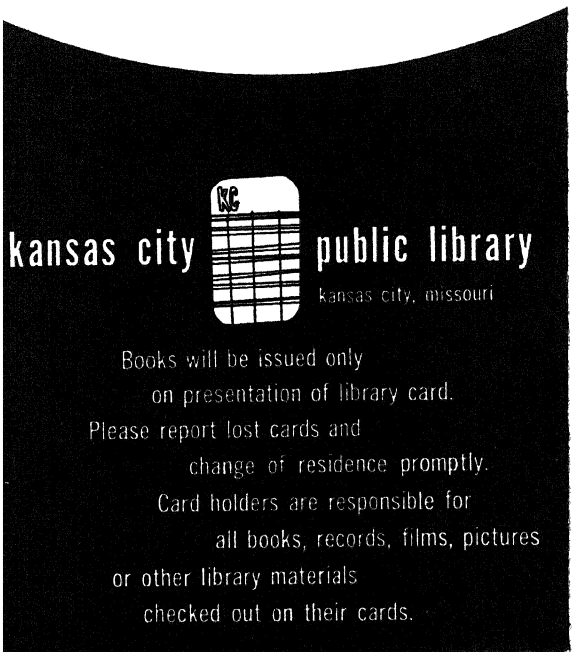


John Roebling was one of the greatest civil engineers of the nineteenth century; his genius still survives in bridges and acqueducts that span the rivers of America. He gave us the Eighth Wonder of the World—the magnificent Brooklyn Bridge. It cost him his life and nearly killed his son. But Washington Roebling, stricken while working in an underwater caisson and in ill health for years, fulfilled his father's dream.

A German emigrant, young John Roebling founded a farm colony in Pennsylvania. But he wanted to raise bridges, not crops, and felt that his technical education was being wasted. His chance came when a storm severely damaged the Allegheny River Acqueduct at Pittsburgh. From its ruins John built the first suspension bridge in history. But his climb to fame was slow and perilous—his plan to use wire rope for bridges was too revolutionary; he was plagued by petty politics and greedy business in-

John terests.

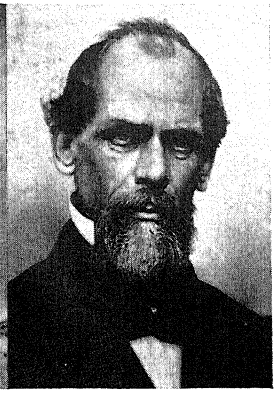
BORI Meanwhile his son Washington had become a dis-

DIED tinguished engineer and the two met a fantastic challenge—spanning the East River between Brooklyn and New York. John Roebling, surveying the tower location, died in an accident. Despite overwhelming opposition young Washington carried on. But the bridge seemed jinxed through strikes, fires and the dreaded disease o" "the bends" which overtook workers and paralyzed him from the waist down. Doctors despaired of his life and he lost the power of speech. But Washington was determined that nothing must stop construction, and he managed to make his wife understand his directions which she relayed to his engineers. Slowly, incredibly, through his indomitable will, the great bridge rose as an enduring monument to his father.

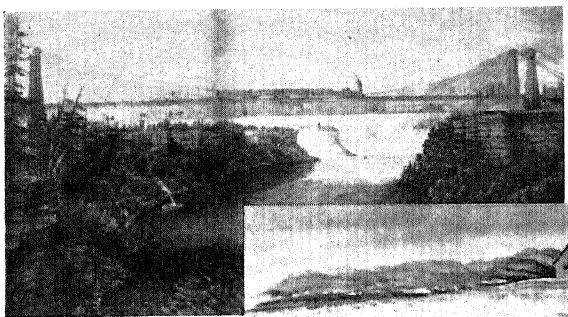
The Roeblings' story is not only an inspiring page in scientific history, but it is also incomparable adventure.

Washington A. Roebling

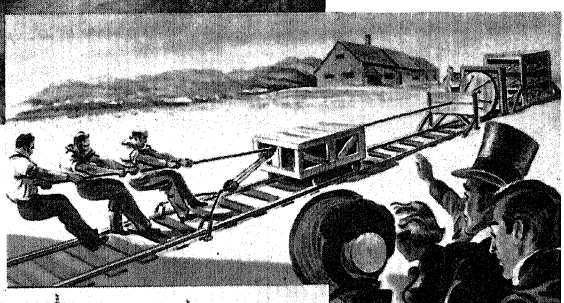
Emily Warren Roebling



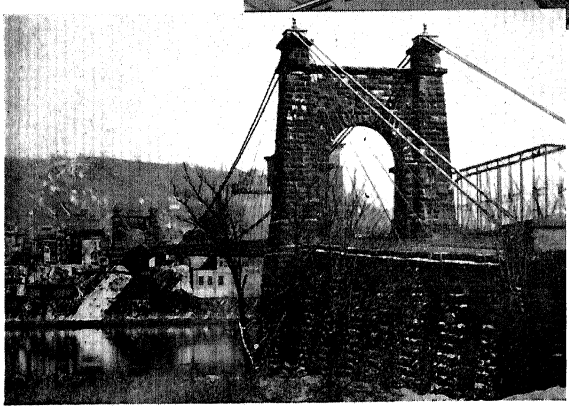
John A. Roebling



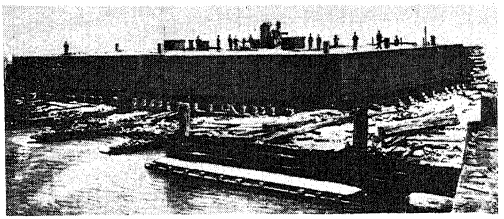
Niagara Gorge Bridge—first successful suspension railway bridge in the world



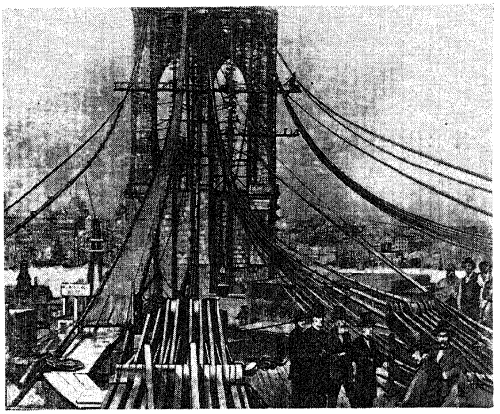
Drawing of the rope walk used by John Roebling in the meadow behind his Saxonburg farm



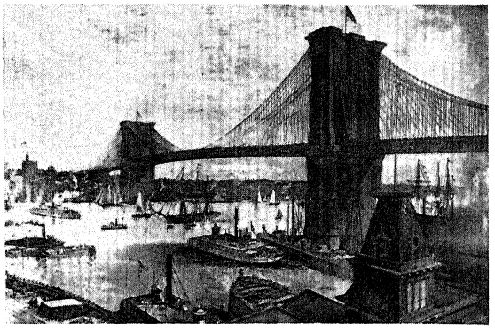
Wheeling Bridge in West Virginia



Brooklyn Caisson, East River Bridge

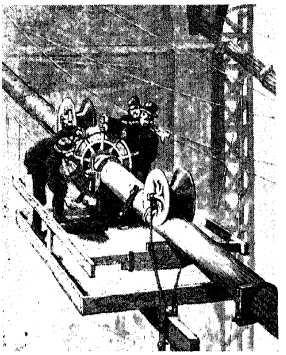


The Brooklyn Bridge during construction



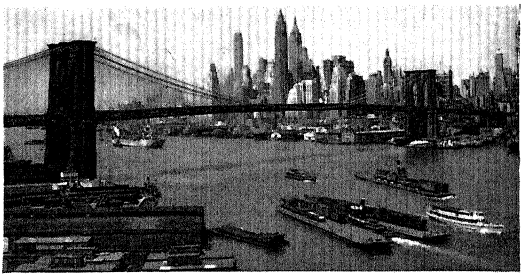
The Brooklyn Bridge when it was opened in 1883

Farrington crossing the span



Wrapping the cables

The Brooklyn Bridge today



KATHRYN E. HARROD

Master Bridge Builders

The Story of the Roeblings

JULIAN MESSNER, INC., NEW YORK

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Curtis W. Garrison

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CONTENTS

ACKNOWLEDGMENT

The Brooklyn Bridge has long fascinated those who see it, but it becomes a vital, living thing to one who lives in its shadow. Until Dr. David B. Steinman published his biography *The Builders of the Bridge* in 1945, few people knew anything of the human drama surrounding it and the history of its builders, as well as the other great Roebling bridges.

In writing this story about the life of John and Washington Roebling, the author found Dr. Steinman's study invaluable. I am equally indebted to an earlier biography of Hamilton Schuyler's, who quoted extensively from correspondence and documents no longer available. Thanks are also due Albert Neroni of the John A. Roebling's Sons Corporation of Trenton for copies of letters and other material. Walter E. Joyce, C.E., who is now Senior Associate with the David B. Steinman Company, Consulting Engineers, New York City, and formerly associated with the Roebling Company, in charge of the erection of cables for the Golden Gate Bridge, was kind enough to read the portions of the manuscript dealing with wire rope and bridge building and correct several inaccuracies. Mrs. Charlotte Gowing Cooper furnished reminiscences of the Trenton period in the life of Washington Roebling. Dr. Curtis W. Garrison read the entire manuscript and made valuable suggestions.

CHAPTER ONE

A German Boyhood

Nine-year-old John Augustus Roebling had only one thought that murky summer afternoon as he sat on the floor of his father's tobacco shop. He must finish the model of the gate tower before tomorrow—his mother's birthday. He had worked on it during every spare moment for several weeks, and all had gone well until it came time to add the center arch blocks. Try as he would to keep them in place, they always fell to the floor when he drew his hand away. Finally, in desperation, he placed two wooden props to act as centering, then shoved the keystone into place and removed the props. The arch held fast! His deep-set gray eyes lit up. There was a bright flush on his high cheekbones. Nervously, he ran his fingers through his mop of curly blond hair, then slid back a few feet into the open doorway to admire his work.

He was so pleased with the success of his invention that he did not notice the long faint shadow which moved into the low-ceilinged room. He did not hear the sound of marching feet in the narrow streets of Mühlhausen, the ancient Thuringian town which was his home.

Suddenly, a long, shining steel blade grazed his elbow and sent the model flying toward the counter, pieces tumbling under the oaken chairs and window table. The sword dropped, narrowly missing John's right hand. He looked up, startled. A

blue-jacketed soldier glowered at him above a golden chin strap.

"See what you've done!" The boy scrambled to his feet, his thin face pinched, his eyes snapping indignation. "You have ruined my model!"

"Model? Bah!" scoffed the dragooner. "Play, will you? With half your neighbors on their way to fight Napoleon?"

His father who had all the while been working behind the counter, stood rigid, staring first at John, then at the Prussian. "Sh, ssh, hold your temper, son. Now, Herr Captain, what will it be today?"

The boy scurried around the room, rescuing the pieces and trying to fight back the tears. His father was right, of course. He knew how to deal with rough, overbearing soldiers and was not going to risk having his precious stocks of Arabian tobacco dumped in the streets. John did not blame him for that. Still his heart was heavy as he piled the blocks on the window table. A few minutes before it had all been so beautiful. He darted a furious glance at the dragooner who threw a few coins on the counter and pocketed his small bundle. With anxious fingers, John began to sort the pieces of his model. Even if he stayed up all night, he could not rebuild it in time.

Suddenly an idea struck him. Since the gift would be late, anyway, why not start afresh with stones and set them in lime plaster? "Let any old Prussian try to smash *that* with his sword!" he murmured, triumphantly.

John hurried out of the shop, through the winding narrow streets and down to the stream bed near the tower gate. "It will be beautiful; it will last forever," he chanted, making a little tune as he dropped the smooth, waterworn stones into the folds of his faded blue smock.

Many years later, when John Roebling had achieved worldwide fame as the designer of the Brooklyn Bridge, an American army engineer noticed a small, perfectly scaled stone model in the window of a farmhouse near Mühlhausen. The

German housewife nodded happily when the officer expressed his admiration. "Roebling, the great engineer, built that. He was only a boy, then."

Fancy uniforms, rude-spoken soldiers from far away places were no novelty in the quaint medieval town of Mühlhausen. A few months after John's birth on June 12, 1806, Napoleon passed through the province of Thuringia on his way to the capture of Berlin. Germany was a group of small states in those days, united only by language and culture. The dream of a strong national government was not to be realized for many years. All through the see-saw battles of the Napoleonic Wars, until the Battle of Waterloo in 1815, soldiers camped on the rolling plains outside the town—the French, the Cossacks, the Prussians and the Austrians. Each succeeding master of the province exacted his share in heavy taxes and confiscated goods.

It was natural that the boys of Mühlhausen loved to play soldier, to dangle their legs over the town wall and watch the military drills or breathe the acrid smoke from the army campfires as it sifted through the orchards. But not John Roebling. He was a rather frail boy with no longing for the day when he could march across the stony ridges of his province to battle the enemy. When he sat on the wall, he drew pictures of buildings such as old St. Blasius' Church or he watched the sun set on the hills near the Werra River, many miles to the west. The family sitting room above the tobacco shop was crowded with John's drawings and silhouettes which his mother carefully dusted and bragged about to friends when they dropped in for a cup of afternoon coffee. This spurred John to even greater efforts.

Although Mr. Roebling seldom said so, the boy knew that his father, too, was proud of his talent, and that he was pleased with the very good grades he earned in school. Such things were common in the Roebling family. John's great-grandfather, the son of an architect and town treasurer, had moved

from near-by Tennstedt back in 1670 and soon made a good place for himself among the merchants of Mühlhausen. His son, John's grandfather, had been a town councilor. While the Roeblings were not rich, they were well connected by marriage to good families in other parts of northern Germany. The boy's mother came from the Mueller family, small merchants known for their musical ability, and John inherited this talent, also.

Every evening just before bedtime, Frederike Roebling sat beside her youngest son at the old-fashioned piano, directing his finger exercises or helping him over the difficult passages of a sonata.

Cristolf Roebling usually appeared to be asleep on these occasions, but when John slid down from the stool and started up the narrow staircase to the room which he shared with his brother Carl, he noticed that his father opened his eyes and said, *"Gut, gut."*

One evening when John worked longer than usual at the piano, his father motioned him to his side. "All this is very good, son, but why don't you play with other boys your age? There is plenty of time ahead for music and drawing. You should get out in the sunshine. Run races and . . ."

John did not know how to reply. He had not been aware that his father even noticed that he seldom played with the other boys. "I do sometimes." He hesitated. If only the boys wouldn't call him "old elephant legs" because he came in last all the time!

His mother came to his rescue. "John has no talent in his legs, I tell you. His talent is in his head and hands. They will make him famous."

"Famous? How you do talk, my little wife." Cristolf Roebling looked quite amused as he lit his long porcelain-bowled pipe. "No one becomes famous in Mühlhausen. You do not have to be a draftsman or know geometry to make cigars."

Still at a loss to know what to say, John hurried toward the stairs. For an instant he looked back, then grasping the door

handle, he blurted out, "I do not want to make cigars!" and dashed up the stairs to bed.

His head was in a spin as he sat on the edge of the feather mattress, trying to collect his thoughts. Carl lay in the middle, as usual, sleeping soundly. John glanced at his brother's delicate but untroubled face. For an instant he was tempted to rouse him, but what was the use? Carl would not understand. Good, simple Carl who was satisfied to be just smart enough—but not too smart—in games or in school. As John looked at his sleeping brother, his pounding heart gradually quieted. He pulled off his blouse and baggy trousers and crawled in beside him. "Move over, you ox!" he said, prodding Carl gently in the ribs.

The next morning, when he and his mother were alone, John blurted out, "I hate cigars."

She looked at him understandingly. "Your father is a good man, John. Do not worry. You won't have to spend your life making cigars. Hermann and Carl can do that. It comes natural to them. Your sister Amalia will marry soon, then I will see if I can save more money. You keep up your school grades. I will find a way to give you the education you want. That I promise. You will someday do something important—and it will be far from these prison walls of Mühlhausen!"

John had not realized that his mother felt this way about Mühlhausen. Perhaps she, too, longed to see the distant hills beyond the Werra. Perhaps she, too, often looked at the foreign uniforms and wondered what it must be like in the faraway lands from which their wearers came.

That very afternoon a letter arrived in the tobacco shop. John took it to the counter. "It is from America, Papa! Do you want me to open it?" The arrival of a letter was a rare event in the Roebling household—and one from America!

His father only shrugged. "Put it on the shelf, there. From our Schmidt friends in America, no doubt. Why do they go so far away? It is so quiet here now that the wars are ended."

John held the slim envelope in his hand, looking curiously at the stamp and handwriting.

"Put it on the shelf," his father repeated gruffly. "It is not important that I read about noisy, busy America."

Remembering his mother's promise, John began to give more and more time to his schoolwork. He still practiced on the piano and often stopped in at St. Blasius' Church to finger the wheezy old organ where Johann Sebastian Bach had composed his first cantatas a hundred years before. John still drew pictures and occasionally built a model, but his chief interest now was in doing his arithmetic problems. By the time he was twelve, he was able to enter the local Gymnasium, or higher classical school, two years ahead of other boys his age. It no longer bothered him so much that his classmates called him "elephant legs." He even pretended that he did not mind being left out of games at birthday parties and Christmas celebrations.

John's happiest hours were spent with Ludwig Lies, the tutor from Eschwege whom his mother hired to give him lessons in drafting and solid geometry. Ludwig was five years older than he, and it flattered John that the tutor often walked home with him after the lessons and accepted his mother's invitations to have coffee with them.

One day in early summer, shortly before the end of the second-year school term, Ludwig sat in the low-backed armchair by the coffee table, one foot wrapped around his long trousered leg. "I have been meaning to ask you, John, would you like to spend the vacation with me in Eschwege?"

John was surprised and very pleased. "Oh, yes, indeed I would!" He had never been more than a few miles from home in his life, and Eschwege was twenty-five miles away!

His mother nodded her assent. "It would be a fine opportunity for him, a fine opportunity."

John had a wonderful summer in the lovely old town on the Werra. Eschwege was smaller than Mühlhausen but much

prettier, he thought. Ludwig claimed that it was founded by Charlemagne and that the ancient black tower which dominated the skyline dated from the year A.D. 1000. John liked to sit at its base and look out over the rolling valley. He drew many sketches there, which he later gathered into a folio for his mother.

But his great surprise for her that summer was something quite different. Ludwig spent every morning and most of the afternoon tutoring him in drafting, in preparation for the State Builders' examination. John made excellent progress and worked far into the night so that he could reach the goal. "Not many can pass that examination at the age of fourteen!" he boasted to Ludwig. "I will show those fellows at home a thing or two. And won't my mother be surprised!"

The tutor gave him a sharp poke in the ribs. "You have not passed it yet, old elephant legs."

John turned crimson and returned to his drawing board. But he got the point. Ludwig was forever accusing him of bragging.

Just before John left for home, he passed the difficult four-hour examination and received his certificate. When he handed it to his mother, she rewarded him with one of her rare smiles.

"And now, son, you wish to be a builder?"

"Yes, a builder, but not yet. There is so much more to learn first," John replied thoughtfully.

It was fine to have passed the examination, but the certificate was only a first step. Perhaps it was the effect of his visit away from home. It may have been the fact that he had reached a difficult goal, but his horizon was now broader. He must go much farther, much higher in mathematics, if he intended to become famous. He did not know what road he would travel in his search for fame. He would not worry about that now, but take one step at a time.

There was plenty to occupy his mind at the Gymnasium that winter, for in the year's course several subjects were really difficult for him. He had to take advanced Greek, Latin and

geography. Night after night he tried to cram for these examinations, but it was difficult to concentrate on them. "What is the point to learning a lot of dead languages?" he protested. "I like to study practical subjects."

Characteristically, he found a way out of his dilemma—at least for the time being. Friedrich Stueler, a neighbor who was several years older than he, invited him to take a walk one day.

Friedrich talked enthusiastically about a private school which he was attending in Erfurt. "For technical subjects only," he explained. "Dr. Unger is the head of it. A famous mathematician, you know."

John had not known until now, but he nodded, anyway.

"Well, when I finish there next year I will be able to enter the Royal Technical Academy in Berlin."

"You mean that you will not have to take a lot of classical subjects at the academy? Not any?" John asked, hopefully.

"I do mean that. It is a state school, the academy, set up to train men for government jobs in engineering. They do not train college professors and preachers, you know. Not there. Those men attend the University of Berlin."

This was all news to John Roebling, but one thing he did know—he would have a talk with his mother that night. How glorious it would be to study only technical subjects—to be an engineer!

Poor Frederike Roebling looked bewildered when John announced that he wanted to go to Erfurt to prepare for a career in civil engineering. She immediately led him to her bedroom and pointed to a blue and gray crock which stood far back on the low shelf of her cupboard. She shook it and John heard the jingle of coins.

"I have already saved a little sum," she explained.

John was so pleased he could have hugged her, but he held back and said only, "Oh, Mutti, how wonderful!"

His mother never showed her feelings the way the mothers of some boys did. John could not remember when he had seen

her kiss anyone. He did not mind, really. It was nice that she always treated him like a grownup. He knew she loved him. Why else would one sit up night after night, patching pants, turning skirts, letting down hems, making suits over and over? To save money for his education, of course. Every penny she could spare, evidently, went into that crock.

By September, the year John was fifteen, there was enough to pay his tuition at Dr. Unger's technical school.

Erfurt was the largest city in Thuringia, and John found it very beautiful. All around the wooded landscape were patches of brightly colored flowers. During the first difficult months, John had little time to admire scenery and architecture and no time to draw pictures or play the piano.

Dr. Unger was a stern teacher, and John was determined to do his best, to become the smartest student in the school. He pored over books on trigonometry, surveying and science and began to devise his own problems and ways of finding solutions. Professor Unger was delighted. *"Wunderbar!"* Looking at the tall, thin, serious-faced youth, he added, "I should have known you would be smart. You are so homely."

Taken aback, John looked at the floor to hide his confusion.

Dr. Unger put his arm around the boy's shoulders. "Excuse me. I meant it only as a compliment. You have originality, you think clearly. You are a born student. Mathematics is the most wonderful subject in the world. It is a kind of symphony, a poetic form of expression. It will help you to understand the universe."

Gratefully, John looked into the man's kindly eyes. "Yes, I think it will, I think it will." He had grown accustomed to compliments. He expected them. But this was the best yet. Even the great mathematician admitted that he was smart.

At this period in German history, the people were weary of their autocratic rulers. Scholarship stood at the pinnacle of respect in their minds. The giants of culture provided a kind

of national unity which consoled Germans such as Frederike Roebling, even when they could not grasp their full meaning. Some leaders among the intellectuals, young and old, strongly sympathzied with the democratic ideals which swept over France, even hoping that they, too, might achieve these goals. But the intervals of hope were tragically short, for the petty German rulers, fearful of democracy, smothered their subjects' cries for freedom.

John Roebling listened to the whispers of the intellectuals at Dr. Unger's school. Being young, he was naturally optimistic. "Political freedom and unity will soon come to Germany," he predicted loftily one day when he was talking to Friedrich Stueler.

His friend laughed good naturedly. "Oh, John, you are going to be an engineer, aren't you? Why bother about politics? I can design a building just as easily under an autocratic Kaiser as I can under a democratic government. Engineering and politics do not mix."

"But they should!"

"Lower your voice, John. This kind of talk will get you into trouble. Engineering and politics do not mix, I tell you!"

A few days later, when a student was taken into custody by the police, John decided to heed Friedrich's advice. For the time being he would stick to his studies so that he, too, could go to Berlin.

John was seventeen when he completed his studies at Dr. Unger's technical school. By now he was so accustomed to his mother's financial sacrifices that he took them for granted. He fully expected that she would have the money for his tuition at the Royal Technical Academy in Berlin. She did, but John was not prepared for the sacrifices of other members of his family. Hermann and Carl presented him with money for books and drawing supplies. Amalia had gifts. "I embroidered two blouses for you, little brother," she said proudly.

Cristolf Roebling led John into his bedroom, to the tall carved oak cupboard. When he opened the door, the boy saw

a pair of long, tapering green pants and a matching coat with large, shiny brass buttons. "City clothes!" his father explained. "My son will not enter the academy dressed as a country bumpkin."

John did not notice that his mother looked very weary that windy morning as she walked beside him to the Langefelder Gate where he climbed into the stagecoach. All he saw was one of her rare smiles as she handed him a silver flute.

"My father's. I want you to have it."

"Mutti!" John hugged her close and choked back the lump in his throat. He was glad that the townsfolk gathered around them, waving and calling their good wishes and good-bys.

At the last minute two of his professors from the Gymnasium pressed letters into his hands through the lowered window.

Recommendations! He tucked them inside his greatcoat pocket next to the one from Dr. Unger. "How good you all are!"

As the driver swung his long whip over the heads of his horses, and the coach darted off smartly on the first lap of the two-hundred-mile journey to Berlin, John leaned out to wave.

"Auf Wiedersehen!"

He did not doubt for a moment that he would make a big splash in Berlin. He had never been so self-confident in his life. "I will be famous, I *will*," he murmured as the wheels rolled over the bumpy road and he saw the last of the beautiful towers that dominated the skyline of his beloved Mühlhausen.

CHAPTER TWO

Berlin

The two-hundred-mile stagecoach ride to Berlin and Charlottenburg was exhausting for most travelers, but John Roebling enjoyed every minute of it. He was fascinated by the city of Leipzig, one of the overnight stops, and after supper at an inn, he wandered through the old streets to marvel at the ancient buildings. He stood before the gates of the four-hundred-year-old University of Leipzig, whose first students were political refugees from Prague.

At midnight of the fourth day, in a pouring rain they came to Charlottenburg, the suburb of Berlin where the Royal Technical Academy was located.

He stood in the deep mire before the pension, his trunk at his feet. Even in the dim light he could see that there was a new look about the village, that the streets were wide, the buildings set on broad lots, so different from the cramped streets of ancient Leipzig. Grasping his trunk with both hands, he lifted it to his shoulder and climbed the few steps to the pension which had been recommended by one of his fellow coach riders.

