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time had access to him as a matter of course. The Princess Anastasia is immovable in the determination to render the court of Athens impeccably respectable as well as edifyingly pious.

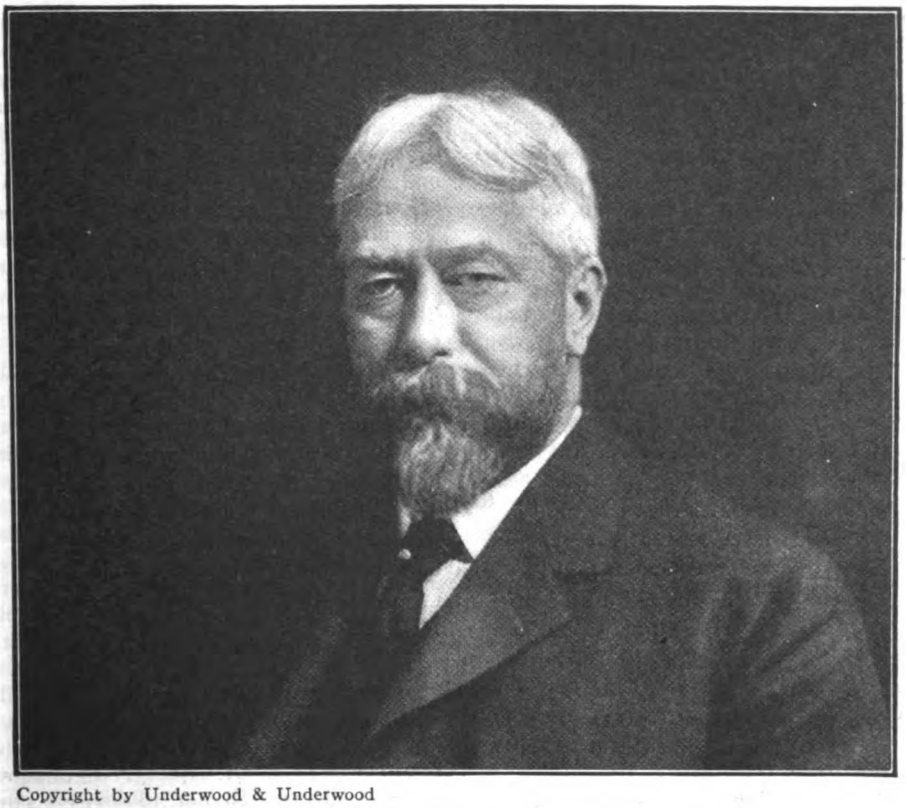
The French live in some dread of the American influence of the Princess, which will, it is assumed, achieve prodigies at Washington for Constantine. She is sensitive to what is said of her in the land of her birth and the *Echo* reports her consternation at some words circulated here as hers in what must have been a garbled form. She does not seem to have said that American millionaires are dissipated. What she said was that the heirs to great American estates have lived very much like Russian grand dukes of the bad old period, exiles from their country, dragging out meaningless existences at Monte Carlo and elsewhere. She is proud of her countrymen who, having gained immense wealth, continue abstemious in their habits and virtuous in their deportment. The functionary thus interpreting the thought in the mind of the dollar princess added some words of eulogy on her behalf with reference to Americans generally—a detail confirming the worst fears of the French. She must, they argue, be meditating a descent upon Washington for the exploitation there of her fascinating manner, her irresistible eye and her appealing way with men. Meanwhile, it is interesting to note, on the authority of the *Action*, that notwithstanding all the money she has spent in getting Tino back home, she still has seventy million dollars left.

A GREAT BUILDER OF GREAT BRIDGES

IT is perfectly possible for an engineer, given enough money, to do practically anything. One could build a bridge across the Atlantic and have the piers on a vrtually solid foundation, even tho in places the ocean is three miles deep. The bridge could be built three hundred 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. This remarkable statement is made, in the *American Magazine*, by Gustav Lindenthal, who is called the greatest bridge builder of the age and who is now planning to construct across the Hudson River the most stupendous bridge in the world.

Lindenthal does not know how many bridges he has built or been concerned with. There is, Samuel Crowther, the magazine writer, assures us, no affectation in this. 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 the 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 River; he has surveyed and laid hundreds of miles of railway tracks; he has built piers and deep foundations and about everything else a civil engineer can construct. But bridge-building has been his overshadowing work and it is Lindenthal who has designed and will construct the superbridge over the North River, as the Hudson is called where it skirts New York City. On this project he has been working for thirty years. If he has the opportunity to carry it through he will have made Manhattan and Long Island a part of the New Jersey and New York mainland by bridges and tunnels in every direction. That will be no mean monument to an American by adoption.

