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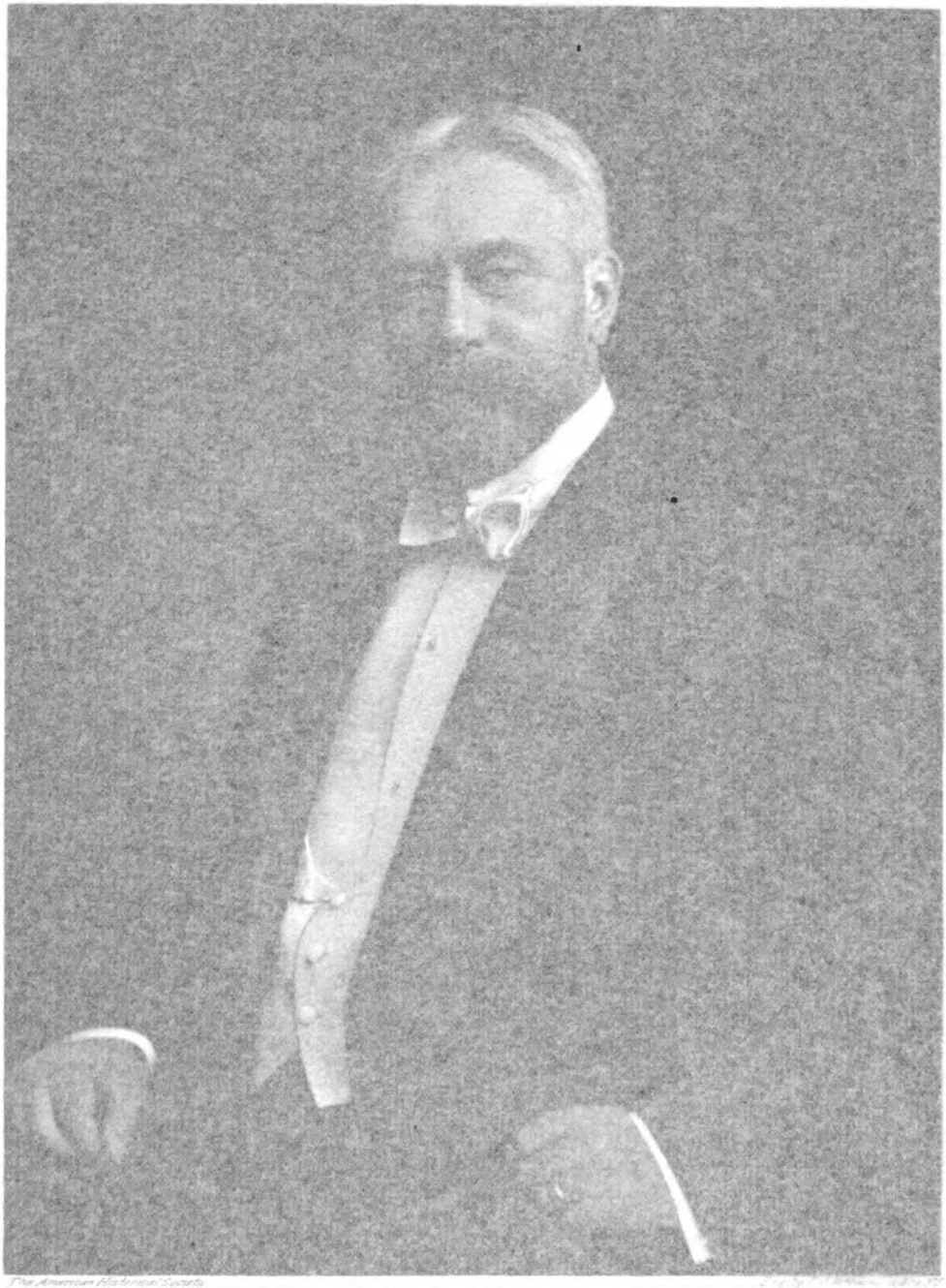
LINDENTHAL, Gustav,

Civil Engineer, Noted for Bridge Construction.

