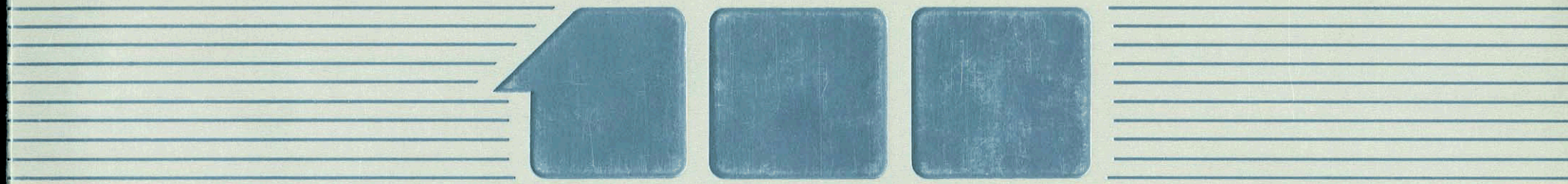
HALL-HEROULT



FIRST CENTURY OF ALUMINUM PROCESS TECHNOLOGY

1886 1986

CENTENNIAL

Hall-Héroult Centennial

First Century of Aluminum Process Technology 1886 - 1986

The anniversary volume sponsored by the Light Metals Committee of The Metallurgical Society and presented at the 115th TMS Annual Meeting held in New Orleans, Louisiana, March 2-6, 1986.

Edited by
Warren S. Peterson, Consultant
Metallurgical Chemical Processes
2113 East 37 Avenue
Spokane, Washington 99203
and
Ronald E. Miller
Alcoa Technical Center
Alcoa Center, Pennsylvania 15069

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Preface

One hundred years ago, two young men, oceans apart, independently devised a new method of making aluminum. This discovery in 1886 by Charles M. Hall in the United States and Paul T. Héroult in France gave the world the shiny light metal at costs that made it competitive in the market place.

The Light Metals Committee of The Metallurgical Society is proud to celebrate the anniversary of this important event by publishing Volume I of *Light Metals 1986* as a Centennial Edition.

This special edition has two parts: a pictorial section and a series of invited papers. The objective is to highlight with pictures and text the important developments in the past one hundred years in the process metallurgy of aluminum. This includes the electrolytic method of making aluminum, emission and waste control measures in plant operations, manufacture of carbon electrodes, methods of processing bauxite and alumina, technology for melting and casting process ingots and processes for reclamation and recycling.

Pictorial Review

This collection shows "how it was' and "how it is now", during the years in which the infant aluminum industry grew into a giant. Many companies from all over the world opened their archives to provide a large collection of photos from which to make selections. The Russians were invited, but, regrettably, did not respond.

Wherever possible, photographs were chosen which show people at work. This is fitting because this Centennial Edition is a tribute, not only to Hall and Héroult, but to all the men and women who have made contributions to the Aluminum Industry.

In addition to material from industry, we have drawn heavily upon the literature for drawings and photographs to provide a visual record of the changing nature and scale of the numerous processes involved in making aluminum and aluminum process ingots.

Invited Papers

An important part of this Hall-Héroult Centennial volume is a series of papers by experts in their fields. A pair of human interest reports tell us about the personal lives of Charles Hall and Paul Héroult at the time of their discovery. These reports are followed by papers describing developments in technology, equipment, and practice in the various areas of aluminum process metallurgy during the past one hundred years.

Ronald E. Miller,
Chairman
Light Metals Committee

Acknowledgements

Pictorial Review

This Pictorial Review is the result of efforts of many individuals and companies. Without their willingness to open their files and send photos, this Review could not have been assembled.