For Gustav Lindenthal, altho he has been here nearly half a century, was 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 is said to have determined to be a civil engineer, and he never abandoned the idea. His parents were able to give him all the education that Europe could offer. They sent him to



HE COULD BUILD A BRIDGE ACROSS THE ATLANTIC OCEAN

But Gustav Lindenthal, who cannot recall how many bridges he has designed and has had a hand in building, does not think that such a bridge would ever pay sufficiently to warrant the investment.

college at Brunn and at Vienna, and he was made to work. Graduating at twenty, during the next four years he 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, we read, had studied American methods at the great international Sabebetum in Paris and Vienna and was so impressed that he decided to take a course of practical railroad construction and bridge-building in America. With a few hundred dollars he landed in New York, intending to finish what he considered his preliminary education and then go back home as an especially qualified man. That was in 1874. But he was so quickly absorbed into the life of America that he gave up the idea of returning and became an American citizen.

Work was then starting on the Centennial Exposition at Philadelphia, and Lindenthal tried for a job in the drafting department. None was to be had. Then he did something which many a professional man would scorn—wrapped up his professional titles for the time being, remembered that he had also some skill and experience as a mason, bought a second-hand set of tools, applied for a job on the foundations of Memorial Hall and got it. Incidentally, he let the chief engineer know that he was a draftsman. As a result, the engineering office suddenly finding itself short of men, Lindenthal was engaged for a drafting task which was expected to take three months. It was done in three weeks, and the new draftsman was given a permanent place on the staff. They put him to

planning iron construction and he designed the dome for Memorial Hall, which is still standing in Fairmount Park, Philadelphia. That is, he designed the dome for the very building on which he had started as a mason working on the foundations. Also he designed a good part of Horticultural Hall, an iron and glass structure which was considered one of the show places of the Exposition, and which also is still standing.

Going west from Philadelphia after the Centennial, he did construction work on the Atlantic and Great Western, a road with a six-foot gauge, which began nowhere and ended in the same place. Lindenthal revamped the road, strengthened more than a hundred bridges and built fifty new iron bridges. Then came the business boom of the early eighties, and one thing put up to him was the changing of three hundred and forty miles of six-foot-gauge railway into standard gauge. He organized working squads, it is recorded, commanded by his captains and lieutenants at proper points along the line, and assembled all the materials. The longest day of the year was selected for the battle. At dawn on that day every man in every squad started the assigned task. In exactly nine hours the transformation was accomplished.

Lindenthal built bridges and surveyed and built railroads throughout Ohio, Pennsylvania, Virginia, West Virginia, Indiana and the Middle West generally. At Pittsburgh he designed and built a number of bridges over the Monongahela and Allegheny Rivers. Over the Ohio at Scottville he threw the heaviest girder bridge, sixteen hundred feet long, that had been built anywhere. He built the Kentucky River High Bridge over a canyon three hundred and fifty feet above the river, from the shores out, without falsework.

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

In this connection, the most remarkable bridge ever built is, Lindenthal declares, the Britannia Bridge, over the Menai Straits, near Bangor, Wales. It was built of wrought iron, tubular girders fifteen hundred feet long, with two spans of four hundred and sixty feet each and two of more than half that length, without any data other than the engineers could collect from their own experiments. That was in 1845 when, to quote Lindenthal, "people knew but little of the habits of cast or wrought iron. And, what is more, they could not build over scaffolding but had to assemble the spans on shore, float them out, and raise them a hundred feet into place by hydraulic presses. That is what I call a great adventure. Robert Stephenson, who did that work, was a truly great engineer, because he was an explorer in unknown lands of science. He had to devise his own formulas, test them in a small way, and then apply them in a big way."

Bridging the Hudson at New York City has long been considered one of the great engineering problems of the world. Altho there are many difficulties in the way, there are said to be no impossibilities, because the largest and most remunerative stream of traffic in the world is there to make a bridge pay at any cost. This bridge, with its appurtenances, will cost about $200,000,000. It will be twice as wide as the Brooklyn Bridge and will be a double-decker, carrying eight railroad tracks, six rapid transit tracks, wide driveways for trucks and automobiles, and a promenade. In a bridge of this kind, the heaviest weight it has to carry is its own and "all the trains and vehicle loads that can be put on it would not be more important than a string of fleas on a heavy wash line." It will have the capacity of eighteen tunnels, but, says its designer and probable builder, it will not cost as much as nine tunnels and will save $12,000,000 yearly on transportation costs.