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CHARLES HOLMES HERTY, JR.

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A Biographical Memoir by
PAUL D. MERICA

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IT HAS BEEN SAID of Charles Holmes Herty, Jr., physical chemist and steel metallurgist, that he fathered, in the United States at least, the science and physical chemistry of steelmaking.

The application of the principles of physical chemistry to the art of making steel very early became Herty's primary and passionate professional preoccupation when he carried out research work for his doctoral dissertation at the Lackawanna plant of the Bethlehem Steel Company from 1924 to 1926. His dissertation was entitled "The Interreaction Between Gas, Slag and Metal in the Basic Openhearth Process."

For the remainder of his life his professional interest was devoted to this important area of metallurgy and he pursued it faithfully and brilliantly both in the laboratory and in the steel plant. He attacked the many metallurgical problems of the making of steel as student, as metallurgical investigator, as steel company metallurgist, and finally as steel company executive. Rare indeed is a career in which a single area of interest is cultivated so steadfastly and from so many angles, both theoretical and practical.

Herty was author or coauthor of some eighty professional papers in his chosen field. Dr. John Chipman who also has achieved international reputation in the field of the physical chemistry of steelmaking, thus characterizes Herty's principal contributions in this field:[1]

[1] Quoted from Dr. John Chipman's Charles M. Schwab Memorial Lecture before The American Iron and Steel Institute in 1953.

"He developed the first dependable method for chemical determination of the oxygen content of the steel bath.

"He demonstrated clearly the mechanism of formation of nonmetallic inclusions when deoxidisers are added to steel.

"He showed how the content of nonmetallic oxide inclusions could be minimized.

"He devised and put into operation the first scientifically based system for the control of iron oxide in the slag.

"He determined quantitatively the effects of oxygen and of deoxidation methods upon the physical properties of the finished steel, including grain size, impact strength and aging behaviour."

In addition Herty and his coworkers determined the "deoxidation constants" for certain important deoxidizing agents in steel and made many important studies of the fluidity or viscosity of steel slags.

Notwithstanding the great significance of the direct scientific contributions of Herty and his associates, it is not impossible that of even greater practical value may have been Herty's contribution in translating his theoretical findings into improved practice in steel plants. His unique experience and background, both technical and practical, as well as his rare ability to understand the practical operating man's viewpoint and to talk to him in the latter's own vernacular, made this possible. Herty possessed an unusual facility for infecting practical steel operators as well as students of metallurgy with his own unfailing enthusiasm for and interest in the value of science in steelmaking.

Finally one must mention the fine quality of his leadership among his professional associates and the pleasant and productive art of his stimulation of their creative activities. He was a catalyzer of others' creations as well as a creator himself and his pioneer work stimulated an ever-broadening flow of later research in this field.

Herty's important contributions to the physical chemistry of steelmaking have been given wide recognition in this country and abroad and it is not surprising that many honors have come to him because of his outstanding work. In 1928 he received the Robert W. Hunt

Medal and Prize of the American Institute of Mining and Metallurgical Engineers, and in 1935 he was presented with the Francis J. Clamer Medal of the Philadelphia Technical Society for the most meritorious achievement in the field of metallurgy. In 1943 he was winner of the Albert Sauveur Achievement Award of the American Society for Metals, and he received the Bradley Stoughton Award of the Lehigh Chapter of the American Society for Metals in 1946. In 1950 he received the honorary degree of Doctor of Science from Lehigh University.

In 1931 Dr. Herty gave the Campbell Memorial Lecture of the American Society for Metals and in 1940 he delivered the Howe Memorial Lecture of the American Institute of Mining and Metallurgical Engineers.

Dr. Herty was National President of the American Society for Metals in 1946, and in 1947 he was elected to the National Academy of Sciences.

Announcement [2] has been made of the publication by the American Institute of Mining, Metallurgical and Petroleum Engineers of a memorial volume in honor of Dr. Herty. This memorial will consist of a special volume of some of his previously published papers on the deoxidation of steel and will emphasize the significance of this earlier research work for the art and science of steelmaking.

Herty's absorbing interest in things chemical arose very naturally by reason of the fact that his father was one the country's distinguished chemists, with a significant career both as a professor of chemistry and as a business man in the chemical industry. He will be remembered for his development of the method of converting the once useless southern slash pine into paper, thereby greatly advancing both the paper industry and the economic development of the South.

The younger Herty was born October 6, 1896, in Athens, Georgia, in a southern family of Scottish origin. After attending the Asheville School in Asheville, North Carolina, he studied chemistry, played shortstop, and strummed the guitar at the University of North Caro-

[2] April 25, 1957.

lina, where he received his degree of Bachelor of Science in 1918. That summer he joined the Army as a private in the Chemical Warfare Service and served until 1919, when he was discharged as a sergeant in the Ordnance Department.

At the conclusion of the war he went to the Massachusetts Institute of Technology and received his degree of Master of Science (1921) in chemical engineering. Parts of the years 1921 and 1922 were spent at the Institute's postgraduate Buffalo Station School of Chemical Engineering Practice, where he acquired his first experience in steelmaking metallurgy at the Lackawanna Plant of the Bethlehem Steel Company. Here he carried out the research work leading to his dissertation for the Doctor of Science degree, which he received in 1924. He remained at the Buffalo Station for two more years, during which something happened which served to crystallize in very substantial manner his interest in metallurgy and in steel.