The air was close inside the smoky room, and the woman who came from behind the desk spoke brusquely, but not unkindly. "Will you be staying long? Are you a student?"

John felt the amused curiosity which centered on him. Four

young men who sat at a corner table put their heads together. He thought that he heard one of them say, *"Provinzell."* *"Auslander,"* said a second. The others laughed.

John colored. "Provincial, yes, but not a foreigner!" And he followed with his trunk as the woman led him into the hall.

The back room at the top of the second flight of stairs was small but cozy. John was relieved when the woman left him and he was able to pull off his wet boots. Carefully, he unpacked his new city clothes and hung them on the pegs inside a tall clothes cupboard.

There was a constant babble of voices from the rooms around him, and out in the street young men were singing. The sound of rolling wheels splashing through the mire came through the window. He was used to damp weather, but the cold of Charlottenburg was more penetrating; it seeped into his bones. Perhaps he was overtired, but he had no desire to go downstairs again and eat the supper which the woman had offered him. Within a few minutes he was in bed and asleep, the feather comforter pulled up tightly around his chin.

When he awakened, sunlight streamed through the narrow windowpanes. The maid placed a tray on the study table near his bed, and he hastily consumed the small breakfast of boiled egg, roll and tea. When he was at last dressed in his new clothes, he felt better. The air was still damp, but he enjoyed the cleanness of it as he stepped out into the street.

Everyone was in such a hurry. Young and old jostled his elbows as they passed him, and he had to speak quite loudly before one young man stopped to listen. "Pardon, but can you tell me how far it is to the Royal Technical Academy?" he asked.

"The academy? Only five minutes that way, toward the river," the young man explained in a deep guttural accent.

He paused in front of the three-story square cement building which bore the sign KOENIGLICHE BAU AKADEMIE. Looking up he saw three rows of large windows set between tall, flat columns of masonry. How lovely the building was, and so

large. There were eight windows at each level. It looked new, yet substantial in its solid square next to the Spree River Basin. He entered the door in happy anticipation.

His first day at the academy was a strange experience. The professors who interviewed him read his letters of recommendation and looked over the record of his schooling with only casual interest, it seemed to John. Even the letter from Dr. Unger was merely scanned with the remark, "We shall see."

John hardly knew what to think. He had been welcomed so warmly at Dr. Unger's. Suddenly fingering his new trousers, his jacket, he realized the material was coarse. These were not city clothes at all. The other young men who bustled through the halls were dressed in smooth-finished fabrics, some in military uniforms, others in tight-fitting pants which were buckled under thin-soled black, shiny shoes. Most of them wore small visored caps. John was relieved when the secretary in the office at last handed him his schedule of courses and a receipt for his tuition.

He was within a block of his pension when he saw a familiar figure coming down the street. "Friedrich Stueler!" he called happily. "It has been ages. My, am I glad to see you!"

His old schoolmate laughed quietly. "So you managed it. Well, I am glad, you know. I must say, it is nice to see someone from home." He had been working as a builder for two years in Prussia, and had also just arrived at the academy to begin his advanced technical schooling, he explained.

The two young students spent the rest of the day together. Friedrich appeared to feel perfectly at home among strangers, and as they sat in an open-air restaurant eating a hearty dinner of stuffed cabbage and turnips, he talked glibly about his plans for becoming an architectural engineer.

John forgot his self-consciousness after he began to attend lectures at the academy. Industriously he made notes in all courses—basic engineering, architecture, foundation construction, hydraulics—each calling on all his previous technical training and demanding the closest study. After a month, he

wrote his mother: "The smartest boy in Mühlhausen is not the smartest boy in Berlin."

It became increasingly clear that many of his classmates were far ahead of him, particularly in actual experience; for some of them, like Friedrich Stueler, had done field work after graduation from technical schools. In order to keep up with them, John worked so hard that he seldom took time to have a leisurely evening with Friedrich and his fun-loving friends, although they repeatedly invited him to go along to hear an opera or concert, or enjoy a supper at a nice restaurant on the banks of the Spree.

One Saturday evening, after John had been at the academy all winter, Friedrich managed to pry him away from his studies. John was surprised to hear the students talking, not of their work at the academy, but about lectures they were attending at the University of Berlin, three miles distant.

"You mean," he asked Friedrich, "that you have to take courses in philosophy at the university in order to graduate from the academy?"

There was a shocked silence, then his friend explained, "No, it is just that *anybody* who wants to be *somebody* must sit under Hegel. His lectures on the philosophy of history at Berlin are a must, you know."

John said nothing, but the next day he borrowed two of the philosopher's books from Friedrich and began to read out of curiosity. "I can make neither head nor tail of this stuff," he protested after several hours of concentrated study.

The next week, John and Friedrich walked together down the long, broad avenue which bordered the Tiergarten, a huge, densely forested park between Charlottenburg and the center of Berlin. They strode through a side arch of the Brandenburg Gate into the wide avenue of Unter den Linden, past the large royal palaces to the U-shaped white cement building of the university.

John was curious and excited. By now he realized that the philosopher Georg Friedrich Wilhelm Hegel was looked upon

as the greatest scholar in Berlin. Well, if you had to sit under Hegel to be somebody, he would at least try, but John had no intention of spending good money for a course in philosophy without knowing first that he would get full value.

He was amazed to see the great size of the lecture hall, and he noticed that nearly every seat was taken—not just by young students, but by men of all ages, some very well dressed and even gray haired. The stooped, rather thin professor with wispy hair, who sat behind the huge mahogany writing table, was dressed in a long yellow robe with a sparkling white stock at his throat. His rectangular face had heavy pouches under the eyes, and he appeared older than his early fifties. Now he was fussing with his books and papers, as if he had lost something. Finally Hegel cleared his throat, looked up briefly, scanned the room and began to speak.

John had to strain his ears to hear, and it was several minutes before he could get used to the halting speech broken by frequent coughs and long silences. The man groped for words, each sentence he spoke standing alone, as if he were making up his lecture as he went along. Members of the class frequently interrupted him with questions or comments. To John's surprise, Professor Hegel appeared to welcome these intrusions.

The subject of his lecture was "Freedom."

"Freedom for the individual is a sacred right. And by freedom I do not mean that every man may do as he wishes. Freedom must be controlled; it must be subject to the welfare of the State. Only spiritual law stands above the State. All history is the growth of freedom."

At the close of the hour-long lecture, Hegel arose from his chair, dropped the notes he was holding and began to speak in loud, clear tones. The hesitation was gone as he brought the lecture to a close.

"Man is not free when he is not thinking. All thinking must be directed toward a definite goal, a goal pursued with pas-

sion by the individual, protected by the State. The history of all government is, or should be, freedom organized."

John was not sure that he understood all this, but before he left for Charlottenburg he signed up for Hegel's course in the philosophy of history, and paid the auditor's fee.

While he worked as hard as before on his technical subjects, he gave what time he could during that next year to reading and trying to understand Hegel's philosophy. He, too, began to interrupt on occasion.

Poor Frederike Roebling must have been surprised to read in the same letter about the wonderful course in bridge building and the marvelous lectures in philosophy, for John felt that he had to keep her posted on all of his interests. He wrote that he had signed up for courses in advanced French and—at Hegel's suggestion—was now studying English which he had begun during the summer. He proudly reported that Professor Hegel frequently invited him to take long walks through the Tiergarten.

One day, after a very heavy rain, the two were walking through this park at their usual leisurely pace. John picked his way, skirting puddles, but Hegel did not seem to notice that the ground was soggy.

Suddenly John realized that his companion was limping. "Why, Professor Hegel, you have lost a shoe!"

The great scholar looked down, then quite casually he said, "So I have. Please go back and look for it."

John rescued the almost submerged shoe from a bog twenty yards back, and the walk continued as if nothing had happened.

Hegel said that in his opinion the German people were God's chosen. "We are a nation of philosophers. Germany should give the world intellectual leadership, yes, spiritual leadership. As for political leadership, that is far in the future, I fear."

Then he talked about the struggle ahead for a unified Germany. For the first time, he mentioned the United States. "The

land of the future. It is the place for all those who are weary of the fight for unity. It is for all those who want to do great things—*now.*"

John wished that they had not reached the end of their walk. This last remark brought many questions to his eager mind, and he thought about them on the long stroll back to the academy. Was Professor Hegel serious about America? Did he really think it was the land of opportunity?

The young student from Mühlhausen soon dismissed all this from his mind in the steady grind of study. He had almost two more years at the academy, then three more in field work before the coveted engineering certificate would be his. He knew that at the end of that time, he would be expected to enter the Prussian State Service.

By the end of his senior year at the academy, he made an important decision. Of all his courses there, the one in advanced theory of bridge building fascinated him most.

Professor Dietelyn was a dynamic lecturer, who read from a carefully prepared text. John had studied enough engineering by now to understand the basic types of bridges thoroughly. So he was listening, quite bored, as the professor explained them.

"The suspension bridge dates back to primitive man. He first made this by tying a vine around a tree along a riverbank, we are told; then he fastened the other end to a tree on the opposite side. It may be as old as the beam bridge, which early man made by felling a tree across a gorge. I have explained many times how the Romans built their now-famous arch bridges."

John and the other students shifted restlessly in their chairs.

"I repeat all this to give you background for what I am about to say. I want you to see that everything goes back to simple fundamentals.

"Up until recent years, it was supposed that the suspension bridge could not be made strong enough to carry heavy loads,

that it would always be unstable. I tell you, young men, this is not true!"

A low murmur of surprise floated across the small classroom.

"A way has already been found to suspend a bridge from iron chain bars. The English built two of these recently; unfortunately, however, they could not withstand the force of strong winds."

John sat back, disappointed.

"The same was true of a suspension bridge which a man named James Finley built in Pennsylvania, in America. And another Pennsylvanian even tried a suspension bridge using iron wire instead of chains. That fell within a few months."

The class burst out laughing, but John wondered what Professor Dietelyn was about to say.

The professor held up a warning finger. "Not so fast, young men. Mark my words. We engineers have a great challenge before us. Modern man demands and needs safe transportation. We are now at the beginning of a great step forward in bridge design. Before many years, someone must—someone *will*—find a way to build suspension bridges which will be free of vibrations and be able to carry heavy loads in safety."

Those around him continued to murmur in amusement, but John's eager mind grasped the implications of Dietelyn's words. If a way could be found . . .

"Then great rivers and broad harbors could be spanned with ease. And when that day comes, you will admit that the suspension bridge is less costly, more simple and truly beautiful."

After the long, involved technical discussion which followed these remarks, John slipped through the file of students as they were leaving the room. He made his way to the desk.

Professor Dietelyn looked up from his book. "Yes?"

John gulped. Although he might seem impertinent or ridiculous, still he must know. "Is there such a bridge in Germany?"

The teacher was evidently surprised, for he scratched his head and looked at John curiously. "Oh, yes—naturally, you refer to my remarks about the suspension theory. They are starting to build one, a chain bridge, at Bamberg over the Regnitz River." Then he turned his eyes back to his book.

Far from being discouraged by this abrupt dismissal, John left the room in a whirl of excitement. Somehow, before he went home on vacation, he must get to Bamberg in Bavaria. He had not seen his mother or any member of the family for two years, but he would write a letter and explain why he would be late getting home.

John craned his neck, staring out of the small stagecoach window as it rolled across the wide plain of the broad Regnitz River Valley, three miles above its confluence with the river Main. There ahead, he saw the four towers of the cathedral above the left bank, the section of Bamberg known as the Bishop's Town, where the only papal grave in Germany, that of Clement II, is located. As the coach came to a stop, he alighted on the right bank opposite a narrow beam bridge. In its center was the city hall.

He did not wait for the innkeeper to show him a room but walked hastily along the riverbank, clutching his small valise. Near the city hall he saw the strange sloping-roofed fishermen's homes, built above the water, with boathouses under their living quarters and small balconies above.

He came to a bend in the river, and as he followed around the narrow walk he suddenly saw ahead of him—*the* bridge! Four large iron bar chains hung in a graceful arc between the stone towers.

Workmen were busy laying the roadbed as John stood spellbound on the riverbank.

There it was—no masonry piers amidstream, nothing to break the gently flowing current—the entire weight of the span to be carried by iron chains.

Hastily, John reached into his valise and drew out paper

and a drawing pencil. He squatted on the bank, and with quick, practiced strokes began to sketch, estimating the width, the depth of the arc, calculating stress and weight. The span was over two hundred feet long. It was truly beautiful.

Finally he realized that he was chilly and that lights shone in the windows of the houses along the riverbanks. Reluctantly, he walked back to his room at the inn.

But at dawn he was out again, talking to the workmen as they arrived, asking all manner of questions of the superintendent of construction. Then he made more notes, more estimates. Gradually, he saw places for improvement. He had several ideas which would help in the solution of the problem of vibration. The towers were not quite high enough. For three days he figured, sketched, made notes, and over and over again he kept saying: "A miracle bridge."

To John Roebling this was a two-way miracle. In one great, full realization, it came to him. "I shall be a builder, a designer of suspension bridges."

CHAPTER THREE

Westward Vision

John stopped in Berlin on his return from vacation and handed in his graduation thesis—the plan and specifications for a suspension bridge. He used the "miracle bridge," of course, as a basis but added the refinements and changes which he felt would improve its stability and beauty. He was not in the least surprised when his thesis was accepted with a special award of merit. He was now a full-fledged engineer with an appointment as apprentice in the Prussian State Service. Although he had reached his first great goal, it did not give him the feeling of satisfaction which he had anticipated. As he told Friedrich, "It is a good beginning. I will build larger, longer suspension bridges than anyone has planned, and they will be safe."

Friedrich voiced no open doubts, merely remarking, "You are in too much of a hurry. Take your time."

John knew that he was right, for there were three long years of actual field work ahead before the coveted state license would be his. It would not be easy advice to follow, however. There were moments when he envied Friedrich—always patient, always able to go ahead without fuss or fret. Not that his friend lacked ambition. He openly expressed his hope of being the next Chief Architect to the Court of Prussia, but the two young men had different ways of pursuing their goals.

Professor Hegel was pleased to hear about John's success and his appointment as assistant road builder in Westphalia. He, too, had some advice: "You have made a brilliant record as a student. I know you will go far. But remember that older men, your supervisors, have the benefit of experience. They have learned to work in the difficult world of government. Be patient. Do not force ideas ahead of your experience."

"Surely, if my ideas are better than theirs, they will listen," John protested.

"Ah, how I wish this were so! Youth is in such a hurry. You are only twenty. You have much to learn about bridges —and men."

John began his three years of apprenticeship with characteristic self-confidence. He assisted in making plans for the repair of roads that had been long neglected as a result of the Napoleonic Wars. On one occasion, when a small arch had to be replaced, he suggested that he draw plans for a suspension bridge. He was both shocked by the lack of interest in his idea and hurt by the look of derision which his superior gave him. Later, he had other suggestions which he defended hotly at first, then gradually with more tact.

Hegel was right. No one listened to him. The older men even called him impudent.

At the end of his three long, frustrating years, he went home for a visit, weary of his dull field job, of the slowness with which the creaking autocratic government moved. To be sure, he had gained practical experience; he now had his coveted state license and a permanent appointment—poorly paid—but he had no great accomplishment to report to family and friends in Mühlhausen.

To his surprise, his family was well pleased with his progress. They talked happily about his wonderful future as a civil engineer, the steady salary, the security of a government position. Neighbors and friends congratulated him and said how fine it was that he did not have to live in Mühlhausen these days.

"No future here for a young man," one woman told him.

"Business is not good," his father complained. "Taxes, taxes, no rich soldiers around any more. Crops are bad—and so they have been for three summers in a row. *Ach,* how good it is that you will now have a salary!"

John wandered through the streets of his home town and finally stopped at St. Blasius' Church to sit at the organ as he had in his student days. He seldom played the piano now that he had Grandfather Mueller's flute and a violin. It was like old times to play the organ. The cool, damp air of the vaulted church soothed his weary nerves.

He did not see Carl take a seat behind him in the choir loft.

"John," his brother asked during a pause, "do you remember Etzler the merchant's son?"

"Etzler? Who went to America a few years back? Sure, why?"

"Well, he came home this morning."

John shrugged and began to idle the organ keys. "Didn't make good in the promised land, I suppose. It does not surprise me. He is so . . ."

"On the contrary. He says we are crazy to stay here. Sometimes I think he is right, but one must be careful not to say so publicly. If you dare mention our friends in America, the state police will clap you in jail."

John whirled around. "You do not mean it! Why?"

Carl smiled. "You live in your head, always. Haven't you noticed that business is bad here? That people are restless? I doubt that there will be enough income from the tobacco shop to keep both Hermann and me as well as Papa and Mutti. Several families have sold out and taken their little pockets of cash to America, just recently. The state authorities do not like it because they want the taxes, no matter how little there is to tax. If Etzler is not careful . . ."

"So that is the way the goose hangs, is it?" interrupted John as he slid from the bench. "I think we had better find out what

Etzler is up to in that case. We will go over to see him after supper."

Etzler congratulated John in glowing terms on his appointment, then plunged into his story. "I am recruiting men to form a colony. There is plenty of good land in the Ohio Valley. The country wants immigrants. I know all about America. The opportunities are endless. German-trained bridge and road builders are in great demand. I heard that the officials even meet the boats and sign you up before you have a chance to land."

Carl exchanged glances with John. "I am no engineer or trained technician, you know that."

Etzler replied quickly. "Neither am I. You have more education than most Americans, Carl. They are an ignorant lot. You seldom find one who has gone through high school."

"What kind of work will you do in the United States?" John asked.

"I intend to locate land, start a colony, then set up a small store, as a beginning. A good, hard worker cannot fail."

Carl looked doubtful.

"Etzler may be right, Carl," John said. "Anyone with your ability to work with his hands could run a farm. It must be quite easy." At least it offered a way out for his brother.

"I do not take much stock in this talk of things being easy. Still, I might make a stab at it. I will not go unless you do, John."

The younger brother remained silent for a moment. It would be unwise for him to make too quick a decision on so vital a matter. Presently, he spoke. "With me it is somewhat different. I have my appointment. I am a trained civil engineer. I love the Fatherland as much as anyone does. I will have to think about this for a long time, know more about this paradise you talk of. I cannot afford to make a hasty decision."

And there the matter stood when John returned from his

vacation by way of Berlin. Again he sought out his friends, Friedrich and Professor Hegel.

The young architect was aghast. "Pardon me, but you sound crazy. Surely, you would not consider leaving Germany now that you have gotten this far. You are too well educated to enjoy living in America, you know."

"I did not say that I was really considering it, Friedrich, only thinking about it in case things go no better this year."

His friend brightened. "I am about to begin work in the Court Architect's office. I have an idea. I know people with influence and will soon be on very friendly terms with them. You know how I am. That will give me a chance to see if you could be placed elsewhere—under a more suitable supervisor. They are not all so stodgy and backward as those in Westphalia. Surely, you will soon have a chance to design a suspension bridge. You will not mind the red tape after you get the hang of it."

There was no use in talking further about his problem with Friedrich. He would never understand. Hopefully, John sought out his favorite professor.

Hegel heard him to the end, then said—in between coughs and much clearing of his throat—"You will, of course, take plenty of time to come to a decision, but meanwhile . . ."

John waited eagerly, wondering.

"I trust you have learned patience in the past three years, at least to keep your mouth shut on occasion."

John smiled ruefully. "It is not easy."

Hegel threw back his large head and laughed heartily. "Ah, John, you will not live long enough to keep silent whenever it is wise. I cannot see that there is much hope for your type here in Prussia. Freedom for new ideas is a long way off in Germany. Men are afraid to be different, to think. Learn all you can, read everything you find on that wild and wonderful America. Only then should you make up your mind."

John gratefully shook his teacher's hand. "You mean, you think I should go?"

Hegel laid a gentle arm around John's broad shoulder, then he hurried up the steps to his home. "Wait a minute, please. I shall bring something for you."

Presently he returned, holding out a small pamphlet. *"Auf Wiedersehen!"* And he disappeared.

John studied the title on the cover: *Opportunities in the United States for Emigrants and Plans to Settle There.*

Before leaving for Westphalia he added more books and pamphlets to this beginning of a collection. Among them were *The New Columbus;* a twelve-volume work published by the Geographical Institute at Weimar, entitled *Everything About America,* several advanced textbooks on the English language and two histories of the United States.

"Well," he remarked to Friedrich as his friend helped him load the heavy box onto the back of the stagecoach to Essen, "it is going to be an interesting winter—in the evenings."

The days were as dull and frustrating as before. John was grateful that he at least had something new to occupy his mind, to relieve the monotony. Not that he had come to a definite decision, but studying English and reading the history of the United States was absorbing. He was fascinated by the descriptions of the people, their work, their leaders. Only one point displeased him—the institution of slavery. *If* a person decided to settle in the new country, life in a nonslavery area would be most congenial, he concluded.

Late in December, he received a letter from Friedrich. As he opened it, he smiled. "No doubt Friedrich has been able to place me as a bridge builder extraordinary to the court."

The letter was of a far different, indeed a tragic, nature. Cholera had taken a great toll in the Prussian capital, Friedrich reported. He himself had escaped and the epidemic was on the wane. However, Georg Friedrich Wilhelm Hegel, the intellectual beacon of Germany, was dead!

John sat for a long time on the edge of his bed. Memories of all the years of his friendship with the great man passed through his mind. He recalled every conversation, every scold-

ing, every bit of praise, every kindness. He smiled at he remembered how he rescued Hegel's boot. Slowly he arose and stood for an hour, motionless, staring unseeingly out of the window. Much of Hegel's advice he had not taken. Some of it he had not understood.

The next morning, John Roebling handed in his resignation as assistant road builder, to take effect in six months, giving ample time for training a new engineer. He had made up his mind. He would go to America. Hegel knew all along that he would. Of this John was certain.

The weeks passed speedily and he no longer minded his work so much. He felt more kindly toward his supervisor, toward his well-meaning, unimaginative co-workers. He even accepted an occasional invitation to go to a jolly inn for supper or to visit near-by Essen on a Saturday and hear a concert. For the first time in his life, he behaved as most other young men of his age behaved in their free time. He learned to enjoy the cozy, relaxed way of life which the Germans call, in an untranslatable word—*Gemütlichkeit.*

He wrote more often to Carl, telling him about his plans. "It will be best if you say nothing to our parents," he cautioned. "It is my job to tell them. I cannot do it by letter, though."

When he arrived in Mühlhausen, his mother and father seemed to think that he was only on vacation.

"It is better so, for the moment. I want to plan undisturbed for a few days," he confided to Carl.

His brother nodded a ready assent. "You are quite right. The police are very strict these days. They have orders not to allow people to solicit or make up parties for emigration." The next morning, he returned to the bedroom to awaken John. "I have just heard. The state police have jailed Etzler!"

"Jailed him? He is in jail, you say? You must be joking," John insisted as he shook the sleep from his eyes.

"Not at all. Etzler talks too much. We shall be in jail, too, if you do not keep your mouth shut."

For the first time John realized how carefully they must plan. He now had to reveal to his parents the true reason for his return home.

Both of them were evidently taken by surprise. His father was the first to speak. "I never heard of such nonsense. What has come over you boys? And especially you, John. Here we have all sacrificed for years to give you the finest education money can buy. Now you throw it all out of the window to become a mere adventurer. You want to fight Indians!"

"Oh, Papa, you do not understand," moaned John. "I am going to America so that I will be able to use my fine education. I have tried hard in Westphalia. But I am convinced that working for the Prussian government will get me nowhere. Every tiny bridge plan must be talked over for years, investigated, redrawn endlessly. By the time building starts, more money has been spent than the cost of the bridge itself. The bureaucrats are afraid to try something new. I will never be able to build a suspension bridge if I stay here."

"And over there? Do you think the Americans are smarter than we Germans? They do not even know what a suspension bridge is, I will wager."

"Most of them do not, I agree. But Americans are not afraid to try new ideas. That much I learned from Professor Hegel."

"Always you hark back to Hegel. It is he who put these crazy ideas into your head. You no longer listen to what your parents tell you. You are too high and mighty!"

His mother spoke. "Do you have the money for this trip to America?"

John was glad for a new turn in the argument. "I have no money to speak of, only a few hundred dollars. But Carl and I will organize a settlement plan and take subscriptions. We will live among Germans. Etzler assures me that I will be able to get an engineering job easily once I get settled. Land is cheap over there—and good."

His father shook his head sadly. "You would leave the beautiful Fatherland to go to a country of savages and cheats.

I cannot understand this in one as smart as you. And what kind of a farmer would you make? That ignorant Etzler with his big talk. *Ach* . . . I could laugh if I were not so close to tears."

Frederike Roebling said no more as she returned to her scrubbing.

John went down to the tobacco shop to talk with Carl. His brother was not surprised at their father's reaction. Hermann looked up from his account book. "For the flip of a coin I would go with you. Each month business gets worse."

The news of Etzler's arrest deepened the tense feeling between John and his father. Cristolf Roebling shook his head sadly when men stopped at the house to talk quietly with his sons about plans for a colony. He read with furrowed brow the pamphlet which they prepared with the help of Etzler after his month in jail:

> "We are not going with exaggerated hopes. Anyone who decides to settle in America must himself believe that he is doing what is right for him. The way will be hard, but it is full of opportunity."

Within a week of the pamphlet's secret publication, John found himself in a predicament.

His mother called him aside. "A state policeman was here today. He searched your room."

John felt the flesh creep at the nape of his neck. "Oh, Mutti. Of course he found our pamphlet."

"No, I had time enough to hide all the copies. They are inside the bread dough," and she motioned to the covered wooden trough near the oven. "Have any of the men signed to go with you?"

"Yes, we have twenty names already. By spring I am sure there will be many more. Oh, Mutti, you are wonderful! You do understand, don't you?"

She dropped the potato she was peeling and sat beside him

on the oven seat. "It is difficult for your father to understand. If it were not for him, I would go with you. Perhaps I will be able to persuade him later."

That was the wonderful way she had. He never had to explain anything to his mother. From the day of his earliest memories, John knew that she trusted his judgment. How amazing it was that she, now old, weary and gray, could talk about going to America!

Twice more during the next month Prussian police scoured the Roebling home. Each time there was a renewed argument with his father.

