

Golden Gate Bridge

Transcript

Narrator: In June 1921, a 51-year old bridge builder from Chicago arrived in San Francisco to deliver plans for the project of his dreams. Joseph Strauss made His living building ordinary draw bridges, but he was a relentless dreamer - a man determined to be remembered for something much bigger. Now, Strauss had conceived plans for what he considered the most daring bridge ever. His chosen site fronted the turbulent waters of the Pacific Ocean at the mouth of one of the world's great harbors. San Francisco's Golden Gate was a treacherous spot the likes of which no bridge builder had ever attempted to span. Little did San Francisco's City Engineer realize, he was dealing with a man who had once proposed bridging the Bering Strait.

Kevin Starr, Historian of California: There was an archetypal American kind of personality, who comes to fruition mythically in the Wizard of Oz behind the curtain. And that's the promoter, the P.T. Barnum, the visionary, the man who is constantly dreaming dreams and promoting big projects. And Joseph Strauss was that kind of person.

Narrator: Strauss arrived at an opportune moment. Though his plans would languish in the city bureaucracy for another 18 months, San Franciscans would soon understand they held the key to the city's future. Sitting at the tip of a peninsula, surrounded on three sides by water, San Francisco was bottled up, its expansion stunted by geography. By 1920, the federal census revealed the city's growth had dipped below the national average. Even worse, San Francisco had fallen behind its rival to the south. With plenty of land, Los Angeles was booming. San Francisco's future would depend on its ability to link with the underpopulated counties of northern California which stretched more than 300 miles to the Oregon border.

Kevin Starr: San Franciscans were beginning to realize that there was a vast northern and interior empire that had to be integrated into the San Francisco economy and transportation

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and travel network, for San Francisco truly to survive. It had already exploited as much of this bay hinterland as it could.

Narrator: San Francisco Bay separated two worlds, one urban and congested; the other rural and wide open.

Richard Dillon, Author, High Steel: Sausalito and Marin County was a rural and pastoral country.....dairy ranches, chicken ranches, that kind of thing, all the way extending up the coast...

Kevin Starr: It was also the area that you went for amusement... So you'd go over there on the weekends to go to the outdoors, to the park, to amusement centers, to enjoy the beaches; it was the playground of San Francisco..... And coming back on Sunday night could be quite a long line of cars waiting to come back to San Francisco.

Richard Dillon: My brother Bill, Bill Dillon, was a traffic cop for the Golden Gate Ferries. And his job was, with other officers, to keep the traffic from jamming the little town. They piled themselves up on that one main street, Water Street, all the way to the north edge of town and beyond.

Narrator: Over time, the weekend crush became a daily one. By the 1920's, 50,000 commuters a week surged through San Francisco's ferry building . Many came from the east bay, but increasingly from the counties to the north. It would take more than ferries to accommodate the growing traffic between San Francisco, and its outlying counties.

Kevin Starr: The 1920's is the decade of the automobile. San Francisco knew that it had to push forward, via the automobile, to its hinterlands. And that meant a bridge.

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Narrator: In 1922 Joseph Strauss crossed the Gate by ferry and set out on a road trip north. The first stop on his self-orchestrated campaign was Sausalito's city council. A bridge would boost property values, he told a curious audience, encourage development and invite tourism. In short, the day a bridge opened, anyone who owned property in Marin County would automatically be wealthy. It was a performance Strauss would repeat before countless civic organizations and public meetings from communities throughout Northern California.

Mark Ketchum, Civil Engineer: This bridge needed a promoter. It needed a champion, someone willing to work half their life, almost, probably to his own financial detriment-promoting this bridge and making it happen.

Narrator: "If the people of San Francisco and other communities are willing to spend the money," Strauss told the San Francisco Chronicle, "the Golden Gate could be bridged by 1927."

To build his bridge, Strauss would have to overcome a formidable environment. Northern California's rivers, fed by the heavy snows of the Sierras, have only one outlet. The mountain water flows into San Francisco Bay, and then toward the mile-wide gap called the Golden Gate. At the Gate, it collides head-on with the incoming force of the Pacific Ocean.

