An excellent view of the Ingerbelle open pit showing one of the 100-ton Lectra-Haul trucks being loaded by a P & H shovel and showing the auxiliary equipment in the background.

The Similkameen Project

FOREWORD

Just before entering Princeton, British Columbia, about 170 miles east by road from Vancouver, there is a historical sign by the roadside. It is one of many familiar to travellers in the west-coast province and they are designed to spell out the significance of a nearby historical spot and in many cases to relate, briefly, the background of what has gone before in areas which may be abandoned, or which have merely changed their character during the past 100 years or so.

The sign, overlooking the Similkameen River, reads:

"Princeton, the first town of the interior. In the early days it was known to Salish, Athapaska, Cree and Blackfoot Indians as "Place of the Red Earth". Here they traded for this red earth for their bodies.

"Royal Engineers under Col. Edgar Dewdney in 1860 built the trail from Hope. Land was taken by Hudson's Bay men, miners, cattlemen and others – looking for gold. After gold, first coal mines and then copper mines operated. The completion of the Hope-Princeton highway in 1949 brought auto traffic from the West to Princeton".

The previous page gives an unusual view of the Similkameen concentrator, surface buildings, the loading out area and, in the foreground the suspension bridge described in this article which carries the tailings to the storage area and the reclaim water back to the mill over the steep Similkameen River canyon.

HISTORY

To the casual visitor and reader it would not seem that mining had been all that important. But in fact mining has been the principal economic support of the area. Early copper showings were known on what is now Similkameen property since before 1900 and various amounts of development work were done before 1923 when what later became the Copper Mountain mine, east of the Similkameen River was acquired by The Granby Consolidated Mining, Smelting and Power Company Limited, now known as The Granby Mining Company Ltd.

Copper Mountain successfully produced copper from the area from 1926-1930 and from 1937-1957 with approximately 34,000,000 tons of ore grading about 1.0% copper being mined and treated. For the most part this was an underground operation although during the last part of the operation two small open pits were developed. Higher prices for copper which saw the advent of large-tonnage, open-pit operations which could successfully treat low-grade deposits were not then dreamed of.

In 1966, Newmont Mining Corporation acquired the Ingerbelle property on the west side of the Similkameen River and in 1967 purchased all the assets of the Granby Mining Company in the Princeton area and formed a wholly-owned subsidiary, Similkameen Mining Company Limited. Thus Similkameen now owns two main orebodies, the Ingerbelle (now in production) and the Copper Mountain orebodies known as the Similkameen deposits. These are separated by a deep valley. This valley played an important part in the planning of the total development of the orebodies.

The concentrator is on the site of the Ingerbelle deposit with the tailings being transported in unique fashion, as can be seen in the accompanying photo, across the valley. When a decision is made to bring the Similkameen deposits to production the ore will be transported by belt conveyor on a separate suspension bridge across the valley to the present concentrator.

A significant factor in the development of these deposits and the Ingerbelle being brought to production is that J. Harvey Parliament, well-known mining man, had a long association with the original Granby company at Copper Mountain prior to rising up the executive ladder to become manager of Granby's Phoenix property, general manager of Granby and finally executive vice-president.