It was Hermann who managed to quiet him. "Papa, the Prussians always buy your tobacco when they come. I wish they were here every day."

His father snorted. "How you talk. Do you want to see your brothers go away, across the ocean? You wouldn't be planning to go, too?" he added, anxiously.

Hermann and John looked at each other.

"He is not coming." John said. "Not as long as you need him here. That is true, Hermann?"

The oldest brother looked serious. "I'm afraid it is."

Evidently, their father was greatly relieved. "At least one of my boys has a little common sense." He did not know that Amalia was trying to persuade her husband Carl Meissner to join the settlement at a later date.

Finally, in early spring, when the police had questioned the entire family on two successive days, John went to see the Mayor of Mühlhausen.

His honor took a serious view of the situation. "I keep trying to silence them, John. Really, I do not blame you. I wish you luck. But my advice is to get your party together as soon as you can. I can do only so much. Your secret is now in the open. I also advise you to let Etzler go ahead of you. He is not considered reliable and has been jailed once. It may save you and Carl the same experience."

John, Carl and Etzler ran off additional copies of their

pamphlet. Before long they received letters from near-by towns. John answered all of them frankly, being careful not to mention the actual plan lest the police find one of his letters and use it as evidence. Only his high standing in Mühlhausen saved him from arrest. He was surprised to find that Ferdinand Baehr, one of the most prominent businessmen in town, entrusted him with money, promising to go to America as soon as the place of settlement had been found. Two hundred people, some from places as far distant as Darmstadt, enrolled.

As the Mayor had suggested, John and Etzler moved the day for leaving up to May and arranged to leave about a week apart, Etzler going first.

By May 11th John had all the passage money in his pocket, plus six hundred dollars belonging to himself and Carl and one thousand dollars which Ferdinand Baehr advanced him. He would have enough for a down payment on land. Herr Manco, one member of the party, who lived near Bremen and was a sailor as well as a farmer, knew about shipping arrangements and agreed to take care of the travel details for the entire group.

The party of ninety from near Mühlhausen bade relatives and friends farewell at Langefelder Gate. Frederike Roebling wore her bonnet and traveling cape.

Hermann, who was going to Bremen to see his brothers off, turned to John. "Do not let Mother go. She has not been well, lately. If you had not been so busy you would have noticed."

Their father pulled Herman back. "Do not argue with her, boys. You should know as well as I that your mother has decided, and that is that." He threw his arms around John and added, "You are like her. You are both muleheaded."

"I always wanted to look at the sea," Frederike said and climbed into the stagecoach.

At Bremen John learned from Herr Manco and Etzler that the first group of emigrants had sailed a few days earlier, leaving a note which explained that there had been too many people for one ship. They were bound for Baltimore and

would wait there for word from John on his arrival in Philadelphia.

As John and Carl followed the ninety-three passengers aboard the pilot boat which was to take them down the river to the small sailing vessel *August Eduard* early on the morning of May 22, 1831, Frederike Roebling handed the last of her gold coins to John. For the first time since any of her sons could remember, she kissed the departing ones, weeping silently, then moved back so that the dockmen could raise the gangplank.

CHAPTER FOUR

The Promised Land

Even with her sails furled, the sturdy two hundred and thirty ton three-master, *August Eduard,* looked beautiful to John Roebling, and the cries of delight from the forty-three Germans with him filled his heart with joy. Proudly he led them off the pilot boat and up to the deck where the tall, dignified Captain Probst reached out his hand in greeting.

"Welcome and a good trip to all of you!"

He then led John and Carl into the spacious deck cabin which they were to share with him and five others. It was far more luxurious than the brothers expected—a carpet over the entire floor, four large windows, a long mahogany table with eight comfortable-looking armchairs set around it, and beds lined up against the sidewalls. At the far end was a glass-encased compass and under it a small bookshelf filled with maps, charts and various-sized volumes.

The Roeblings shoved their small trunks under two of the beds and again went on deck. "I must take a look at the steerage," John said as he hurried toward the gangway. He was a bit ashamed when he stopped at the bottom to glance around. What a contrast to his own quarters! Both sides of the long, stuffy, low-ceilinged room were lined with rows of narrow double bunks. He quickly estimated that to hold all the passengers, as many as four people must sleep in each bed.

But the voyagers did not seem to mind. They were laughing and talking as he strolled among them. Finally he came to a lower bunk, amidships, which had a trunk on it. A heavy cardboard nameplate read, Gerhardt Etzler, and tucked under its edge was a note:

"Do not remove. This bunk is mine. G.E."

Count on Etzler to get the best for himself. One of the few windows was directly above his trunk.

A few minutes later, Etzler stopped John on the deck. "I think you should furnish decent passage for me, too," he remarked sullenly.

John was dumbfounded. "Did you expect me to pay the extra money for you?"

"Certainly, and why not? All of this was my idea."

John held a tight rein on his temper as he led the way toward the starboard rail. "Now, let us get this straight, Etzler. My brother and I agreed to use our own six hundred dollars for a first payment on a tract of land. We have only enough extra to last until we find such a place—a few weeks at most. We do have another thousand which belongs to Ferdinand Baehr. This we keep separate, to purchase his land only. You and the others will pay for yours when you receive money from home or profits on the first crops. I am sorry if you misunderstood." With this remark, John turned on his heels and marched toward the cabin.

Carl, trotting at his heels, muttered in low tones, but John was too upset to listen.

This was only the beginning of trouble. Even before the *August Eduard* sailed past Bremerhaven, Manco, the man who had made the sailing arrangements for the party, called him aside. "The first mate battened all the hatches. We are about to suffocate down there."

Although John Roebling knew next to nothing about ship customs, he could see no reason for this action and went at once to Captain Probst.

"The mate always does that at the start of a sailing. Saves trouble during storms," the captain explained.

"But the sky is perfectly clear today. These people need air!" John protested.

After a long argument, Probst ordered the first mate to leave the hatches open on fair days. And during the next two weeks, John won other concessions—the steerage passengers were given more deck space, those who wished could cook their own meals, better toilet facilities were set up. But even this was not the end. Many of the passengers became seasick and for some reason expected John Roebling to find a way to relieve them.

But John was beginning to feel strange, himself, when they sailed into the English Channel. One moment his feet were almost lifted from the deck, then an instant later his whole body felt leaden. His stomach moved up as his feet went down. However, he was determined not to give in to seasickness. It was bad enough to watch the others. Carl remained in his bed, moaning and groaning, but John paced the deck as best he could, although it was difficult to keep from falling at times. Finally, he grew accustomed to the ship's roll and was able to eat again. He looked over the books in the cabin. Most of them were histories of the United States. One was a geography, another a book on farming, and about a dozen were advanced English and French textbooks. With these, John managed to while away six monotonous weeks. By mid-June, due to a lengthy calm, the *August Eduard* was only half-way to its destination. This was disappointing to John. He had secretly hoped to be in Philadelphia by July 4th and watch the Americans celebrate the holiday. No chances of that, now.

The steerage passengers, with Etzler as their leader, went on complaining. John finally turned a deaf ear. He had done as much as possible. During the last half of the twelve-week voyage, he studied English, recorded in his journal impressions of the sea, the sight of a derelict ship, details about

storms and schools of porpoises and the magic of phosphorescent lights dancing on the waves at night.

At last, on August 6th, 1831, the *August Eduard* docked at Philadelphia. Etzler said that he would find boarding houses for the members of the company while the Roeblings found their own and discovered the whereabouts of those who had come to the new world on the *Barclay*. Although John was a little surprised by this offer of cooperation, he was pleased and went off in high spirits, promising to see Etzler late that evening at the docks. As he and Carl strolled through the streets of Philadelphia, they repeatedly expressed their delight. This was a beautiful city—wide streets, neat and roomy brick houses, broad pavements with lovely trees bordering them. Nowhere was there a person in rags. Even the common workmen were clean. "You can tell by the way they walk that they are free men. What a contrast to our poor oppressed Germans!" John exclaimed.

At the shipping office he found a letter from the *Barclay* passengers, telling him that they had docked at Baltimore two weeks earlier and had set sail again for Savannah. It seemed that one of the party had a relative there who wrote about new lands available in Alabama. Rather than spend their meagre funds waiting for the *August Eduard* to arrive, they decided to go south at once, hoping that the others would follow. But they gave no address.

John was bitterly disappointed and revealed the sad news to Manco when they met him a little later.

Manco was most sympathetic. "That is not all, Herr Roebling," he said. "Etzler has talked the others into leaving at once for Ohio."

"Why?" John and Carl asked in one voice.

"He argued that since he had been there, he knew more about it than you. And the scoundrel got them to promise him free travel and living expenses!"

Manco hurried on. "But I am staying with you and your

brother. I do not trust that Etzler. Genss and his family said no to him, too."

John sat down on a doorstep. "I am ruined, ruined!" he moaned.

"Not at all!" Carl, put his hand on John's shoulder. "You forget there are others at home who will come."

Genss and his family had signed only a few days before sailing. Manco was almost a stranger to the Roeblings. There was something ironical about all this to John. His townsmen, those on whom he had counted most, the people he tried so hard to help, had deserted. For a moment he thought of giving up the whole idea of a colony, to look for a job here in Philadelphia, as a cigar-maker if nothing better, but when he looked up and saw the smiles on the faces of his brother and Manco, his courage returned. He would not give up now!

John found the Americans most helpful in making suggestions. Good land in the East was expensive, they told him, but railroads were coming in soon and there were new canals now, which made travel and shipping as far as the Alleghenies comparatively easy. Farmers in the Ohio Valley had to send their produce down the Mississippi—which added greatly to marketing costs. When the railroads spread to that section, all this would be changed, of course. John thought this was a poor prospect for perhaps ten years to come, so he decided to take his party only as far as Pittsburgh, going up the Schuylkill River to Reading, then by canal to Harrisburg and on westward. Perhaps they would hear of good, inexpensive land along the way. He refused to consider the South, with its problem of slavery.

They embarked on this last leg of the journey in an optimistic mood. John was rather glad that he would have a chance to see the country west of Philadelphia. Starting a colony would be hard, but it would be a challenge, too. He was certain that he could soon pick up the knack of running a farm. Amalia and her husband Carl Meissner would join them soon; his parents, too, and Hermann. With so many

other people from Mühlhausen on the move, his father could not resist the idea of joining a cozy, friendly German colony, a bit of the homeland in free America. By that time, John assured himself, he would be making a good living from his crops. He would hire someone to farm for him and look for work in engineering. The United States would need many new bridges and roads. As he stood looking over the rail of the small steamer, chugging its way up the Schuylkill River, the future looked rosy, indeed. He was only twenty-five. He could afford to give two years to making this dream of a colony come true—perhaps three years.

The journey as far as Reading was interesting. All the members of the party were impressed by the large size of the farms, by the neatness of the small towns which they passed. But when they transferred to the mule-drawn canalboat which was to carry them to Harrisburg, John noticed that the people he saw along the banks had a strange pallor. "What is the matter? I have not seen a rosy-cheeked boy since we started."

"Yes, and there are so many swamps," Carl added ominously.

Carl grew more and more quiet during the last part of this three-hundred-mile journey. He complained about the mosquitoes, the dampness, finally admitting that he had a severe headache. When he began to have chills, John became alarmed.

Then Mr. Genss came down with a fever.

"Do you suppose they have malaria?" John asked Manco. "I heard the Americans on the canal talking about the danger in this section."

Before the party reached Pittsburgh, John had a very sick brother on his hands. He hurriedly found lodgings in a boardinghouse and while Manco and Mrs. Genss put the two ailing members of the party to bed, he went in search of a doctor who confirmed his suspicions—both men had malaria. He prescribed the only known remedy, quinine and mercury. It

would be several weeks, he predicted, before either of them could leave their beds.

John and Mrs. Genss took turns looking after the patients, while Manco agreed to search for farm land in the general vicinity of Pittsburgh.

After several weeks he returned with a favorable report. A Widow Collins owned about twelve thousand acres of land in Butler County, most of it undeveloped and much of it adapted only for sheep raising. Aside from two good small farms a few miles from this tract, Manco had heard of nothing else. "I am sure that you could find sixteen hundred good acres there," he assured John. "The land is on a plateau, no marshes or mosquitoes. A farmer told me that it is healthy country. The winters are cold and windy."

John brushed aside this objection. "We can build good, stout log houses. I am anxious to settle on high land. Did you see any children?"

Manco thought a moment. "Not on the tract. The families that did live there moved on to Ohio. The children in Freeport had rosy cheeks."

That settled it for John Roebling. He asked Manco to look after his brother, who was feeling no better, and went to the land broker's office. He borrowed surveying instruments from him, then hired a horse and started for Butler County. It was far better than he had expected and he spent three days surveying and mapping a sixteen-hundred-acre section of the tract, dividing it into farms with long, narrow strips which led, German fashion, to a center section which he reserved for his town.

He returned to Pittsburgh in a glow of satisfaction. He liked this city with its many new buildings, and its growing population that was already twenty-five thousand. It was a manufacturing town, somewhat dirty from the heavy smoke which settled in the valley. Iron, wool and cotton cloth factories dotted the slopes. A few years from now, farm products would bring high prices. The whole area would boom when they

finished the railroad between Pittsburgh and Baltimore, reducing travel time to one and a half days between the cities!

"Pittsburgh will be the metropolis of the West in a few years," the broker predicted, not knowing then that western expansion would be so far reaching as to make Pittsburgh an eastern city.

John used all his persuasive powers in his attempts to bring down the price of Widow Collins' land and after several weeks she agreed to sell at John's price, with a down payment of one third. The other two installments were due in two yearly payments.

Meanwhile, Manco and Genss, who had recovered much faster than Carl, looked over the two farms nearer Freeport and decided that they preferred to buy them, since the houses were in good condition and the fields already fenced.

John was disappointed but his brother pointed out, this meant they could reserve the best land for Baehr and themselves. The other plots would be divided on the basis of "first come, first served."

John wrote his parents about his good fortune, then sent a book-length letter to Ferdinand Baehr, telling him the details of his transaction and describing the tract in glowing terms without minimizing the difficulties that lay ahead. He sent instructions for people who were to come with Baehr, listing tools, seeds and adequate clothing as essentials to bring with them.

"If this region is built up by industrious Germans," he wrote, "it can become an earthly paradise. May heaven protect you and your friends and escort you with luck. We shall all be citizens of America."

A full year passed before Ferdinand Baehr arrived with his party. John and Carl had worked hard to lay out their town which they called Saxonburg, after the region of their birth. They purchased a cow and a horse and planted a vegetable garden.

"I put in so much work on the two old houses," he explained

to Baehr as he showed him around, "that I did not manage to clear land for raising grain."

The soft-spoken, solemn-faced Baehr understood perfectly. "Never mind, with these twenty men we will put up new houses and clear the fields in no time."

Only one thought dimmed John's enthusiasm. His parents would never see the plot which he reserved for them. His mother suffered a heart attack soon after he and Carl left Bremen. Now a widower, his father was more determined than ever to spend his remaining years in Mühlhausen, and as long as he lived, Hermann would stay at home to look after the tobacco shop. Amalia and her husband decided to remain behind, too, since business in their home town was now much better.

One of the next families to arrive in Saxonburg was that of Carl Anglerodt. The village was abuzz with excitement when news came of their arrival. John chatted excitedly with Baehr as they rode out to meet them. "How different this is now. The new houses all in a row. Your fine home at the top of the hill. The fences, the corn. See, it is waist high!"

"I am not too sure that it will ripen before frost," his friend observed. "They told me in Butler that the nights are not hot enough here for corn."

John was too happy to worry. Carl Anglerodt was well off and highly respected in Mühlhausen. He would add distinction to the new town.

Herr Anglerodt descended from the coach with a flourish, shook hands with John and Baehr and complained about the terrible roads over which he and his family had traveled. John noticed that Frau Anglerodt and her daughter peered with frightened eyes out of the coach window. Carl and the other settlers pushed forward to shake Herr Anglerodt's hand. But in the midst of the greetings, the new arrival raised his head high, looked at the row of houses on the slope and turned angrily to John.

"You are a swindler!" he shouted.

Everyone gasped.

"A swindler? Why, what do you mean? You have just arrived. I do not . . ." John could not imagine what had come over the man.

"You call that a town? Look at it!" Anglerodt swung his cape grandly from side to side. "It is only a row of pigpens, not even houses. My dear little wife and daughter could not possibly live in such a place."

Baehr stepped forward. "My good sir. You can have any kind of house you want. We will all help build it for you. See that fine pink two-story house at the crest of the hill? That is mine. I defy you to call it a hovel!"

John saw that the others had retreated a few yards up the slope. "Give us time. We have been here only a year and a half," he pleaded.

"You live like peasants!" Anglerodt spluttered.

John was now more angry than worried. "We may live like peasants, but at least we are free. In America it is no shame to work with your hands. You are not good enough to live in Saxonburg. I suggest that you get in your fine new rig and drive on to Pittsburgh. It is a real town. You will locate a good, expensive hotel there."

The effect of Anglerodt's sudden arrival and equally sudden departure was twofold. He wrote a scathing letter to his friends in Mühlhausen, stopping almost all further emigration to western Pennsylvania. But his rude treatment of John Roebling welded the small group of German settlers into a town. Even the few earlier complainers came to John's defense, announcing that Saxonburg was the answer to their dreams.

Their standards were not high, for most of them came from poor sections of Germany, and like all pioneers before them, they soon gave up hope of becoming rich quickly. They settled into their log houses, content in their determination to provide a better future for their children.

John Roebling grew increasingly restless. Every night he

read his old textbooks and reviewed his notes on bridge building. When he had any spare cash, he subscribed to magazines dealing with phases of engineering in the United States. Frequently he made notes on new inventions and on his own ideas which came to him as he read.

"How can you read night after night?" Carl asked one evening.

John was surprised by this question. "It takes my mind off the monotony. Reading these books is like a tonic to me."

Carl had a serious look on his face. "I wonder if you would stay here if it weren't for me."

"Of course I would," John heard himself saying somewhat too loudly. "I love Saxonburg."

Carl crossed his legs as he sat on the bed and, shaking his head, he went on: "Would you like to live here alone?"

John closed his book hurriedly and turned around. "Why, what do you mean?"

Carl smiled. "I am going to be married soon. I had hoped to build a new house, but I do not want you to feel deserted."

The brothers talked late into the night. John was pleased that Carl had decided to marry the plump little blond girl who found so many ways to show her love for him.

"Why don't you marry, too?" Carl asked one morning as they walked out to their fields.

"I do not make enough from my crops to support myself, let alone a family. If Papa had not sent us our inheritance, I would still owe for this land."

"You could find a job in your own line."

"I hate to leave all our friends. Besides, I am too stubborn to give up."

Carl had made a good profit on his first crops. His milk cow had borne two healthy calves, while John's was a failure. But that was just bad luck, of course.

Soon after Carl married and moved into his new house, John decided that he must find a way to increase his income immediately. What about canaries? Everyone he talked to

was enthusiastic. When he had twenty orders, John sent a letter to a breeder in the Harz Mountains of Germany, and within a few months he was in business. At first, he enjoyed looking after the birds. The yellow cocks singing in the morn-ign added a cheery note to his lonely house. But in spite of all he learned from *A Guide to Canaries,* the birds soon stopped singing. Each new brood was more somber than the last. Many of the young ones died. Finally, John sought out Friedrich Herting, a former tailor from Mühlhausen, who had bred canaries in Germany for a short time.

"What is wrong? I follow all the rules. I keep the cages in the sun and put fresh sand in several times each week. I am careful about drafts. I even weigh the feed. No one will buy a canary that does not sing."

Herr Herting was consoling. "The same things ail the birds that ail you, Roebling. They are lonely. They need cheerful human voices around."

"What am I supposed to do? Talk to myself?"

Herting was a jolly, kindly man. He offered to take the birds off John's hand and share any profits he might receive.

"Take them. All I ask is my costs up to now. No hurry about it."

Every time John stopped in at the Herting cabin he marveled at how much happier the canaries were; their clear high notes chorused through the rooms as they hopped around in their cages.

John himself felt cheerful when he entered this house. The tailor and his three daughters greeted him with broad smiles, while Mrs. Herting seemed to take pride in preparing delicious meals for him. Soon he was eating at their home every Sunday dinner. Of the three girls, John found Joanna the most companionable. She had a way of listening that made him feel important. Her ringing laugh, her capable hands, her quiet skill in making him comfortable—all this appealed to the lonely young farmer.

Carl now had a son. And when his brother dropped in to

see him, he frequently asked, "When are you going to get married?"

John kept asking himself the same question. Would Joanna be willing to marry the poorest farmer in Saxonburg? "I cannot offer you a bright future, but the crops came in better last fall. I hope that by next year . . ."

Joanna whirled her full skirts and danced around the room. "Ah, you dear goose. I thought you would *never* propose. I shall not fear the future with you. No matter what comes!"

In the spring of 1836, on a fine shining Sunday, John Roebling married Joanna Herting and took her to live in his new home on the hill. He was so happy for a time that he even tried to tell himself he liked farming. His wife worked with him in the fields and somehow the crops grew better when she tended them. He had been a farmer for more than four years, yet he did not know half of what she had learned in such a short time. One would think she had been born on the land.

Two events during the next year caused John Roebling to take a close look at his chances for the future. First, Carl suffered a sunstroke while plowing in his wheat field one afternoon and died. This was a very great blow and made him feel more lonely than ever. Even though he still lived among Germans and no longer went home to an empty house, John felt that with Carl's death his only close link to Saxonburg was gone. And since his brother left a widow and two babies, John now had to bear an increased burden. He had to help support this second family at a time when he could scarcely support his own. The second event was a happy one—the birth of his first child on May 26, 1837.

It was a beautiful morning, and John was only too glad to leave the burden of midwifery to his capable mother-in-law. He walked for hours across his fields, through the woods and up to the top of Chestnut Ridge where he could see far into the distance. Only one thought spoiled the happiness of this day. For the first time in his life he told himself, "I am a

failure." Never, if he lived a hundred years, would he be a success at farming. Somehow he must find a way to return to his own profession. It would not be easy, for with six mouths to feed he had no money to squander on a long trip east. He could not make the direct contacts so necessary for securing a professional job.

When he stepped inside the house, he looked at himself in the small mirror by the door. He was only thirty-one, but even he could see that he had aged in the past few years. His wavy hair was getting thin on top. His cheeks, bronzed by the sun, had a hollow look. Even now, his eyes showed the sadness that lay deep in his heart. He shook his head and smiled at his reflection. What was the matter with him? Mother Herting had called from the window—the baby was here! He could hear the infant wails from the top of the staircase. Slowly, he turned and walked up to the bedroom.

Joanna lay there, a happy smile on her broad face. "It is a boy, husband, a boy!"

Forgetting his sadness, John hurried to her and grasped her hands. "Is the child healthy?" he asked, peering at the blanketed infant lying close to his mother.

Joanna unfolded the covering. "But of course? And why not?" she asked, proudly displaying the red-faced sleeping baby. "Isn't he beautiful?"

John felt a warm glow of satisfaction as he watched Joanna, saw her pride and happiness. He could not truthfully agree that his son was beautiful, although he was plump and healthy looking. "What shall we name him?" he asked, eager to change the subject.

Joanna appeared surprised. "Why, how can you ask? He must be named for you!"

This was customary in German families, but as John thought about it he felt that somehow, here in America, it would not do. His son should have a different name, one that would always show that he was born in this country. "I have

it! We shall call him Washington, after the first of all this country's citizens."

Joanna frowned. "If you prefer, of course, only . . ."

In an effort to bring the smile back to her face, John did some quick thinking. "Would Washington Augustus Roebling sound nice? This would use my middle name."

It was unlike Joanna to oppose one of his ideas. Usually this would have angered him, but he tried to make his reasons clear. "It would be a fine mixture of the old world and the new—really fitting. Washington Augustus Roebling. It is not musical, but I like the sound."

She repeated the name slowly, then nodded. "As you say."

After a moment of silence, a slow smile crossed her face. "I was thinking before you came upstairs, husband. I hope the boy does not grow up to be a tailor. That is such tiresome, confining work. Perhaps he will be a farmer and stay outside in the sunshine all day."

John almost shrieked his reply. "A farmer? No, no! I will not hear of it. Our first boy will be an engineer." He reached across Joanna and gathered the baby in his arms, hugging him close, almost fiercely, to his breast. As a loud wail emerged from the blanket, he hurriedly handed his son back to Joanna. "Yes, an engineer, an engineer! That he will be!"

CHAPTER FIVE

The Long Road Back

John Roebling laid careful plans for returning to his profession. He knew that it might take a long time since he could not journey east where he would be most likely to find other engineers. Somehow, he must bring his name before those who were now engaged in construction work. If only his English were better, he could write a fine letter about his ideas. He had lived in Saxonburg among Germans so long that he had lost the little grasp he had gained of the new language. Could he make his qualifications clear in English? He ran through his file of technical magazines, hoping to find names of German-born engineers who now worked in the United States—not a single one. There was no other way out; he must choose an American in his field and draft a letter to him.

Ferdinand Baehr suggested that he ask the Postmaster in Butler, and though the suggestion was tempting John decided that this solution would be dishonest. He must write his own letter, imperfect though it would be. How foolish he was to give up practicing and studying English.

Then, quite unexpectedly, Fate came to his rescue. He received a letter from Edward Thierry, a former classmate at Dr. Unger's school, who now lived near Philadelphia. Hermann Roebling had sent him John's address, he explained.

"I have taken a job on the Pennsylvania Canal. The people in charge want to know if there are other German engineers who would like jobs. They need men to work on the Sandy and Beaver canal project in eastern Ohio. I thought at once of you." If interested, he should write to Mr. Edward H. Gill, Chief Engineer for the new canal, at his temporary office in Harrisburg.

John had thought of looking for work in Pittsburgh, but until now he had known of no one he could talk to about it. This was wonderful. It might provide the toe hold in his own profession. He immediately wrote to Mr. Gill, outlining his qualifications and experience. Two weeks later he had an answer. The superintendent suggested that he come to the new canal office in Pittsburgh. This was almost too good to be true!

"Who will look after the crops?" Joanna asked, when John told her the news.

