

Mispickel, and Arsenical and Antimionial sulphides are rare, and traces only of tellurides are met with, the only exceptions being the Huronian vein in Moss Township which produced very fine specimens of sylvanite, and in the Gold Creek vein on the Lake of the Woods, which, in a narrow pay shoot, carries the rare silver telluride aessite.

Leaves of native copper are comparatively common in the gold ores of the district and particles of native silver and of native platinum have been found associated with gold in several veins on the Lake of the Woods. Molybdenite is commonly found in gold bearing veins but possesses no significance as an indicative mineral.

As indicative minerals, the sulphides range in value as follows: 1. Zinc Blende. 2. Galena. 3 Copper Pyrites. 4. Iron Pyrites.

As may be gathered from the foregoing notes, the gold ores of the district may be regarded as "free milling," and experience has shown that from 70 to 90 per cent. of the total gold contents of the ores may be obtained by simple battery amalgamation, and that a satisfactory percentage of the remaining values may be obtained by subsequent concentration and chlorination, or cyaniding, or by direct cyaniding without previous concentration.

The "free milling" character of the ore has been retained in depth, and from the considerations presented in these notes, it is to be expected that these characteristics will be permanent to any depth, and since from a geological standpoint there is no reason why the deposits themselves may not run to as great depths as are practicable to mine, it would seem that in spite of many disastrous failures up to date that as soon as the era of "wild catting" and stock jobbing schemes passes over that money and common sense will ultimately make a profitable, permanent mining industry in Western Ontario.

There is no district in the world where so many classes of gold bearing deposits may be met with as in this, and nowhere else is there such a wide spread diffusion of the precious metal, and although it is not to be expected that all of these gold deposits can be made to pay, it is to be expected that some of the best of them under the favorable conditions as to accessibility, climate, water, fuel and water power, may be made profitable mines when ample capital and experienced management are brought to bear upon them.

The Development of Gold-Dredging in the United States.

By Ralph L. Montague, A. I., M. E.*

Although gold-dredging had been carried on successfully on a moderate scale in New Zealand for a number of years, the efforts of American engineers were invariably met with failure when they tried to handle placer deposits by this method, and it was not until 1895 that the first successful dredge was built. Previous to this date various machines had been installed in different parts of the country, but from one cause or another they all failed. One fault common to nearly all these earlier types was that the machinery used was not powerful enough. In some localities, notably the Snake River, in Idaho, the gold was too fine to save in the appliances used; but the most common fault was that the final disposition of the tailings had not been taken into consideration, and consequently it was only a matter of time when the tailings crowded in on the dredge and work had to cease.

The first successful dredge in America was installed at Bannack, Montana, and commenced operations on the 19th June, 1895. In its earlier stages the management of this undertaking was in in very inefficient hands, and this dredge would undoubtedly have been a failure if the management had been changed; but by judicious changes and additions to the machinery it became, as it is to-day, the most efficient dredge in the United States.

The most important points to be considered when selecting or designing gold-dredging machinery are:—First, the ability to handle a large amount of gravel economically, e.g., to excavate; secondly, to dispose of the tailings with the least expenditure of power; thirdly, to save the gold. I have put the gold saving problem last, because the most perfect arrangements for saving gold will be useless if a large yardage is not handled; and, furthermore, if a machine is capable of handling several hundred cubic yards in twenty-four hours some sort of device can be adopted that will save the gold.

The type of dredge that is so successful in America is, in its main features, totally different from the New Zealand type of machine. The gravel in place is excavated by an endless chain of buckets; in some instances the buckets are connected by links, in others the buckets are continuous. The upper tumbler which drives this chain of buckets is set about 14 ft. above water-level. The excavated gravel is dumped into a shoot that leads into a revolving screen or grizzly. This grizzly is placed with its lower end and projecting over the side of the boat, and the large boulders drop overboard, and are thus easily disposed of. The finer material that passes through the openings in the screen (these openings average 4½ in. square) falls into a sump, and a centrifugal pump picks up this gravel, together with the water necessary to sluice it, and elevates it into a sluice-box, which is supported on a auxiliary flat boat at the stern of the dredge. It is not necessary to have the upper end of the sluice box over 20 ft. above water-level; the average height taked from a number of dredges operating in various localities is 15 feet.

This type of dredge, instead of being held in position by a series of wire cables, is held by means of a "spud" or anchor, which consists of a timber shod with a steel shoe, or, as is the case in some places, the spud is made up of sheets of steel and channels, I beams, &c. The digging is performed by starting the bucket chain on one side of the face of the cut and moving slowly across the face. As the dredge is pivoted on a spud at the stern, only one line is needed to swing the dredge. When the other side of the face is reached the ladder supporting the bucket-chain is lowered and the dredge swung slowly back, thus taking off another cut. This process is kept up until the bed-rock is reached; then the dredge is moved up towards the face, and the process is repeated. There are several advantages in this method of

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