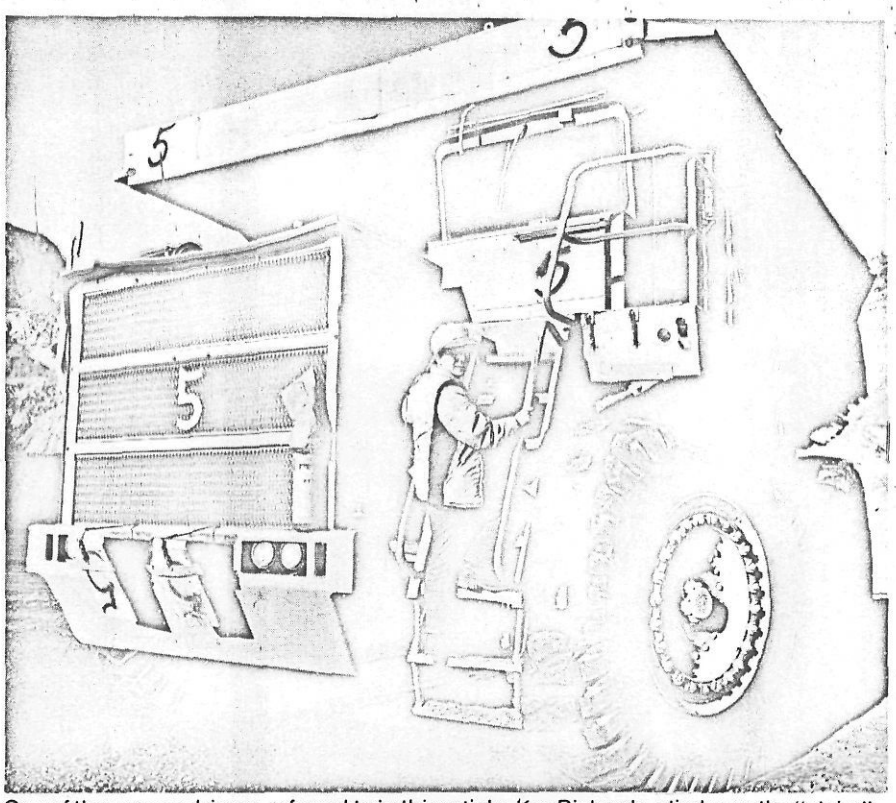
In 1968, he joined Newmont Mining

Corporation as executive vice-president of Similkameen Mining Company, returning to the area he knows so well, to guide the development to production stage of the Ingerbelle property. Mr. Parliament is also vice-president and general manager of Granduc Operating Company, another Newmont company held in association with Asarco and which operates the Grandue mine in northwestern British Columbia.

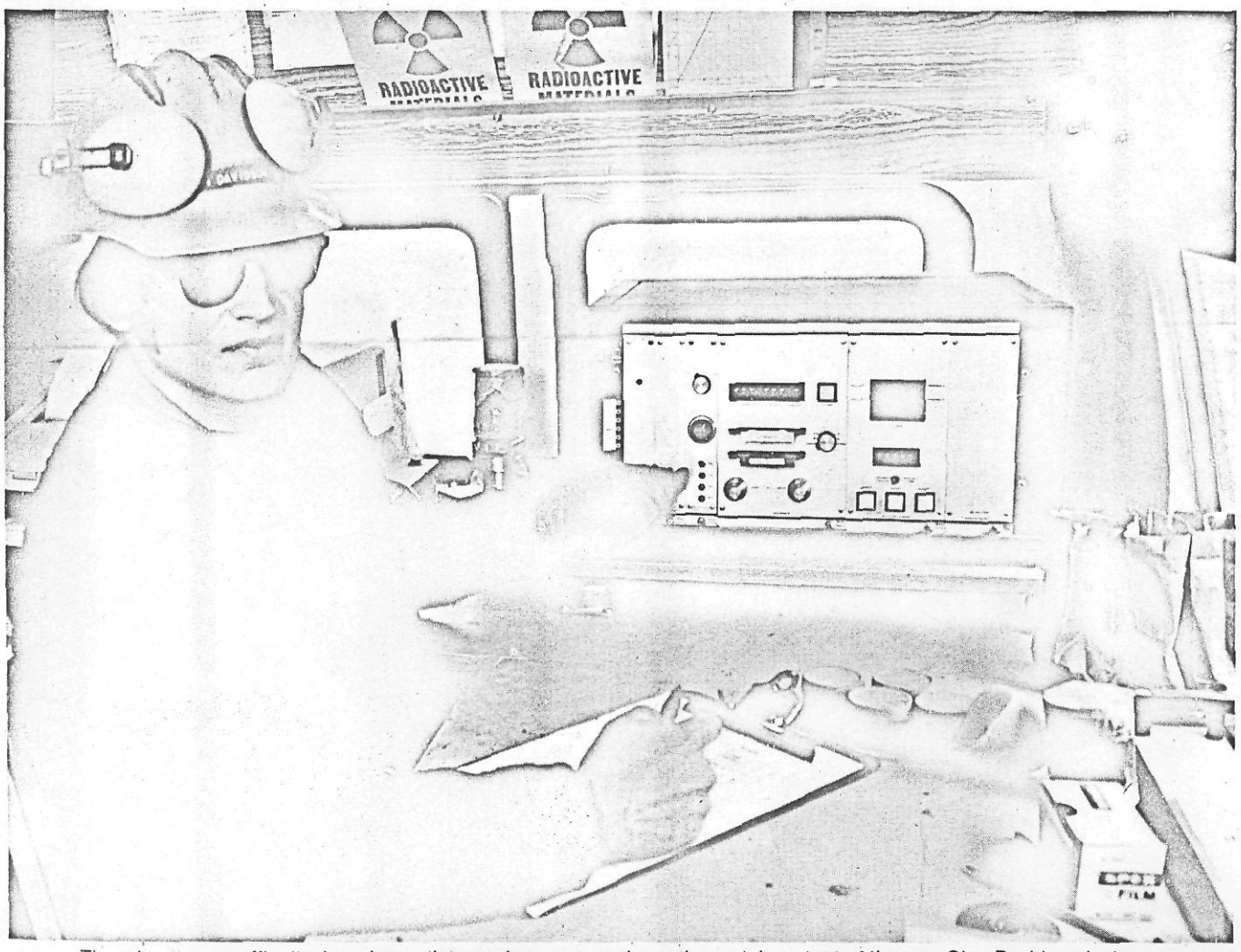
This story is based largely upon reports supplied by Mr. Parliament and also by Alex Bissett, resident manager of the Similkameen company. "Western Miner" wishes to acknowledge with thanks their co-operation in presenting this feature.

