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1920

# The American Magazine

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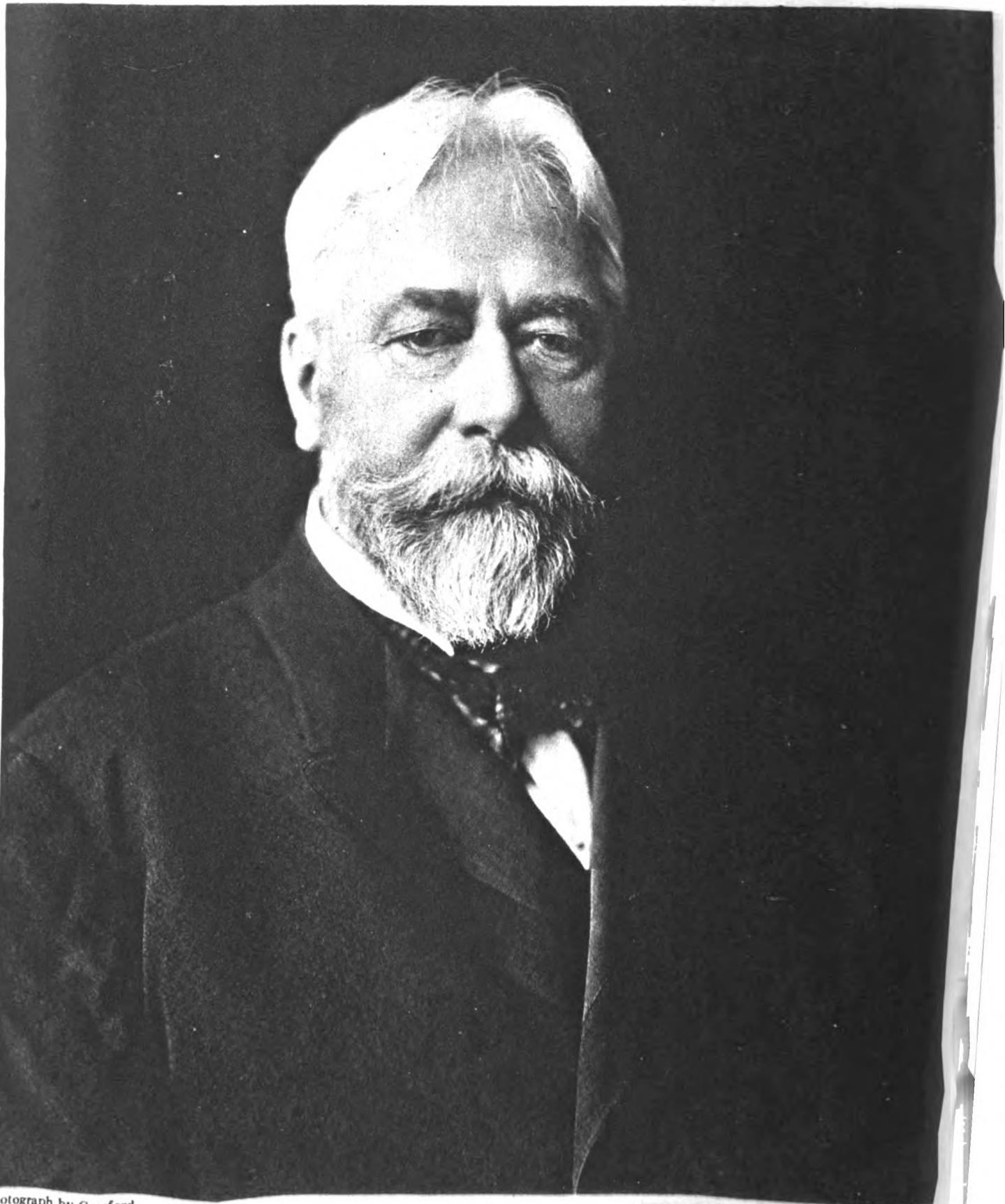


