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The History of Stainless Steel (#05279G)

The History of Stainless Steel

Harold M. Cobb

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The History of Stainless Steel
is dedicated to my dear wife
Joan Inman Cobb

Front Cover

The Chrysler Building, erected in New York City in 1930, was once the tallest building in the world, being almost twice as high as the Washington Monument. It is widely acclaimed as the finest skyscraper, with its art deco style and the ornate tower that is clad with stainless steel.

The Chrysler Building was the first major use of stainless steel in architecture. The Nirosta chromium-nickel alloy had first been introduced in America just three years earlier, and the long-term endurance of the metal in the atmosphere was unknown. The building has become an icon of the stainless steel industry, a symbol of endurance and beauty, and a favorite of architects.

The photograph was taken by Ms. Catherine M. Houska, TMR Stainless, Pittsburgh, Pennsylvania, for the Nickel Development Association, Toronto, Ontario, Canada.

Inside Front Cover

1934 photograph of the Burlington Zephyr at the E.G. Budd Manufacturing Company in Philadelphia, Pennsylvania. Courtesy of the Hagley Museum

Inside Back Cover

List of stainless steels given in Carl Zapffe's 1949 book, *Stainless Steels.*

Back Cover

Top. At a height of 630 feet, the Gateway Arch in St. Louis, Missouri, is the world's tallest monument, which surpassed the 555 foot height of the Washington Monument. With an exterior of stainless steel, the shape of the arch is that of an inverted catenary (or the shape of a chain dangling from two points at the same level). Courtesy of the Jefferson National Expansion Memorial National Park Service, St. Louis, Missouri.

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Preface

What is stainless steel? The average person has no inkling, but it is all around us, and readers will be surprised to learn some of the stories of this remarkable material that one prominent metallurgist called "the miracle metal."

Every day, most of us use stainless steel tableware and wear a wristwatch with a stainless steel case and band. There are stainless steel racks in refrigerators and ovens, and there are stainless steel toasters, tea kettles, and even kitchen sinks. Cars have stainless steel exhaust systems that last for ten years instead of three when they were made of ordinary steel.

The amazing story is told of Harry Brearley, who rose from poverty, became a self-taught metallurgist, was one of the early discoverers of stainless steel, and received the Bessemer Gold Medal.

In the early days of stainless steel, the metal was often used when the goal was to produce the finest, the most durable, and the most beautiful product that money could buy. The Rolls-Royce Motor Car Company, for example, was one of the first to use stainless steel on an automobile. Their 1929 car displayed the most striking radiator grille imaginable in silvery stainless steel.

In America in 1930, the office building of automaker Walter P. Chrysler opened in New York City. The Chrysler Building was the tallest and most ornate skyscraper in the world. The top 100 feet of the tower was clad in Nirosta stainless steel, making it the most beautiful and most visible building on the New York City skyline.

In 1934, a Philadelphia autobody company tried their hand at building a stainless steel train for the Chicago, Burlington, & Quincy Railroad. It was a streamlined, lightweight, luxurious, silvery train that

became the world's fastest. It traveled 3.2 million miles in 25 years and is now on display at the Chicago Museum of Science and Industry.

Eero Saarinen designed the St. Louis Gateway Arch, which was completed in 1965. The 630 foot, stainless-clad arch is the tallest monument. Saarinen wanted the arch to last for a thousand years.

Stainless steel was an expensive material, costing as much as 15 times that of ordinary steel. The story is told of how one young metallurgist in 1970 discovered, in the laboratory, a process that would cut the cost of stainless steel in half and produce better steel. The other part of the story was that it took 12 years to discover how to develop the process for large-scale production.

How it was possible for things like these to happen and the story of how stainless steels were discovered are explained in this first history of stainless steel. Stainless steels have become the third most widely used metals, following aluminum and steel.

Harold M. Cobb
Kennett Square, Pennsylvania
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Harold M. Cobb
Kennett Square, Pennsylvania
October 2009

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About the Author

Harold M. Cobb graduated from Yale University in 1942, receiving a B.E. degree in metallurgical engineering. He has had a broad background in the stainless steel industry, where he was involved in the development of new stainless steel products, including watch screws, hollow stainless steel aircraft propeller blades, roll-formed compressor blades and vanes for jet engines, boron carbide stainless steel for moderating nuclear reactors, and sinter-bonded porous stainless steel fiber-metal products.

Cobb's industrial experience included positions at the Edward G. Budd Manufacturing Co., Westinghouse Aviation Gas Turbine Division, United Nuclear Corp., and as chief metallurgist at Clevite Aeroproducts and Pratt & Whitney.

He was chairman of the Philadelphia and Connecticut sections of the American Institute of Mining, Metallurgical and Petroleum Engineers (AIME). He holds a patent on a manufacturing process for nuclear fuel elements.

After 22 years in the metals industry, Cobb became a manager at the American Society for Testing and Materials (ASTM) in Philadelphia, working with many of the metals technical committees, including Committee A-10 on Stainless Steel. He was one of the principal promoters and developers of the Unified Numbering System (UNS) for metals, which was organized jointly by the Society of Automotive Engineers (SAE) and ASTM in 1970. For many years, Cobb developed and served as the number assigner for the miscellaneous steels series of UNS numbers, the K series. He has been the principal editorial consultant for the last four editions of *Metals and Alloys in the Unified Numbering System (UNS)*.

Cobb served as Secretary of the U.S. Secretariat for the International Standards Committee ISO/TC17/SC12 on Carbon Steel Sheet and Strip for 15 years. He has edited 22 books on steel, including works on carbon, alloy and coated steel sheet and strip, tool steels, stainless steel specifications, and a *Pocketbook of Standard Wrought Steels*. In 1999, he became editor of the *Stainless Steels Products Manual*, one of the 16 steel products manuals that the American Iron and Steel Institute (AISI) initiated in the 1950s. In 2008, Cobb edited and substantially revised his second edition of *Stainless Steels*, now published by the Association for Iron and Steel Technology.

He has written the articles "Development of the Unified Numbering System for Metals," "The Naming and Numbering of Stainless Steels," and "The 75th Anniversary of the Burlington Zephyr Stainless Steel Train." Cobb is a member of ASTM Committee A-1 on Steel, Stainless Steel, and Related Alloys and is a Life Member of ASM International.

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