He had not thought of this problem, but it was minor. "Baehr will find a man to work in the fields." Although he would not admit it openly, John knew that Joanna would direct the planting, harvesting and marketing better than he could. He wished that he had the words to tell her how lucky he was to have such a wife. Many people in Mühlhausen would look down their noses at Joanna. They would never understand that in America a graduate of the best technical school in the world did not lower himself socially when he married the daughter of a tailor. In taking Joanna for a wife he had acted like a native-born American! With this prospect of a job, he was beginning to feel like one.

John wanted to make himself a part of his adopted country legally, too. On his way to Pittsburgh to see Mr. Gill, he stopped off in Butler, the county seat, to take out his citizenship papers.

Dressed in his simple black suit, which Joanna sponged and pressed for the occasion, he tied his horse in front of the red brick building and entered the common pleas court-

room. It was a chilly day and the windows were closed. The smell of stale tobacco smoke and dust filled the square, plainly-furnished chamber. The Judge, seated in his high-backed chair behind a wooden partition, looked quite different from the berobed, bewigged, austere gentlemen who presided over German courts. Next to him sat the clerk, holding his quill pen over a large, open ledger.

John sat on a bench beside Mr. Shilly, the Postmaster, who had agreed to appear as his witness. For an instant John thought of his wife and son. He should have brought them with him to share this important event.

The clerk called his name and John arose, trembling with excitement, his shoulders squared, his heels close together.

"Are you John Augustus Roebling?" the Judge asked as he looked down at him over his bushy red whiskers.

"I am," John replied in a loud, positive tone. His voice was shaky.

"You wish to apply for admission to citizenship. Who is your witness?"

John swallowed the temptation to smile. Mr. Shilly was the only person in the room beside the Judge, the clerk and himself.

The Postmaster took his place beside John. "I serve as the witness, your Honor," he said in the voice of one who is used to courts.

When the Judge appeared satisfied that Mr. Shilly had known "the applicant five years, that John Roebling was a respectable, law-abiding resident of the Commonwealth of Pennsylvania, that he had never been arrested," he motioned to the clerk: "Hold up the Bible. Place your hand on it, Mr. Roebling. Repeat . . ."

John spoke in a loud, firm voice. "I do solemnly swear to support the Constitution of the United States. I renounce all allegiance to Germany, the country of my birth. Henceforth I shall obey no foreign prince, potentate, state or sovereign

whatever. I shall carry out my duties as a citizen to the best of my abilities."

The clerk clapped the Bible shut with a loud bang which echoed through the room. The Judge shoved the ledger into a cabinet directly behind him.

John waited, still standing at attention, wondering what came next.

Mr. Shilly gently pulled his trembling arm and led him out into the paved hall. As the echoes of their feet on the brick floor sounded in his ears, John thought he heard someone call his name.

"You forgot your citizenship paper, Mr. Roebling," the clerk called as he ran toward them.

"Oh, *danke sehr!* Thank you!" John replied, bowing in confusion as he hurriedly pocketed the document.

"You see, it was simple," the Postmaster remarked when they reached the street. "I have stood witness to more than fifty new citizens in the past five years. It is easy to become an American. Too easy, some people say."

When Mr. Shilly left him, John stood beside his horse and stared at the white cupola above the courthouse. These past five years had been the most difficult in his life. Leaving his Fatherland, seeing his mother for the last time, working to build a settlement, clearing, plowing, always hoping that the next season would be better than the last, losing Carl . . . "No, only an American born in this country should say it is easy," he murmured.

The simple, brief ceremony in the courtroom was no measure of his struggle to win this coveted citizenship paper. It reminded him of the day he received his certificate as a licensed civil engineer in Westphalia. He had this same feeling then, a disappointment that the ceremony which marked the end of his long years of preparation should be so unimpressive. That civil engineer's license did not make him a builder of bridges. His appearance in court today did not make him an American. No judge, no court, no person on earth could do

that for him. Citizenship papers were only another kind of license.

John made a real effort to appear calm when he stepped into the office of the Chief Engineer at Pittsburgh the next day. Hat in hand, he listened as Mr. Gill outlined the work to be done.

"The Sandy and Beaver will connect the new canal between Lake Erie and the Ohio River west of here," he explained as he pointed to a large wall map. "The Sandy and Beaver will follow the Beaver River to the border of Pennsylvania. I want you as an assistant in surveys for the dams and locks. This work will take two months."

John tried not to show his disappointment. He had hoped for permanent work.

Mr. Gill cleared his throat and continued: "Now, Mr. Roebling, I looked over your letter carefully. You are very well qualified. My only fear is that the salary will not meet your needs and training." He waved John to silence. "You see, the men who direct the work will have to make long reports. I am afraid that your English is not yet good enough for that. The best I can offer is one dollar and twenty-five cents a day."

"That will do very well, sir!" John dared not show how pleased he was. To have that much money would be wonderful after all those years of pushing a plow for almost nothing. But that night, after he wrote to Joanna, telling her the good news about his citizenship and his job, he added a brief postscript: "Send my English textbooks."

He was not able to give much time to his books, but he practiced English on the workmen who were patient and helpful, even though at times they laughed heartily at his mistakes. John Roebling was not a man who enjoyed jokes at his own expense, but he silenced his pride and doggedly continued to translate in his mind from German to English before he spoke. When he returned home at the end of the two months, he was determined not to slip back into the comfort of his

native language. All during the long, snowy winter he worked, hour after hour, at the large oaken table near the fireplace, composing long letters and essays which he then tossed into the fireplace. He discovered that some of the English or American phrases which he learned from diggers along the canal had to be unlearned. Mr. Shilly often stopped by the house to chat with him and correct his writing; it was most helpful. After about three months of this practice, John began a letter to Mr. Gill. He wanted to keep his name before his boss and also to impress him by the progress he was making in English. When he had slaved for several days over the draft of his letter, he showed it to Mr. Shilly.

The Postmaster was tactful. "There are only a few mistakes. I will mark them. Suppose you correct the letter, then show it to me tomorrow when you are in Butler."

At last John began the final copy. After a brief introduction which he copied from one of his textbooks, he launched into the message itself: "I shall embrace the first opportunity to enter service again. But I should decline any offer if I could entertain the hope of being engaged by you."

He said even more to impress Mr. Gill.

"I have improved on plans and constructions regarding engineering, and I should like to submit them to your judgment." He described ideas he had for dams and locks on the Ohio and Monongahela rivers, to make them navigable during periods of shallow water. He showed how the channel of the Mississippi River could be improved below New Orleans, and even described a device for switching railroad cars by means of movable rails and turnouts. He proved to Mr. Gill that he was a man with ideas as well as determination. He hoped that the man would notice what good English he now used.

Whether it was the result of his facility with the language or the impact of his novel ideas, John did not know, but Mr. Gill immediately offered him a supervisory construction job on a feeder canal which would run between Freeport and the nearly completed western end of the Pennsylvania Canal.

Joanna was rocking Washington following his bath when John rushed into the house and waved the letter under her nose.

"It is from Mr. Gill! I am to direct other workmen this time. And now, wife, comes the good news. He will pay me four dollars a day!"

Before she could reply, Washington opened his small mouth and wailed loudly.

"And you, young fellow! Why must you cry? This is good news!" He picked up his son and danced with him around the room. "You have a very smart father, do you hear?"

Joanna listened to his boasting just as his mother had, without comment.

When he returned home for the winter after completing the surveys, Joanna greeted him as if he had not even been away, smiling, contented, happy to bring him his slippers, to cook for him seven days a week instead of only on week ends. She knit new sweaters and listened to his mysterious talk about canal construction. When he settled down to work at the big table over his drawings and books, she went about her own work efficiently and silently. She seldom asked anything of him. It never appeared to matter that he did not notice her own achievements. She did not point out how much better the farm prospered these days. He showed no more interest in the farm when he was home all the time than when he was there only on week ends.

The next spring John found a new job which took him away from home for many weeks at a time. He was supervisory engineer for the Pennsylvania Canal Commission, directing surveys for the portage railroad which would carry the boats across the mountains between Hollidaysburg and Johnstown, connecting the completed western and eastern sections of the canal.

When he finished this work he was promoted to the job of principal assistant to Charles L. Schlatter, Chief Engineer of

the Pennsylvania Commission. John was to survey for a proposed Harrisburg and Pittsburgh Railroad.

This gave him an opportunity to hire a number of his Saxonburg neighbors, including Ferdinand Baehr, who welcomed an opportunity to see something of Pennsylvania as well as to earn extra money, which they all needed. John and his men lived in tents most of the time, working through hot summers and cold, blustery winters, starting at Pittsburgh and moving eastward through wild mountain ranges to Harrisburg. Frequently John had to push ahead of his party. Alone, he dragged his surveyor's compass up the steep and treacherous Laurel and Chestnut hills which cut diagonal lines through the state. There were few settlements where he could purchase food, so he and his men "lived off the country." They killed bear and deer, fished in the sparkling mountain streams and gathered watercress and wild roots for food.

Mr. Schlatter cautioned John to use the greatest care in his handling of state money. The axmen must provide their own tools. "Take receipts for all horses you hire—and I will try and pass them at the auditor's office. I leave everything to your judgment, of course."

This was no trial to John Roebling. He had never known what it was to spend freely, and he found ways to save the taxpayers' money. His reports were necessarily long, but he wrote them in closely lined script on both sides of the paper. Maps could not be compressed. He was horrified when he learned that a roll of drawings he sent to Harrisburg would cost six dollars, so he advised Mr. Schlatter to abandon them in the post office. "I will make duplicates on my next trip to Harrisburg," he wrote.

He kept a careful account of his personal expenses, too, allowing himself only two luxuries—a wood fire during the coldest weather, and his engineering magazine subscriptions. These he read from cover to cover, always hoping to find news of bridge construction.

In 1840 most bridges in the United States were built under

contract by carpenters rather than by engineers. These men depended on "rule of thumb" methods without bothering to make blueprints. Apparently, it never occurred to them that they should be able to do elaborate calculations.

One night, as John sat in his room at the boardinghouse with a newly arrived copy of *The American Railroad Journal* on his lap, he came across the name of Charles Ellet at the head of an article entitled "Wire Cable Bridge." He quickly read through to the end. Mr. Ellet hoped to build a wire cable suspension bridge with a span of two hundred and fifty-eight feet across the Schuylkill River in Philadelphia, replacing the famous timber bridge "Colossus" which had been destroyed by fire.

The news came as a thunderbolt to John. Of course, he remembered the old bridge under which he had passed on his way westward nine years ago. Shades of Professor Dietelyn! "Has someone at last found the answer to that problem?" he asked himself. "I must find out." And more important, he was going to do his best to have a part in building that bridge.

Who was this Charles Ellet? The article gave no clue. John reread it but found no mention of other bridges the engineer had designed. He would take a chance and write to the man at once, coming right to the point.

"The study of suspension bridges formed my favorite occupation for the last few years of my residence in Europe," he began. "Your article revived in me the old ideas. Let but a single bridge of the kind be put up in Philadelphia, and it needs no prophecy to foretell its effect. You will certainly occupy a very enviable position, as the first engineer who succeeds in a new mode of construction. Should you need an assistant who is competent, please bear me in mind."

In signing the letter, John had taken care to add his degree after his name. Although he scarcely dared believe that he would receive an immediate reply, he kept hoping. After only a week he began to make daily trips to the post office near his work.

Finally a letter came, addressed to Mr. John A. Roebling, Esquire. It was postmarked Philadelphia.

John tore the seal with shaking fingers and his heart throbbed wildly as he read:

> "It gives me much pleasure to learn that you have not neglected the subject of suspension bridges. It is my intention to introduce this improvement in the United States. You correctly estimate the character of the American people in supposing that they will not fail to recognize the merits of these structures. I hope to have the pleasure of engaging the services of one who is familiar with the subject."

Gradually, as John read and reread the letter, he decided that Mr. Ellet had not committed himself. He wrote a long description of plans for a suspension bridge, hoping to impress the American. When an entire month passed with no reply, he asked Ferdinand Baehr, "Where did I fail?"

"Your chance will come. Be patient. Wait until more people get to know you."

As much as John valued Baehr's advice, he could not see that patience alone would do much good. He decided to follow Ellet's example. He, too, would write an article for *The American Railroad Journal.*

He described what he considered was an ideal suspension bridge, discussing in thorough German fashion the reasons for failures of earlier spans and for the fatigue of iron. He pointed out the greater elasticity of wire cables over chains.

The editor praised the article and asked that he submit others. While John was pleased with this reaction, he was even happier when he received a letter from a contractor named Andrew Young who stated that he expected to build the Schuylkill River Bridge. "Would you be interested in the job of engineer and designer of this bridge?"

Would he! So Ellet had not gotten the contract after all.

John wrote to Mr. Young, accepting the appointment without even asking about salary.

Several months passed with no more news. Was there a jinx on this bridge?

At last word came. "I have been most shamefully cheated out of the contract for the bridge," Young explained. "Charles Ellet went underhandedly to the county board, after they had turned down his bid as too high, and offered to take shares as payment. I had no idea that there was sufficient corruption on the board for Ellet to succeed in his foul acts."

So that was it—politics! Politics baffled him in Westphalia, and now here it was again. He had left Germany in order to live in a country which was free from shady politics, or so he thought. Were elected officials here as bad as those appointed in Germany? As he walked back to his room he felt lonely and depressed.

Ferdinand Baehr listened as John poured out his feelings, his belief that everywhere he went he was doomed to frustration.

"No, do not indulge in self-pity, my friend. You have already come a long way. Many men would be satisfied with a good state job such as you have. Still, I do not think you should give up your ambitions—unless you want to."

John was bewildered by this reply. "What am I to do? I am no politician. Stueler is right. Engineering and politics do not mix."

Baehr laughed heartily. "That Stueler and his pious talk! He is a great one. How do you think he got where he is today —the new Chief Architect to the Court of Prussia?"

"Well, he is a very good architect. He was on the spot when they needed him. It is simple."

Baehr leaned forward and tapped John on the shoulder. "And just how did he happen to be on the spot? Why did he get the job instead of one of the others? I will tell you, since you are so blind. Stueler is a very good politician."

"But he is honest. He would never indulge in this shady business," John protested.

"Of course not. He does not have to. Besides being very good in his work, he makes friends. That is the art of good politics, John. Make friends."

John felt battered and weary. It was so baffling, so foolish. Yet in his heart he knew that Baehr spoke the truth. Brains, talent, imagination, inventiveness were not enough. He must do more than write brilliant articles. He must make friends among Americans, search for his opportunities and convince people that he could do the job they wanted done. If this is what it took to get to the top, he told himself, he would do it. He knew that he could.

CHAPTER SIX

Wire Rope

The canal era in the United States now reached its height. Spurred on by the success and competition from the great Erie Canal in upper New York, the Pennsylvanians had launched their own far-flung system of waterways in a determined effort to win their share of commerce and travel to the booming "west." Even before the new portage over the mountains on the Pennsylvania Canal Route was finished, the system was threatened by another rival—a proposed railroad from east to west and along the eastern seaboard. While plans for immediate construction had to be temporarily abandoned for lack of capital, there was no doubt that the railroad age was on its way.

Meanwhile, the Pennsylvania Canal continued to serve as the chief means of travel for westward migration through the state. Much of the route was parallel to that which John Roebling was surveying for the railroad. He liked to sit on the hillside in the evening watching the boats loaded with passengers moving slowly westward.

John Potts, the collector of tolls at the Johnstown end of the new portage section on the canal, often joined him. By the autumn of 1840 they were close friends.

"It is surprising how much fun the boat travelers have when they ride up the hill," John remarked as they watched a flat-

car loaded with a canalboat start its trip down the mountain. "They wave and shout like children on a holiday."

Mr. Potts looked thoughtful. "People who live here along the canal know the danger."

The grade in front of them, with its pattern of rails leading into Johnstown, was very steep. John himself had made the surveys for it, laying a system of six inclines and planes across the mountain ridges. At the top of the nearest ridge, he and his friend could see two huge steam engines belching smoke. "Who makes those rope hawsers that pull the cars?" he asked.

"Some company in Louisville or Pittsburgh, I believe. Anyway, they use Kentucky hemp, and each cable costs nearly three thousand dollars."

"Whew!" John exclaimed. "I noticed this morning that one section is frayed in places. That is a lot of money for a piece of hemp rope."

"Listen to them. They will whoop louder as the car descends."

John dropped the stick he was whittling. He saw the end of the flatcar edge down cautiously. Its one-boat cargo rocked sideways for an instant. The happy whoops stopped short; then to his horror John heard screams! With rapidly gaining speed the car whirred toward the level.

Both men jumped to their feet.

"Look! The hawser snapped!" Potts cried.

John felt a sickening cramp around his heart. He rushed forward. The car swept by so fast he could scarcely see the few people who were left in it, but he noticed that a number of them tumbled out onto the hillside.

A loud crash, then the sound of splintering wood. Car and boat careened from the track. A moment of silence was followed by shouting men who rushed toward the wreck from all sides.

When the first excitement quieted and the dead and injured were carried into Johnstown, John climbed the plane to finger the limp, dangling, broken hawser. "There must be a better

way, there *must* be . . ." The screams, the screech of the wheels, the final crash still echoed in his ears. It had happened so quickly. Without warning. A feeling of hot indignation came over him. This accident was inexcusable, pure carelessness. Of course it cost money to replace frayed cables, but what was money when lives could be saved? Was there really a better way?

"Has anyone tried something stronger, more durable than hemp for those hawsers?" John asked when he and Potts met at the tollhouse.

"Stronger? A rope is a rope. Breakage is part of the hazard. The inspector said yesterday that this rope would last another month. They usually have to replace them four times a year."

John was trying to recall something he had read in a magazine back in Westphalia. It was a notice about a new invention. He could not remember the name of the writer. Some German had used iron wire to make rope. Wire rope! Yes, that was it.

John scarcely spoke as he watched Mrs. Potts dish up the good supper she had prepared over the open hearth. In a few minutes he jumped to his feet. "Excuse me. Thank you for the food, Mrs. Potts, but I . . ." He must leave, think this through before he said anything.

Mrs. Potts, a smiling little wisp of a woman, looked surprised. "Surely you will taste that bear meat stew."

John flushed, bowed, blurted out his apologies and shook hands with his hosts. "I am leaving this job as soon as they can find a replacement."

"You are joking. What has happened? Surely this unfortunate accident has nothing to do with your leaving the railroad survey," Mr. Potts said.

"On the contrary. I may, I just *may* have the answer to these awful accidents." John picked up his broad-brimmed hat and hurried to the door.

A few days later, he appeared at the office of the Pennsylvania Canal Commission in Harrisburg. His first thought had

been to address a carefully worded letter to this august body, but he changed his mind. This idea for wire rope was too important to risk having it lost in a pile of unanswered correspondence.

John B. Butler, the Chairman of the Commission, asked him to outline his proposition. Charles Schlatter, the Chief Engineer, stood in the doorway, a look of surprise on his face.

"Have you ever seen a wire rope?" the Chairman asked when John finished.

"No, sir, I have only read about wire rope."

"Can you tell me of any place here in the United States where it is being used?"

Again John had to say no. "But I am sure that I could make such a rope and that it would be far less costly to the Commonwealth than what you are now using. It would be safe and last many times longer than hemp."

"You have seen the canal portage in operation," observed Mr. Schlatter, "so you know that the rope must be flexible. Surely, Mr. Roebling, you must admit that a wire heavy enough to do this kind of hauling would be stiff and unwieldy."

"On that point I do not agree."

"Do you have a factory? Who will furnish the capital?" Mr. Butler asked.

John sighed. How could these men be so unimaginative? Government officials were the same the world over. "No, I do not have a factory, but I do have a farm with level land which will serve as a ropewalk. I am prepared to take all responsibility, to buy the wire, make and install the rope. All I ask is that you buy the finished product."

Two immobile faces turned toward him. Finally, Mr. Butler spoke. "Mr. Roebling, as you infer, we cannot risk public money. Suppose you *try* to make a wire rope and let us know the result. If it seems safe, perhaps we can give it a trial, if the commission approves."

John left Harrisburg determined to put every scrap of en-

ergy he had into his invention of wire rope—to risk his reputation and his savings on this one idea. Actually, he hardly knew how he would go about it, except that he intended to follow the general method used in making hemp ropes, a process he had observed in Essen. A factory? That was ridiculous. How stupid these men were. He would show them. He would force them to admit that his invention was practical.

On his arrival in Saxonburg he found Grandfather Herting at the house playing with Washington. Joanna was surprised to see him. "Did you lose your job?" she asked jokingly.

"I gave up my job, wife."

Joanna and her father looked at him in surprise. Washington grabbed him around the knees. "You are home, Papa! You are home!"

"Yes, Washington, I am home. Get up from the floor. You and everyone in Saxonburg are going to be busy from now on."

Grandfather Herting hurriedly excused himself and left.

When Joanna had heard his enthusiastic story to the end, she only commented: "Where will I put the cows while you are using that nice meadow behind the new church?"

Cows and farm problems in general were of minor importance to John Roebling. His one consuming desire was to make wire rope. He could not afford to buy the simplest kind of twisting machine. He would fashion his own from such materials as he could buy cheaply in Pittsburgh. Every ounce of his skill and considerable mechanical genius would go into planning the manufacture of wire rope.

Fortunately, he found plenty of willing hands in Saxonburg. The industrious German farmers were happy to earn extra money at the ropewalk, and they enjoyed learning a new skill under the direction of this enthusiastic neighbor. Their first task was to erect a small frame building one and a half stories for splicing and winding the wires onto large reels. Next they built the long walk which looked like a miniature railroad track. They strung the reeled wire out from the building in

seven separate strands. The strands came together in a hole centered in a large wooden disk at the head of the walk. From there they twisted the wires into strands by hand, walking backward and bracing themselves on the track. When this part was finished, they had to twist seven strands to make the finished rope.

"The secret of good rope is in the twisting," Roebling told his men. "It must be uniform. Every twist the same size."

During the first few weeks, the young inventor kept a close watch on every step of the work, from splicing to final twisting. The men worked from dawn until sundown, even in stormy weather. The job was backbreaking, but they did not complain.

John Roebling was very happy when the first rope neared completion. He wrote a letter to Mr. Schlatter, enclosing it with his final survey report. "I am now engaged in the manufacture of a wire rope six hundred feet long and one inch thick. It will be finished in another week and in the best style. I hope to be able to test it."

Meanwhile, John set himself another task. There was no time to waste. He must apply at once for a patent which he called "Methods of Manufacture of Wire Rope." In his description of the process, John stressed his dominant purpose—to maintain uniform tension on all wires of a strand and on all strands of a rope. While the method he described in this pioneer application would look crude to inventors today, John's principle of uniform tension is still considered the most important requirement for good wire rope. "This is one patent I shall cash in on," he told Ferdinand Baehr.

His friend was enthusiastic. "You are on your way; you will soon be a great manufacturer."

"I have no ambition to be known as a great manufacturer. My only hope is that I make enough money to support my real ambition."

Baehr looked puzzled. "Your real ambition?"

"It is what it has always been, what it will always be—to

build suspension bridges, to be the best civil engineer in the business."

Baehr laughed. "You never give up, do you, John?"

A less stubborn and self-confident man would certainly have given up after the experiences John had during the following months. Although Schlatter showed unexpected belief in wire rope, John found that Mr. Butler was still dubious. After much haggling, he obtained the consent of the authorities to demonstrate his invention, but at his own expense and risk. He received the impression that Mr. Schlatter alone wanted him to succeed, and this puzzled him. Surely, the safety and reduced expense would automatically please the state officials. It mattered little that the experiments must be at his own expense. It was the doubt that bothered him the most.

When the great day finally arrived, John stood at the top of the windy, damp Allegheny Ridge with John B. Butler, President of the Pennsylvania Canal Commission. The moment was tense as John Potts gave the signal for the trial run.

John smiled proudly as he saw a puff of smoke and steam rise from the engines on the ridge. A small car started up the slope. This was the moment he had been waiting for, the chance he needed. Up and up the car rose, steadily, surely, then suddenly it began to wobble. Involuntarily John clutched Mr. Butler's arm. What was wrong? Had a wheel come loose? Had the engines failed? Then he heard a loud snap. He watched, speechless, as the car slid down to the level and bounced from the tracks!

He did not—he dared not—look at Mr. Butler. "I am ruined!" he gasped and dropped to the ground, covering his face with his hands and moaning. Ruined—yes, he was ruined!

When John regained some of his composure he looked up to see John Potts running toward him. "How could it have happened?" he asked in a hoarse voice. "I examined every

twist as it was made. I know it was good. My rope was strong."

Mr. Potts sat on the slope beside him. "I believe you, but old man Butler went back to the hotel smiling. All the hemp rope men in Pittsburgh will be smiling when they hear this news, Mr. Roebling."

"I even watched every move of its installation," John kept saying, still dazed. When he raised his head, he saw the toll-keeper skidding down the slope in the driving rain toward his house. Somewhat surprised by this sudden departure, John followed, grief-stricken, weak, stunned by his failure.

Mrs. Potts handed him a cup of coffee. "My husband has gone into town to talk to Mr. Butler. He wants you to wait for him."

"What is there to say?" John asked.

As it happened, Mr. Potts had plenty to say when he strode into the small stone dwelling about an hour later. "Well, sir, I would say that you are not ruined at all." He looked as if he had never been so happy.

"What do you mean?" John asked, surprised but not daring to hope.

"Did you notice that there was no one in the car when the test was made? Well, if I know these Johnstown men, one of the daredevils was bound to go along just to say he rode in the first car pulled by wire rope. It dawned on me that something was rotten. Now I know. I saw an agent for one of the hemp men around town yesterday. I should have smelled a rat. Come with me."

Incredulous, but holding to a spark of hope, John followed his friend up the muddy slope to the scene of disaster. With trembling hands he took hold of the broken cable. He saw the marks. "Someone has filed the wires!"

"I begged Mr. Butler not to go on to Hollidaysburg tonight. He promised to stay here and give you another trial after I explained what happened."

John turned to Mr. Potts. How could he thank him? What

could he say? It was lucky that his friend at least kept his wits about him. John grasped his hand and pumped it until his own arm ached. *"Gott sei dankt!"* he repeated again and again.

