TCS → Trail

888924

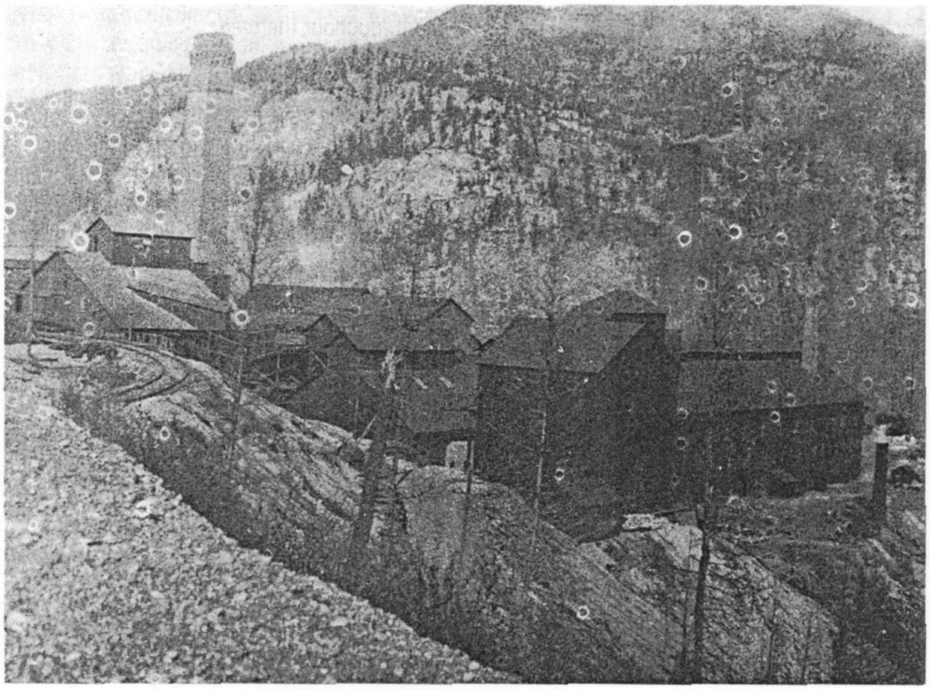

Fig. 1. An overview of the Trail smelter as it appeared in 1896.

100 years of smelting at Trail, British Columbia: 1896-1996

by Richard H. Fish
Cominco Limited
Trail, British Columbia

The Beginning

The world's largest zinc and lead smelting complex stands at Trail, in southern British Columbia. In fact, there has been a smelter at the Trail site for 100 years that has evolved from crude to sophisticated, modern technology and continues to provide the Province of British Columbia with one of its main economic engines. This colourful story began on February 1, 1896, when the first copper furnace was blown in at Fritz Heinze's B.C. Smelting and Refining Company at Trail Creek Landing. Figure 1 shows an overview of the smelter as it existed in 1896, and its size and construction are clearly different from today's modern smelting facility. This smelter, however, started a chain of events that led to the formation of a "Great Canadian Enterprise", now known as Cominco, which has touched the lives of millions around the world. Originally built to smelt the copper and gold ores from the nearby Rossland mines, the Trail smelter soon diversified into other products and new metallurgical technologies.

Smelters were not new to British Columbia. At the turn of the century, there were nineteen in operation; however, most failed because of poor technology, lack of operating expertise or the lack of strong financial backing. It could be asked, then, why the Trail smelter succeeded where so many others failed.

Fritz Heinze's smelter was not a technological leader. The roasting was done by the heap method, where ore and wood were piled up and set alight to drive off the sulphur as sulphur dioxide gas. The copper furnaces were also crude and resulted in an impure copper matte which had to be shipped to an American smelter for refining. Figure 2 illustrates two of the early converters used in the Trail copper smelter to make copper matte for shipment. In fact, the smelter itself would probably have gone the way of all the others once the Rossland mines were exhausted had it not been for Heinze's railway interests. He had secured the rights to build railway lines from Trail to Castlegar and on to Penticton, thereby blocking a vital link in the Canadian Pacific southern route.