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Photograph by Gessford

*Gustav Lindenthal*

**AT SEVENTY, Lindenthal is hoping to crown a lifetime of achievement by building the greatest bridge, so far, in history. He has designed, built, repaired, or is designs and formulas have helped to build, practically all the great bridges in this country. Now he**

**is planning one greater than all the rest—a bridge across the Hudson at New York City. Lindenthal was born in Austria, came to this country in 1874 to complete his technical education, and liked America so well that he stayed and became an American citizen.**

# The Story of a Builder of Marvelous Bridges

Lindenthal is called the greatest bridge builder of the age, and is now planning to construct the most stupendous bridge in the world

By Samuel Crowther

Photographs copyrighted by Underwood & Underwood

ON A MORNING in 1901, a little after dawn and long before people had started to work, a policeman noticed that the great, towering Brooklyn Bridge looked queer. Its appearance was slightly like that of certain citizens the policeman was accustomed to see tacking home at that hour of the morning.

He rubbed his eyes and looked around at other familiar objects to see if they, too, had gone queer. But he saw that the ships had no more masts or funnels than usual and that the office buildings wore their customary calm and impersonal air.

Then he looked again at the bridge. Certainly the roadway had a list.

Being a good policeman, and willing to take the chance of being guyed if he were wrong, he instantly telephoned his superior and then closed the bridge to traffic.

He was not wrong. When a few hours later, the inhabitants of Brooklyn started on their daily journey to Manhattan they would not believe that *The Bridge, Their Bridge*, had failed them. In those days there was only one bridge over the East River. It was *The Bridge* then—a vital, essential part of Brooklyn. The idea of the bridge quitting was as easy to believe as that Long Island itself had moved out to sea.

They stormed, they fumed. But the authorities sent for Gustav Lindenthal; and he said that if the bridge had been left open that morning and the packed trains had begun their pounding—for this bridge has been from the beginning, and is to-day the busiest bridge in the whole world—the suspending rods would have given way altogether, and the roadway would have plunged the hundreds of feet into the water below, together with the seldom less than five thousand people who are on the bridge during the morning rush hour.

That event brought Gustav Lindenthal

for the first time before the general public. The newly elected mayor, Seth Low, made him his commissioner of bridges and asked him to repair the greatest bridge in the world, because he was already known to engineers and railway men as the authority on bridge construction. Whenever you look at any big bridge anywhere in this country that has been built within the past thirty years you may be certain

important of all cantilever bridges, and Hell Gate is the largest of all steel arch bridges. Lindenthal's hand was on all of them.

He repaired the Brooklyn Bridge, finished the Williamsburg Bridge, designed the Manhattan and Queensboro bridges, and built the Hell Gate Bridge.

Brooklyn Bridge, Roebing's masterpiece, is wearing out. The surging wagon

traffic is chewing up its wooden roadways. The steel girders groan and protest under the heavy electric trains, which were not even dreamed of when the bridge was built. Lindenthal long ago saw the end, and made plans for its reconstruction. They are in the archives of New York City, ready for use as soon as the city can spare the money. And when his plans are followed, the work will be done without interrupting traffic and the bridge will be twice as strong as before. With his love for the beautiful in bridge architecture, his plans preserve the gigantic stone towers and spiderlike iron network, which are an indispensable part of the famous harbor view of New York.

Take the second bridge up the East River, the Manhattan Bridge. It has perhaps the most remarkable history of any big bridge. Lindenthal had designed a beautiful chain bridge of noble construction, combining the artistic with the useful. He had put into the bridge anchorages (which have each about