John worked feverishly to construct another wire cable and the second trial came off without a hitch.

John B. Butler smiled once more, but this time John knew that he was smiling with him. "Are you prepared to carry on the manufacture of wire rope?" he asked when the car—the first in history to be pulled by wire rope—reached the brow of the hill.

John was so happy he could only nod.

"Would you also be able to accept a position on the canal?"

At this question, John regained his voice. "Yes, sir. My friend Ferdinand Baehr can direct the wire-pulling operation."

"Good. The commonwealth will stand behind you. We will reimburse you for your present expenses. Go ahead. Install your wire rope on all of the planes."

All Saxonburg turned out to celebrate John's success and the inauguration of his ropewalk factory built to carry out the contracts he had been awarded. Manco and Genss joined their neighbors. Mr. and Mrs. Potts came over from Johnstown. While the Roeblings did all they could to see that their American-born guests enjoyed themselves, it was evident to John that they felt awkward. They could not understand the German songs, the simple old-world prayers of gratitude to a God who had sheltered and helped them during the long hard years which preceded Roebling's triumph. It was their triumph, too, these Germans felt. They had succeeded in making a settlement; they had worked their mediocre land; they had brought American babies into the world. Now they were a part of a new industry, the result of the determination and inventive genius of one of their own. They had many reasons to celebrate.

Only one evidence of his initial success pleased John Roebling more. It was the first letter he received from the Pennsylvania Canal Commission after his successful trial. It was addressed not to "Mr. John Roebling, Esquire," as earlier letters had been, but to "John A. Roebling, Civil Engineer."

CHAPTER SEVEN

The Turn in the Road

During the two years following his initial success with wire rope, John Roebling spent most of his time away from home, working at his job with the canal commission and, as time permitted, seeking new markets for his product. But his search went far beyond wire rope and its uses. The more he traveled, the more he noticed other opportunities.

The short-line railroads in eastern Pennsylvania wound through heavily wooded sections, and on several occasions he saw sparks from the wide, cone-shaped engine funnels set fire to large tracts as the trains whizzed along. To meet this constant menace, John drew plans for a "spark arrester," and had the satisfaction of seeing it installed on the "David R. Porter," an early locomotive which became famous in the history of railroading. When he heard about frequent river steamboat explosions, his quick imagination turned to a new method for constructing steam boilers. He had dozens of ideas, and every time he applied for a patent he hoped that this one would bring in the extra money he needed to set himself up as a bridge builder. Unfortunately, none of them lived up to his expectations. In each case legal questions were raised by rival inventors; lawsuits were filed in distant courthouses requiring expert legal advice which John Roebling could not afford.

Every time he saw a bridge or an aqueduct, he groaned.

Frequently he launched into a tirade, pouring out his indignation to anyone who happened to be near. "Just look at that," he would exclaim, "the work of a third-rate carpenter! Put together by jig and saw, a monstrosity, ugly, unsafe. No wonder the government is forever spending money to prop up its aqueducts and bridges. I am surprised that any of them stands through a storm."

Many did not, and John kept his ears cocked, waiting for his opportunity. It was bound to come, he reasoned, and when it did he would be on hand to argue for a safe, well-designed bridge, one that cost no more than these pitiful structures so offensive to his artistic soul, so dangerous to those who used them.

One span which he had his eye on was a clumsy wooden canal aqueduct across the Allegheny River at Pittsburgh. It was old and rotten. Each spring thaw on the northern rivers sent ice and logs crashing downstream, damaging its numerous heavy piers. In May, 1844, the opportunity presented itself.

John happened to be in Saxonburg. His friend and foreman Ferdinand Baehr was very ill and unable to oversee the work on the ropewalk; and since it was evident that he would never be well again, John had to train a new foreman. It was at this time that he received a letter from R. Townsend & Company at Pittsburgh, the firm which supplied wire for his ropes. At the end of a letter concerning his latest order, the writer called his attention to a recent announcement. The old aqueduct across the Allegheny had been so severely damaged by the latest storm that it was now beyond repair. The committee in charge of rebuilding offered a premium of one hundred dollars to the designer of the best plan for a new wooden aqueduct. With the award went the contract for building it.

All thoughts and worries about the wire rope operation went into the discard. John Roebling saw the opening he had waited for—a chance to design a bridge—not a real bridge, of course, but at least a long river aqueduct. In a way, he told

himself, this was even better. It would prove a greater test for his theories and skill in designing and erecting a suspension span.

Within a few minutes after he read the letter, the Roebling household was in a state of excitement. John barked out his orders without bothering to explain his purpose. "Clear the table! Washington, get my drawing board! Give me my paper!" It did not matter that dinner was about ready, or that baby Ferdie was crying and four-year-old Laura had crawled into the cradle beside him. Washington was at that moment removing his "church shoes" and good black jeans. He had to stop. Off came the dishes, away went the food. Washington, hobbling around with one shoe off and the other unlaced, asked where they should eat. "Set the plates on the floor. I have no appetite!" John shouted.

So great were his powers of concentration that he was blind to all that went on in the house for the rest of the day. He worked like a man possessed. No need to make a trip to Pittsburgh immediately. He knew to the foot how long that aqueduct had to be. He knew that it should have only five piers—constructed of stone, good and thick, piers which would hold fast against any amount of ice. He knew just how high the towers must be at the shore lines, and how much stone and cement he would need for the anchorages. He figured the amount of wire he would use for the two cables, the lumber for the good, stout water trough and mule walks on each side of the aqueduct. His pencil could not keep up with his brain. He worked all night long by candlelight, not even stopping to drink the coffee which Joanna set on the hearth before she took the children to bed. But before dawn, when she came down to start breakfast and Washington left with his old cowbell to call the men to the walk, he had fallen asleep, his head on the table—exhausted.

"Husband!" Joanna laid a gentle hand on his shoulder. "What is the matter? You must eat! You cannot . . ."

John came to his senses with a start. "Eat? What time is it?"

Every muscle in his body was stiff. His stout neck had a cramp, and he could not straighten his back. "Oh, well, I believe I am hungry."

Joanna stirred up the fire, reheated the coffee and set the corn meal mush to boil in the old iron pot. "Now, if you will just tell me a little, perhaps I can make things easier for you. We must have the table for the workers' breakfast."

John sighed. It was Monday and work must go on at the ropewalk. Well, so be it. "I will go upstairs and work on my drawings there," he said as he sat down to drink his coffee. While they were waiting for the mush, he told Joanna what he was doing—not in detail, but enough to make her see why he had not a minute to waste, enough to provide her with excuses for keeping the neighbors from pestering him. His new foreman, an old hand on the ropewalk, really knew enough to boss the work alone. "Tell him I said so," he remarked as he went next door to tell the good news to Baehr.

Again he worked through the day and night, until the drawings were all finished and the estimates neatly copied. As nearly as he could figure, the lowest cost would be somewhere in the neighborhood of sixty-three thousand dollars. Profit? He had not thought of that. Much as he hated to, he had to ride into Pittsburgh, talk with his friends at the Townsend Company to sound them out on this point and discover, if possible, what competition he was likely to meet in the contest. His profit, if any, would depend on who was bidding against him.

"I expected you in here yesterday," the Townsend Company official remarked as John entered the small office. "You will enter a drawing?"

"Of course. And I am grateful to you for notifying me. Do you know if anyone else has entered?"

"Just the usual array of carpenters, of course."

John brushed this aside. "I meant, is anyone else, say an engineer, entering?"

His friend reached for a copy of the Pittsburgh *Gazette*. "It

says here that Mr. Charles Ellet, the engineer who built that span across the Schuylkill, has entered—or will."

John's heart sank as he read the short notice. He might have known. How did Ellet manage to hear so soon? Thinking it best not to comment, he tossed the paper aside as if he were unconcerned over the problem of competition with Ellet. "Have you any idea how much the committee is willing to spend?"

"No, I have not heard. My only advice is to make the lowest possible estimate. If I hear anything I will let you know."

John went home rather dejected, but as he started his letter to the committee, his hopes rose. His plan was so good, so practical. Some carpenter might underbid him, of course, but if he spelled out his theory, made a good argument for a suspension aqueduct, if he gave a rock-bottom estimate, well, his chances were good, even against Ellet.

The rock-bottom price, refigured without the slightest hope of anything extra, was sixty-two thousand dollars. He could not do it for a dollar less. He must forget profit on this first span. The experience and publicity could make up for that.

He worked long and hard on the letter, then read it to Baehr who thought it clear and convincing. Still he was not satisfied. He read it to Joanna, thinking that if she could understand it, the members of the committee would, too. Finally, he decided that a letter was too much of a risk. Instead he would construct a model of his aqueduct and present it in person.

All the way into the city, John thought about how he would word his arguments. A suspension aqueduct was entirely new —even his method of making cables differed radically from that used by Ellet and other French-trained builders. Instead of wires strung on the ground and wound into a number of small cables which were then fastened together by iron bars before installation, John proposed to use only two large cables, one on each side of the aqueduct. He would string the

wires from shore to shore, over the piers and towers, then wrap them into small strands and finally into the large, compact, round cables—*in the air.* He searched his mind for a term which would describe his method. "Air spinning" would do it! Yes, he liked the sound of this—air spinning. It was precise, almost romantic. And when the committee asked about weathering and its effect on his large cables, as he knew they would, he had an answer for them. He would use annealed wire as a cover for both strands and cables, then paint the cables on the outside. This would provide a tight, hermetically sealed wrapping, absolutely weather proof, an insurance against breakage.

Only when John had all these points firmly in mind did he begin to worry. Was his English equal to his task? Could he find the words to carry his points across? He must be bold, self-confident, appeal to the American spirit of enterprise and daring he had heard so much about. He must show these people that German though he was, he could more than match any of their countrymen as an engineer and bridge builder.

One after another, the questions came.

"How do you know that a suspension aqueduct will do the job?"

"Will the cables hold the weight of the canalboats as well as the two thousand tons of water in the trough?"

"Will the aqueduct sway when boats and mules cross the span?"

"How long will the aqueduct last?"

"Are you sure you can build this? Will you take the risk of failure or added cost? Can you complete the job in the allotted time?"

John did more than answer the questions. He watched every face for doubts, and even when questions remained unspoken, he hastened to fill in with details and assurances. He described his experiences with wires and cables on the canals. He told of his education and work in Germany. He climaxed his presentation with what he believed was an impressive, even

stirring, declaration of his determination to spend the remainder of his life building suspension bridges. "I absolutely guarantee my work," he said in conclusion. "I will bear all of the expense if I fail—but, gentlemen, I will *not* fail! I say to you that in all my thirty-eight years I have never been more certain than I am here today."

He could tell that many of the men were convinced by his passionate appeal, and he half expected them to give him the award that day. This hope was, of course, ill founded. The chairman pointed out that while they were all deeply impressed by his model and arguments, there were forty-three other proposals under consideration.

Taken aback, but still optimistic, John returned to Saxonburg. Certain that he would win, he sent in his resignation to the canal commission and prepared to wait for the inevitable decision.

Convinced though he was of the outcome, the next two months seemed endless. They were not quiet. Free of his state job, John plunged into tasks long neglected in Saxonburg. First, there was the necessary addition to his own home. A new baby was on the way and they were already crowded. Then there was the need for a schoolhouse. He had been aware of this for over a year. Parents were complaining because their children had to travel all the way to Butler to attend classes, and heavy snows often kept them at home for weeks at a time. Now that his own son Washington was six, John himself grew more eager to see a school established in the town.

Before the foundation for the building was complete, a German immigrant named Julius Riedel, the son of a Lithuanian nobleman, happened into the community on his way to Ohio in search of work. When John discovered that Riedel was well educated and a former tutor, he hired him to teach Washington during the summer and stay on for the winter term in the new schoolhouse.

Herr Riedel was a jolly, fat little man, with manners typical of the wellborn. John liked the way he clicked his heels and

bowed when he spoke to him and always said, *"Mein Herr,"* instead of plain "mister." It would do his son good to be exposed to such fine behavior. The boy was too impulsive, too wild. "My wish is that you be very strict with Washington," he said. "I want you to make sure that he pushes ahead in arithmetic. That and reading must come first. An engineer needs a good foundation in these subjects."

"An engineer?" Herr Riedel had a puzzled look on his ruddy face. "The boy is only six, *Mein Herr.* How can you tell he will want to be an engineer?"

John bristled. "It is ridiculous to ask a boy what he wants. He is too young to know. Washington will be an engineer because I say he will!"

The teacher only smiled and looked down at Washington from behind his large spectacles. "You want to be an engineer, boy?"

Washington gulped and pushed the heavy lock of blond curls from his broad forehead. "Yes, sir, that is, if my father says so."

John puffed with fatherly pride. "You see? He will be an engineer."

In spite of his positive statement, John did not rest easily until he heard from the new teacher that Washington was, indeed, quick at arithmetic. By August the boy was already learning to multiply and divide, and he could read and write simple sentences.

With Washington under Herr Riedel's tutelage all day, John made arrangements for someone else to take over the boy's household duties. He immediately assigned four-year-old Laura to calling the men to work each morning at daybreak, and he induced Joanna's younger sister Leanora to come in six days a week to help with the cooking and washing. John suggested that his wife teach Ferdie to prepare vegetables, but he gave up this idea when she reminded him that a two-year-old was a bit young for even this simple work. He would surely waste half of each potato he peeled! John had not thought of

that. In fact, he was too engrossed in his work, plans and hopes ever to play with his children. He had even forgotten their ages. However, their childish prattle did not bother him. He could work through almost any amount of noise. And work he did that summer, on new inventions. One was a "radial engine" and another a new kind of ship propeller. It was impossible for him to sit idle and wait. Once he had the ropewalk and house running smoothly, he had to turn his mind to something, even though it brought him no money. John Roebling was now a man possessed.

This meant that Joanna had to carry the full responsibility of the children. She learned this the hard way. One day when she left the house with Laura to visit her mother, she asked John to keep an eye on Ferdie, who was playing on the floor with his blocks. He merely nodded and went back to his drawings. Soon he was lost to the world and had no idea what was going on in the room.

Suddenly, Washington tugged at his arm, calling in a shrill voice, "Papa! Papa! Come, quick!"

"Huh? Let go of my jacket. Get away, boy!" he replied impatiently.

"Come, quick, it is Ferdie. I can't get him out!" Washington was jumping up and down and waving his arm toward the back door.

With a groan, John put down his pencil. "Stop screaming. What is the matter?"

"It's Ferdie. He fell into the rain barrel. I saw him when I came up with the wood!"

John dashed from the room, through the lean-to and outside. He reached down into the barrel and pulled out the limp body of his younger son. He laid him on the ground and began to pump the child's arms. Finally, to his great relief, Ferdie came to his senses. John had been so frightened by this ordeal that he could not get his mind back on his work all afternoon.

Stern father though he was, John Roebling really loved his

children. But he simply did not know how to show it. He had no time to learn, for all his thoughts and energies went into his work. Only in times of crisis did he show his feelings, either to himself or those around him. He was away from home the day Baehr's barn caught on fire and returned late in the afternoon to find it burned to the ground. His own house had been in grave peril, his neighbors told him, and Washington almost lost his life attempting to save it.

John waited to hear no more, but rushed upstairs to the boys' bedroom.

Joanna, her mother and father and Mrs. Baehr were working over the unconscious child.

"What is wrong? In Heaven's name, tell me! He is not dead?"

Grandfather Herting pulled him back. "You are in the way. He has too much smoke in his lungs, that is all. He climbed to the roof to throw water on the shingles."

John moaned. He tried to pull away, to see for himself. "Joanna, are you sure he lives?" He longed to hear Washington's voice. As the women moved around, carrying wet towels, wrapping and unwrapping the limp body of his son, John stood at the foot of the bed, his hands grasping the wooden rails, his nerves tense. He was tortured by fear. After what seemed an hour to him, Joanna looked up and smiled.

"Yes, he breathes more easily, husband. See, his eyelids flutter."

"Son, son!" John called. Unable to bear the distance, he rushed to the head of the bed and stooped down to stroke Washington's damp face. "It is Papa. Speak to me!"

The boy's head moved and he opened his large blue eyes. Then a frown crossed his face. "No! Mama, I want my mama!" he moaned.

A cold chill came over John Roebling when he heard this. He arose and motioned to Joanna as he allowed Grandfather Herting to lead him from the room. He could not speak. Although tears of joy and thanksgiving filled his eyes, there

was a new sadness in his heart. Washington called only for his mother.

As if he had read his son-in-law's thoughts, Grandfather said in his kind old voice, "It is so with children. They always want their mothers. It will be different when he becomes a man."

John tried to convince himself that this was true, but he brooded over the event for several days. He even suggested that Herr Riedel stop the lesons for a week. But soon other matters began to occupy his mind. In mid-August Ferdinand Baehr died—his friend, the cofounder of Saxonburg, true, understanding, faithful and wise. The town would never be quite the same to John Roebling.

But there was good news, too. The letter from the committee on the new aqueduct arrived at this time. "You are hereby awarded one hundred dollars for submitting the winning plan. Under the terms of the contract, you must complete the new Allegheny Aqueduct by the end of May, 1845. The committee will not be responsible for any costs above sixty-two thousand dollars. Yours was the lowest bid."

John was so delighted over winning the award that at first he did not notice the final sentence. He had won! He had gotten the better of that man Ellet! He would show the world that a suspension aqueduct was possible. After he translated the letter to Joanna, he felt a twingle of disappointment. The last sentence—"the lowest bid." None of his carefully worded arguments—his fine pronouncements on the wonders of the suspension theory—had soaked into their thick heads. These men were taking no chances. They cared only for money, the lowest bid.

When John's neighbors—lacking in understanding but strong in good will—came to congratulate him, he felt happy again. What did it matter? Here, at long last, in his thirty-eighth year, he was on his way toward his goal.

He left immediately for Pittsburgh, and as soon as the office at the top of the hill above the Allegheny was finished, he

advertised for experienced carpenters and stonemasons. By the time the advertisement appeared in the Pittsburgh *Gazette,* he had assembled his supply of wire, tools, lumber, stone and cement, and was ready to begin operations.

John was well pleased with his crew of carefully selected men. Although none of them had engineering training, they were all experienced in bridge repair. But one man stood out from all the rest. He was a short, heavy-set, pleasant-spoken carpenter named Charles Swan. His eager, intelligent gray eyes and his direct manner of questioning appealed to John Roebling.

"Wouldn't it be easier to make the cables on the ground, lay the wires out in a straight line first, side by side?" he asked after John explained his system of cable-making.

The builder smiled. This man had imagination. "It would be possible but not wise. The cables will be stronger if they are spun with the wires hanging in their natural curve."

Swan nodded, then asked another question. "Won't the cables have a tendency to slip at the points where they cross the towers because of the great weight of the aqueduct? That would change the natural curve of the wires, wouldn't it?"

John took another close look at Swan's round face. A question like this was worthy of a student in engineering. "I can prevent this. We will add extra wires at the towers in each cable. This will form a bulge which will keep the cables from slipping at these points." He did not expect anyone to understand completely, but to find a man so willing to learn was almost a miracle.

Charles Swan was made foreman and he plunged into the job with enthusiasm equal to that of the designer himself. He took direction good naturedly and carried out orders to the letter, never complaining about difficulties. There were many, since in those days there were no intricate tools for even the most common tasks. Screws were made by hand. Wire must be tested by use of a vise, also by hand. On several occasions John had to revise his original plans, largely because of his

own inexperience. Swan understood. He also had the ability to inspire his men to their best efforts—not a single worker left the job. With Swan as foreman, John had no worries on this score. Gradually, he learned something of the man's background. He came to the United States at the age of ten, about twenty years ago, with his widowed mother from Breslau, Germany. For several years he worked as an apprentice to a carpenter in Pittsburgh, then later advanced to boss a crew of men in charge of bridge and canal repair.

It amused John to watch him swinging over the river in the cramped metal seat, his stout legs dangling, his powerful hands pulling the wires together. Swan managed the wrapping machine expertly, twisting the annealed wire with such great care that not an inch of the small cables inside was exposed. No rain was too heavy, no wind too strong to keep him from working. And because he and John Roebling paid no attention to bad weather, the workmen followed their example. There were many days during the winter when John was tempted to call them off the job, but with the deadline in mind, he was afraid to waste even a single hour. He dared not risk the investment. Although he considered this part of the contract unfair, he had signed with his eyes open. Next time, he told himself, he would insist on more leeway. All he needed now was to prove that his theories were practical.

Through inexperience he made another blunder. He neglected to figure the cost of tolls which he had to pay for delivery of materials to be shipped from the East. He wrote a letter to the canal commission, asking them to refund one hundred and eleven dollars which had come out of his pocket for this purpose. To his dismay they refused: "There is no power vested in us to refund tolls."

The final weeks were the hardest. John and his foreman worked sixteen hours a day, and all the men worked overtime. But on Monday afternoon, May 22, 1845, the last board was in place; the cables shone with their new coat of lead weather

paint. Roebling and Swan stood on the ridge, their men around them, watching a crowd of townspeople, city officials and even a few visiting engineers as they gathered to see the two thousand tons of water flow into the giant trough. This was the crucial hour. The canal aqueduct was finished on time, but would it stand the test? Noticing the anxious looks on the faces around him, John tried to keep his own anxiety well hidden. He knew that all the others were asking themselves the same questions that were running through his mind.

Will the cables hold? Will the water burst through and spill into the river? Will those canal boats and mules break through the planking and carry the drivers to their death? Will the aqueduct sag between piers?

At last, the moment arrived. John stepped forward, craning his neck, his fingernails biting into the palms of his hands. He was dizzy with suspense.

Gently, the water flowed into the trough, spreading over the planks, then gushed forth, sloshing against the sides, rising higher and higher until it formed its own quiet river within the wooden walls. John breathed a little easier. So far, so good.

He waited as the first boat, loaded to the top with pig iron, floated into the aqueduct drawn from the shore by four sweating mules. He could see the driver swing his long bullwhip over their heads. He heard the steady clop-clop of their hoofs and noticed how they strained as they dragged their heavy load in the hot spring sun. All else was quiet now, except for the swish of the water flowing downriver. John held his breath.

"Look! The trough holds!" whispered Charles Swan.

A cry of victory came from the workmen. They surged forward, pushing the foreman to one side. "Congratulations! It holds! Wonderful, isn't it?"

Yes, it was wonderful, thought John. No other word could describe it. The first suspension aqueduct in history! How sweet was the sound of the cheering men!

John Roebling knew that his air-spinning method of constructing cables was an important development in the construction of suspension bridges, and he took pains to obtain a patent on it. The method immediately became an indispensable part of suspension bridge building—a place it holds to this day.

John also devised a new form of anchorage for this bridge —the permanent seal, doing away with the open gallery anchorages used by the French and, of course, Charles Ellet, as a means of easy access for repair. The special waterproof cement used by Roebling prevented oxidation of the metal buried inside the anchorage, making repairs unnecessary.

CHAPTER EIGHT

The Monongahela Bridge

As John Roebling was putting the final touches on the canal aqueduct and drawing up his report in the temporary office, Charles Swan pushed the door open and called, "Fire, fire!"

For a moment John thought that his foreman was talking about the new aqueduct and a sudden numbness came over him as he ran to the window and looked out. "Fire? Where? I do not see any smoke."

"Not here," Swan explained. "In town. Down in the center. Started near the Smithfield Toll Bridge. It's spreading into the business houses!"

John heaved a sigh of relief, then grabbed his hat and followed Swan down the slope and into the heart of Pittsburgh. As he approached, he saw flames shooting high near the Monongahela River. Smoke blew into his eyes as he ran, making them smart and water. Presently, he caught up with his foreman. They pushed as near as they could to the flames, but the heat was intense and it was very difficult to see. Each man grabbed a pail which the volunteer fire fighters handed out to all who came: men, women and children. They worked without letup for five hours, but it was of no use. Banks, clothing stores, the glass works, the iron foundry, hotels and churches within a forty-acre space went up in flames. Over one hundred families, John learned, lost their homes in one of the greatest fires the western part of the country had seen. Fortunately, all lives had been saved.

Only seven stone piers and the shore towers of the old wooden Smithfield Bridge were still standing, like giant steppingstones in the broad stream. The proud landmark, built in 1818, was a complete wreck.

John Roebling, exhausted after these frantic, futile efforts, sat down on the hill beside Swan to rest. After a few minutes, he was lost in thought. Sometimes a tragedy like this marked the road to opportunity. If he acted promptly, before someone else had a chance, it might be possible to win the contract for a new span.

"I never thought much of this ugly old bridge. Expected it to go down last spring when the ice broke upstream," he said. "Who is the most influential man in Pittsburgh when it comes to city projects? I would like to build a real bridge here."

Swan grinned and thought a moment. "I would say that the editor of the Pittsburgh *Gazette*, a Mr. Craig, would be the best man to talk with."

John forgot about being tired. He returned to the office and immediately began drawing plans for a suspension bridge. A few days later they were complete, and he went at once to Mr. Craig's office.

The editor received him cordially. He was a nervous but pleasant man who came right to the point. "I am glad to meet you, Roebling. One of my reporters was just going to interview you about the new canal aqueduct. A great success. For myself, there was never any doubt. Still, well you know how people are. What can I do for you?"

"It's about the fire. Have you heard whether there are any plans to rebuild the Smithfield Bridge?"

Mr. Craig had a wry smile on his face. "If you read the last edition of the *Gazette*, out today, you know that this fire damage amounts to something in the neighborhood of six million dollars—quite a sum. There has been some talk of using a ferry, perhaps for a year or two, until the city can catch its breath."

"What do the bridge officials have to say?" John asked,

intent on making the purpose of his visit clear.

"Naturally, they hate to lose the tolls. Traffic was heavy on that bridge. Very profitable. Ferries could never handle it, summer or winter. I, for one, believe that we should rebuild at once. Our business houses cannot afford to lose trade at this point. What kind of bridge would you suggest?"

John was primed for this question. "The only practical plan would be a suspension bridge. It would be almost immune against ice damage. Of course, I would rather build a single span, heighten and strengthen the old towers and raise the level of the roadbed."

The editor held up a warning hand. "Wait a minute! We must keep the cost as low as possible. Don't let yourself be carried away, Mr. Roebling."