We are indebted to the following companies: Air Industrie, Alcan, Alcoa, Almeq, Alusuisse, Aluminum Association, Arco Metals, ASV, British Alcan, Consolidated Aluminum Company (Conalco), Commonwealth Aluminum Company (Comalco), Elkem, Granges Aluminum, Hazelett, Hunter Engineering, Intalco, Japan Aluminum Federation, Kaiser Aluminum and Chemical Corporation (KACC), KBI (Cabot Corporation), Loma Machine, Mitsui Aluminum, National Southwire Aluminum, Norsk Viftefabrikk (Flakt), Pechiney, Properzi International, Pyrotek, Reynolds Metals Company, Showa Aluminum K.K., Sumitomo Aluminum, Union Carbide (Linde Division), VAW, Wagstaff Engineering.

I will not list, but hereby, thank all contributors. A special acknowledgement is due to: Kjell Nielson (consultant); W.O. Stauffer (consultant); J. Peter McGeer, G.G.Robertson (Alcan); Vergi Sapp, Ronald E. Miller, Gordon Bell (Alcoa); Ulrich Mannweiler (Alusuisse); Andreas Anderson (ASV); David Williams, H. McDonald (Conalco); Gunnar Sem (Elkem); T. Pritchard, H.E. Miller, W. Kramer, B.J. Foster, R. Zabreznik (KACC); F.R. Mollard (KBI); A. Nussbaum (Loma Machine); N. Bjune (Mosal); E. Keul (Norsk Viftefabrikk); Prof. N. Craig (Oberlin College); Christian Bickert (Pechiney); A. Roy (Pyrotek); C.M. McMinn, S. Levy, J. Creel (Reynolds Metals); T. Matshushima (Showa); K. Yamada (Sumitomo); G. Winkhaus (VAW); W. Wagstaff (Wagstaff Engineering).

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Invited Papers

A special thanks is extended to Dr. Subodh K. Das of Arco Metals for soliciting the invited papers, and to each invited author who contributed to this volume: P. Atkins, D. Belitskus, C. Bickert, N. Craig, R. Friederich, W. Haupin, J. P. McGeer, N. Oberg, W. Peterson, N. Richards, B. Welch.

W.S. Peterson
R.E. Miller

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Abbreviations

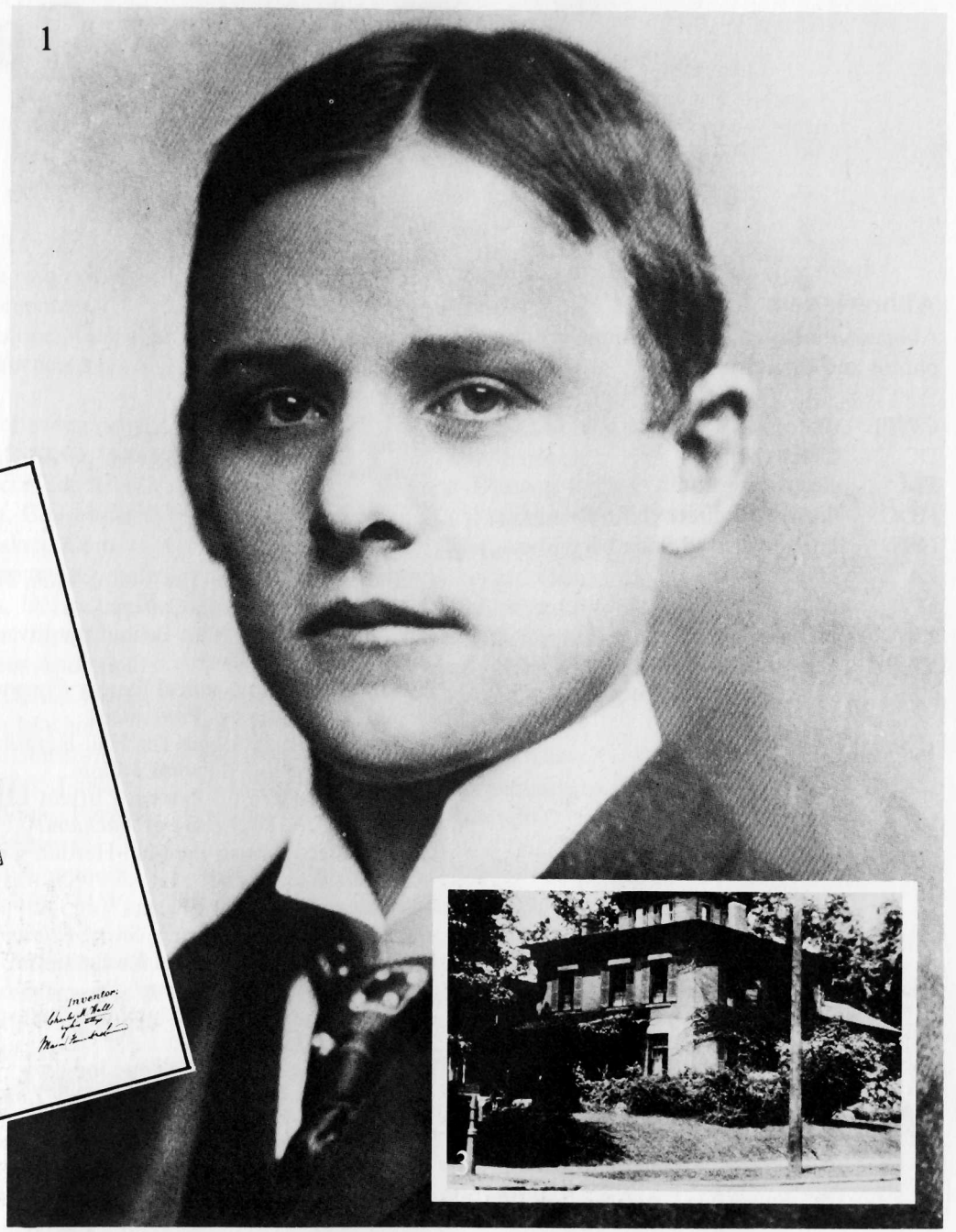
Abbreviations used in the captions to the photos and figures include:

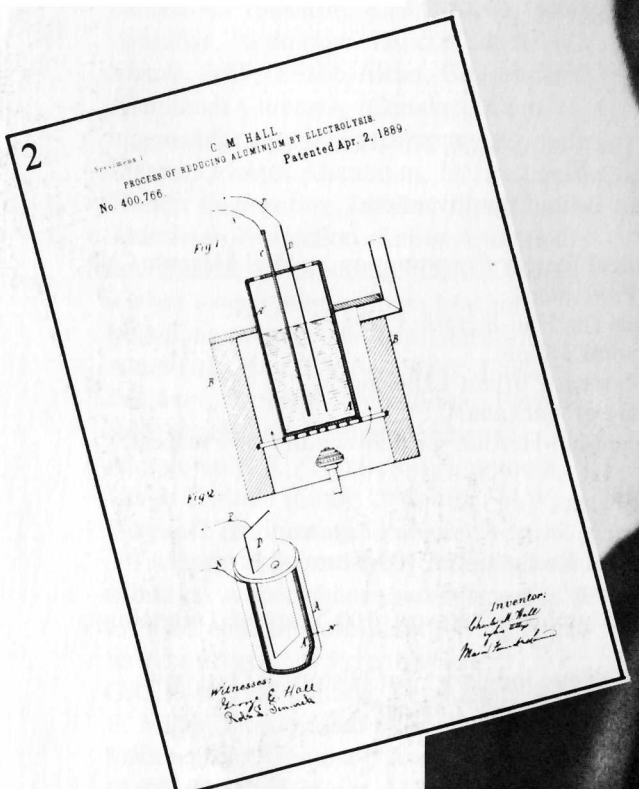
CWPB	center work prebake pot
DC	direct chill
EM	electromagnetic
HDC	horizontal direct chill
HSS	horizontal stud Soderberg
kA	kilo amperes
MW	mega watts
PBA	prebake anode
SWPB	side work prebake pot
VSS	vertical stud Soderberg

1. Charles Martin Hall. Born December 6, 1863 in Thompson, Ohio and later moved with his family to Oberlin, Ohio. Graduated from Oberlin in 1885. Worked in family woodshed on aluminum experiment. Died December 27, 1914 at the age of 51.