The Canadian Pacific Railway

In 1897, the Canadian Pacific Railway (CPR) sent Walter H. Aldridge to negotiate

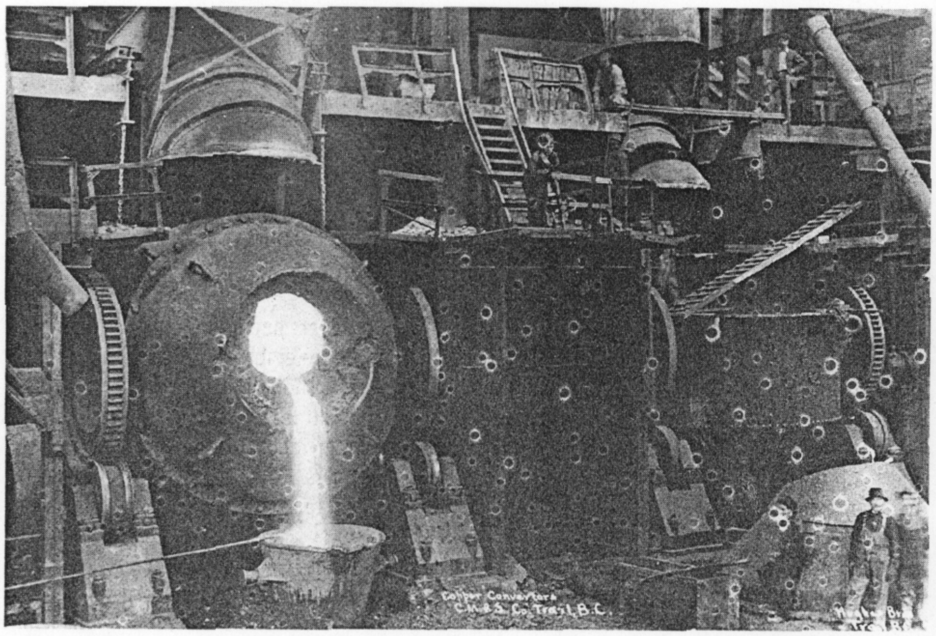

Fig. 2. Early copper converters in use at the Trail smelter.

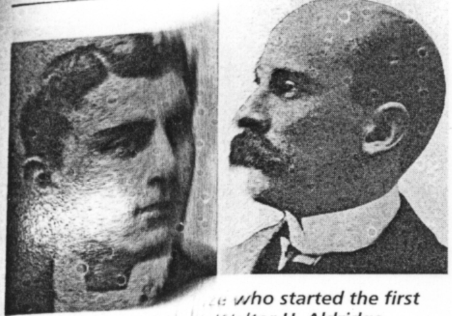

Fig. 3. (Left) Fritz [illegible] who started the first smelter at Trail. (Right) Walter H. Aldridge, negotiator for the [illegible]dian Pacific Railway.

[illegible] Columbia assets, but
for He[illegible] the railway rights he
they really wan[illegible] smelter. The negotiations
held and not [illegible] Aldridge, whose pho-
between Heinze [illegible] in Figures 3 and 4,
tographs are [illegible] wanted more than
stalled when [illegible] the railway rights and
Aldridge thought [illegible] Characteristic of
smelter were [illegible] entrepreneurial style,
Heinze's flamboy[illegible] play a hand of poker to
he [illegible] — a matter of
settle the diff[illegible] being more conserva-
$300,000! Aldrid[illegible] alternative. Consequen-
tive, suggested [illegible] the night, the two men
tly, in the middle [illegible] buggy up the mountain
took a horse and [illegible] dragged the manager
road to Rossland [illegible]al, J.S.C. Fraser, out of
of the Bank of Mo[illegible]rator. Fraser borrowed
bed [illegible] to help him look the
a lawyer's black [illegible]dge and Heinze negoti-
part, and then A[illegible] through the night until
ated back and for[illegible] On March 1, 1898, the
they struck a de[illegible] named the Canadian
Trail plant was [illegible] the new owner.
Smelting Works [illegible]ded to broaden the