GEOLOGY

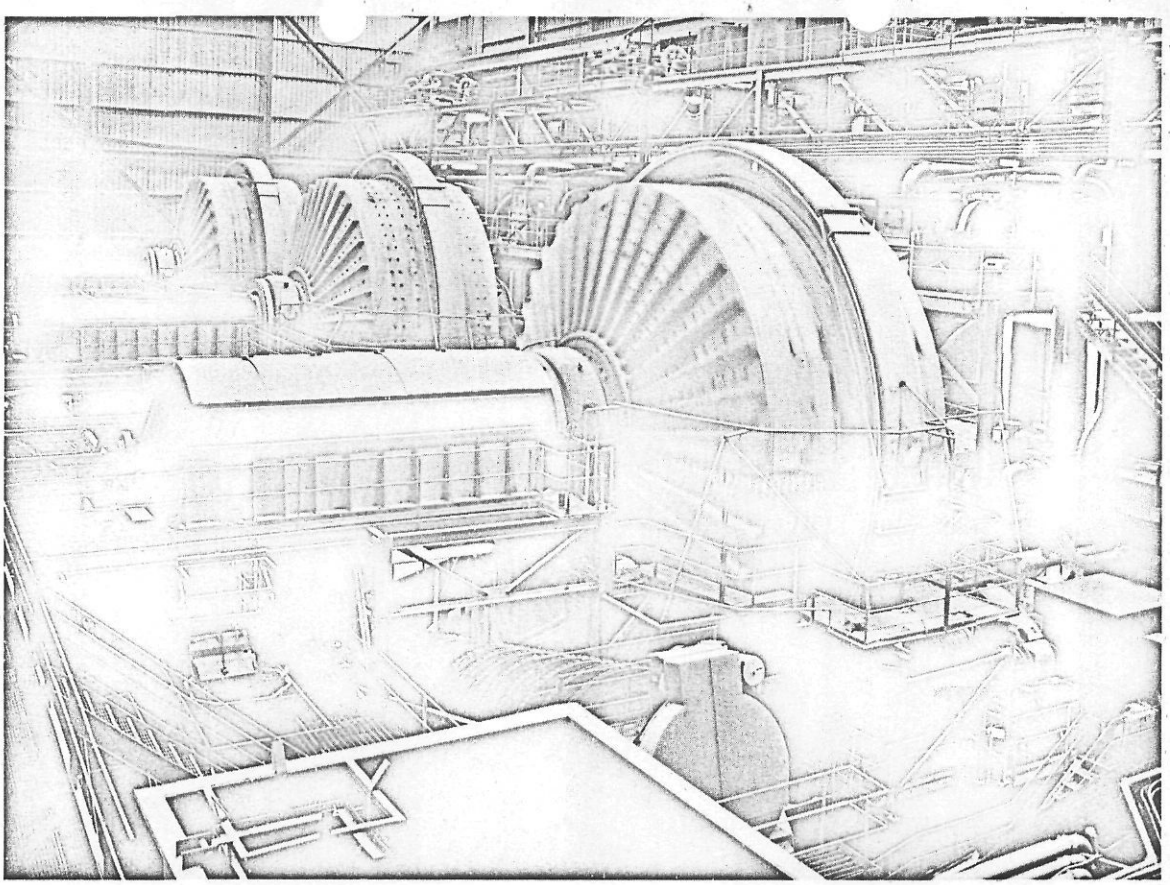
The Ingerbelle and Copper Mountain orebodies lie within a 14,000 by 3,500 foot belt of Nicola rocks. These rocks are composed of andesitic tuffs and agglomerates, lesser amounts of flows, and some lensy siltstone layers. The west end of this belt is in fault contact with other Nicola rocks including flows, agglomerates, and argillites. The volcanic belt is bounded on the south by the



One of the women drivers, referred to in this article, Kay Richards, climbs up the "stairs" to the cab of her 100-ton Lectra-Haul.