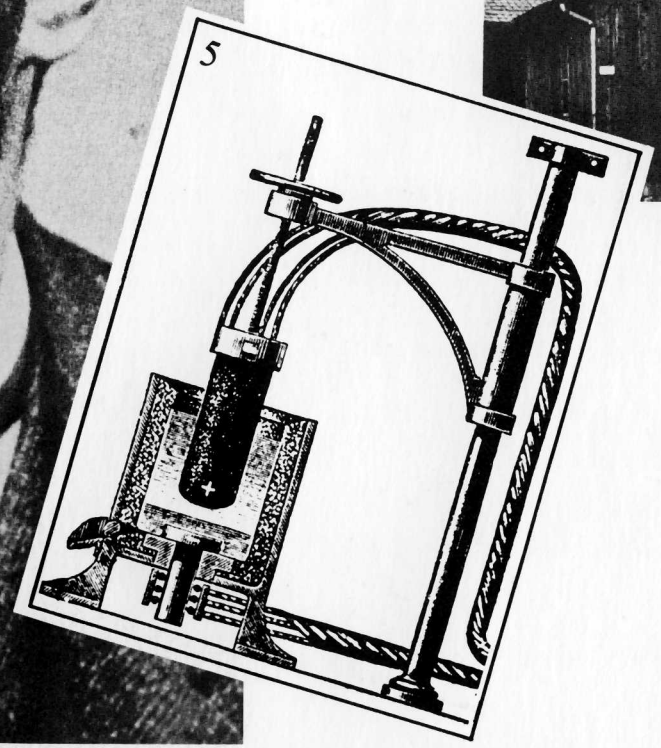
2. Original Hall patent. Alcoa.

3. Hall's home in Oberlin, Ohio with wood shed in rear - 1886. Alcoa.

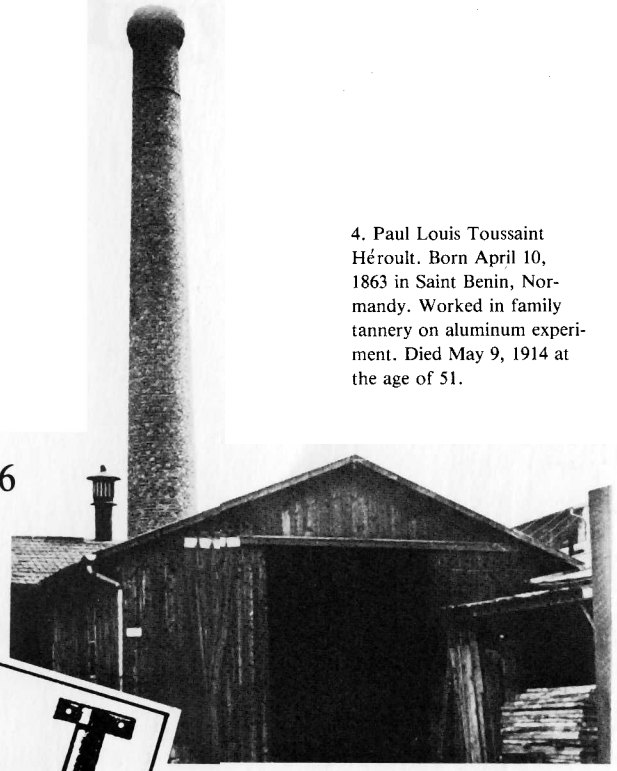



C. M. HALL.
PROCESS OF REDUCING ALUMINIUM BY ELECTROLYSIS.
No. 400,766. Patented Apr. 2, 1889.

4. Paul Louis Toussaint Héroult. Born April 10, 1863 in Saint Benin, Normandy. Worked in family tannery on aluminum experiment. Died May 9, 1914 at the age of 51.



5. Héroult cell for pure aluminum circa 1892. Alcoa.



6. The Héroult Tannery, Geulette, France, where Paul Héroult discovered the electrolytic process for producing aluminum. Alcoa.