Aldridge [illegible]ding lead furnaces to
smelter's base b[illegible] number of lead mines
serve the growin[illegible] compete with other
in the area and [illegible]ned a contract for the
smelters. He also [illegible]gene mine on Moyie
ore from the St [illegible] a supply of smelter
Lake, thus secur[illegible] significant move was
feed. Aldridge's [illegible] McGill graduate named
to hire a recent [illegible] thereby ensuring a
Selwyn G. Bla[illegible]n which would prove
leadership succe[illegible]yond Aldridge's great-
to be successful [illegible]
est hopes.

Technological Development

The next ste[illegible]as to evaluate the con-
struction of a lead [illegible] refinery at Trail to treat
Canadian lead [illegible] Canada, instead of ship-
ping crude bullion [illegible] the United States for
refining. Then [illegible]ow, the shipping dis-
tance from the [illegible]et made it tough to be
competitive with [illegible] American refineries,
but now super[illegible] technology came into
play. Aldridge opted for the new Betts electrolytic process. In 1902, he commissioned the world's first electrolytic lead refinery and that same process, with very little difference, is still used at Trail today. Figure 5 illustrates the exterior of the original lead refinery, and Figure 6 shows many of the early Betts electrorefining cells. The Betts process produced an excellent quality of lead and is said to be solely responsible for establishing the Canadian lead industry.

Aldridge recognized the value in the smelter owning its own mines. In 1905, he began consolidating the Rossland mines and the St. Eugene mine with the smelter. Agreement was reached with the War Eagle, Centre Star and St. Eugene mine owners, and the CPR gained a controlling interest in them for $825,000. The new company formed in 1906 to reflect the expanded mining and smelting base was called The Consolidated Mining and Smelting Company of Canada Limited. Some people still call it CM&S. Cominco became the Company's official name in 1966.

The relationship between CM&S and Canadian Pacific was a good one. The railway received increasing amounts of business from the mines and smelter, plus a share in CM&S's profits. Consolidated benefited from having a powerful financial backer. It is amazing to think that this relationship survived almost 80 years on essentially the same basis.

With CPR backing, Aldridge set out to expand smelter production and to secure additional sources of ore for his Trail Operations. In late 1910, CM&S took a lease on the Sullivan mine in Kimberley

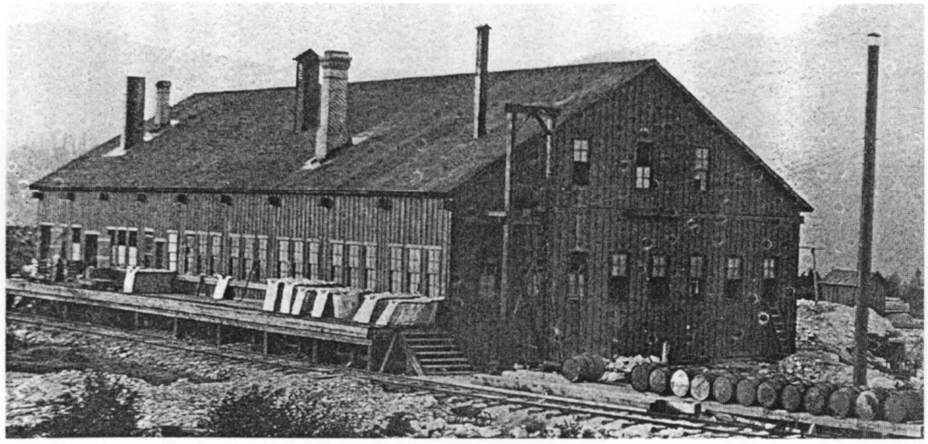

Fig. 5. Exterior view of the early Betts electrolytic lead refinery at Trail.