Stephen Cassady, Author, *Spanning the Gate*: What you see is the collision of natural forces: fresh water and salt. All of the Pacific Ocean that hits the California coast is looking for a place to go. It has one place. And that's the mile-and-a-quarter aperture between Fort Point and Lime Point, between Marin and San Francisco.

Mark Ketchum: If you go out to the bridge site, you can see the waves crashing over the south shore. And those waves are only the surface manifestation of a big energy pump underneath the water.

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Stephen Cassady: On top of that, you have really terrible weather: cold wind, it's slick. If you say, "Well, what an ideal site for building a bridge," it isn't.

Narrator: But Strauss saw only a magnificent challenge.

Kevin Starr: Well, Strauss is a, by temperament, a dreamer, a mystic, a visionary. When he was at the University of Cincinnati and he tried out for the football team, and he was hurt, and he had to recover, he could watch from his infirmary window the construction of the Covington Bridge across the Ohio River into Kentucky. And as he watched that bridge under construction, the dream of great bridges possessed him as-as-as his life's work.

Narrator: Despite his great ambitions, Strauss had built his career stamping out mundane, functional bridges.

Mark Ketchum: Strauss was a remarkably prolific designer of movable bridges that were built across inland rivers all over the Americas. These bridges are bascule bridges. Bascule is really a short name for a bridge that opens like this, or like this.

John van der Zee, Author, The Gate: He was the drawbridge king. He was the guy who built these bridges, these pattern bridges all over the world. Of the 400 bridges that the Strauss firm built during its existence, 390 of them at least were these little pattern drawbridges.

Narrator: Strauss found inventive ways to draw attention to his work. For San Francisco's 1915 exposition, he converted a bascule design into an amusement ride that offered a spinning view of the city's skyline. It was fun, but hardly a feat of engineering. The plans Strauss delivered for a bridge at the Golden Gate similarly called for a bascule design of huge proportions. It was functional, affordable, and looked, to one critic, like "an upside down rat trap."

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Mark Ketchum: This bridge really looks like a bascule bridge on steroids, with the lift span in the middle replaced with a cable-supported span. Most people (myself included) think that it was very ugly, to the point of hideous.

Kevin Starr: Joseph Strauss was not much of an engineer. He was a great visionary. And his initial draft of the Golden Gate Bridge was awkward and clumsy, and if by any impossible chance it had been built, it would have been a catastrophe today. There'd be a movement to tear it down.

Narrator: Four years after delivering his plans, Joseph Strauss moved from Chicago to San Francisco's Palace Hotel. He had come to pursue his dream full-time. And that meant convincing Californians to pay for it...Strauss lobbied the northern California counties to join a bridge district that would issue bonds to raise the thirty-five million dollars a bridge would cost. With little state or federal interest in the project, local citizens would have to put up their own homes and businesses as collateral. In the end, five northern counties agreed to join the bridge district.

Richard Dillon: I don't really know exactly how Strauss did pull it off, how in the world he got the support of our little counties over here? Marin County was lightly populated and Sonoma and Napa and Mendocino had very few people. And Del Norte County had no people, you might say. And yet these rather impoverished counties got together to hock their homes and their ranches for a bond issue in 1930.

Narrator: In San Francisco itself, Strauss encountered unexpected resistance.

John Van Der Zee: When the idea returned to the Board of Supervisors it got stalled. So Strauss hired a man named Doc Meyers who was a political fixer and bribed one of the members of the San Francisco Board of Supervisors named Warren Shannon. Shannon became the bagman. He would, come to the Strauss offices and be given a sealed envelope with a

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\$100 bill inside, which he either kept for himself or distributed to the necessary supervisors to bring them on board.

Charles Kring: His secretary told me that every month someone would show up, pick up a paper sack with \$400 in it. Well, \$400 in those days was the equivalent of about \$2,000 today.