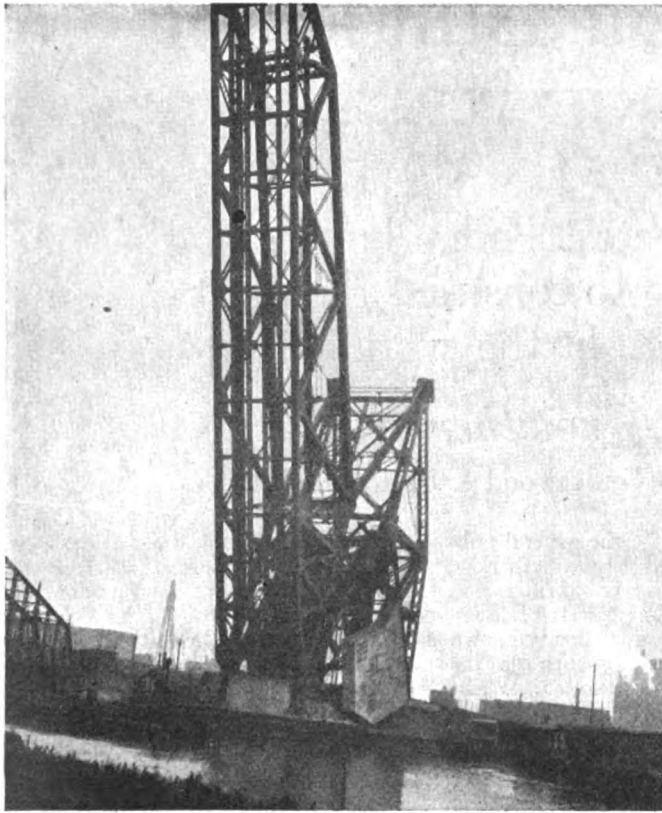
one-half-acre waste space) great assembly halls, each larger than Carnegie Hall. Greater New York suffers from a scarcity of large auditoriums, and Lindenthal figured that the city would get a yearly rental of at least \$100,000 from the two halls without extra cost. But the voters decided otherwise. Tammany won the next election and Lindenthal, with Mayor Seth Low, had to leave office. His design, which was estimated to cost \$23,000,000 to build, was replaced with what

## Think of a Bridge Across the Atlantic Ocean!

"IT is perfectly possible," says Mr. Lindenthal, "for an engineer, given enough money, to do practically anything. I could build a bridge across the Atlantic and have the piers on a solid foundation, even though in places the ocean is three miles deep. That bridge could be built 300 feet high on floating, anchored islands, and would be strong enough to carry the heaviest traffic and to resist the biggest gales that have ever blown. There is nothing at all *impossible* in such a project. But it is not practical, because the cost would run into figures that would look like a modern war debt, and it could not carry traffic enough to pay the legitimate interest on its cost of construction and maintenance."

that Gustav Lindenthal designed it, or was consulted about its design, or that some of his design formulas were used. This is not to say that he is responsible for all of the large bridges in America; but he has had a hand in approving or disapproving the designs of most of them.

Take New York, for example, which is the greatest bridge city in the world. It has the largest three suspension bridges—Brooklyn, Williamsburg, and Manhattan—while the Queensboro is one of the most



This queer-looking affair, which spans the Chicago River at Twelfth Street, is a modern type used where a bridge must be at the level of the banks, yet permits boats to pass when necessary. Time and space are saved by elevating the span, instead of turning it around, as in drawbridges



When Brooklyn Bridge was built, 1870-1883, it had the longest single span in the world, 1,595 feet in length and about 150 feet above the water. It has double tracks for elevated trains, a wide roadway for vehicles, two tracks for surface cars, and a promenade, shown above, for pedestrians

he considered an inferior design, costing over \$30,000,000.

The Williamsburg Bridge is the third suspension bridge up the river. The plans for it were already made when Lindenthal took hold of it. The work had been dragging along; but he finished that bridge in less than two years, when everyone said it could not be done. He wanted to afford Seth Low, then the "Reform Mayor" of Greater New York, the satisfaction of opening it, twenty years after Mr. Low, as the young mayor of Brooklyn, had led the procession at the opening of the great Brooklyn Bridge by President Arthur.

**L**INDENTHAL had a larger share in building the Williamsburg Bridge than anyone else had; but he refused to allow his name to go on it, because he believed that the original plans for it were not as good as they should have been.

The Queensboro cantilever bridge, the fourth over the East River, is from Lindenthal's design. He made the plans and let the contracts. But because of a change in administration, he did not complete the structure; and after he left office his plans were changed without consulting him.