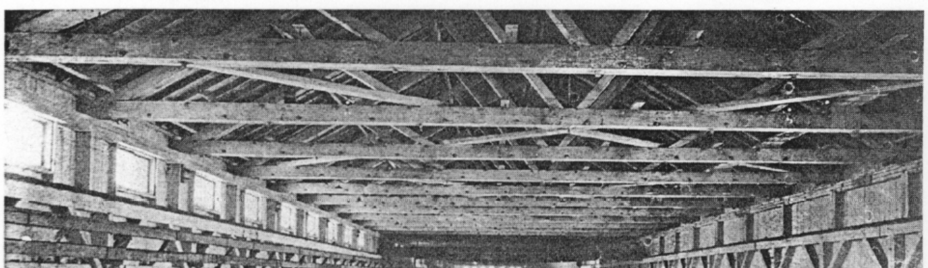

Fig. 6. Interior view of the early Betts electrolytic refinery showing the arrangement of the cells.

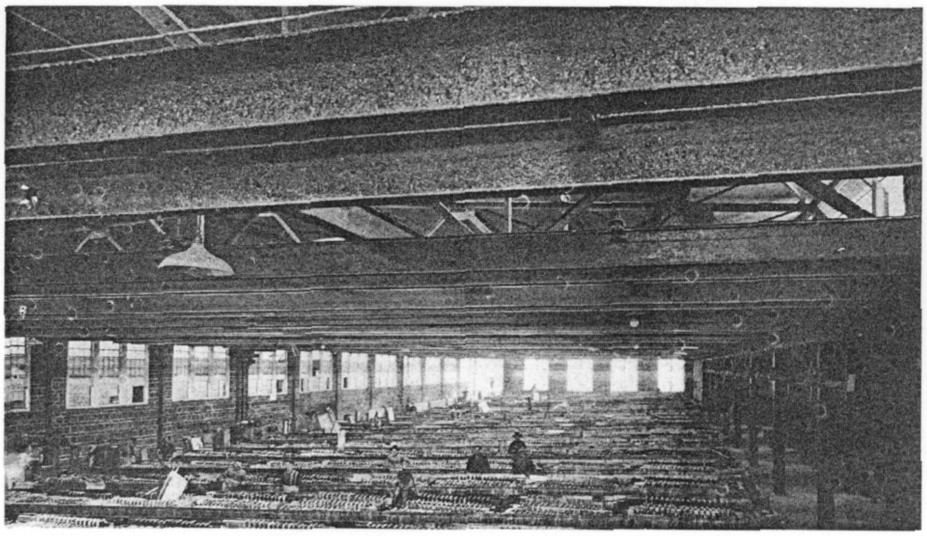

Fig. 7. Interior of the Trail electrolytic zinc refinery as it appeared in the 1920's.

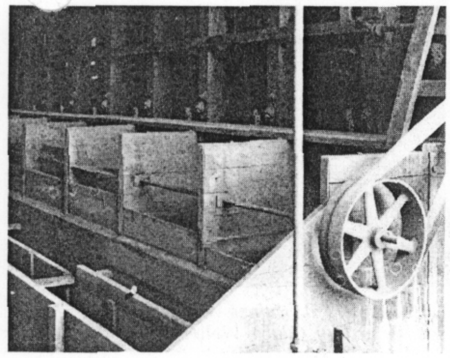

Fig. 9. Early wooden froth flotation cells to make separate lead and zinc concentrates.

with an option to buy. They probably did not realize at the time just how good a decision it would prove to be.

Aldridge resigned as Managing Director in 1910, and Pat Stewart became General Manager and Blaylock assumed the role of Assistant General Manager. At about this time, work began on a zinc extraction process at Trail. Although the initial emphasis was mostly on eliminating the zinc, this would soon change and, along with it, the fortunes of the Consolidated Mining and Smelting Company.

A laboratory process was developed to make refined zinc by electrolysis, but at that time, Consolidated was not too well off financially. However, World War I demands for cartridge brass increased the need for zinc. Consequently, a 50-ton per day plant started in 1916, becoming one of the two first electrolytic zinc refineries in the world.