Narrator: Magically, San Francisco's resistance evaporated, and Strauss looked forward to being named Chief Engineer. But the newly appointed bridge board questioned his design and started considering other candidates with far more experience. Determined not to let the job slip away, Strauss agreed to retain his 2 chief rivals as consultants, cut his own fee nearly in half, and even scrap his own bridge design. Strauss did insist on one thing: that he be credited as the engineer who designed and built the Golden Gate Bridge.

The man most pleased with the need to start over was Strauss' deputy, Charles Ellis, whose job it would be to calculate and draw up the new plans. A meticulous intellectual, Ellis was in every way Strauss' opposite. He'd studied Greek classics and was a distinguished professor of engineering before joining Strauss' Chicago office at age 54.

Fred Apsey, Student of Charles Ellis: Charles Ellis always wore his black suit. He had on this white shirt, starched collar, and his little tie, and when you looked at him, he just looked precise with the way he dressed. That was the whole image that he presented.

Narrator: Unlike Strauss, Ellis's ambition lay not in the glory of fame, but in the pure challenge of calculating every engineering detail.

John van der Zee: The bridge is like a gigantic math problem. And he had the mathematical skills to implement it. This was, in effect, 10 and a half volumes of pre-computer higher mathematics, done by one man, using a circular slide rule and a hand-cranked adding machine.

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Fred Apsey: He was coming up with some calculations that there were 35 unknown units in it. And the only way you can do it is to solve all these equations together, to try to find out what some of these unknowns are, and then eventually you'll get down to where you got one more unknown to solve for, and you find that, and so then you're home Scott free.

Narrator: Ellis's calculations worked out the practical details of a radical design for a suspension bridge that had been broadly conceived by Leon Moisseiff. Moisseiff, a leading bridge designer, had developed a revolutionary theory that allowed for an unusually graceful main span. It would stretch 4,200 feet, longer than any yet built. Unlike the famous Brooklyn Bridge, with its stout towers and rigid elements, the Golden Gate would be so flexible as to bow out sideways 27 feet in a strong wind.

Alan Temko, Architectural Critic: Moisseiff was an artist and he approached this the way a poet approaches language. Much of it is intuitive. It came as what the French call a coup de foudre, a lightning flash.

John van der Zee: Moisseiff believed that up to half the stress caused by winds could be absorbed in a suspension bridge by the bridge cables and suspender ropes, and transmitted to the bridge towers and abutments. So if a bridge were designed to bend and sway with the winds, and flex, the suspended structure (the roadbed) would act as a counterweight and restore the bridge to equilibrium.

Narrator: Moisseiff and Ellis struggled to see how far they could push the limits of theory and still end up with a bridge that would stand. With Ellis in Chicago and Moisseiff in New York, the telegram traffic between them was thick. "What do you consider maximum allowable deflection side span?" Chicago would ask. "Deflection side span six thousand," New York would answer. Strauss was growing impatient. The bridge board still hadn't seen plans for its bridge, and Strauss put pressure on Ellis to deliver by June 1930.

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Fred Apsey: Strauss did not understand the complexity of what Ellis was doing and how long it took. Strauss even accused him of spending too much money. Well, when you're talking about a structure that has never been built in the world, something that is earthshaking in the engineering field, you don't hurry. You do it right. There's only one way.

Narrator: The light and color of San Francisco Bay and the Marin Headlands had long fascinated an obscure local architect named Irving Foster Morrow. Morrow, who usually designed houses, had never before worked on anything approaching the scale of the bridge.

Alan Temko: Irving Morrow was scarcely known. And Strauss hired him, I think, because he thought he could master him.

Narrator: Morrow's imaginings of bridge towers with stunning art deco detail first began to take form in charcoal on paper. His architectural instincts were matched by an uncanny ability to handle the prickly Chief Engineer.

Alan Temko: Morrow, through just the most deft resistance to Strauss's ideas, gradually persuaded him to see the drama of the bridge. Strauss himself had the stupidest ideas of what a bridge could look like. And you know, he thought you'd paint them black too, so they wouldn't show dirt. Well, this isn't Chicago.