The mine "assay office" where immediate analyses are made on the metal content of the ore. Glen Davidson is the technician in this photo.



A view of the interior of the compact concentrator showing the huge autogeneous mills in operation. In the foreground is the Akins classifier.

concentrically zoned Copper Mountain stock consisting of diorite, monzonite and pegmatitic syenite and on the north by the complex Lost Horse Intrusive. Small masses of this intrusive also occur in the volcanics.

The Ingerbelle mineralized zone is crudely L-shaped. The southwest arm is about 1,000 feet wide and tails off to a narrow erratic zone of low-grade mineralization. Narrowing as it wraps around the point of the L, the zone broadens to a width of 1,500 feet as it trends southeast to the Similkameen River. A 900-foot width of Nicola volcanics lying between the orebody and the Copper Mountain stock is practically devoid of copper. On the northwest side mineralization terminates abruptly against highly altered volcanics, but small patches of it are scattered through the less altered volcanics further to the north and east.

Chalcopyrite mineralization at Ingerbelle occurs as disseminations, discontinuous fracture-fillings and coarse blebs. Sulphide veins up to several inches thick are rare. The host rocks are mainly altered tuffs and agglomerates. Massive andesite, although mineralized, is less favourable for ore-grade material. Less than 10% of the ore is in small masses of monzonite or diorite.

At Ingerbelle the most prominent alteration associated with copper mineralization is a pale greenish bleaching of the dark volcanics. This alteration involves a conversion of andesine plagioclase to albite, together with the formation of considerable epidote and lessor amounts of chlorite, scapolite, calcite, and occasionally hornblende. The recrystallization has converted the host into a hard, tough rock with many of the original fractures healed together.

Ore reserves recoverable by open pit mining at Ingerbelle are estimated at 45 million tons of 0.53% Cu. The stripping ratio at Ingerbelle is 2.6 tons of waste to one ton of ore.

MINING

Total reserves in all pits as announced earlier this year amount to some 76 million tons with a grade of 0.53% copper and an average ratio of 2.2 tons of waste to one ton of ore. In addition an appreciable tonnage of ore of similar grade will be recoverable from the old caved area of the original Copper Mountain mine.

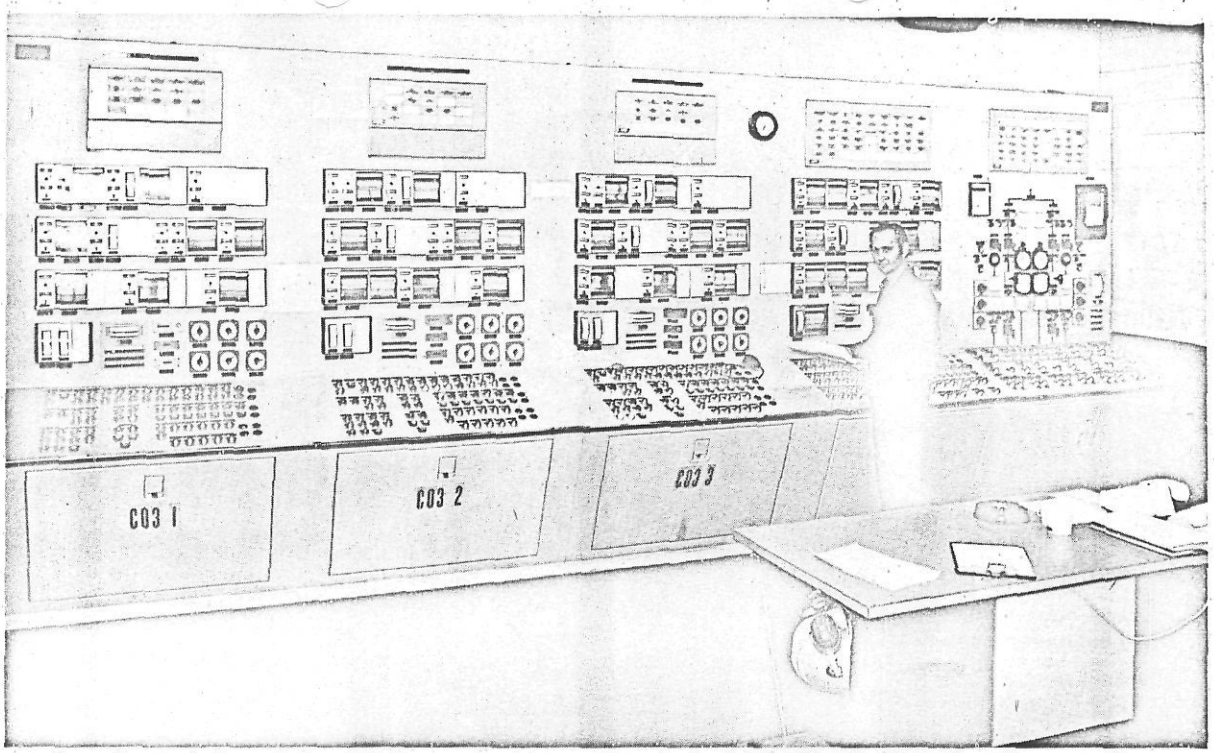
J.H. Parliament
Executive Vice President,
Similkameen Mining Co. Ltd.