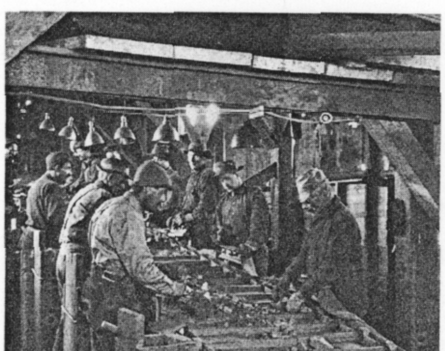

Fig. 8. Hand sorting to separate lead and zinc minerals at the Sullivan mine.

Figure 7 illustrates the interior of that first zinc refinery. That first year's production totalled 11,000 tons — a remarkable scale-up from the laboratory process. These events occurred at a time when no technique had yet been devised to make separate lead and zinc concentrates at the mines. Zinc ore still had to be hand-separated from lead ore, as is shown in Figure 8.

Good technological development work, coupled with good business sense, again proved to be profitable for Consolidated. Increased demand for zinc and lead during the First World War drove the effort to make separate zinc and lead concentrates at the Sullivan mine. While CM&S could make refined zinc, the process was by no means efficient and much of the ore became waste. A differential flotation method, one that would make separate sulphide concentrates of zinc, lead and iron, was essential for the zinc plant to survive. It would also ensure the most efficient use of the enormous Sullivan orebody. To lead the differential flotation project, Blaylock recruited Ralph W. Diamond from the Anaconda Copper Company in 1917, and a 300-ton-per-day test mill was built at Trail for him to carry out his research. By early 1918, a partial solution was found, giving the zinc plant a new lease on life, and the test mill became an operating plant. Diamond's team continued to improve their process and the costs started to decrease, but barely keeping pace with dropping metal prices which occurred at the end of the war.

Hundreds of chemical reagents were tried in an effort to find those that would selectively float the fine lead minerals first, then the zinc minerals, leaving behind the iron sulphides. Finally, on August 13, 1920,

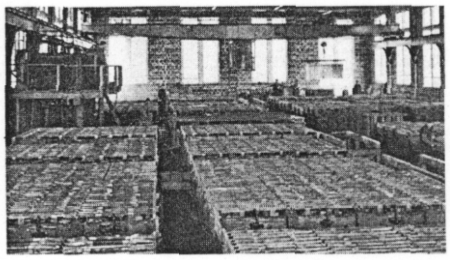

Fig. 10. Interior view of Canada's first electrolytic copper refinery which was located at Trail; the refinery ceased operations by 1930.

Diamond was able to say, "Commercial separation by selective flotation of Sullivan ore into a lead concentrate, a zinc concentrate and an iron concentrate, was reality." Examples of the early wooden flotation cells used to separate the lead, zinc and iron minerals are shown in Figure 9. On the basis of this work, a 2,500-ton-per-day mill was built at Kimberley, and was put into operation in mid 1923. This process made it possible to extract the maximum amount of valuable minerals from the Sullivan ore; it ensured low-cost production and good profits for many decades to come.

Thus, a strong commitment to technological development again proved its worth and set the tone for the Company's operations to this day. Aldridge was proven right again; the smelter required its own mines to realize the best profit. It is doubtful whether the Trail Operations could have survived and prospered without the Sullivan mine and the development of differential flotation.

World War I also increased the demand for copper and led to the construction of Canada's first electrolytic copper refinery at the Trail site. The interior of that pioneering Canadian copper refinery is presented in Figure 10. Although the refining process itself was not new, the 30-ton-per-day plant signalled the beginning of the copper refining industry in Canada. At that time, the Rossland mines were still producing gold and copper ore, but before long, a decline set in. By 1930, Consolidated was out of the copper business as the price had dropped and new copper mines in the region were scarce.