John van der Zee: The open spaces that again were in the original architectural treatment were turned by Morrow into these giant portals framing the sky. And he had this signature vertical fluting that he used in some of his residential architecture that he incorporated into the bridge... So that the bridge catches the light and changes with the sun as the sun moves throughout the day and around the year. By incorporating light into the bridge, Morrow had turned it into a sculpture.

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Narrator: Later, Morrow would turn his attention to the bridge's color. He tested different paint formulas, exposing metal panels to the salty weather of the gate. The choices came down to carbon black, steel gray and Morrow's personal favorite, a mixture he called international orange.

John van der Zee: There were differences of opinion. The Navy felt it should be painted with yellow and black stripes, for visibility. They were still thinking of ordinary bridges.

Narrator: Morrow pursued the issue with Strauss until the Chief Engineer finally gave in. Like Charles Ellis, he succeeded by quietly working around Strauss.

Kevin Starr: For Charles Ellis and Irving Morrow to have worked for Joseph Strauss was probably bad news and good news. The bad news were-was, they worked for a commanding ego who wanted the credit. The good news was that they somehow worked for a commanding ego who saw in them, neither of whom had national reputations, the ability to achieve something spectacular, and who empowered them to that achievement.

Narrator: On August 27th, 1930, two months behind schedule, Joseph Strauss delivered his much anticipated report to the board of directors. At 285 pages, it was intended to answer the board's every question. As a finishing touch, Strauss had added to his own credentials a "C.E.," or graduate certificate of engineering, a degree he never received. Charles Ellis, who had done most of the design work, was listed merely as Strauss's chief assistant on the project, despite his signature as the preparer of every drawing. Yet, it was soon clear to members of the bridge board who had done the work.

Fred Apsey: While he was in San Francisco, people of the bridge commission, the engineers kept talking to Ellis directly. They would ask him questions on technical things. That started the distance between Ellis and Strauss.

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Narrator: Strauss ordered Ellis back to Chicago to finish his work. But Ellis continued to obsess over the towers.

John van der Zee: Strauss kept urging Ellis to get on and finish the job, turn it over to someone else, get on with something else. Ellis felt he couldn't do that since his signature was on the plans-that they had to be precisely accurate and guaranteed.

Narrator: Believing more labor spent on the towers was a waste of time and money, Strauss decided to replace Ellis. First, he ordered Ellis to take a vacation. Three days before his scheduled return, Strauss told him not to bother coming back.

John van der Zee: Strauss fired Ellis, I believe, because there was a certain deep insecurity in Mr. Strauss's makeup. Work that Charles Ellis did was attributed to Strauss. Charles Ellis' role as the designing engineer of the Golden Gate Bridge disappeared from general view.

Narrator: In November 1930, San Francisco, like the rest of the nation, was sliding into the Great Depression. It was a difficult moment to ask voters to underwrite a major construction project, but that's exactly what the bridge board was proposing. With the financial risks evident, the opposition came out in full force.

Kevin Starr: Shippers were opposed to the idea of the bridge. They thought it would get in the way of shipping. The War Department was opposed to the bridge. It thought that the bridge could collapse in wartime and block the San Francisco harbor. The Sierra Club was opposed to the bridge on the- on environmental basis. And of course the Southern Pacific, a rather successful ferry system, was opposed to the bridge because it was going to cut into its business.

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Narrator: Naysayers were quickly dubbed the "Old Guard," intent on tearing down the Bay Area's future. With the promise of new jobs, voters approved the bonds by a 3-1 margin. But the victory would be hollow if the bonds couldn't be sold.

John van der Zee: No bond house, no bank would-would take the bridge bonds. By the fall of 1932, they were desperate once again.

Narrator: By 1932, few civic leaders were projecting confidence, except for one. A.P. Giannini, a first generation Italian-American, had graduated from his family's produce business to start a bank that grew to become the Bank of America. Giannini tackled the Great Depression head on, with slogans like "Back to Good Times," and "California can lead the nation." Desperate to find a buyer for the bridge bonds, Joseph Strauss decided to pay the banker a personal visit.