Mining at Ingerbelle is carried out on a 3-shift, five day per week basis but it is hoped that a full seven-day-a-week operation can be achieved next year. Bench heights are designed at 40 feet and the overall final wall slope varies between 45° and 50°. The pit itself has an average eventual depth of 800 feet.

There are two unique factors in the operation of the Ingerbelle pit, one technical and scientific and the other, well, let's say visually attractive.

Much has been made in recent times of equality for women. In the Ingerbelle pit they have it and five women are included in the crew which operates the big 100-ton Lectra-Haul trucks, with dexterity and aplomb. The supervisory staff has nothing but praise for the efficiency with which these female heavy duty truck drivers work on equal basis with their male counterparts.

The other is "at-the-face" assaying. After every fifth truck load an "Inax" X-ray fluorescent analyser is used to check ore samples right at the face so that as the huge loads are being trucked to the concentrator a report on its metal content is immediately available.



Dave Brooks is the operator of this console which monitors every detail of the Similkameen mill process flow.

Drilling is in 22-ft. by 22-ft. patterns with three Bucyrus-Erie 60-R drills being used. Hole size is 9⅞ ins. and they penetrate nine feet below grade. Dupont of Canada Ltd. has a three-year contract to provide blasting materials.

Four P & H. model 1900 shovels with 10 cu. yd. buckets three of which are in use at all times, are used to load the 100-ton capacity electric-wheel trucks which are powered with 1,000 h.p. engines. Of the total fleet of 15, eleven are scheduled for continuous use.