Even at that comparatively late date the practice of refining steel, particularly in the open-hearth furnace, continued to be an art, at least to a very considerable degree, and many of the chemical reactions which took place during steelmaking had not been clearly revealed even to professional experts in the metallurgical field. They were not understood by practical open-hearth operators, who relied on rules of thumb based upon unrelated observations not usefully connected by fundamental knowledge of the chemical reactions involved. Producers of steel had begun to recognize that the industry was suffering loss by reason of this situation, because of the continued use of wholly empirical procedures for melting, as well as by unduly large rejections of steel heats for failure to meet quality specifications.

For this reason a group of about thirty interested steel companies entered into an agreement with the United States Bureau of Mines and the Carnegie Institute of Technology and established the Metallurgical Advisory Board in Pittsburgh in 1926. This Board was created for the purpose of entering into a program of research work at the Carnegie Institute and at the Pittsburgh Station of the Bureau of Mines on the physical chemistry of steelmaking. The Board selected Dr. Herty to direct this investigation.

Dr. Herty threw himself into this work with his characteristic energy and devotion and surrounded himself with a metallurgical research group comprising some thirty research workers by the end of 1931. It may be noted that, notwithstanding the absorbing interest of his research work in Pittsburgh, he also found time to devote to teaching metallurgy and was actively associated with the initiation of graduate courses in metallurgy at Carnegie Institute.

By 1932 most of the results of this research were in the hands of its sponsors and the published findings were acclaimed by metallurgists in Europe and America. It was during these years that Dr. Herty, together with his associates, carried to a successful conclusion many of those researches in this field for which his name will be long remembered.

It is characteristic of Herty that his reports were so clear and well-prepared and so comprehensibly presented that operating steel men found them easy to understand and could make practical application of them in steel melting plants. By this time Herty knew his way around a steel plant and was able to make a heat himself to verify laboratory findings and he could speak the open-hearth man's language.

It is not improbable that the largest contribution that Herty made to steelmaking technology was the development on the part of steel executives as well as steel operators of an awareness that many of the factors which were previously considered mysterious actually had a solid foundation upon scientific principles and could therefore be placed under control.

In 1934 the Metallurgical Advisory Board decided that the investigation had proceeded far enough to fulfill largely its initial objectives and Herty decided to join the staff of the Bethlehem Steel Company. Beginning as a research engineer, his career with this company developed in significance and he became assistant to the vice president of the steel division in 1942, which position he occupied at the time of his death.

During his nineteen years with the Bethlehem Steel Company,

Herty was responsible for bringing about many improvements in its steelmaking process, particularly in open-hearth practice, and in connection with the basic problems of the control of slag reactions with molten steel. He devised several methods for testing the fluidity or viscosity of slag, among which is the Herty Viscosimeter.

During World War II he gave active and valuable assistance to the Government on many metallurgical matters and served on advisory committees to the War Production Board in Washington. In particular Herty was widely recognized as a manganese recovery expert and his work and counsel contributed greatly during the war to the better conservation of strategic materials.

Dr. Herty was active throughout his professional life in the work of technical societies. He was a member of the American Iron and Steel Institute, the (British) Iron and Steel Institute, the American Chemical Society, First Iron Works Association, American Ordnance Association, and many others. He had become a member of the honorary societies Phi Beta Kappa, Sigma Xi, and Alpha Chi Sigma while at college.

He died January 17, 1953, and was survived by his wife, the former Kathleen Malloy, and four children, as well as by a brother, Frank B. Herty.

What Charles Holmes Herty, Jr. accomplished in the course of his professional career is written clearly and impressively in the record of metallurgical literature and of steelmaking practice.

What Herty was is impressed in the memories and hearts of his many friends and associates. They will always remember "Charlie" Herty as a leader of men, full of energy and with outstanding and infectious enthusiasm,—one who inspired younger associates both by his kindly interest in them and by his constant incitation to accurate and creative scientific thinking. A ready controversialist in matters upon which he had deep conviction—and they were many—he presented his arguments without animosity, stimulating constructive thought rather than leaving scars of resentment. His was the way of a Christian gentleman.

KEY TO ABBREVIATIONS

Amer. Inst. Min. Met. Engr. Tech. Pub.=American Institute of Mining and Metallurgical Engineers, Technical Publication
Amer. Iron Steel Inst. Yrbk.=American Iron and Steel Institute Yearbook
Ind. Eng. Chem.=Industrial and Engineering Chemistry
Jour. Amer. Soc. Steel Treat.=Journal of the American Society for Steel Treating
Jour. Ind. Eng. Chem.=Journal of Industrial and Engineering Chemistry
Min. Met.=Mining and Metallurgy
Proc. Amer. Soc. Test. Mat.=Proceedings of the American Society for Testing Materials
Proc. Eng. Soc. West. Pa.=Proceedings of the Engineers' Society of Western Pennsylvania
R. I. Bur. Mines=Report of Investigations, United States Bureau of Mines
Trans. Amer. Inst. Min. Met. Engr.=Transactions, American Institute of Mining and Metallurgical Engineers
Trans. Amer. Soc. Met.=Transactions of the American Society for Metals
Trans. Amer. Soc. Steel Treat.=Transactions of the American Society for Steel Treating

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