John van der Zee: Strauss and the directors went to the offices of A.P. Giannini. They told him, "Nobody will lend us money. If we can't get a loan to start construction, we're out of business." Giannini thought for a moment and then he said, "We need the bridge. We'll take the bonds."

Narrator: Giannini asked how long the bridge might last. Without hesitation, Strauss replied, "Forever."

Construction began in January 1933, with the excavation of three and a quarter million cubic feet of dirt to accommodate the bridge's massive anchorages, one on each side of the Gate. Twelve stories high, the anchorages had to be strong enough to secure 63 million pounds -- twice the pull of the bridge's main cables. By the hundred, men were hired on to do the dirty, back-breaking labor of working cement by hand. Word spread fast that there were jobs to be had building a bridge in San Francisco.

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Walter Vestnys, Iron Worker, Local 377: Obviously there's not that many ironworker bridgemen that live in downtown San Francisco, so a lot of these people were boomers from Chicago and New York and, you know, other places. It was all handled through the ironworkers' local, 377. No matter where you came from, you had to clear through the local, so in order to be a local person, you bought addresses and Social Security numbers from people that were local.

Narrator: The bridge became a magnet for young men kicking around the west looking for work, like 25-year old Slim Lambert.

Skip Lambert, Son of Slim Lambert: My dad had been a cowboy, stevedore, worked in a brick factory, done some lumberjacking....One day they're walking down the Embarcadero, trying to figure out their next move, and a fellow comes out of a construction office along the side of the road, and says, "Are you boys iron workers?"

Walter Vestnys: There was a lot of people wanted to get on that-that job. And when they were asked, "Listen, have you ever been an ironworker?" "Yeah, I was born an ironworker. I been an ironworker all my life."

Charles Kring : There were very few jobs in those days, and the best were the ones that got the jobs. And there was always somebody waiting at the base of the tower for someone to fall off so they'd get a job.

Richard Dillon: They were farm boys and clerks and taxicab drivers and things like that, who became high steel men. So they were my heroes en masse, these guys that I see from the ferry boat, teetering along on a girder up there in the space.

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Narrator: The towers would each be supported by a concrete foundation. Built at shore's edge, the Marin foundation was finished ahead of schedule. The San Francisco side was another story.

Mark Ketchum: The south tower of the Golden Gate Bridge, near San Francisco, is built over a thousand feet out into open ocean. And it was a tremendous construction challenge.

Narrator: An eleven-hundred foot trestle was built out from the south shore into open water. From there, divers set bombs to blast away rock for setting the piles. But the treacherous currents at the Gate afforded them very narrow windows of opportunity.

Stephen Cassady, Author, *Spanning the Gate*: If you're going to send your divers down either to excavate or to do any underwater construction, you'll have an hour and 15 minutes a time, and you want to get the maximum out of them. Sometimes you're pulling them up before they're ready, and-and decompression could set in.

Narrator: Between the wind and the fog, the weather was relentless. The trestle was lost, first after it was rammed by a ship in the fog, then taken out by a storm. The result was a five-month delay. To complicate matters, the Chief Engineer had gone missing.

The bridge directors accused Strauss of shirking his duties, and said as much in the local papers. The decade-long fight to begin construction had drained the engineer, psychologically and emotionally. He had cleared every hurdle, but at a cost to his own health.

Stephen Cassady: Strauss disappeared for a period of 6 months. Rumor put him in the Adirondacks, recovering from a nervous breakdown.

Narrator: Strauss's office announced he was recuperating on a cruise through the panama canal. Strauss finally wired from New York, to say he was "beginning to feel like his old self,"

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and would "return to San Francisco by leisurely stages." He neglected to mention he had left his long-time wife to marry a budding singer, nearly 20 years his junior.

John van der Zee: He pretty much withdrew then to his apartment on Nob Hill, and oversaw the construction at a distance.