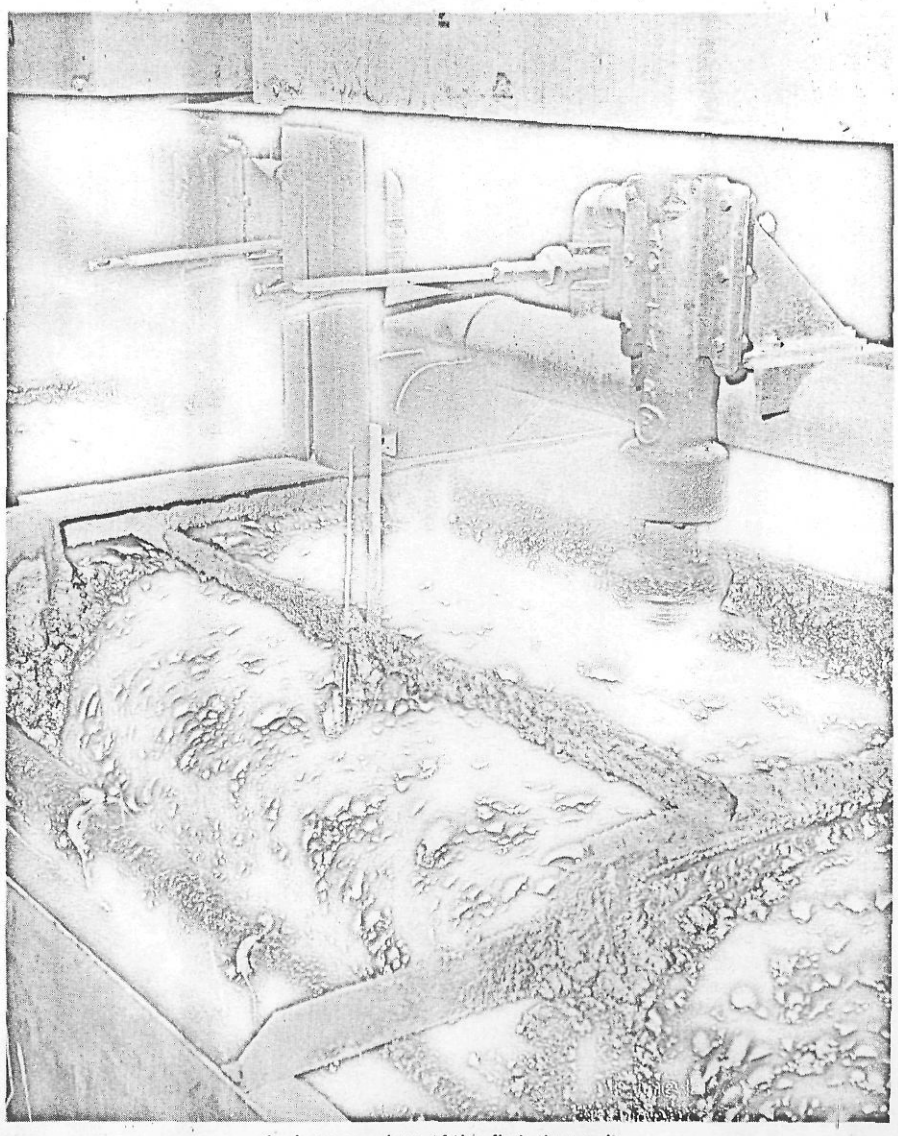
Pit cleanup is done by three rubber-tired Caterpillar 824B bulldozers. A LeTourneau 15 cu. yd. front end loader is used to supplement the shovels and for loading jobs outside the pit area.

HIGHWAY CONSTRUCTION

The Ingerbelle claims were crossed by the Southern Trans provincial No. 3 highway, commonly called the Hope-Princeton highway, prior to, and during part of, their development. This caused some problems in the early stages and automobile traffic was disrupted, to a very minor degree, while blasting took place.

However, this problem led to a very interesting solution. It was decided to construct a new highway some four miles in length west of the pit to replace the old highway. Furthermore it was necessary that this work be finished before start-up of the concentrator.

The highway section was built at company expense and to a great extent by company crews and grades and alignments were those specified by the B.C. Department of Highways. Be-



A close-up view of the flotation cells.

A complete repair and maintenance shop at Similkameen looks after the huge heavy duty equipment.

The 70-ft. Eimco thickener

Wilfred Tsang in the mill assay office

cause of the mountainous nature of the area large fills were required. These were built with mine equipment using waste material removed from stripping the orebody and an almost complete integration with the mining development program was achieved.

To those who have travelled on this highway it can be said that the average motorist will drive past the mine and mill without knowing they are there. A large berm was built along the minesite for about 4000 feet contiguous to the highway. This has been planted and today, just a few months after commencement of production, it looks like part of the general scenery.

MILLING

The concentrator, designed to treat 15,000 tons of ore per day operates on a seven-day week basis, 24 hours per day.

Selection of a site for this plant plus the usual surface buildings, repair shops, took careful consideration. Finally the approved site was on a sloping hillside just above the break-off into the canyon. The hillside was excavated to provide a level site for the surface buildings with the removed material used to build a flat area at a slightly lower elevation for the construction campsite. This is now used for concentrate storage and loadout.

Careful consideration had also to be given to the foundation material, particularly in view of the fact that the concentrator was designed around the installation of not only a large 74-in. by 65-in. crusher, a heavy piece of equipment itself, but also three 32-ft. autogoneous mills. Use of autogoneous mills is relatively new in Western Canada, two other installations being at Lornex Mining Corp. and at the Island Copper Mine of Utah Mines Ltd. This mode of operation lends itself to lower capital costs and decreased operating costs.

Another fact about the concentrator, obvious to the visitor, is the high degree of automation, only four men being required to operate per shift. A photo which appears elsewhere shows the flow control console which allows the operator to spot at once any extraordinary change in operating and control procedures.

