

off the town mains at 2,200 volts and operating the hot mills. The starting torque is obtained by an arrangement of resistances connected similar to those of the cold roll motor. Twenty-two $1\frac{3}{4}$ -inch cotton ropes connect each motor with a 30-foot flywheel which weighs 75 tons. Each of the motors is designed to carry four sets of 26-inch hot mills. These mills are connected in train direct to the large wheel by means of 18-inch spindles and loose coupling boxes.

The buildings are of steel, concrete and stone, spacious, well lighted and ventilated. The plant is of the most improved design and constructed with a view to economical production. Mr. N. D. Lewis, the general manager, together with Messrs. Peacock Bros., engineers, Montreal, designed the lay-out. Mr. Lewis, together with Mr. B. B. Tucker, resident engineer, personally supervised construction.

HYDRAULIC MINING IN THE YUKON.

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The pre-eminent thing in the Yukon territory, Canada, and in Alaska is, of course, gold. Commencing with south-eastern Alaska, at Juneau, is situated the famous Tredwell mine, mining the lowest grade quartz ore in the world at an average rate of about \$2.60 per ton. Near the Yukon boundary, at Atlin, B.C., gold occurs to a considerable extent. Continuing down the Yukon River, we have Dawson city, once the "most celebrated camp of the North." Here gold occurs, both in quartz and free in sand. Fairbanks represents the placer mining district of central Alaska, while Nome, on the north-west coast of Alaska, is the scene of an extensive placer district, which closely resembles Dawson and its surrounding creeps in many ways.

The latest "rush" is up the Koyukuk River, Alaska, well inside the Arctic Circle. From what the writer could ascertain in Nome last August this district promises to be very rich in placer gold. It may be of interest to note the total gold productions up to 1906:—

Alaska	\$ 99,650,830
Yukon	118,959,800

The gold occurs almost entirely in the free, or "placer" state. For the past twenty-eight years in Alaska and twenty-three years in the Yukon the major occupation has been the separation of this metal from the sands and gravel with which it is associated. The various processes involved are all spoken of as gold "mining"; although this term is somewhat misleading, since in few cases does anything exist which resembles a mine as usually concerned.

The "pay" sand or gravel may be found in the bottom of creeks and small rivers, in their valleys or along the hillsides. At Nome gold is also found on the sea beach, as well as along the creeks of the surrounding district. The typical gold-bearing sand is of a dark bluish-black color, and is known as "black sand." But there is also found a yellow sand. In Bonanza and Eldorado and some other creeks near Dawson it is generally acceded that this variety is richer than the black sand.

The pay sand is usually found just above bed-rock, which exists along Bonanza Basin at an average depth of about seventeen feet. At Nome rock is found to be at a much greater depth, although "colors," or indications of gold, may be found anywhere from the surface to bed-rock. In the Yukon, therefore, any method of obtaining the metal must necessarily include disposing of the ground, which, by the way, is frozen, and overlies bed-rock throughout the entire district.

The manner of occurrence of the pay sand governs the system of prospecting. The most natural places to expect gold are the bottoms of creeks, which have cut their way to almost bed-rock through this frozen ground. If such streams are shallow or dry the mining is a comparatively simple matter. Prospect holes are sunken in the valleys of

such creeks, and also the contiguous hillsides are tested, and have been found to yield pay sand similar in all respects to that found in the creek bottoms. Hence, it is probable that the deposit of placer gold was of glacial origin. However, the two geological conditions which constitute the engineering problems of mining in the Yukon are the occurrence of the pay sand at bed-rock depth, and the existence of frozen ground.

Experience has developed several systems of mining, but every method depends to a greater or less extent upon the use of water. Hence, the term "hydraulic mining" may be taken to include all gold mining operations in the Yukon, although there is a special application of the term which will be referred to later. The comparative simplicity of the mineralogical aspect of placer gold also renders the term mining somewhat of a fallacy. Especially is this the case since the hydraulic portion of this unique department of engineering known as "hydraulic mining" is by far the more important, from both scientific and financial standpoints. At least, the foregoing statement is true of operations as carried on at the present time, when the ground is being worked at a cost of millions and the entire country virtually controlled by large corporations.



Fig. 1.—A Yukon Gold Dredge.

It is the intention of this article to deal with the several methods of gold mining employed in the Yukon the arrangement being in logical order of development, and in a subsequent article to describe the complete hydraulic and hydro-electric installation of the Yukon Gold Company, which has been necessitated by the vast extent of their gold mining project, and recently constructed on this account. Certain statistics will be introduced which have been assimilated during the writer's connection with the work. However, much of the information, and also any opinions expressed in both articles, are the result of personal observation, and are in no way intended to relate to financial or speculative interests connected with stock manipulation.

The Placer Mining.

The fall of 1906 saw the beginning of the great Klondike gold rush. Thousands of prospectors tramped over the hazardous White Pass route from Skaguay to White Horse and floated down the Yukon River in small boats to the junction of the Klondike River, where the city of Dawson sprang into existence. This new town became the metropolis of the world-famous gold district, which comprises Bonanza, Klondike, Eldorado and other creeks bearing familiar names. The average annual production of this district has been \$12,000,000.

* With Hazen & Whipple, consulting engineers, New York.