When the big Quebec Bridge over the St. Lawrence River in Canada fell, in 1907, it produced a great scare in the public mind about the safety of the Queensboro cantilever bridge. Everybody was asking, "Is this cantilever bridge safe? Will it, also, fall down?" The public demand became so insistent that an official investigation by disinterested engineers was ordered. It was found that Lindenthal's plans had been tampered with, that the cost was largely increased, and the bridge so weakened that it could carry only half the loads for which it was intended.

When it was decided to build the big Hell Gate Bridge, which is the fifth over the East River, Lindenthal was entrusted with full authority as to design and execution. You have only to see the colossal steel arches to understand that it is the strongest bridge in the world, intended for the heaviest loads. There is nothing like it. It can carry day after day four processions of the heaviest locomotives; there is room for sixty of them between the towers. The bridge, with its beautiful approaches, is three and one-half miles long, and contains more steel and masonry than any two other bridges over the East River put together; and yet it cost less than any one of the other bridges. It was built in record time, and so quietly as hardly to attract public attention.



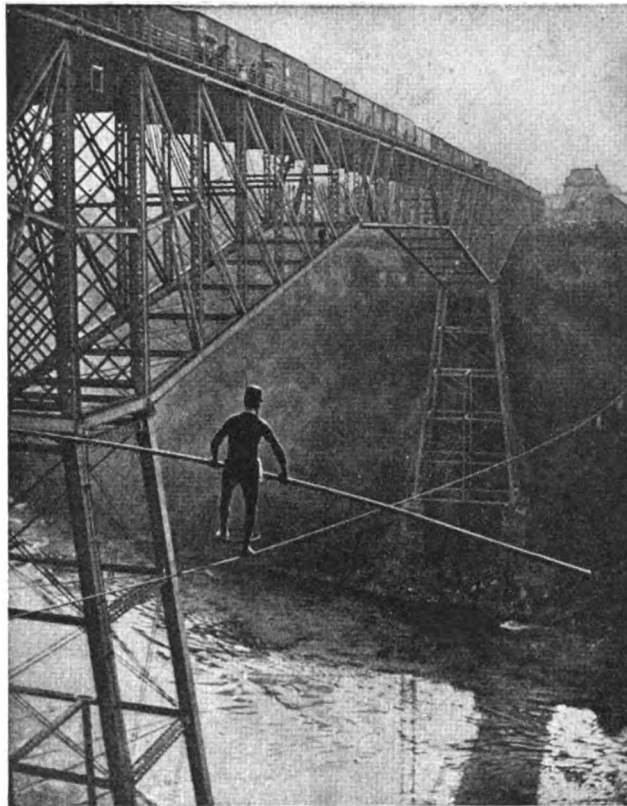
At the right is Brooklyn Bridge, built by Roebling years ago. Overloaded far beyond the capacity for which it was intended, it threatened to collapse in 1901, but was repaired by Lindenthal and is still in service. At the left is Manhattan Bridge. Lindenthal designed it originally; but, owing to a change in the city administration, it was built by other engineers, who altered the plans

**I**F YOU go down the St. Lawrence River from Montreal, you will see the biggest cantilever bridge in the world, at Quebec. Lindenthal made the first plans for it, his design being for a suspension bridge. But a cantilever structure was preferred, against his advice. When they tried to build it, however, it fell and 80 men were killed and 15,000 tons of steel dropped into the deep river. That was in 1907.



Again Lindenthal advised a suspension bridge as best suited that place. But again a tiler was chosen—and it tipped into the river a second time, in 1916. When, at last, the structure was completed, the final cost was twenty-four million dollars, instead of the million that would have been required for the stronger structure which Lindenthal had advised and for which he had laid the plans.

