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Lloyd M. Pidgeon (1903-1999)

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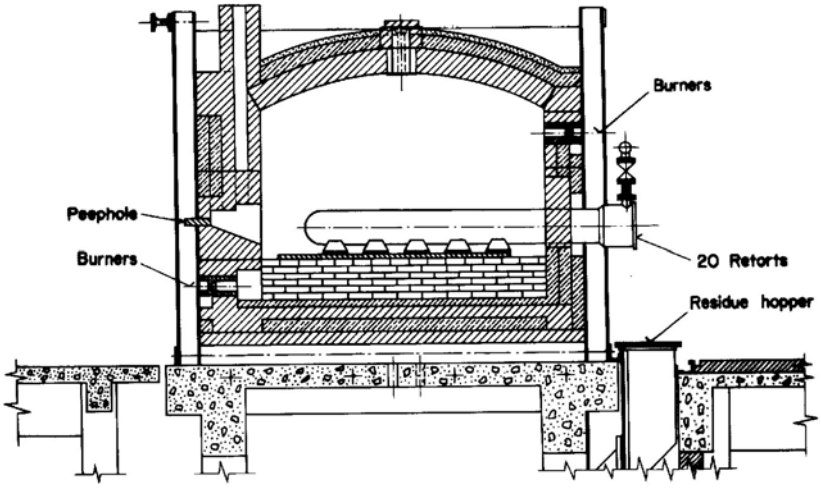
Pidgeon process

When I was in the Mines Branch in Ottawa as a Postdoctoral Fellow in 1960-62 I heard about a process for the production of magnesium invented by the Canadian Lloyd M. Pidgeon who was teaching at the University of Toronto. I was much impressed but it did not mean much to me. When, however, I started teaching pyrometallurgy at Montana School of Mines in 1964 I started to know about this process and its competition with the electrolytic process. Pidgeon used calcined dolomite and ferrosilicon: calcined dolomite, CaO·MgO, is preferred to MgO as a raw material because CaO reacts with SiO_2 liberated to form a low-melting slag and ferrosilicon is preferred to silicon because it is cheaper:

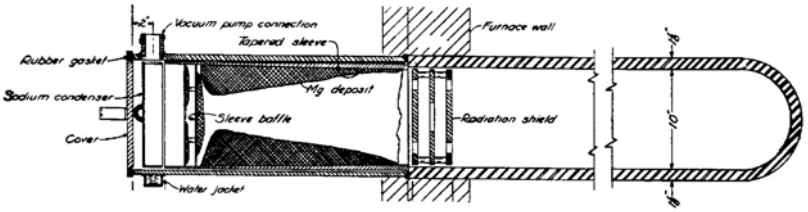
$$2MgO{\cdot}CaO + (Fe)Si \rightarrow 2Mg + Ca_2SiO_4 + Fe$$

A group of prominent mining men from Toronto, became interested in the project and raised capital that enabled Pidgeon to establish a pilot plant. After a year and a half, all parties were convinced the method could be used commercially. Pidgeon's discovery led to the formation of Dominion Magnesium, which he joined in 1941 as a director of research. The plant is owned and operated by Timminco. Because of the demand for magnesium during the Second World War, six magnesium plants were built throughout North America.

Reduction is conducted batch-wise in cylindrical retorts 250 mm in diameter and 7 m long made of chrome-nickel steel and heated in a furnace. Magnesium is the only volatile product of the reaction, thus it can be easily condensed at the cold end of the tube. Sodium and potassium volatilize also if present in the raw material.



Retort furnace for the production of magnesium, 1940s



Retort for the production of magnesium, 1940s


An operator collecting the magnesium from the condenser, 1940s

Magnesium was used for a variety of military efforts and was considered to be the metal of choice where strength with lightness was required, as for example, in aircraft. Pidgeon process was improved later by the Magnetherm process and found competition with the electrolytic process.

Biography

Pidgeon was born in Markham, Ontario, but lived in a number of Canadian cities where his father worked as a minister. He graduated in 1925 in chemistry from the University of Manitoba, and then studied at McGill University, obtaining a Ph.D. in 1929. After several years at Oxford University, Pidgeon joined the National Research Council of Canada where he developed the process for the production of magnesium. In 1943, Pidgeon was appointed professor and head of the department of metallurgical engineering at the University of Toronto, a post he held until his retirement in 1969. He also developed similar metallothermic technology for the production of calcium and strontium.

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