"I was thinking of the future," John persisted. "Pittsburgh is growing rapidly. A beautiful suspension bridge, with the level raised, would be ideal. It would do away with that steep grade at each approach. These are dangerous. You have seen how horses slip and fall when there is ice underfoot?"

Craig looked thoughtful and toyed with his letter seal for a moment. "You're right about that last point. But utility is the main consideration. Beauty may have to be sacrificed for the sake of economy."

John swallowed his objections and promised to bring in plans using the old towers and piers, much as they were before the fire.

Mr. Craig said that he would call the company's board together to give him a hearing.

All the way back to the office, John fussed and fumed. He stopped to look again at the ruins and made a few notes. He should have brought up another point. By raising the bridge level he would make it possible for river steamers with tall smokestacks to pass under it. Up to now they had been forced to stop at this point. Passengers going to or from Brownsville, upstream, where the new National Road ended, had to use smaller boats and transfer here. This was expensive and a

waste of their time. Such an argument should appeal to any hardheaded businessman, John assured himself.

Once more his estimate was based only on actual costs—fifty-five thousand dollars. Raising the level would add only ten thousand dollars to this figure. Surely, these men shared his faith in the future of Pittsburgh, he told himself as he began his presentation. Even if they would not consider a single span, they would agree to this small added expense, especially since he was again willing to sacrifice his own profit.

When at last he sat down, a tall, dour-faced man in a stovepipe hat jumped to his feet. "Fifty-five thousand dollars is as high as we can go!" he shouted. "We cannot add the cost of raising the level!"

"Mr. Roebling said he could use the old piers. That will save a lot," Mr. Craig said.

"Why add to it?" the dour-faced man replied.

"I get your point, Captain Hart," Craig said, narrowing his eyes and turning toward the speaker. "But I told you only yesterday that a banker friend of mine in Philadelphia promised to lend us more money if we need it."

This was news to John Roebling, and it lifted his hopes.

Captain Hart glowered at Craig from under the narrow brim of his hat. "I am against raising the level, even if this Mr. Roebling could do it for the sum he has set."

John was puzzled and disappointed by this reaction. He studied the sullen faces turned in his direction. Here before him sat the "fathers of Pittsburgh." What a measly lot they were! His argument about saving money for travelers had fallen on deaf, even hostile, ears.

Again Craig spoke. "I think we owe it to this man to give him an explanation. What do you say, Captain Hart?"

The Captain studied the table top. "I do not see that it is any business of his; but if you want to talk so much, go ahead."

"Very well, then I will talk." Craig spoke to John in a low voice. "I explained to the businessmen of Pittsburgh why you

wanted them to agree to raise the level. The idea makes sense, except for one thing, as far as they are concerned. These men do not want river steamers going all the way to Brownsville!"

The board members shifted uneasily in their chairs. John was shocked. Surely, these men could not be so petty.

"To my mind," Craig continued, "this is sheer folly. Pittsburgh is a large city. She lies at the end of the Pennsylvania Canal. Undoubtedly, this will be the spot where a cross-mountain railroad will pass a few years from now. As a center for commerce, no other place equals our city. Still, these men here are afraid. What of? They are afraid that they will lose a few overnight hotel guests!"

John was even more astonished at this news. It was ridiculous! Pittsburgh fear competition from little Brownsville? Still, this was the way things stood. The newspaper editor must know what he was talking about.

Craig was really excited, now, as he made his final remarks. "We should be glad to raise the bridge level. It would save accidents on the approaches. What if it does give our Brownsville neighbors a little more trade? I say, give them every opportunity to outrun Pittsburgh! We have nothing to fear."

These men were selfish, greedy. John longed to tell them so, openly and clearly, but he dared not enter into the argument for fear of losing the contract altogether. This he could not afford to do. He might have to wait several years before another chance to build a suspension bridge came his way. With this in mind, he kept silent and tried to hide his disgust. He was very glad that he did, for a few days later he received the contract. No one had suggested calling for bids from other designers.

Since John did not plan to build the bridge from scratch, he had to employ many compromises. The existing shore towers were slender in proportion to the weight they must support. To avoid a tendency on the part of the heavily weighted cables to pull the towers toward the center of the span, he installed a system of pendulums to provide an auto-

matic method for keeping the pull uniform on each side of the towers. The cables were five feet closer together at their lowest points, or centers, than at the points where they crossed the towers. In this way, Roebling increased the resistance to lateral sway—an important innovation. He also invented a system of diagonal stays. These were iron rods which he fastened at the tower summits and to the timber beams of the roadway below, and for equal distances on each side of the piers. These stays, according to a noted present-day bridge designer Dr. David B. Steinman, were most significant, since they added strength and rigidity hitherto unknown in suspension bridges. There was one more important innovation. John provided for a system of lattice trusses, with heavy timber chords at the top and bottom. This increased the resistence to undulations and was in the form of a deep railing on each side of the bridge. In fact, John kept in mind all the stresses which he could imagine would affect this bridge. He wanted it safe against hurricane winds, against the dreaded rhythm of a herd of marching cattle, the weight of six-horse teams with wagons loaded with coal, crowds of pedestrians—any hazard whatever.

The Monongahela Suspension Bridge had to meet its first great test much sooner than John had expected. It was Saturday afternoon, in January, 1846. The farmers were closing their stalls in the market place. Many of them lived at a considerable distance from the city, so they had to get an early start for home in order to milk their cows, feed their chickens and pigs. From the center of the bridge, where John stood conferring with Charles Swan, he could see the men hitching their horses to wagons and carts. Packet boats chugged along the gently flowing icy water of the Monongahela. Flatboats and rafts loaded with passengers started out. Most of the homeward-bound crowd had not yet crossed the river when John noticed dark clouds to the northwest. "We may get a storm before sundown," he remarked to Swan. "It looks threatening over there."

Almost before he finished speaking, he heard a thunderous roar upstream. A wall of water, ice, overturned boats, logs and planks tumbled around the bend. Shouts of "Help!" "Run for your life!" "Jump ashore!" rang from all sides.

John was too surprised to move. The wall of water lunged toward the bridge. It crashed against the piers, splashing him as he stood clutching the railing.

As soon as it had passed, he saw the packets, rafts, and houseboats scurry for the safety of the banks. Men, women and children ran from near-by houses onto the bridge to see what was the matter.

Another wall of water appeared, almost as high as the first.

John and his foreman still leaned over the unfinished railing. The river was an angry, swollen mass. "Will this last long?" he asked, amazed and awed by the spectacle which he had only heard about on earlier occasions.

"Guess this warm weather broke the ice up north," Swan explained, talking at the top of his voice. "It may take hours for the crest to pass. Too bad it had to happen on a Saturday."

John continued to watch the churning, foaming water as it rushed between the sturdy piers. They were strong, all right, really strong. This was a good test.

"Look at that crowd!" Swan exclaimed. "Solid along the banks from here to Liberty Street. Say, someone is motioning to us from the east tower."

John saw Craig hurrying toward him.

"These farmers have to get to their stock," the editor called out of breath and red faced. "Would it be safe to let them cross the bridge?"

John looked at Swan who stood scratching his touseled head.

"That third span is minus some planks, boss."

It would be a risk, but John decided that they must take the chance. "Order the men to fill the gaps as fast as they can. Drive in a few nails." Then he turned to Craig. "The first wagons and carts can start across as soon as Swan gets the

planks in. Tell them to drive carefully, though, and stay clear of the rails."

A few minutes later, above the roar of the ice, John heard the delighted whoops of the farmers and their families. An hour later the first wagons rolled onto the roadbed, followed by men and women, all eager to get to the other side. John Roebling watched the horses and wagons forming a continuous line over all eight spans. His still uncompleted bridge stood the test, not even vibrating under the steady clop of the horses' hoofs.

John Roebling was now a man to reckon with in Pennsylvania. When he walked down the streets of Pittsburgh, strangers bowed to him and during the weeks he spent in his office preparing his final report on the new bridge, he was frequently interrupted by visiting engineers from the East, eager to have him explain his new theories. John welcomed these men and was proud and happy to point out details of construction understandable only to trained minds.

So that still other engineers might have the benefit of his experience and, incidentally, to bring his name into national prominence, John wrote an article for the *American Railroad Journal* describing the new bridge.

In the flush of this new success, John believed that from now on he would have a clear, unobstructed road to fame. He was sure that he could win all future contracts for suspension bridges. In his letter to Mr. Minor, the editor of the magazine, John said, "The Monongahela Suspension Bridge has silenced the opposition to suspension spans forever."

He could not resist adding a "catty" remark: "The Philadelphia Bridge of Mr. Ellet's is well known here, and is in disrepute on account of the vibrations. The stiffness I promised for the Monongahela Bridge has been fully attained."

It would be only a short time, he told himself, until he would build a larger, stronger bridge—from scratch. It would be so beautiful that even Charles Ellet would bow before it.

CHAPTER NINE

Rivals

John Roebling returned to Saxonburg full of hope and expectation. As always, when he had been away from home for a long period, he found problems to be solved. Herr Riedel, who had married Joanna's sister Leonora, was moving to Ohio, lured by the prospect of good land. While John was able to find a new teacher for the one-room school, his son Washington had done so well in his studies that he felt the boy should have more opportunity to advance than he could possibly have in Saxonburg or even in Butler. He arranged to send the stocky eight-year-old to a private school in Pittsburgh, where he would board all year and certainly make rapid strides in his education.

There were two unpleasant days following this announcement. Washington begged to remain at home, pointing out that his mother needed him to help care for two-year-old Elvira. Joanna said that while Washington was tall and strong for his age, in her opinion he was too young to go so far from home.

John silenced all objections with a wave of his hand. Washington went to Pittsburgh.

Roebling's fine reputation soon paid off. He received a contract to build a canal aqueduct at the mouth of the Lackawaxen River, where it flowed into the Delaware. This meant

that once more he had to be away from home for months at a time, and probably would not be there when the next baby was due in the spring.

Charles Swan promised to look after the family as well as the rope business of which he was now general overseer. John was more pleased than ever with the man. Swan was, like himself, a born executive. He immediately won the confidence of the old Saxonburg workers and the operations went smoothly, even better than they had under Baehr.

It was not until 1847, two years after the opening of the Monongahela Bridge, that John saw his next opportunity to bid on a suspension bridge contract. He was at home at the time—Joanna had just given birth to her sixth child (one had died immediately after birth in 1839), and it was named Josephine. John was holding the infant when Swan brought him the letter from Wheeling, West Virginia. He immediately handed Josephine to her mother and went to the office. Although he had never been in Wheeling, he knew that the city was an important gateway to the West. According to the letter, local businessmen wanted a suspension toll span to take care of increasing travel and commerce. They were calling on two engineers for proposals—John Roebling and Charles Ellet.

The news that he had one competitor did not bother John until he read the accompanying specifications which called for a single span only twenty-four feet wide, with a roadway one hundred feet above the river, a thousand feet from bank to bank.

John immediately realized the folly of such a demand. "A thousand-foot span is practicable," he said, "but it cannot be that narrow."

"What are you going to do, boss? Forget it or convince them?" Swan asked, a twinkle in his eyes.

"I will draw plans for one span of six hundred feet and two short end spans," John replied. "Even then, we would need extra stiffening." One of the most fascinating aspects of bridge

design, he felt, was that each location was unique, calling for new ideas, new solutions to age-old problems.

Swan sat down at the desk and propped his feet on the window sill. "I will bet my bottom dollar that your old rival will draw a single span. That seems to be what they expect and want, judging from the way I read. And from what you have said about Ellet, he is not one to argue and risk losing a contract."

John did not have to be told this. He shook his head defiantly. "What do these men know about suspension bridges? Nothing! All they want is to avoid the expense of building piers as well as towers. I will make it perfectly clear that I oppose a single span—and why!"

Eager though he was to build this bridge, he would not compromise on his principles of safety.

"If Ellet follows their lead, his bid will be lower than yours," Swan said.

Irked by this reminder, John sat on his high stool before the slanted desk and refigured. It was useless. He could not risk his reputation on such a prospect, Ellet or no Ellet.

When the award was announced, John was disappointed, though not greatly surprised. The board of local businessmen, apparently carried away by the prospect of low costs, gave the contract to Ellet. From the brief description of the proposed bridge which the board sent, John could see that it would be a flimsy affair, the prey to vibrations and other hazards. "Someone will have to come along later and add stiffening. That will cost more money and spoil its appearance. They may even have to rebuild. If they could only see ahead!" It was disheartening to be stopped by such ridiculous competition.

"Well, they do not see ahead, so?" Swan asked.

John threw the letter to the floor and left the office. "Come on. I might as well make a few important decisions while I am here."

For several years John had known that Saxonburg was a

poor location for his rope business. It had outgrown the town. The small mill and ropewalk already had difficulty in filling the orders. Even when he turned out enough wire rope, the long, hard winters and the deep snows often kept him from making eastern delivery on time. There were several days at a stretch when he could not even haul his rope to Pittsburgh.

"I should have faced this long ago," John explained as they squatted on stumps near the door. 'I cannot afford to be sentimental any longer. I must find a new location."

"What about the men here who are dependent on you for their jobs?"

"I have thought about that, Swan. Many of these families need the money. The land does not pay well, even for good farmers. But if I stay, I will lose many of my best customers. Bad weather cost us thousands last year, as you know." John sat silent for a long time. Did he really have to pull up stakes? Did he want to leave Saxonburg and all it still meant to him? He knew that a large number of his German neighbors would rather starve than move away and live among strangers. Desperately, he searched for a way out of his dilemma. "I will write to the editor of the *American Railroad Journal,"* he said, finally. "Perhaps he can suggest the name of a factory in the East where I could make a profit-sharing deal. Let someone else manufacture wire rope for my customers there." This was his only hope.

John did not have to wait long for an answer. Mr. Minor wrote that he had talked to Mr. Peter Cooper, Esquire, a prominent New Yorker. "He is a very candid man. He said that he did not know of anyone, but he assured me that he would send any information he could find."

John was disappointed, for he had heard of Peter Cooper. He was a manufacturer and had built the famous "Tom Thumb" locomotive. It might be a good idea to write him direct. He would be a good man to know.

The industrialist was most cordial. He suggested the name

of the I. and G. Washburn Company at Worcester, Massachusetts. They were leading makers of wire.

The Washburn Company replied that they had never seen wire rope and were not interested.

Again John met a blank wall. There was now only one solution. He must find a new location for his mill. Once again he wrote to Peter Cooper.

This time the industrialist was more helpful. He suggested that John look over a tract of land on the outskirts of Trenton, New Jersey.

Trenton was a small manufacturing town of only six thousand people, but it was well located, accessible to New York, Wilmington and Philadelphia. John decided that the available tract could not be better. It was on the Delaware and Raritan Canal as well as on the new Camden and Amboy Railroad. He and Swan walked over almost every foot of the twenty-five acres. It had no buildings and was originally granted to an officer in the United States Navy who had expected to develop it as a farm. Since the land was undeveloped, the price, John surmised, must be low.

Adjoining it was a fine new mill bearing a sign: THE TRENTON IRON COMPANY.

"Do you know anything about them?" Swan asked as they sauntered over to the building.

A man dressed in rough work clothes stood in the doorway, his right elbow propped against the jamb. He nodded to the newcomers as they approached, but said nothing.

"What do you make here?" John asked.

The workman looked him up and down and continued to chew on a wad of tobacco which formed a sizable lump in one cheek. Then he sent a fine, expertly aimed spray directly over Swan's head.

John dodged to one side, out of range. He was disgusted. No mere workman in Pittsburgh would greet him in this audacious manner. John had grown a mustache and pointed beard, and now was a man of substance, dressed in the best

fashion, with a high, stiff white collar and black stock. When he was wearing a hat, to cover his almost bald head, he cut an imposing figure, at least in his own mind. He drew back his broad, straight shoulders and repeated, in a more authoritative tone, "What do you make here?"

"Mostly train rails," the man said, pulling a plug of tobacco out of his pocket and tearing off a large piece. "Also draw iron wire."

A light began to dawn in John's mind. "Who owns the Trenton Iron Company?"

"Three men from New York."

"And what are their names?" John was beginning to lose what was left of his patience. "You see, I may buy this land next to you. I should like to know first who my neighbors would be."

"Oh," the worker wiped his chin on his sleeve and for the first time showed an interest. "This mill belongs to Mr. Peter Cooper, and to his son and son-in-law Abram Hewitt, who run it for him. Want me to show you gentlemen around?"

All John's anger was now gone. He was amused at this about-face. "No, thanks. Some other time."

As he and Swan walked away, John was smiling. If he bought this tract he would not only be in noted company, but he would also be neighbor to a very good businessman. That sly Peter Cooper knew what he was about when he suggested this "choice" land to him. He expected to supply the Roebling Company with iron wire!

Before John left Trenton, he signed an option on the land, agreeing to a price of three thousand dollars. It was a bargain and he knew it. He was not thinking in terms of Peter Cooper and his ready supply of iron wire, either. The fine transportation, the room for expansion were his main considerations. In the back of his mind was a new plan, one he had thought of on the spot. If the Trenton Iron Company could draw wire, so could John A. Roebling!

"Why split the profits? Peter Cooper holds no patent on that process," John explained to Charles Swan.

His companion looked flabbergasted. "Boss, I am willing to move here with you and run the mill. I got the hang of twisting wire into rope without much trouble, but drawing wire? I don't know the first thing about that. And I do not see how I could manage everything!"

"Don't get excited," John replied, hoping to mollify Swan. "It will not come all at once. We have to build the plant first, then the houses. This will take a couple of years. Then there will be the problem of a larger operation. Do not fret. I will look for a man who knows how to draw wire. There are dozens of German mechanics coming into New York every week. I will advertise in the papers."

Swan was only partly satisfied. "Ummhmm. And with you away building aqueducts, I will be left high and dry. How do you know I can live up to all this?"

"You will," John answered, a bit nettled by the question. "Any man who could spin cables so well in that short time can draw wire. Besides, men all like you. That is even more important. You are to be the superintendent here, and that is that!"

John himself planned and drew the designs for the buildings of his mill and shops at Trenton. They were small stone affairs arranged so they could be enlarged easily to meet growing demands. While the work at Saxonburg was still all done by hand, John knew that he must design machines to replace part of the labor in the new location. He sent Swan back to Trenton with the building plans, while he stayed on to keep the old mill in operation and to work on machinery designs. He worked so rapidly that he did not take time to patent his inventions. But to keep outsiders from stealing his ideas, he ordered Swan to raise the window levels in the new buildings and allow no strangers inside.

During this period, he formed the habit of writing daily letters to Swan, all of which were answered promptly and effi-

ciently. In the late stage of building, however, John managed to spend considerable time in Trenton, although he was working on the construction of three more aqueducts on the Delaware and Hudson Canal. Swan had done a fine job with the building, but since he knew nothing about the new machines the inventor had to install them himself.

One day, when John had finished work on a new machine, he noticed that there was something wrong with the pulley. "Let me see what the trouble is up there," he said as he reached high with his left hand.

"Careful, boss, let me turn off the motor!" Swan warned.

He was too late. John's hand became wedged under the fast-moving belt, and he felt himself being lifted from the floor, his legs dangling helplessly.

In an instant, Swan grabbed his feet and pulled him down.

Faint though he was, John saw that his hand was badly mangled and bleeding heavily. The pain was almost blinding. Moaning, he sat on the floor and held his wrist tightly wedged between his knees. He had to stop the blood.

"Here," Swan cried, excitedly. "I'll fasten my tie around your arm. You will bleed to death! Why, the bones are all broken!"

John looked at his hand, shapeless, tortured by pain. "Quick, get some cloths. Dip them in cold water!" He felt lightheaded. How could he have been so careless?

"Water? You need a doctor!" Swan exclaimed, as he started for the door.

"Water, I said!"

John Roebling had very little use for doctors. He had seen too many workers who lost their lives because of poor care after just such accidents as this. He had recently become converted to the popular water cure, and as far as he could see it did as much as any doctor could do.

Swan finally brought the cloths, after what seemed to John a long search. He dipped them in a wooden pailful of water

and wrapped the injured hand and wrist. Although the bleeding stopped, the pain was greater than ever.

That night, John set the broken bones himself. His hand was so swollen that he could not tell whether he was doing a good job or not. Actually, the injury was so bad that even a doctor would have had trouble setting the bones. Fortunately, his general physical condition was excellent, and the injury healed without complications. But he would never be able to play the piano or flute again, or even manage a simple tool. As soon as he recovered from the shock of the accident, he hurried back to his work on the aqueducts.

When he found time, he built a new frame house for his family, and Grandfather Herting brought Joanna and the children to Trenton. John managed to greet them there. He was well pleased with his new buildings and the house. It was much larger than the one in Saxonburg and furnished with good, solid secondhand pieces from a store in Trenton.

"I have a surprise for you, wife," he announced proudly. "We have a cookstove. You will not have to work over an open fireplace any more."

Joanna looked pleased as she inspected the heavy, square iron stove in a corner near the kitchen windows. "I'm glad of that. What about the other rooms? We need a heating stove in the parlor, too. Then the children would not get so many colds."

John had not thought of this American invention. Back in Germany people had large brick ovens to heat rooms—much more efficient than open hearths. "I will buy a heating stove, too," he said, expansively.

Grandfather Herting, who had been walking around outside with the children, came in at this point.

John turned to him. "I want you folks to move down here. I have drawn plans for a nice little house. You and Mama . . ."

Grandfather shook his head. "No. The smoke from these mills would be bad for the canaries. Mama and I are too old

to move again. Besides, what about my flower garden?" The old gentleman appeared to be quite upset.

"There is plenty of space for a flower garden," John insisted.

Grandfather had a note of finality in his voice. "No. We stay in Saxonburg."

John had always liked his wife's family. But he knew that it would be hard for them to tear up roots at their age, especially since their other daughters had now married and two of them were living in or near Saxonburg. Leanora and Julius Riedel had recently returned from Ohio and were staying in the Roebling house. But Joanna had always seemed to depend on her parents more than the other girls did. Perhaps it was because he was away for such long periods. She still spoke German and retained her old-country manners. It would be difficult for her to celebrate birthdays and Christmas away from her own family and neighbors. John noticed with a twinge of conscience that Joanna looked rather unhappy as she walked through the large rooms.

Surely, she must be pleased to have a really fine house after so many years of living in a simple one. What made her so sad? Was it more than the prospect of this separation? At last, John thought he had a clue. "You are sad because the house is not made of stone or brick?"

To anyone brought up in Germany, where a home was expected to last forever, or at least for many generations, a wooden frame house, no matter how large, looked poor, indeed. No one could feel altogether happy and prosperous living in a place exposed to wind and weather.

"Never mind, wife. I promise that in a few years you and the children will live in a brick house—much larger than this —and so fine!" John was rather surprised at himself for making such a hasty decision, but he wanted to do something to bring a smile to her worn face. A brick house would be a sign of success, a tribute to their long struggle in the new land.

Surely, this would make up for the separation from her family and friends in Saxonburg.

As it turned out, the Roeblings were soon in need of a much larger house. Washington, now eleven years old, attended a local academy. He and Ferdie shared one room, and Laura, Elvira and Josephine shared another. John had counted on this—four bedrooms, one as a spare. This would have been enough had not his sister Amalia decided to come to America with her seven children. Now that both her husband and her father were dead she longed to live near her favorite brother. This was fine wtih John; he would squeeze them all in, somehow. Then Edmund Riedel, the son of Washington's first teacher, came to live with the Roeblings. He was a close friend of Ferdie's and attended the Trenton Academy, too.

Crowded though the new house was, John still thought that there was room for one more. While he was working on the aqueducts, he found an expert mechanic who knew how to draw wire. This was the man he had been looking for, and he wrote the good news to Charles Swan.

"Bulkley is a very good worker. He can take complete charge of wire drawing. I promised him that we would find living quarters near the mill. Since he is a bachelor, it would be just as well to avoid sending him into Trenton each night. He would be lonely and might get into bad company."

Swan replied that there was no space for the new man to sleep at the mill, and the small room above the shop was already full.

Disgusted by this flimsy argument, John wrote: "Mrs. Roebling can board and bed him at the house."

He was shocked by Swan's next reply. "Your wife asks where Mr. Bulkley will sleep? All of the beds are full. Even the living room floor is occupied."

John shot back his answer. "Mr. Bulkley can sleep in the bathroom. When the new brick house is finished, he can have an attic room. All Mrs. Roebling needs to do now is to buy extra bedding."

For a time, John wondered whether he would be able to fulfill his promise to build a fine brick house with an attic room for Mr. Bulkley. A depression hit the eastern part of the country in the winter of 1851–1852, and some of his wire rope customers were too hard up to pay. When the Cooper mill next door stopped operations, John knew that he must take immediate steps to avoid financial disaster for himself. He was greatly alarmed when he discovered that there were bread lines in Trenton. Half of the working population was out of jobs. If business grew worse, John would be in real trouble himself.

His first move was to start a fund for the poor of Trenton. Then he made sweeping changes in his operations at the mill.

"Do not sell anything to customers who do not pay promptly," he warned Swan. "I will have to find new ones who can pay. Now, keep all the men at work. Some of them can build the new house. I should have built it two years ago, when I planned. Well, it will cost less, now. Here are the plans."

In a letter a few weeks later, he said, "I have told Mrs. Roebling that she is to buy nothing in the stores in Trenton. You are to get coal, food, cloth at wholesale. Washington will sell to workers after school and on Saturdays. He will keep the books. You are to give the pay, half in cash, the rest in goods. Set the prices below what they would have to pay at retail stores. This way, the men will be content. Ferdie and Edmund will raise flowers and sell them from door to door."

It did not occur to John to send Edmund Riedel back to Saxonburg to live with his family. He was not one to drop any responsibility, no matter how troublesome. During this hard winter he was supporting his wife and seven children, which now included baby Charles born in 1849, Edmund Riedel, his sister Amalia and her seven children, and he was paying tuition for ten in school. At a period when many parents did not bother to educate their daughters, John Roebling insisted that his girls should have a sound schooling,

too. And he would not hear of a suggestion that Washington give up his violin lessons to save money. "They go on as before. Someone must give us music during the Christmas holidays," he explained to Swan.