Narrator: For most of the next two years, the Chief Engineer made only sporadic appearances at the construction site. Back home in Illinois, Charles Ellis, was consumed by the idea that there might be a flaw in the calculations for the bridge towers.

Fred Apsey: Ellis sat down in his office, and he started to do the calculations again. And he went all through them. And he found out that there were some of the areas that had been assumed, were not exactly right. He did 5 months of work unpaid, because he felt so obligated to that project.

Narrator: Ellis wrote a flurry of letters to Moissieff and the other consulting engineers, urging further study.

John van der Zee: He became obsessed with the towers. He felt that the structure of the towers was unsafe, and finally a test of a model tower, while the bridge was being constructed, was undertaken at Princeton, largely under Moisseiff, to sort of assuage these feelings when it was decided that the tower design was satisfactory and safe.

Narrator: Moissieff would later lament that Ellis "Started on an incline plane and accelerates himself accordingly."

Satisfied the towers would stand, the bridge's consulting engineers gave the go-ahead for work on the towers to begin. Two dramatic sculptures began to rise 745 feet in the air. Each was composed of a collection of cells, 42 inches square and 35 feet high. The first went up at

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the base of the Marin headlands, followed by a second that rose from a concrete foundation in the middle of the bay. Workers marveled at the precision of the fit, which stood in place without a single rivet, if only temporarily.

Walter Vestnys: Rivet gangs normally speaking are organized. Four men and the heater is usually the boss. He had a small forge, and he had to heat those rivets and keep them just right. They couldn't be too hot, they couldn't be too cold. And he had to have 2-inch ones and 2 and a half and 3-inch and when the catcher said, "I want a 3-inch rivet," and banged a can, look out, because that rivet- And they went "Zing!" just like a bullet. Boy, they- Scare hell out of you when that rivet is coming up there. And you best catch it, and take it out, and you had to put it in fast. When the inspector comes along and he goes "ding-ding-ding," and he gets a "dong," that's a cutout. And if there's too many cutouts, you're going down the road.

Narrator: As concerned as Strauss was with speed and efficiency, he seemed determined not to build at the cost of human life. The bridge exposed workers to wind gusts up to 60 miles per hour. There had been injuries and close calls, but in nearly forty-six months of construction, only a single worker had died.

Walter Vestnys: The fog would come in and go out all day long. And the fog oftentimes is just like rain. When it's wet, the iron is just like ice, it's ah pretty chancy when you have to walk around so much.

Skip Lambert: You had to be extremely careful when you were up high, because a gust could come along and literally blow you right off.

Narrator: Across the bay, the Oakland Bay Bridge had already seen 22 workers fall to their deaths.

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Richard Dillon: And the old tradition was that you lose one life for every million dollars on a bridge project. And this was a \$35 million bridge, more or less. So we should have lost 35 guys during the building.

Narrator: Whether out of genuine concern or concern for his image, Strauss proudly imposed one safety rule after another.

Richard Dillon: He was probably the first of the hard hats to be used. And they were leather: half football helmet, half hard hat in that day. He was probably the first to use the hard hats...

Stephen Cassady: They had to wear safety lines. They always had been safety lines, but a lot of guys wouldn't wear them. Well, in the Golden Gate Bridge, if you didn't wear one, you were fired.

Walter Vestnys: I worked with a guy named Ed Walker, and he was a rotten, no-good S.O.B. And his spit bounced. And he would fight anybody, and he was a tremendous ironworker. He stopped all the time. And Strauss fired him, because he wouldn't use a safety belt. Strauss told him, "Tie off there," and he told him go screw himself, and so Strauss had him fired right then.

Narrator: In the fall of 1935, the Roebling company was brought in to spin the bridge's cables. Since the company's founders built the Brooklyn Bridge 52 years earlier, Roebling had greatly advanced cable spinning technology. 80,000 miles of wire had been delivered to the bridge site. From narrow catwalks suspended between the towers, workers would weave and compress thousands of strands into two 36-inch main cables. Roebling had agreed to a tight schedule: finish the job within a year or lose money for each day it was over schedule.