LINDENTHAL himself does not know how many bridges he has built or been concerned in. There is no affectation in it. It is simply that when one thing is done he passes on to the next; and, in a marvelously busy life, that has now passed threescore and ten mark, he has built many things other than bridges. He is responsible, in a large part, for the Pennsylvania tunnels under the Hudson and East rivers; he surveyed and laid hundreds of miles of railway tracks; he built piers, and deep foundations, and about everything that a civil engineer can construct. But he is best known for his bridge work, and he is the man who has designed and constructed the bridge of Longaneses—that over the North River, as the Hudson is called here, that skirts New York City. On this project he has been working for many years. If he has the opportunity to carry it through he will have made Manhattan and Long Island a part of the Jersey and New York mainland by bridges and tunnels in every direction. It will be no mean monument to an American by adoption. Gustav Lindenthal, although he has been here nearly half a century, was



Niagara River has several bridges below the falls, so that you can walk, drive, or ride across in a railway train. But the venturesome gentleman in the picture above chose to make the trip by a little method of his own. It seems to us to have only one advantage—he won't be bothered by too much traffic along the way

"My father," said Mr. Lindenthal, "was a severe man who believed that mere theoretical studies were not work, but only pastimes and indulgence, and that every man should train his mind and hands also for practical usefulness, so that he would be capable of supporting himself in a number of ways. He allowed me to travel for study in Germany and France, but during my vacations he made me work—sometimes as a carpenter, sometimes as a mason. It just so happens that if I had not received this training it would have gone hard with me in America."

YOUNG Lindenthal finished college at twenty, and for four years had a part in surveying and constructing railroads and bridges in Austria and Switzerland. European engineering was then ahead of American—with one exception. That was in the location of railroads and the speedy construction of bridges. Lindenthal had studied the great international Sabetum in Paris and Vienna, and they so impressed him that he decided he could never hope to consider his engineering education finished unless he took a course in practical railroad construction and bridge-building in America.

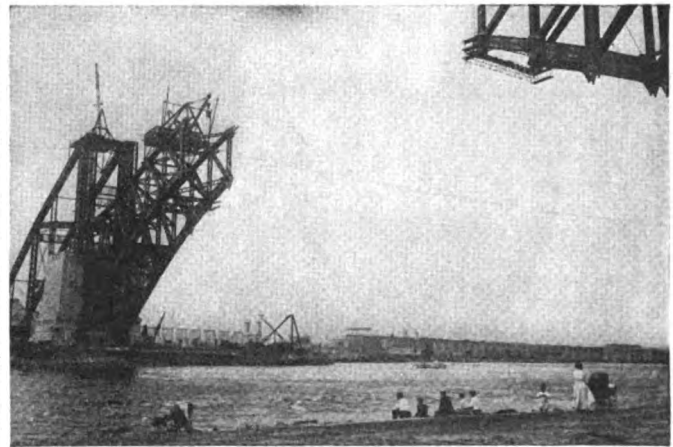
born in Austria. His career strikingly demonstrates the importance of early discovering what one wants to do, and then doing it. Before he was fifteen he determined to be a civil engineer; and thereafter his every move was with that idea in mind. His parents possessed the means to give him all the education that Europe could offer. They sent him to college at Brünn and at Vienna—but they made him work.

That is indicative of the way the man goes about things. He has a consuming passion for thorough and absolute knowledge. Whenever he does anything it is because he has first investigated, from every possible standpoint, and then tried out the theory in a practical way. He thinks that failure is only an epitaph for lack of preparation.

For instance, (Continued on page 91)



When Quebec wanted a bridge across the St. Lawrence River, Lindenthal designed one, choosing the suspension type as best suited to the place. But his plans were not accepted, and a cantilever type was chosen instead. The shore spans were completed—as seen above. Then the great central span was floated down and an attempt made to raise it into position. It fell into the river, carrying eighty men with it. This picture was taken one minute after it fell and shows rescue parties trying to pick up the survivors. A second central span was built; but this one also fell. The bridge, when finally completed, cost twice what Lindenthal's would have cost



This shows how the 1,000-foot arch of the magnificent Hell Gate Bridge at New York was constructed. In the distance, at the right, can be seen a part of the concrete approaches—a great curving sweep of climbing white arches. Altogether, Hell Gate Bridge and its approaches are three and one-half miles long. The steel arch was built out from the piers, not on a superstructure, and engineers predicted that it would fall, as the Québec Bridge did. But Lindenthal had calculated everything so perfectly that the undertaking was a complete success. This is the largest of all steel arch bridges, having room for sixty locomotives between its towers