Christmas was one time during the year when John enjoyed life to the full. It was a time for singing, dancing and feasting, a time for thankfulness, for keeping alive the fine traditions of the Fatherland. He directed the celebrations each year with all the efficiency he used in his work. The birch rod lay unused on the mantel for two weeks, and the head of the Roebling household became a happy, jolly father, generous to all, including his employees. When the season was over, he became his stern self once again. His only recreation during the rest of the year was to sit in his big chair at home on occasional Saturday evenings and listen to Washington play the violin.

In a way, this made up for the loss of his own ability to play an instrument. He sat back, eyes closed, humming the refrain, occasionally looking at his favorite son, a feeling of pride and achievement, unspoken but full in his heart.

This financial crisis spurred John's imagination. He had completed work on two of the aqueducts, so he was free to use most of his energies in seeking new markets for wire rope. The first was as a means for transmitting power to replace the expensive, inefficient flat-belt method then in general use. He installed a power cable seven thousand feet long to operate his ropewalk, and immediately applied for a patent. Its success had far-reaching results, and it became the standard method for transmitting power over long distances, remaining in use for many years. And it also became an added source of much-needed income for John Roebling.

He wrote an article for the New York *Journal of Commerce,* suggesting a transatlantic cable between the United States and England. Unfortunately, it was five years before Cyrus W. Field took up the idea and discussed it with Peter Cooper. Twelve years passed after John's proposal before the

cable actually materialized. So the idea was of no financial help during this crisis.

He went personally to see mine operators and sold them on wire rope, and he traveled into the forests to point out its use to loggers. He convinced manufacturers that his product would help them haul heavy materials at low cost, and persuaded every canal company to install wire rope.

As soon as the financial crisis had passed, John turned his thoughts to bridge building again. He wrote an article pointing out that by making heavier cables, using far more wire than he had used at Pittsburgh, it would be possible to build a suspension railroad bridge. His imagination turned to several spectacular locations: one was at Cincinnati across the Ohio River; another, across the Mississippi at St. Louis, the third at an even more famous spot—over the stupendous gorge of the Niagara River near the falls. It was this last which he urged.

"I think my article may stir things up a bit. The Great Western Railroad of Canada has a terminus there. I know for a fact they want to cross the river," he told Swan.

Since childhood, John had seen pictures of Niagara Falls. Every German boy knew of it and longed to visit this amazing place. What an honor it would be to build the first great bridge there! What fame it would bring to his name . . .

His article, which appeared in the *Railroad Journal,* did stir things up as he expected. It renewed old speculation about a bridge at Niagara. Within a few weeks, John received a letter from Major Charles Stuart, the newly appointed Engineer for the state of New York. He confirmed John's prediction that the demand for a bridge across Niagara would force action. But the Major wished to proceed with caution.

"Before making a decision, we are sending this circular letter to leading bridge engineers in the United States and Europe. We are asking them whether they believe it would be possible to build a railroad suspension span at Niagara."

Disgusted by such cautious notions, John replied in strong terms that his belief was a sound one.

He knew that it would be many months before all the answers were received at Albany. The majority of engineers would oppose a suspension bridge, particularly those in England and on the Continent, since very simple roads spans, built according to the French plan, were subject to dangerous vibrations. None of them had seen his own suspension bridges, and they probably thought that his printed reports were colored by his prejudices. He had no doubt that professional jealousy would enter the picture, too.

The results of the survey were finally announced. Only two engineers believed that it would be wise to consider a railroad suspension bridge. One of them was, of course, Charles Ellet, who had just completed the longest suspension bridge in the world—at Wheeling. The other was John Roebling. A final decision was due within a few weeks.

CHAPTER TEN

A Bridge at Niagara

John expected to hear from Major Stuart in short order. After a month passed and he still had no letter from him, he wrote to Mr. Minor, the editor, asking him what news he had of the project.

"I am glad to learn that you are moving in the matter of the Niagara Bridge," Minor replied. "I advise you to be *active*, as Mr. Ellet is always untiring in whatever he undertakes. I believe he offered to take stock in the bridge company. I will have a confab with Major Stuart when he comes to New York."

In desperation John wrote to Major Stuart, who as State Engineer was now a commissioner of the Niagara Bridge Company. Wisely, he decided to ignore any mention of Ellet, but to show how carefully he, John Roebling, had thought about the problems at Niagara. "I have put some time on the subject. Wire cables, when well made, offer the safest and cheapest means for the support of heavy weights. Any suspension bridge within fifteen hundred feet can be made perfectly safe for the support of railroad trains. The greater the weight to be supported, the stronger the cables must be. This is a matter which can be figured exactly. There need be no guesswork. The plan I have in mind will convince you."

Mr. Minor had told him that Charles Ellet's bid was two

hundred and twenty-two thousand dollars. John knew that he could more than meet this figure. He would beat Ellet at his own game by underbidding him this time. He drew his estimates carefully, copied them and sent them to Stuart along with his bid of one hundred and eighty thousand dollars. Not only that, he offered to subscribe twenty thousand dollars of that sum himself! Although it would take every cent he could lay his hands on, he did not intend to miss this great opportunity.

In November, 1847, the directors of the American and Canadian Niagara Bridge Company announced that they had reached a decision. They awarded the contract, not to the lowest bidder, but to Charles Ellet who had lowered his bid to one hundred and ninety thousand dollars.

The fact that the company had not accepted his lower bid was proof enough to John Roebling that Stuart was in league with Ellet. Still, this was no guarantee that his rival could actually build the bridge. John followed every move at Niagara as it was reported in the papers.

"Well," he asked when Swan bought in the first clippings, "did he manage to get his first wire across the gorge?"

"Ellet got the first wire across, all right. He should run a circus. What a fortune he would make! He offered five dollars to the boy who could fly a kite to the Canadian bank. There is a big to-do about it in this story from Rochester."

"Really?" John tried to appear indifferent.

"Yup. Hundreds of boys showed up. They had blue kites, red kites, all shapes and sizes. One kid named Homan Walsh managed to fly his across. After that, they tied a wire to the kite and pulled it to the Canadian bank."

"Very original, that Ellet," John admitted, pretending to study a chart which he had before him on the desk.

"That is not all Ellet did for his admiring public. He finally got his first cable strung across the gorge, fastened at each end to temporary wooden towers. Then he had himself hauled across in a wire basket!"

John had to smile. "You mean he made this an excuse to advertise himself?"

"And right away they hauled him back to the American side. I must say he had a nerve. It says here that the wind was very high and it was bitter cold, even on the bank."

John was amazed that Ellet should play up his first crossing of the Niagara gorge. It was only one more chore which any builder would undertake. As for the kite idea, John himself had not figured a better way to get the first wire across. But a contest! He was even more astonished a few months later when Swan showed him a story from a Buffalo newspaper. Ellet had at last managed to erect a narrow footbridge across the gorge. This was a necessary step, since workmen had to have some way to get materials between shores, but Ellet made a big splash with this achievement, too.

"Mr. Ellet himself mounted a horse and rode across the seven and one-half foot bridge," the reporter said. "It still has no sides or handgrasps. As the brave engineer neared the center of the span, two hundred and forty feet above the howling water, women fainted. Men turned their heads. Everyone expected horse and rider to tumble into the whirling rapids far below!"

John read no more. Not in a hundred years could he learn to compete on such a basis with Charles Ellet! Did Americans demand such stunts?

He was actually relieved that Swan brought no more reports on affairs at Niagara during the next few months. Still, John was curious. From this point on, the dear public would have little to amuse them. Ellet's way of making cables on the ground was a long, tedious, uninteresting operation for visitors.

Then a brief item in the papers stated that work on the Niagara span was at a standstill. There was a disagreement between the engineer and members of the bridge company. Many experienced engineers who visited the site had expressed doubts about the safety of the Ellet plan.

A short time later, John heard that Charles Ellet had re-

signed in December, 1849. This was exactly what he had been waiting for, and it came at the right time, before too much money was spent. Now he was in a strong position and immediately laid new plans for securing the contract. Best of all, since he no longer had to fear Ellet's competition, he would not be forced to bid so low that he would be doing the work for almost nothing. The company would pay for its mistake. John Roebling offered to build the bridge for a fixed salary, as contractor and designer. They would pay for all labor and materials. At last he was making an offer on sound business lines for a real suspension bridge. He would be able to show the world that he could do what Ellet could not. As John thought about it now, he was glad the first contract went to his old rival. If it were not for the time and money wasted he could almost say it was fortunate for everyone. Perhaps Ellet had learned a much-needed lesson.

John waited for two long years. Faced with Ellet's failure and plagued by professional doubts, the company dawdled while John sweated and fumed. "If there is one thing I hate it is indecision," he said to Swan. His design was better than any other they would find. It would cost less than an arch bridge, and it would be safe.

At last in the spring of 1851 the news came. John Roebling would build the bridge!

The bridge company's lawyer seemed very nervous when he handed John the contract. John was amused, but he kept a straight face. He said nothing when the lawyer spoke of Ellet's failure. He refused comment when the man repeated views of other bridge designers and noted engineers. He would begin his work as if he had never heard any doubts about its success.

After the lawyer left John's office at the mill, Swan entered. "I thought you might be interested, boss. The news of your award has caused a big stir." He held up a copy of a New York paper.

"No doubt," John replied sarcastically, as he pushed the newspaper away.

"It says here that in New York they have set up lotteries. Men are betting on your success or failure at Niagara. Editorial writers everywhere have articles on it. They even reprinted one from a Chicago paper. 'Can It Be Done?' the editor asks."

John was secretly pleased that the announcement received so much attention, but he would not let Swan know this. "Very amusing. If I were a betting man I could get rich on those lotteries."

After the mail arrived that day, John handed a letter to Swan. "Now this means something. It is from England's greatest bridge engineer Robert Stevenson."

"What bridges has he built?"

"He has just completed the world's first large wrought-iron girder bridge. It is called the 'Britannia' and is in South Wales. A railroad bridge."

"Yes?" his superintendent asked, as if speaking to himself. "He says in this letter that he gave up the idea of a suspension bridge. He does not think you can build one for railroads. Too much weight for cables."

"Read the last paragraph," John ordered, almost proudly.

" 'If your bridge succeeds, then mine have been magnificent blunders.' " Swan looked up. "What do you say to that?"

John reached for the letter. "Robert Stevenson will eat his words."

In 1851 work began at Niagara. There were no wild rides across the footbridge, no fanfare, no contests. John Roebling proceeded methodically, quietly. Residents and travelers at Buffalo came to the falls and watched for a while, then wandered off to view more exciting activities. The engineer did not notice them. He followed every step of his operation, leaving only the actual manual labor to others. It was essential that he look ahead, foresee unexpected difficulties and train men for new operations.

In spite of all precautions, however, there were accidents and other difficulties which caused delays. He lost his head

carpenter when the man was injured by a heavy piece of lumber. This meant that John himself had to take over his duties. Three men died in a dormitory fire when one of them went to sleep with a lighted cigar in his hand. The most disastrous blow was a cholera epidemic—the disease which had killed his old friend Hegel. Sixty of John's workers died in one week. The doctors and nurses could not begin to take care of all the ailing.

John sat back powerless, doing what he could to obtain medicine and more nurses. Nothing helped. Finally, he dismissed the doctors and took matters into his own hands. He called in two stout German workers who still managed to stay on the job. "From now on, every man who takes sick is to be brought into this office. I will set up a row of cots and take care of them myself."

"Are you a doctor?" one of the men asked.

"What good are doctors? They tell me they have no cure for this plague. Nearly everybody dies in spite of the medicine. I am going to try the water cure."

Within a few days all the beds were occupied, and the two stout Germans were nearly exhausted from helping John Roebling apply his water cure. In spite of their efforts, one after another, the victims died.

"You see that house there?" one of the Germans asked.

"What about it?" John asked gloomily.

"Every one of these men lived in that house. Cholera has gotten into the walls."

A sudden light dawned on John. "You may be right! Go over there right now and set fire to the place."

Both men backed away, "Oh, no. We are afraid to go near it."

"I will give each of you one hundred dollars if you will set fire to it."

The bribe proved stronger than their fear, at this point, so they agreed. But that night, while the ashes still smoldered,

one of the men took sick; by sundown the next day, both Germans were dead.

At first, John felt a twinge of conscience. After thinking about it a while, however, he reached the conclusion that fear was the culprit. Keep off fear. Whoever was afraid of cholera would be attacked. Several times during those terrible weeks, John himself felt signs of weakness, but he kept saying over and over, "I will stay well. I *must* stay well."

When the epidemic at last came to an end, he was exhausted but in good health. "I kept well by not giving way to fear," he wrote Swan. "As an added safeguard, I took the water cure. The two methods saved my life."

Although John never managed to gain many converts for this pet enthusiasm, he still kept faith in it. This was strange since he believed so firmly that amateur engineers had no business designing bridges. He was certainly an untrained amateur in medicine. When he held forth on subjects he really knew, he was always on steady ground. He was not in the least surprised when he learned that the "greatest suspension bridge in the world"—the one Ellet had built at Wheeling—fell during a windstorm. It was with mixed feelings of "I told you so," and sadness that he read an account of the disaster in the New York *Times*.

"About three o'clock we walked toward the Suspension Bridge and went upon it, enjoying the cool breeze and undulating motion of the bridge," the reporter said.

John was so disgusted that he had to wait before reading more. Undulating! As if one expected a suspension bridge to do that!

"We had been off the flooring only two minutes, and were on Main Street," the story continued "when we saw persons running toward the riverbank. We followed just in time to see the whole structure heaving and dashing with tremendous force. For a few minutes we watched it with breathless anxiety, lunging like a ship in a storm. At one time it rose to nearly the height of the tower, then fell, and twisted and writhed. It was

dashed almost bottom upward from its dizzy height to the stream below, with an appalling crash and roar."

John read similar reports in the next few weeks, and the more he read, the angrier he became. Many engineers, experienced in bridge building, wrote articles about the tragedy, but only he realized what had caused it. Ellet had ignored the lessons John had tried to teach his profession when he used diagonal stays and extra stiffening in his bridge across the Monongahela. But in fairness to that brilliant, imaginative engineer whose career collapsed with his bridge, it should be remembered that John Roebling was still far ahead of his time. The science of air motion was in its infancy, as were methods of calculating stress. The story of the Wheeling Bridge disaster found a parallel as recently as 1940, when the Tacoma Narrows Bridge collapsed under the same conditions and for the same reasons.

John had no love for Charles Ellet. Actually he never met the man. He had considered him his chief rival in the field of suspension bridges. He wanted to defeat him not through tragedy but by building longer, stronger, more beautiful spans. He believed that with the completion of his Niagara Bridge, he would have a fairly won victory over Ellet. Already he was bidding against him on a bridge across the Ohio River at Cincinnati. He had reason to believe that he would get the job. This other kind of victory tasted of salt. John would have felt far more victorious had he been able to win Ellet to his methods, make him admit when he saw the Niagara Bridge that this was the way to build suspension spans.

The Wheeling disaster had its effects on the work at Niagara. John rushed an order to Swan for more wire rope to add extra diagonal stays below the floor. Even a slight motion during a windstorm would cause panic. He could not afford to take a chance on criticism, although he was positive that his bridge would stand all foreseeable strain.

It was fortunate for him that the Niagara span was so close to completion. As the work came to an end, about a year after

the trouble at Wheeling, John was elated. What a long, hard job it had been! He had not even been able to go home for Christmas that last year. Worse than that, he forgot that there would be a new baby in the house. When Swan wrote, mentioning the infant Edmund, and reporting that the boy and Joanna were fairly well, John was shocked. "This takes me by *surprise*," he replied, "not having been informed of the baby's arrival at all!"

He had been informed, all right, but laid the letter aside unopened. During these four years at Niagara he had turned nearly all family matters over to Swan who continued to keep him informed by letter. John was too busy, too harassed, too preoccupied to think of writing to Joanna. The children had formed the habit of consulting the superintendent on all matters in place of their father, whom the younger ones scarcely knew, since he did not come home often, and for two years remained at his bridge building during the holidays. When he was at home for a day or two, they saw him only at meal times. It was Swan who made the arrangements to send Washington to Rensselaer Polytech where he was now a freshman with a fine scholastic record. The sixteen-year-old wrote long, amusing letters to Swan, keeping him fully informed of all that happened, but here, too, John Roebling was interested only in results—grades. Since Washington was healthy and a superior student, he need know no more.

In his report to the company on completion of the Niagara Railroad Suspension Bridge, John made a special effort to quiet any fears about its safety. And a special argument for other bridge builders, he wrote in more detail, illustrating his article with drawings. It came out the following year in book form, published first in London.

Gradually, with each bridge, John developed his art of suspension construction and design. He put great stress on stiffening all of them, but at Niagara he used real stiffening trusses for the first time. They were in the form of eighteen-foot-deep bracing between the upper and lower decks. This last bridge

approached the goal for which all designers had searched. At Niagara, John Roebling made what Dr. David B. Steinman has termed, "the first important advance in the art of suspension bridge design in two thousand years."

He received the contract for rebuilding the Wheeling Bridge, and to John, it came as an anticlimax. His real reward was a letter from Robert Stevenson, the English builder, whose opinion meant far more to him than that of any man alive.

"If my bridges have not been magnificent blunders," Stevenson said, "at least yours is a spectacular success. You are well started on the road to immortality."

So he was, but the price he had paid was great. John Roebling knew that he had become a stranger in his own home. At times it bothered him, for even during these four years at Niagara, the thought of home, his sons, his daughters and Joanna was always in the back of his mind. And there was Washington, growing to manhood, a student engineer. His plans had not changed. Soon they would be partners.

CHAPTER ELEVEN

Partners

The lean, difficult years of struggle for recognition had come to a close. For the first time John Roebling could demand good pay for his efforts. Money for engineering projects would never come too easily, but he need not subscribe cash from his own pockets to obtain a contract. His position was assured.

John designed a number of other suspension bridges, including one at Waterloo, Iowa. He again urged a railroad span to cross the Ohio River at Cincinnati, but financing problems there delayed action. After he had rebuilt Ellet's span at Wheeling, his first great effort was at Pittsburgh, replacing a covered wooden toll bridge across the Allegheny River at Sixth Street. This was to be his finest yet; everything he had learned would go into it. This time he would use iron, not lumber, for the roadway.

"Are the stockholders willing to pay for that kind of bridge?" the practical Swan asked.

"They will. The town is money happy these days. Everyone takes a rosy view of the future in Pittsburgh."

John's prediction came true. Stock in the new bridge sold out in one day—a sign of confidence in the designer whose first major efforts had been in their city. He felt like a native of Pittsburgh. Everyone spoke to him on the street. Crowds of

people gathered along the riverbank when he surveyed for the shore moorings, but the best part of all was that the company gave him a free hand to build the soundest, most beautiful bridge possible. They told him that the purse was open.

John was smart enough to know that the purse was not bottomless; still he could now, for the first time, work unrestricted by finances. "Swan," he said as he left for Pittsburgh, "I am going to push another load onto you."

Swan groaned. "I am too fat and old to take on more."

"From now on, you will have to stir your stumps to get business for the mill. I will not have time to sell wire rope or scour around for new customers. This means you will have to be away from Trenton part of the time."

"Who will take charge when I am gone?" Swan asked, surprised.

"Washington will graduate next spring. He will be your assistant."

"Well, boss, I thought you would make a bridge builder out of him."

John nodded. "That will come as soon as Ferdie graduates from college."

It did not occur to John Roebling that any of his sons had ideas of their own on this score. He planned their future as he had planned his own. Washington designed a very good suspension aqueduct as his graduation paper. He was thorough, energetic and had a large measure of *sitzfleisch*, or what Americans call "stick-to-itiveness." Yes, this oldest son, in spite of everything, would be a good bridge builder. He would live up to his expectations.

John never had a chance to make plans for Edmund. The child had been sickly from birth and died soon after his second birthday.

Ferdie was a born salesman. A student at Columbian (now George Washington University) in the nation's capital, he was already on the lookout for wire rope customers. This second son would soon be able to take over the outside con-

tacts for the mill, leaving Washington free to join him in bridge building. Swan would then give all his time to the work in Trenton, as he had in the past.

Charles was a natural builder. Although he was now only eight, this was clearly evident. He loved to hang around the mill to "help" Mr. Swan. He showed a knack for handling machinery and possessed an inventive streak. Also, he was already studying the piano and was, all in all, a captivating boy.

Still, it was Washington who would end up as John's partner in bridge building. Nothing would change that.

The year Washington graduated, another financial panic swooped across the country, and the twenty-year-old returned home to take full responsibility at Trenton. Swan was constantly on the go, looking for new business, collecting slow accounts and searching for high-quality iron at low prices. It was a difficult year, but the Roebling firm weathered the storm. John was proud of his son's fine judgment during this critical period. As soon as the panic appeared to be over, he sent for Washington. He needed his help on the Allegheny Bridge. Swan would just have to do the best he could until Ferdie graduated.

The young man did not look at all sad about the turn of events as he jumped off the train. "I have arranged for you to board at a very nice house in Penn Street," John told him proudly.

"No girls there, I hope," Washington remarked as they started toward the street with his bags.

"Oh, no. I knew you would not want to have girls around. They might take your mind off your work." He darted a sly look at his son.

"Absolutely!"

It was a lovely spring Sunday. Father and son first went to Mr. Preston's Presbyterian church which Washington had attended during his boarding school years in Pittsburgh, before the move to Trenton. Then they took a long walk.

"Why, this town is booming," Washington remarked. "So much new building—people putting new iron balconies on their houses. You'd never know there was a panic."

"You can judge the success of a factory town by the amount of smoke in the air. And there is more here than any place I know. Some days, when it is raining, you have to use lamplight at the office in midafternoon."

Washington stood looking at the partially built Allegheny Bridge. "Beautiful!" Down below him the graceful iron tower stood forty-five feet in the air. The one on the opposite shore was still in the beginning stages.

"Yes, the bridge will be beautiful!" John repeated. He could say no more. As he stood there with his son, a wave of emotion swept through him. In this bridge he would fulfill two dreams, if all went well. He would prove that beauty and safety could be combined even in iron and stone. As his assistant, Washington would prove that the name of Roebling could be counted on for many years to come. "It is good to have you here," he said aloud. His voice sounded strange, the words inadequate. He reached out his hand to touch his son, then drew back, embarrassed, shy. He had long ago forgotten how to show his deeper feelings. He hoped that Washington knew just how strongly he meant these simple words.

The next few months were the happiest of John Roebling's life. He was almost too happy. He frequently marveled and wondered if it could last. He found himself laughing out loud at some of Washington's casual, briefly worded remarks, at his offhand, yet efficient manner of solving problems. How like his mother Washington was. When Joanna was young, she had laughed often, too, and was fond of making little jokes. Not in recent years, though. She had been strangely subdued and sad since the move to Trenton.

One morning, soon after Washington's arrival, a pompous little man carrying a worn black bag stepped into the office. "I am Dr. Rogers."

John peered through the crack in the door from the ad-

joining room. The man's face was familiar. Let Washington handle him.

"What can I do for you, sir?" his son asked.

Dr. Rogers cleared his throat nervously. "Long ago, when Mr. Roebling was building the Allegheny Aqueduct, one of your carpenters made use of my medical services."

"I see."

"His name was Charles Snow, I believe. He ran up a bill of forty-five dollars with me."

John stood listening by the door. Snow? Was he speaking of Charles Swan? A small bell rang in the back of his mind. He recalled hearing his foreman speak of some "no-good horse doctor" who had taken out someone's wrong tooth, then nearly killed Swan's wife by bleeding her when she had a stomach-ache. John had no intention of joining in this conversation.

"What do you want, Dr. Rogers?" Washington asked.

"I want my money, that's what. That Snow gave me only ten dollars. He owes thirty-five more. Where is he?"

There was a pause. "Oh, I remember, Snow did work for my father. Showed up in Trenton after we moved back there, a no-good kind of fellow. Father told him to move on. Never heard what became of him."

When Rogers left, John came back into the room. "Why, you liar, you! He was talking about Swan."

Washington turned a perfectly blank face. "I know. It is going to be fun to blackmail Swan. Get even for all that work he pushed on me when I was a boy."

"He was too easy with you boys. If you ask me, he was soft. I sometimes think you think more of him than you do of your own father."

Washington gave him a sidelong look but said nothing. John was afraid to say more, afraid to hear the truth from his son's lips.

The new bridge was not to be a single span. John had designed it with two river and two shore piers, a total length of

more than one thousand feet. It would be high enough to give clearance for steamboats. For the first time, he was experimenting with piers which had rounded ends, to avoid the jamming of debris and ice during spring thaws. The design suited the conditions perfectly and would blend gracefully into the surroundings. He set Washington to work managing the pump while he bossed the pier construction. River traffic was unusually heavy, even for summer. The only real trouble was with raftmen who seemed to take a delight in jamming the pump line and bumping against the wooden framework for the piers. Each time this happened, John wasted several hours repairing the pump. How would Washington meet this kind of emergency?

He soon learned.

His son stood atop the next pier, calling orders to men who were bringing up a load of cement in a small boat. John saw the raft near the frame where the men were to unload. Then it happened. A loud thud, a sound of splintering wood, the machine pump gasped and came to a halt, followed by howls from the workers. Without a word, Washington dived into the swift current and swan below the surface toward the raft where the rough, dirty-faced men stood laughing as if they would split their sides.

He leaped out of the water, grabbed both men by the legs and sent them headfirst into the river. Then he picked up the rafting pole and threw that in after them. Within a few minutes he repaired the pump as calmly as if nothing had happened.

John himself had scolded and threatened on similar occasions, all to no avail. To his delight, this was the last time a raft came near the bridge works.

When a shipment of material arrived, John always presented the bills at once to the treasurer of the bridge company. He disliked the task because the man was so sour faced and hemmed and hawed until he was reminded that it was a part of the contract. John felt it an affront to his dignity to

argue about these bills, so he turned the job over to Washington.

The young man returned from the bill-collecting session as calm as an unfurled sail. "How did you make out?" John asked.

"I told him the company sent us an extra five tons of iron by mistake."

"Oh, you didn't!"