The Home Front

Leadership once again emerged as the dominant factor in the Company's success as Blaylock and Diamond proved to be brilliant technical and business leaders in the decades between the World Wars. Blaylock became President of CM&S at the outbreak of World War II, and he then faced the greatest challenge of his career. The Canadian government virtually conscripted all the company's lead, zinc and chemical production at low fixed prices for the war effort. Many of the best technical staff were assigned to government wartime work and many other employees went into military service, making it more difficult to sustain production. Still, the government pressed for more and more lead and zinc production, and Blaylock saw it as his patriotic duty to Canada and the British Empire to meet these demands. Production was constantly expanded with many women taking the place of men in the operations.

Fig. 11. The secret heavy water plant at Trail that was one of Cominco's many war time contributions.

To meet the extra power needed to sustain this increased production, CM&S built the Brilliant Dam and put it into operation in 1942. A fertilizer plant was constructed to make explosive grade ammonium nitrate and the Canadian and American governments compelled CM&S to build a secret heavy water plant at Trail to supply heavy water for many of the early experiments in nuclear fission. The heavy water plant is shown in Figure 11, and the security fencing and the presence of the military are evident.

By the end of World War II, production had increased and CM&S was well positioned to prosper from post-war growth as soldiers returned home to start their families, a phenomenon now known as the "baby boom."

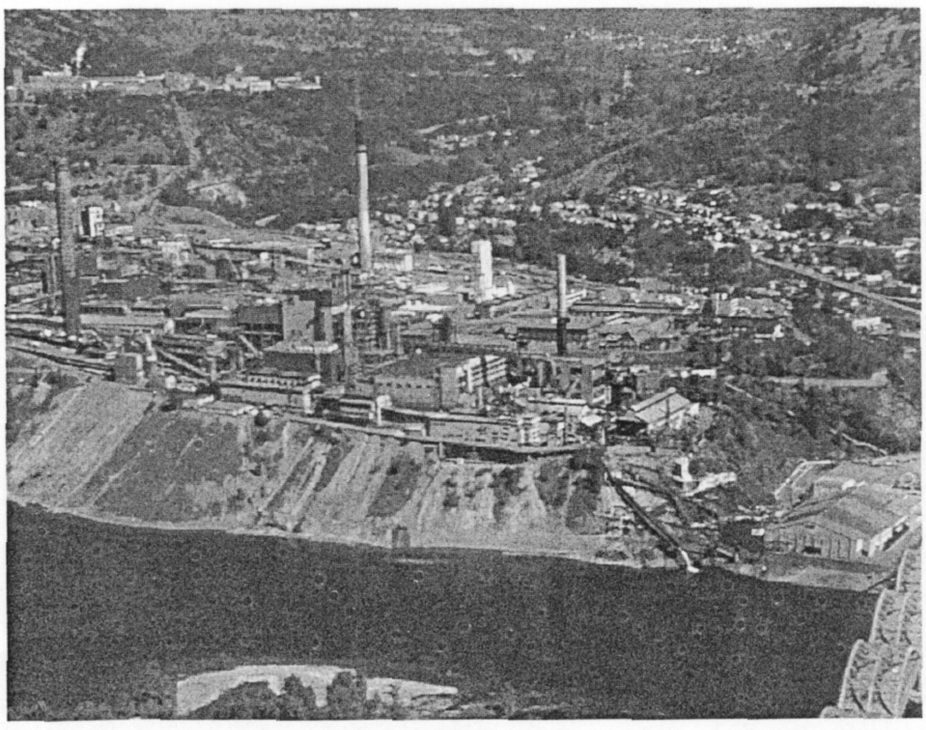

Fig. 12. Panoramic view of the Trail smelter and part of the City of Trail, British Columbia, as it appeared in 1996.

Innovation Continues

At the Cominco Trail Operations of today, the tradition of innovation continues with new processes, new technologies and new products to meet society's needs. This success can be directly traced to the efforts of those pioneering entrepreneurs, miners and smelterworkers who came West 100 years ago seeking their fortunes and who stayed to build one of the largest smelting and refining complexes in the world and the City of Trail, both of which are shown in Figure 12.