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Mark Ketchum: The cable system is really the lifeline of a suspension bridge. It's responsible for carrying all of the load across that massive span, from the deck to the towers. And that big cable that looks so solid when we see it today, was spun in place from individual wires that are each about the size of a pencil. A loop of wire is pulled out of this spool and taken across the top of the top-first tower, down over, across the top of the second tower, all the way to the second anchorage. Then that spinning wheel picks up another wire from that end, and goes back and does the same thing all over again.

Narrator: The spinning had to be precise, with fine adjustments constantly made so the cable would transfer the weight of the bridge to the anchorages as Ellis had specified.

Charles Kring: I was the inspecting engineer, supervising the spinning of the cables in the main span. Had a little office right in the center of the bridge. My job was to see that they were ... spun to the proper lengths. Their profit depended on spinning it as fast as possible. So the faster they could spin it, the more money they made.

Narrator: To beat the deadline, Roebling had to innovate.

Mark Ketchum: They speeded up the spinning process by working from both ends. So instead of just having one spinning wheel going from one end to the other and back again, they had two spinning wheels, meeting in the middle. This speeded up the process tremendously.

Narrator: Roebling increased the pace again. Soon, 25,000 wires were being bundled and compressed with hydraulic jacks to complete the main cables. On May 20, 1936, workers adorned the spinning wheel with flags and sent it across the gate one last time, pulling the very last wire behind it. The cables had been finished ahead of schedule, at a rate four times faster than had been considered possible. The following month, Joseph Strauss made a rare public pronouncement. He revealed that he had ordered the most expensive, elaborate safety

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device ever conceived for a major construction site. He was spending over \$130,000 on a safety net, to be installed as work began on the bridge's roadbed.

Richard Dillon: What he did was to put this wonderful safety net under the entire bridge, so that people who fell would be saved. And he cantilevered it out. 10 feet out on each side from the work space, so that he protected everybody.

Skip Lambert: No matter how high up you were, and how hard you might have been blown off, you would still fall into the net.

Narrator: Nineteen men tumbled into the net, each cheating death. They called themselves the halfway- to-hell-club. The net became a morale - booster -- so much that workers had to be ordered not to jump into it on purpose. For Strauss, the investment paid dividends.

Stephen Cassady: But the loss of life, the delays that would occur from men working slower because they had to be a bit more careful so they wouldn't fall, probably made the \$130,000 a very economic innovation. Strauss was smart that way.

Narrator: Strauss had to be smart. he was determined to finish job before running out of money and the project was headed into its most dangerous phase-extending the roadway outward from the towers.

After two years, Slim Lambert looked forward to finishing the job. He was foreman of a gang stripping away the wooden forms from the underside of the concrete roadway.

Skip Lambert: They were on an 11-ton platform that was kind of like an inverted railroad flat-car with these arms, called hangers, attached to rollers on a track above them.

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Narrator: As it happened, that morning a team of safety inspectors had been brought in to look over the flat cars.

Richard Dillon: And he didn't know it at the time, but there was an opposite one at the other- the San Francisco side, which had been condemned. One of the state inspectors had said, "This thing is not safe."

Narrator: But word hadn't reached Lambert.

Richard Dillon: These guys heard this horrible sound of the ripping of metal. And you can't imagine what went through their- You can imagine, I guess, but...horrible.

Skip Lambert: And then the entire staging let go, a number of bodies fell into the net and then the staging fell on top of them. My dad fell into the net backwards, head first.

Stephen Cassady: You had noise, you had yelling, you had screaming, you had people hanging from girders. Yeah, all hell broke loose.