Gustav Lindenthal is a native of Austria, born in Brunn, Province of Moravia, May 21, 1850, the son of Dominick and Franziska (Schmutz) Lindenthal, and grandson of Dominick Lindenthal. His father and grandfather belonged to one of the old guilds, long extinct, that of designers and makers of decorative furniture at a time when the modern manufacturing methods with machinery in factories was unknown, when individual skill in workmanship and aesthetic taste were acquired and cultivated by long apprenticeship, travel and work in foreign lands, and admission to a mastership in the guild could be obtained only by making and submitting a piece of work that a jury of the guild would adjudge as a masterpiece. That was the time when the mastery and distinction in a trade was a character-building force, transmitted from father to son and from which young Lindenthal benefitted as he was growing up and put through college in his native city.

He was the oldest of seven children. He went through his studies with distinction, and following his father's advice he worked in vacation time at several building trades, one vocation after another. First at carpentering, then at brick and stone masonry, and lastly in a machine shop, thus acquiring practical knowledge, not however very willingly. Only in later years he found out the great advantage that this experience gave him in his professional work as an engineer. Along with his studies and practical preparation for an engineering career went also the study in music (the violin being his instrument) and languages, and that cultivation of mind and taste which travel in foreign lands can give. When only twelve years old he was allowed as a distinction to play with his teacher at concerts. He traveled with his father in Germany and France and visited the great international exhibition in Paris in 1867. The information and instruction he gathered on these occasions had no little influence upon his trend of mind and activity in the following years. So also had the fact that among his teachers were his uncle, the Rev. Josef Lindenthal, Professor of History, and Abbot Gregor Mendel, Professor of Natural Science and Physics, the author of the "Mendelian Law in Biology." The young student, not satisfied with his scientific and technical studies, found time to read historical and philosophical works like Montesquieu, Ranke, Hume, Macauley, Mill, Spencer, Mommsen and others, which usually appeal only to more mature minds and an older age.

Mr. Lindenthal commenced his professional career in 1870 as an assistant in the engineering department of the Austrian Empress Elizabeth Railroad. He was assistant engineer in 1872-73 of the Union Baugesellschaft (Union Construction Company) in Vienna, engaged in building an incline plane and railroad, and was division engineer of the Swiss National Railroad in charge of location and construction during 1873-74. In the latter year he came to America, and earned his first money in this country, working for several months as a journeyman stone mason on the foundation for the memorial granite building of the Centennial International Exhibition in Philadelphia, Pennsylvania. Soon after this he became an assistant engineer in the erection of the centennial permanent buildings, where he was engaged three years, when he became connected with the Keystone Bridge Company, and was for two years employed in constructing bridges in Chi-



Gustav Lindenthal

cago, Illinois, and Pittsburgh, Pennsylvania, and during 1879-81 was bridge engineer of the Atlantic & Great Western Railroad, now a part of the Erie system. During this time he rebuilt a large number of bridges for heavy locomotives.

Thereafter Mr. Lindenthal established himself as an independent engineer with his main office in Pittsburgh, Pennsylvania. He made a specialty of bridge work, designed and built many railroad bridges in the States of Pennsylvania, Ohio, West Virginia, Illinois and Indiana; was chief engineer of railroad surveys in Maryland, West Virginia, Pennsylvania and Ohio; chief engineer of an electric traction railroad from McKeesport to Duquesne, Pennsylvania, also of inclined railroads for the transportation of wagons and street cars in Pittsburgh and Allegheny City, Pennsylvania. He had a large professional practice, and his advice was sought in the construction of railroads, trolley lines, wharves, tunnels and difficult foundations. He tranferred his office in 1892 to New York City, but his practice as advisory and consulting engineer extends to all parts of the Continent as well as abroad.