The ore, after being loaded into the 100-ton trucks, is transported to the primary crushing plant situated above the mill building. The Allis-Chalmers crusher reduces this pit-run ore to minus 9 ins. Here again, the benefits of automation are brought into play with the plant being designed for a one-man operation.

Crushed ore is fed onto a 96-in.-wide belt feeder and then to a 48-in. discharge feeder and then conveyed to a "broomstacker" where it is spread over a 45,000 live ton storage pile.

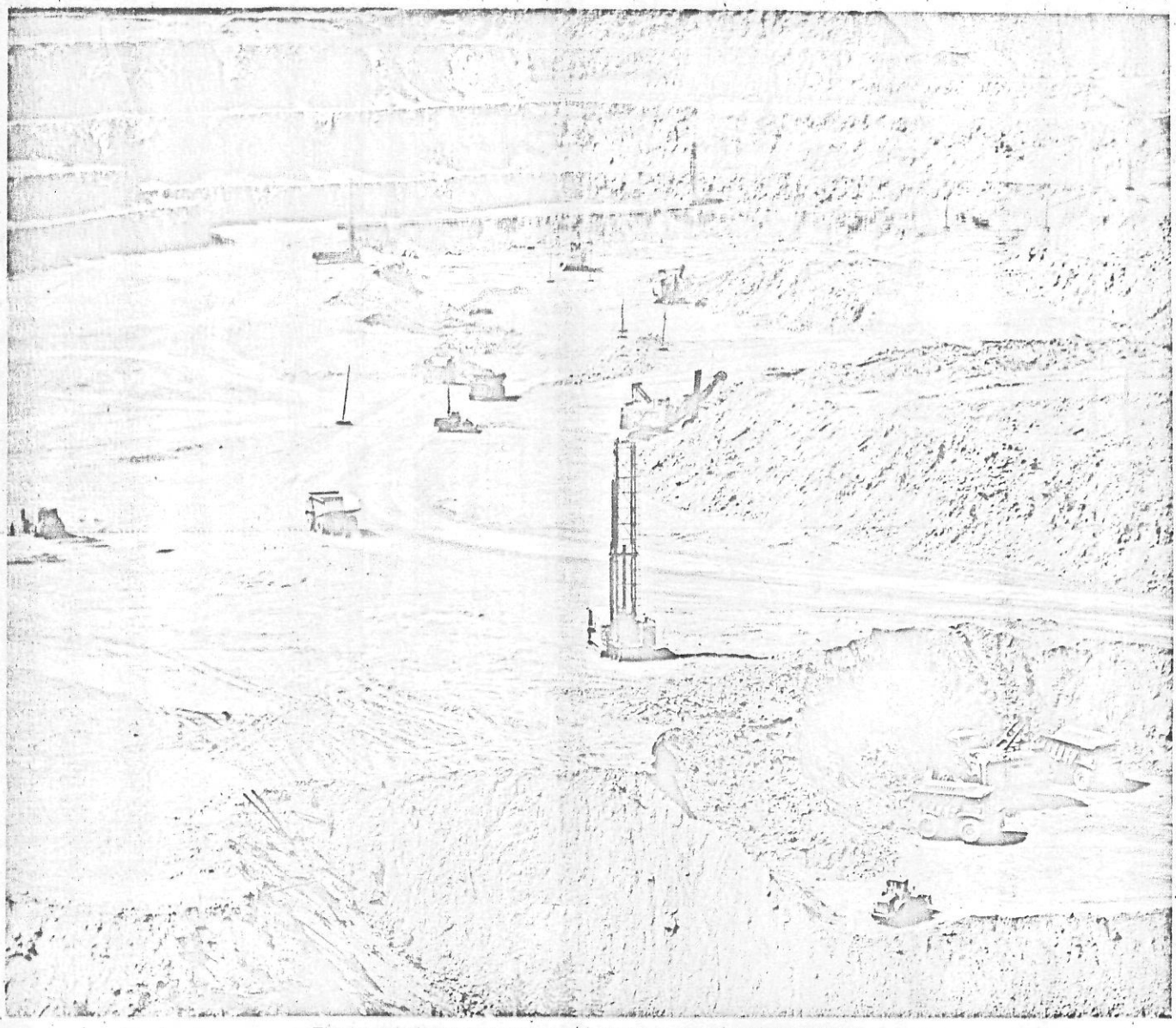
From this stockpile hydrostroke feeders draw ore to feed the three large Hardinage autogoneous mills. No secondary crushing is required since, as the name implies, "autogenous" means that these mills are designed to allow the crushed ore to grind itself. However, experience showed ore from at least part of the mine, proved to be too friable for complete autogoneousness, and it was found necessary to add 4-in. steel balls to obtain a satisfactory grinding rate. Mr. Parliament has reported that it is expected that as the pit becomes deeper the characteristics of the ore will change and the mills will become fully autogoneous. Each mill is designed to grind 5000 tons per day.