Skip Lambert: The net's going down and he's hanging on, going down head first. And he realized that he had to reverse his position and land feet first to have any chance of surviving. When he landed in the water, he was feet first, perfectly vertical but he landed in the corner of the net. And the weight of the staging almost immediately took the net down. He thinks he went way, way down, and wiggling the whole time, and was able to break loose. When he got to the surface, one of his best friends, Fred Dümmtzen, surfaced. He was alive but unconscious. My dad with one arm was able to get some lumber under him, give him a little flotation, and then get his arm around him and hang onto him. Well, this was February. And the water in the bay had to be maybe 50-52 degrees, just- At the outside, a fit person is supposed to last 20 minutes. My dad was in the water for 30 to 40 minutes. Just as my dad was going to succumb to hypothermia, a crab boat came along. The man stopped and was

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able somehow, using extraordinary effort, to pull them onto the boat. My dad had suffered a broken shoulder, broken collar bone, broken ribs, broken neck, broken back, and two horribly twisted ankles. So he was really busted up. When they got to the hospital, he slowly thawed to the point where they could straighten his limbs out and x-ray him. And then they-they found out how badly injured he was. When he got out of the hospital, he was an inch and a quarter shorter than before the accident. So it had taken its toll. My dad was haunted by the fact that they weren't picked up earlier. He felt that if the Coast Guard had seen them and got to them, that Fred Dümmtzen might have lived. It always bothered him that he was regarded as a hero because he said, "I did nothing heroic. I wanted to save my best friend's life, and I did the best that I could."

Narrator: Slim Lambert was one of two men who survived the fall that day. In all, ten bridgemen died. A tangle of net was hauled out from the waters, but most of the bodies were never found. The accident shattered Strauss's great safety record. Fingers pointed in many directions, including Strauss's, but nobody was ever found liable for the accident. Before long, building resumed. The bridge was finished on budget, sixteen years after Joseph Strauss first imagined it and seven years after Moissieff and Ellis proposed a graceful leap across an unprecedented space.

Narrator: May 27, 1937, opening day. At dawn a crowd of people clustered at both ends of the Golden Gate Bridge. The bay area came out en masse to inspect and celebrate its new icon.

Richard Dillon: My dad, on this May day, surprised me, with our very tight budget, with this beautiful black stetson felt cowboy hat and a gorgeous purple cowboy shirt, the kind of thing I saw on Saturdays at the movie house. Wedging our way through that crowd, we hiked the bridge. It was 200,002 people (my dad and myself) crowded onto this bridge.

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Stephen Cassady: It was a national event, an international event, airplanes flying over. Chaos. And as many people as could get to the site, seemed to get to the site and get themselves across.- the impossible accomplished, in such an efficient and glorious manner, was a legitimate cause for celebration.

Narrator: The day's highlight was to be a speech from the Chief Engineer himself. But Joseph Strauss could hardly speak. "This bridge needs neither praise nor eulogy," Strauss said. "It speaks for itself."

Mark Ketchum: He was honored as the creator of the bridge. But he was exhausted. He only lived for a short time after the bridge was completed, and he wasn't that old. I think that one could argue that he probably shortened his life with this project.

Narrator: Joseph Strauss went to Arizona to rest, but within a year of achieving his dream, he died of a stroke.

Charles Ellis, who had poured his heart into the bridge, apparently never got to see his achievement in person.

John van der Zee: He kept on the wall behind his desk a small framed photograph of the Golden Gate Bridge. He told his students, "I designed every stick of steel in that bridge." He was quite firm about what he had done. He had the respect of people he respected, the people in the engineering community.... To my knowledge, he never came out and saw the bridge. He also believed his name was on it. He told his students, "My name is on the plaque." He believed that, or he needed to convince himself.

Alan Temko: I think ordinary people feel the strength, the power, and ... the decisiveness of this great span. It lifts up people's hearts. I've never failed to take people from elsewhere over the bridge without them just going, "Wow!"

Kevin Starr: Great works of art encode within themselves messages that are at once transcendent and enigmatic, mysterious. What does the Parthenon mean? What does Beethoven's Ninth mean? What does Hamlet mean? The Golden Gate Bridge means many things. It means the victory of San Francisco over its environment. It means San Francisco remains competitive. It means that people can cross the channel more easily. But it also means something else. It celebrates in a mysterious way man's creativity and the joy and wonder of being on this planet.

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