Mr. Lindenthal was one of the incorporators and chief engineer for the North River Bridge Company which proposes to bridge the Hudson river at New York City, and he worked out complete plans for such a structure, containing fourteen railway tracks, with a span of 3,100 feet, involving a cost of $100,000,000. The unprecedented boldness of the plans involving the construction of a span double the span of the Brooklyn Bridge, and deeper foundations than ever before thought possible, aroused adverse criticism when first published in 1888, but such attacks ceased when closer scientific investigators and discussions demonstrated the entire feasibility of the plans. The Pennsylvania Railroad Company, in 1901, decided to enter New York City through tunnels under the Hudson river and the proposed railway bridge was temporarily abandoned. He was one of the board of engineers who designed and directed all of the tunnel under the North and East rivers in connection with the Pennsylvania Railroad station in Manhattan. Mayor Seth Low, in 1902, made him commissioner of bridges for New York City. He established the practice of architectural designing of the city's bridge structures. He made plans for the Blackwell's Island (Queensboro Bridge) over the East river, the Manhattan Bridge and for the reconstruction of the old Brooklyn Suspension Bridge; also the first design for a gigantic combined Bridge Terminal and Municipal Building. The plans to bridge the Hudson river between New York City and the Jersey Heights are still under consideration by railroads and commercial interests for whom Mr. Lindenthal is acting as advisory engineer. He designed and built large wharf and steamer piers in Baltimore, Maryland, and Havana, Cuba. He rebuilt the Kentucky River High Bridge, three hundred and fifteen feet high, in place of the old cantilever bridge, the first bridge of this kind ever built in the United States, in 1874, by Shaler Smith.

Mr. Lindenthal was consulting engineer and architect of the New York Connecting Railroad, designed to connect the New York, New Haven & Hartford Railroad with the Pennsylvania system, probably the most expensive railroad mileage in the world to build. The problems to be solved by the enterprise were the carrying of passengers and freight from the New England States through New York City to the West without change. The passenger traffic to be over the New York, New Haven & Hartford Railroad

across Long Island to connect with the Pennsylvania Railroad through the Pennsylvania tunnels under New York City. The freight traffic to go through South Brooklyn and thence by ferry across New York bay to the Pennylvania tracks at Greenville, New Jersey. This ferry to be replaced with a pair of tunnels three miles long under the New York bay later on.

The bridging of Long Island sound and Hell Gate involved the most difficult and expensive work of construction, and there were several problems that were unprecedented in the history of engineering and that called for the greatest display of resourcefulness on the part of the chief engineer, Mr. Lindenthal. As the curved approach to Hell Gate made impossible the use of either a suspension or cantilever type of bridge, the Hell Gate structure was designed as a picturesque braced steel arch, whose span between towers is one thousand and seventeen feet, and whose top from mean low water is three hundred and five feet, with a clear space below the arch to mean low water of one hundred and forty feet. Because of the strong tide that prevailed in Hell Gate and the character of the river bottom, it was impossible to erect temporary support, and the arch was accordingly built out from each shore by what is known as the cantilever method, temporary weights being added on the shore side to counterbalance the weight of the projecting portions while building. Hell Gate Bridge is designed for four railroad tracks carried in heavy stone ballast. It required three miles of viaducts, including a long bridge over Little Hell Gate and a lift bridge over Bronx Kill, containing altogether 90,000 tons of steel, and costing over $25,000,000. Its completion in 1917 was an epoch-making event in the history of American engineering, and the work will stand as an imperishable monument to the genius and ability of its chief engineer. Mr. Lindenthal was also the designer and consulting engineer for the big double track bridge of the Chesapeake & Ohio Northern Railroad at Sciotoville, Ohio. This bridge over the Ohio river has two spans each seven hundred and seventy-five feet long, of continuous riveted trusses, this being the longest span yet attempted of this type.

He is the author of numerous professional papers and received the Rowland prize in 1883 from the American Society of Civil Engineers for an article on "Rebuilding Monongahela Bridge in Pittsburgh, Pennsylvania." His articles on bridges and other engineering subjects have been published in technical and scientific journals in the United States and abroad. He received, in 1911, the degree of Doctor of Engineering, *honoris causa,* from the Polytechnical School of Dresden, the capitol city of Saxony, Germany, and is the only American engineer so honored by a German university. He also received the gold medal at the International Technical Art Exhibition held in Leipzig, Germany, in 1913, for his plans of the Hell Gate Bridge.

He was made a fellow of the American Association for the Advancement of Science for a paper on Economies of Long Span Bridges. He is a member of the Institute of Civil Engineers in London, England; of the Canadian Society of Civil Engineers; the American Institute of Consulting Engineers; honorary member of the Cleveland Engineering Society, corresponding member of the Ingenieure and Architechen-Verein in Vienna, Austria; and member of the Franklin Institute in Philadelphia, also of the Verein Deutscher Maschinen Ingenieure and of other professional societies. He is also a member of the Chamber of Commerce