Mill discharge passes through an 8-ft. dia. by 22-ft. long trommel with ¾-in. square perforations. Trommel oversize returns to the mill with the ¾-in- undersize going to a 96-in. Akins classifier. Sands from the classifier are returned to the mill with the overflow pumped to a bank of seven 20-in. primary cyclones, for further classification. Cyclone overflow about 65%-200 mesh goes on to the flotation circuit and the underflow returns to the mill.

The flotation section supplied by the Galigher Company consists of three parallel banks of ten 400 cu. ft. rougher-scavenger cells, one bank of eight 100-cu. ft. cleaner cells and three 100 cu. ft. recleaner cells and one bank of five 400-cu. ft. cleaner-scavenger cells.

The rougher-scavenger concentrate is delivered to a regrind mill and reduced to about 90 per cent minus 325 mesh.

Concentrate is thickened to about 60 per cent solids in a 70-ft. diameter Eimco thickener located outside the



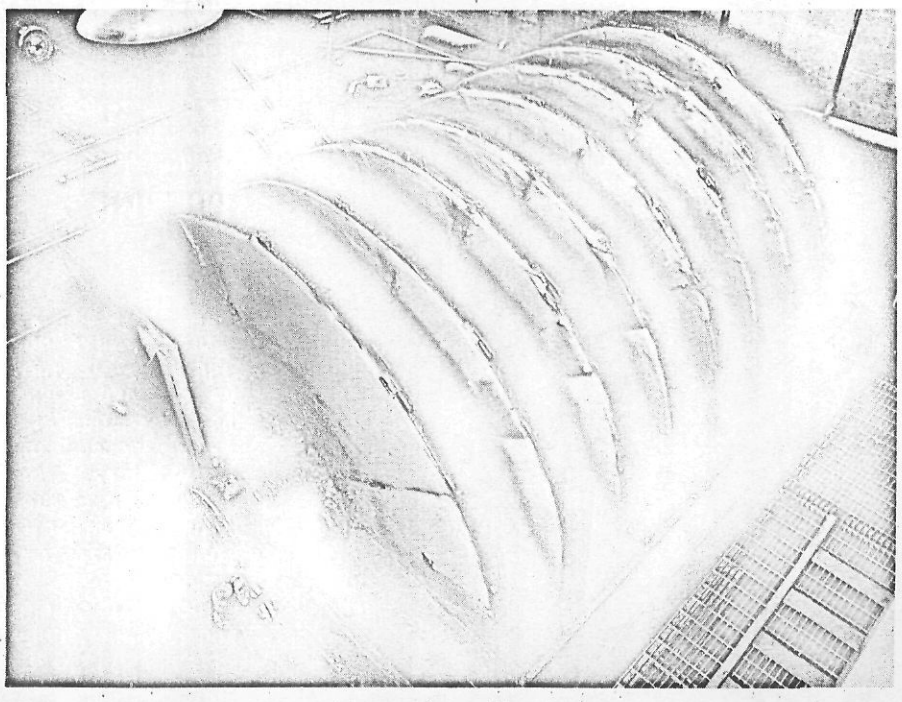
The Ingerbelle open pit showing all types of equipment at work.

concentrator building. Overflow is returned to the plant circuit and the underflow to an Emico disc filter which brings the moisture content to about 15 per cent.

The filter cake then passes through a 50-ft. long x 5-ft. Lochead-Haggerty dryer where the moisture content is further reduced to about 8 per cent and then stored prior to shipment to Vancouver where it is again stored awaiting shipment to Japan.

TAILINGS STORAGE

Final tailings from the concentrator flow by gravity across the suspension bridge, seen in the accompanying photo, which crosses the Similkameen Canyon, along a steep gulley and through a 900-ft. tunnel to the west end of Smelter lake valley. This valley is an old channel of the Similkameen River



The Eimco disc filter