"The old duffer wiped the frown off his face then. 'Don't tell anybody,' he said. Almost cracked his cheeks, but he smiled. Didn't believe my tall story—really. The water cure would be just the thing for him."

"Or you could shove him into the river," John replied. "You may be interested to learn, young fellow, that quite a few people up here believe in the water cure. They go down to West Virginia to those fancy springs and come back looking perfectly fit."

"Then what happens?"

"They go right back to overeating, taking medicine and worrying about diseases. In a month they are sick again."

John had to make frequent trips to Cincinnati to talk with the head of the company which had chosen him to build the new bridge there. They approved his design for the single span and appeared to have full confidence in him. But money in this western area was always scarce, and John found that his excavation work had to come to a temporary halt, due to lack of cash to pay his men. There was also an argument over approaches. Thinking of the future of this great city, John wanted them to be impressive and wide enough to handle very heavy traffic. He argued heatedly for a broad, beautiful avenue. It was useless. Disgusted with the bickering, he returned to Pittsburgh.

Washington had begun work on the cable spinning. He could see him out in the "buggy" high above the water with one of the men, showing him how to wrap the strands. As John

was about to enter the office, he heard a near-by worker gasp. Whirling around, he saw that Washington's head hung limp, his legs dangling helplessly from the buggy. "What happened?" he cried, running toward the river, his heart full of terror. Was the boy dead? No! It could not be! The men were hauling in the buggy.

John hastily unfastened the safety belt and pulled the limp body into his arms. "Washington, my son!" he moaned.

Almost immediately, Washington opened his eyes. He ran one palm over his head and exclaimed in a wobbly voice, "I'm bleeding. Nice experience. That wrench knocked all my troubles out of my brain for a minute. Oh, well . . . Why, Father, you aren't scared?" he added in mock horror.

John was so relieved to hear Washington's voice that he did not notice what he said. "Hurry, quick, get a doctor!" he roared.

"Thought you didn't believe in medicos," Washington said, trying to get up.

There was nothing critically wrong, only the matter of a few stitches; yet John watched anxiously, and when the doctor left he handed him ten dollars.

The doctor stared. "Why, my fee is only one dollar, Mr. Roebling."

John pressed the bill into his hands. "Ten dollars is cheap to me. A fracture might have killed my boy. Take it and be thanked."

Washington recovered rapidly and in a few days took complete charge of the cable spinning. John watched uneasily. His son was almost too unconcerned, too heedless of danger. His enthusiasm reminded him of his own younger days, when his legs never tired. Work itself no longer was a joy to him. His chief pleasure now was in designing, in obtaining the contract, in seeing the work completed.

Washington never complained about working in bad weather. It was cold, damp and rainy when he began to wrap the smaller cables. John watched his son as he worked out on

the frail footbridge. A strong wind came up, and he noticed that the men had trouble keeping their footing, so he signaled them to return to shore.

"What's the matter?" Washington asked. "Anything wrong with the work?"

"I just do not feel like diving into that river to rescue anybody. Look at your footbridge now!"

"Golly, that wind will send it to the dickens! Rearing like a wild horse!"

John was more interested in what happened to the bridge itself. The gale shook it wildly from side to side. "I wish we had the flooring in. With no stiffening in that direction, this storm could dash all our work into the river." Still, one worry was over—Washington was safe.

Father and son remained out in the storm until it finally passed an hour later. John was so tired from the strain that he did not voice his relief. This had been a severe test, but his new bridge held strong.

Soon after the storm, John made another trip to Cincinnati, leaving Washington to finish the work alone. He came back for the opening, however, and he and his son stood together at the site, watching the first team of horses as it crossed the new bridge. "Our bridge," he said, turning to Washington. He knew there were tears in his eyes, but he did not care. They were tears of gratitude and pride.

John had no doubts that the two would build the Cincinnati Bridge together. He even hoped that he could turn over most of the actual work to his partner, for he had his mind on other matters. He had secured a patent for railroad cars to be made of iron, and an experimental car was now in production at New Brighton, near Pittsburgh. Also, he wrote a letter to Abram Hewitt, Peter Cooper's manager, suggesting a one-span bridge between Manhattan and Brooklyn. His proposal stirred considerable interest and even stronger doubts. The newspapers and officials tossed it about for a while, but John could see that the idea had to ripen before anything came of it.

The iron railroad cars were far ahead of the times. John gave up the patent, and the railways were to roll wooden passenger cars for many years to come.

The nation was entering a period which would bring even John's bridge building to a temporary halt. If he had not been so busy he might have foreseen it. He had always considered slavery the one great blot on his adopted homeland. That it would lead to war was unthinkable. He felt sure that Abraham Lincoln, the newly elected president, was strong enough to prevent a rebellion.

Other people, more informed on political trends, were not so sure of this. Among them were the directors of the Cincinnati-Covington Bridge Company. Although the foundations had been started, no one was willing to risk money for John's bridge now. He and Washington returned to Trenton to wait for a more favorable turn. Hopefully, they went down to the railroad station to join the crowd gathered to hear Abraham Lincoln's short platform talk as he paused on the way to his inauguration.

John liked this tall, lanky man with his simple, yet effective manner, but the tone of his speech was not encouraging. "I believe there will be war," he remarked as they walked through the jostling crowd.

Washington said nothing.

During the coming weeks, he silently read the newspaper reports which his father handed him. Still he made no comment. John became uneasy. Was the boy uninterested? He seemed so American. He had courage.

The entire family, except for Washington, showed an intense interest in affairs in the South. Even Joanna asked eager questions each day when John brought in the newspaper. Washington played his violin all evening, as if in a dream. Even the shocking news that the South had fired on Fort Sumter failed to stir a comment. Three evenings later, Washington returned from the mill, pale and drawn.

John studied his face. He must know that President Lin-

coln had called for volunteers. Did this meaning nothing to him? No one could keep his face so quiet if he had any feelings. John did not recall his own boyhood dislike of soldiers. He thought now of the future, the danger to all his own dreams for his sons as engineers and businessmen. He had no desire to see them killed in battle, but he would not sit back and see the government which had made his achievements possible go down to defeat wtihout making his own contribution. Perhaps he had been too "soft" with Washington.

It was a particularly quiet dinner group at the table in the large brick house that evening. John ate little. His thoughts were in a turmoil. Finally the storm broke. He slammed his fist on the table, glowered at Washington and shouted, "Don't you think you have stretched your legs under my mahogany about long enough?"

Washington's expression remained the same, but his fair skin turned red. He let a bite of baked potato drop from his mouth. He laid his fork on the table, arose and stalked from the room.

The outside door slammed.

CHAPTER TWELVE

A Bridge to Eternity

It was several minutes after Washington left the table before John realized what had happened. His outburst was unexpected, even to himself, the result of suspense and worry. As he looked around at the other members of his family, he saw looks of fear and shock on their faces. Then Joanna arose from her place at the foot of the long table and came to him.

"He has left?" John asked weakly.

"Yes, husband, our boy has left. For several weeks now, he has talked about wanting to enlist. He was afraid this might anger you."

"Anger me!" John replied, incredulous. He reached for his wife's hand. "And I thought he was a coward!"

Joanna had a proud smile on her face. "Surely you could not think so!"

But he had. This he could not deny. But why didn't he speak frankly with Washington? How could he have let matters come to this miserable state?

For the next few days, John shuttled back and forth between the mill and his house, waiting, hoping to hear directly from Washington, but to no avail. All the news came through Joanna or Charles Swan. Washington had signed up with the New Jersey volunteers immediately. He drilled each day for several weeks, then was assigned to recruiting. This lasted for

several months, then John learned that his son had joined the New York Horse Artillery and was on his way south.

Not once during this period did he see Washington. In a way, John thought, this was best. A meeting would be awkward now. He was actually relieved when he knew that the boy had left town. But a careful reading of the newspapers disturbed him greatly. The entire recruitment was in a mess—haphazard. Men were going into battle clothed in any old uniform they could find. Some of them had no rifles! John was horrified by this lack of planning and traveled to Washington, D.C., to talk directly with people in the War Office. He would be glad to organize manufacturers and businessmen, to collect funds for this purpose. He met a blank wall. The Secretary of War's secretary assured John Roebling that the situation was only temporary. No need to worry, none at all.

No need to worry?

John read a letter which Washington wrote to Swan. "I am now chief gunner and corporal of one of the new rifled cannon brigades. It is the place I like best, because the gunner has all the sighting and pointing to do and can have the pleasure of popping over the rebels."

John worried, but deep inside he was very proud, too. During the next two years he read every letter Washington sent to Swan or his mother—brief, casual letters, minimizing his own importance, giving only bare details, thanking them for cigars or candy which they sent to his camp. He was at Budd's Ferry, then next he was a lieutenant doing road construction above Fredericksburg. He built a thousand-foot temporary suspension bridge over the Rappahannock, his first. He spoke with a bit of pride about its success. This was splendid experience for the boy, John told himself.

He was in Cincinnati again when this news arrived. He fired a letter to Swan asking, "Why doesn't Washington write to me?" Surely, he must know that his own father would want to know about his bridge building, at least.

It was a frustrating period in every direction for John

Roebling. Work proceeded at a snail's pace on the banks of the Ohio. Materials were hard to get. Wages were going up because of the scarcity of workers. There was a brief strike. Men came on the job one day and went off to battle the next. Then the money ran out, leaving the towers for the new bridge only half finished. John tried to make the businessmen see that a span was necessary for Union defense. They replied that it might serve the southern forces as well, allowing them easy access to the North. There was nothing to do but wait, hoping that they would change their minds. Sometimes it seemed that his whole life had been one long wait.

Every time a casualty list appeared in the newspapers, John scanned it eagerly, dreading what he might find, and after each great battle he wrote frantic letters home, "What is the news from Washington? Tell him to write to me."

Never once during these two years did it occur to John Roebling that he should write to his son himself. Not even later, when he read that Washington, now a captain, was doing balloon duty under General Gouverneur Warren, did John write to congratulate him on his achievements. Washington had been the first to report the northward march of Lee's troops toward Pennsylvania. His name appeared in the newspapers. When one of the bridge company officers at Cincinnati asked, "Is this Major Roebling your son?" John replied proudly that he was. He had not heard about this latest promotion. Still he did not write.

John missed out all around. He was away when Washington came for an overnight visit. He also missed seeing another visitor, a Miss Emily Warren, the sister of General Warren. Ferdie wrote that she was a lovely girl with a fine mind, and that everyone in the family had fallen in love with her. John was pleased to know that Washington expected to marry her. A good wife would settle him. But John wanted to meet her, to judge her qualities for himself.

News was all too brief. During the Battle of Gettysburg, Washington distinguished himself by helping to pull a cannon

up to the crest of Little Round Top, near Seminary Ridge. Several reporters claimed that this feat helped win the battle. Washington was decorated for bravery and received his commission as Lieutenant Colonel after that. Then came the bad news.

For some time now, Joanna had been in poor health. On one of John's rare visits home, in the fall of 1863, he had tried his best to get her to try the water treatment, but she would not. She could see no sense in wrapping herself in wet blankets or sitting over a tub of hot steam. She continued to trust her doctor, saying, "He will pull me through. I will be better soon."

John worried constantly about her. She took his advice as a command on all other subjects, why not on this? She had lost weight, her hair was thin and gray and she grew more and more stooped. It was heartbreaking to see the change in her from the handsome, erect woman she was only a few years earlier. According to Swan, the doctor believed she might have cancer.

In October, 1864, the superintendent wrote that her health was very poor, that her strength was waning. Frantically, John replied, "Get her to try the water treatment. Keep me informed. Read this letter to Mrs. R." New financing had revived work in Cincinnati. It would not be wise for him to leave now.

Then, in November, the telegram came. Joanna was dead.

All the way home, John kept asking himself, "Why didn't I go home last month when Swan first wrote that she was worse? Why didn't I write to her myself?" He was out of the habit. Through the years he had come to take her devotion for granted. As he stared out of the window, his eyes looked far beyond the horizon. He remembered the plump, rosy-cheeked, happy young girl she was twenty-eight years ago in Saxonburg. Never in all the years of their marriage had she disappointed him. She raised their children to be good Americans, trying to preserve the fine German traditions of hard work and

respect for authority. Even he knew this was not easy. She took over the burden of Carl's widow, and found her a good husband who cared for the farm and raised the two boys as if they were his own. Joanna made their own farm pay on a modest scale. She tried hard to seem at home in Trenton, to take her place in the community as the wife of a rising industrialist. All this must have been hard on Joanna.

John Roebling was very tired as he climbed the steps to his large house. His shoulders had an unaccustomed slump. More than anything in the world he hated to enter this home now. He felt forlorn and useless. Reluctantly, he reached for the knob. Before he could touch it, the door swung open. Standing before him, in his blue soldier's uniform, was Washington.

"Son! My son!" he cried. "I am so glad you are here!"

He grasped Washington's wrists, pulled him toward him and held him close. He could not look into his son's face, but he listened with grateful heart to what he said.

"Papa! We are together again!"

John patted his back and managed a weak smile. "Yes, it has been too long. Where is she?" Now he was ready to go inside.

He sat alone in the darkened parlor for almost an hour. Then slowly he walked to the window, pulled back one shutter, took up the quill pen on the mahogany table and turned the pages of the family Bible. On the leaf, directly below the notation about the infant Edmund, he wrote: "Of those angels in human form, who are blessing the earth by their unselfish love and devotion, this dear departed wife was one—she never thought of herself; she thought only of her children. No faults were ever discovered. My only regret is that such pure unselfishness was not sufficiently appreciated by myself."

When he arose he saw that Washington was reading over his shoulder. "That is lovely, Papa. She knew, she understood."

John looked again at his words. "She would prefer that I write it in German. *Ja,* I forgot . . . *immer, immer vergessen.*"

The long, bitter war was coming to an end. In the year following Joanna's death, work went fairly well on the Cincinnati-Covington Bridge. John was sure that in just two more years it would be ready—the greatest suspension bridge in existence! Then his fame would be truly international, the goal for which he had fought all his life.

Somehow, John did not feel the satisfaction in the final stages of the work which he had anticipated. Was it because of the long delays, the obstacles he had found so frustrating at Cincinnati? Was he suffering from a letdown since he no longer had to compete with Charles Ellet? He had no rival now. The man had joined the Union forces early in the war and was killed in battle. Joanna's death was partly responsible for his listlessness, too. He was only fifty-nine, but he felt a great deal older. He could still work out in the open during all kinds of weather. He was physically strong for his age, but he had lost his zest for the future. The will to achieve was missing. Instead, he thought mostly of home, and how nice it would be to be there all the time—no worries, no driving ambition—with his daughters, with that joking, smiling Ferdie, with Charles, industrious, a driver like himself, and with Washington. Washington's term of enlistment would end soon. Yes, he had worked himself out. He really thought that he was satisfied with his achievements.

In January, 1865, Washington wrote that he was out of the service and married to his Emily. In a few days they would arrive in Cincinnati!

John's heart skipped a beat when he read this news. He went to the station an hour early and sat in the small restaurant drinking cup after cup of black coffee. Finally, after what seemed an interminable wait, the man with the big red megaphone called the train. John arose hurriedly and walked onto the platform. He stood far back in the crowd. He wanted to get a look at his son and the new wife, to accustom himself to their actual presence before going up to greet them.

The first to step off the train was Washington. He hopped

down, then reached his hand to assist a tall, dark-eyed, smiling young woman, beautifully dressed in a brown suit and a small flowered hat. In one sweeping glance, John saw it all. Emily was beautiful, just as Ferdie had said—with a firm chin, a self-reliant, intelligent air about her. Washington? Surely he had not changed so much since those days last year in Trenton. But he did look more of a man. Perhaps it was that full blond beard. His hair lay flat against his broad head. It was no longer wavy. And while the shoulders were filled out, they were slightly rounded. But as he led Emily forward, smiling proudly, John saw that Washington moved as he always had, quickly, gracefully, with a careless air about him. In his deep blue eyes were the old gaiety, the mock humor, the hint of boyishness. Yes, his son had come back!

Emily's voice was as soft as her smile. She held out a gloved hand. "Oh, Mr. Roebling, I have so looked forward to meeting you," she exclaimed. Then, without warning, she threw her arms around him and kissed him on the cheek. "You are a darling, really you are!"

John pushed her to arm's length. He forgot his embarrassment at this surprising demonstration of tenderness. "Well, well," he stammered, "and do you really think so?"

Arm in arm, with John Roebling in the middle, they walked to a cab which Washington hailed. While his son was looking after the luggage, John sat quietly beside Emily, listening happily to her chatter about the trip. He felt that behind this girlish talk was a fine, discerning mind, searching for a way to reach into his own, eager for acceptance as a friend.

That evening at the hotel, when dinner was over and Emily had gone to her room to unpack, John led Washington down to the bank of the Ohio.

"Why, Papa! Those towers! It makes my neck ache to look up at them!

John studied his son's face. It was all eagerness. As he watched the twenty-nine-year-old skipping over the scaffolding, examining the machinery, pulling large beams to one side,

he again felt his own weariness. "Well, this is my last bridge. I will leave all that kind of work to you young men," he remarked when they walked up the street.

Washington turned to him. "Why, you must not say that! There are so many bridges to be built. The war is about over. You cannot stop now."

A bit of his long-lost enthusiasm came over John Roebling. Yes, there were many bridges to be built.

"What about that span across the East River in New York?" Washington asked, trying to draw him into the subject.

"I have given that up, son. There was a mild flurry of interest before the war, you remember. Haven't heard anything about it in years." Even so, his heart jumped a beat at the recollection.

"Suppose you ought to write to Hewitt?" Washington asked, a note of insistence in his voice. "He would know the important men to talk to back there."

John sighed. "Oh, Washington, I am tired, I tell you. There is still so much to be done here. By the end of two years . . ." his voice faded.

"Why do you think Emily and I came to Cincinnati? To help you here, to share the burden. I am not bragging, you understand, but I could finish this bridge alone!"

For a moment John was shocked, then he realized that his son was right. Perhaps, with him as his partner again, he could build still another bridge.

Under the influence of Emily's cheerful prodding, his son's enthusiasm and talk of the future, John gradually evolved his plans. By September he felt like a new man. He was in high spirits when he wrote to Abram Hewitt to recommend action on a bridge to Brooklyn. He forgot all about feeling old when his friend replied that action was already under consideration and that he should come east for a conference.

The idea for a bridge between New York and Brooklyn did not originate with John Roebling. Even before 1800, General

Jeremiah Johnson advocated it. But the people called him a dreamer. A bridge would interfere with river traffic. A strong wind would blow it down. It would hurt the ferry business. But ferries could not be depended upon. Fog and storms often held them at their moorings, and in winter, ice repeatedly choked the river. These difficulties amused the smug New Yorkers. "Who wants to go to Brooklyn?" they asked. But to the people on the tip of Long Island, it was no laughing matter. Their city had grown to a quarter of a million, and many men had jobs in New York.

John Roebling was the first engineer to suggest that a bridge was possible, and this was not forgotten in Brooklyn when William C. Kingsley, a prominent builder, revived the proposition at the close of the war. One other engineer, Julius Adams, actually submitted plans to Kingsley, who took up the entire question with Henry C. Murphy, his New York State senator. So John's letter to Hewitt arrived at a fortunate time. With the leading suspension bridge designer in the world insisting that it was possible, even the most indifferent politician had to listen. If they decided to build, Roebling, of course, must be their choice.

John did not fool himself. While any politician would have to listen, he might still doubt. Such a bridge would take several years to plan and at least six years to build. Investors might grow impatient; other engineers would criticize. As eager as he now was to undertake the work, was he—at sixty—too old to undertake so grand a project? "I can do this only if you will work with me, Washington."

"Of course. I always knew I had to be your partner."

John felt his ears redden. From the moment Washington was born, he was given no choice. Now, he was a man—a true American. Everyone called him Colonel. He had served his country well. Should he go out on his own? John would not ask, but that night, alone in his room, he wondered. Did Washington look on this new project merely as a postgraduate

course in bridge building? Did he really *want* to be his partner? Perhaps he would never know.

On his arrival in New York, John found that his doubters were even more vocal than he had anticipated. Horace Greeley, editor of the New York *Tribune*, said he was "staggered by the great length of the span, far greater than any previously tried. It is a leap in the dark!" he protested in an editorial. Mayor Kalbfleisch of Brooklyn agreed. "Fantastic!" was his word for it.

Undaunted, John Roebling set out with his usual deliberation to make his plans. Into them he must pour all his knowledge, all his ingenuity. Further, he would need every bit of tact and political sense that he could muster. In dealing with the opposition of engineers, he was on sure ground. Against popular doubts, he was less certain.

The next three months were the most strenuous of his life. He went without food and sleep, preparing his report for the bridge company board. It was a long, detailed and technical document, but surprisingly understandable, even for a layman. He opened with the assurance that such a bridge would not interfere with navigation. He insisted that a sixteen-hundred-foot, yes, even a three-thousand-foot single span was possible. "The longer the span, the more steel you must use to assure stability against stress and sway."

Steel? Up until now, no engineer had dared propose the use of this new material for bridge building. John had read all he could on the subject and asked Swan to test it at Trenton for durability and strength. The results showed that steel was stronger than iron. Next he discussed the location, and as at Cincinnati, he thought of future needs—traffic, tolls, business —and decided that the New York terminus should be in City Hall Park. He was not ready to name an exact spot on the Brooklyn side. "This should not be determined before final surveys, until the line has actually been traced."

He advocated a wide elevated promenade which "will allow people of leisure and old and young to stroll over the bridge

on fine days. I need not point out that in a crowded city like New York, such a promenade will be of great value."

In describing this unique feature, John Roebling showed a peculiar genius. This bridge would be more than a highway; it would become a part of the very life, the dreams, the hopes of the people. The origin of the promenade idea dated far back to the days when he sat on the wall in Mühlhausen. It was akin to the pleasure he recalled in his walks through the Tiergarten Park with Professor Hegel. A park, a town wall, a bridge must belong to the people.

In this beautifully—in some ways poetically—worded document, John Roebling showed that he had at last mastered the English language. He had grown more American in outlook, but his roots were still deep in the earth of his beloved Fatherland.

The bridge company voted unanimously that he should be named Chief Engineer, with an annual salary of eight thousand dollars—a large sum for those days.

Ignoring the petty opposition during the next two years, John devoted all his energies to his work. When the Cincinnati Bridge was finally completed, he decided to send Washington and Emily to Europe.

This was to be no mere pleasure trip. "I want you to stop first in England and talk with Stevenson. Get acquainted with other bridge men, with the steel manufacturers in Sheffield. Go to Paris; learn everything you can about the new French method of using compressed air in digging underwater foundations. We will try this method here. It is our only hope for sinking the tower bases to a low, safe level."

One other bridge builder in America had adopted the French pneumatic caisson. He was James Eads, who had successfully competed with Roebling and won the contract for an arch bridge which he was now building across the Mississippi River. Although many deaths occurred in the caissons there, John hoped that by now the French had perfected the technique, removed most of the hazards.

While his son and daughter-in-law were away, he again made river soundings. He worked with Mr. Kingsley on contracts. A large part of the money needed for the first materials was subscribed during these months—five million dollars—all in the first flush of optimism. The cities of Brooklyn and New York also voted money. But John was too experienced to take this early enthusiasm as lasting. He demanded that the bridge company appoint a board of consulting engineers to pass on each portion of his plan as the work progressed. He had to obtain the approval of a board of army engineers, a necessary step in order to bridge a major harbor.

Only the final surveys for the Brooklyn terminus remained when Washington and Emily returned from Europe. It had been an exhausting twelve months, and he was relieved to have them back with him again. He was also curious. What was the news of Mühlhausen? Did anyone remember him? How was his brother Hermann? Had they repaired the organ in St. Blasius' Church?

Then—and most important—"What kind of a baby is my grandson?"

Washington and Emily emerged from the cabin. His daughter-in-law plumped the infant into John's waiting arms. "Here he is—John Augustus Roebling II!" she said, smiling happily. The words took John back to the day thirty-two years earlier, when his own wife so proudly displayed this baby's father. This was the name she had chosen for him. How happy Joanna would be if she knew about this. She would be glad to know that her first grandson was born in Mühlhausen, too. It was going to be very nice to share the new town house on Brooklyn Heights with this, his young family.

A short time later John wrote a long letter to his brother Hermann, telling him of his pleasure in meeting his grandson, in hearing news of the Fatherland. At the end of the letter he said, "I am enclosing a bank draft for one thousand dollars. It is to be used for relief of the poor. Please give it to the Mayor of Mühlhausen and tell him it is my way of showing

gratitude. Thank him for returning safely my son and his family."

Then, as if he dare not dwell on sentimental thoughts, he added, "This bridge will be a great work of art, the great engineering work of this Continent and of the age."

On July 6, 1869, John Roebling began his last survey, to pinpoint the exact location for the Brooklyn tower. He stood on a cluster of piles at the Fulton Ferry Slip, looking through his glass toward the New York shore where an assistant stood signaling for the line. "I think we have it!" he shouted happily to the man who stood behind him.

At that moment, a ferry entered the slip, full of passengers. John was so engrossed in his thoughts that he did not notice it. The boat crashed into the rack, forcing it against the piles with a loud crunching sound, and John's right foot was caught between the boards. He fell back into the arms of his assistant. In a moment, he was in great pain. "What a folly, what a folly!" he moaned again and again. "How could I have been so heedless?" He pulled himself up and tried to walk.

"Here, lean on me!" his assistant cried. "Do not try to walk, sir!"

John was very faint now, but he still tried to walk. Finally, he allowed the men to carry him up the hill to the house and into his bedroom.

In a few minutes Emily came in with a physician.

John took a look at his black bag and protested, "What are you doing here?"

"Now, Papa," Emily said in a soothing tone, "just let the doctor look at your foot."

Reluctantly, John allowed the man to examine him, even agreeing when he said that he must amputate two toes. But he absolutely would not allow them to give him an anesthetic. "If you have to do the job, get on with it," he ordered, gritting his teeth.

As soon as John was alone with Washington and Emily, he

called for cold water, removed the bandage and proceeded to bathe his feet.

"But Papa, you might get an infection!" Emily protested.

He refused to heed her warning. Within two days infection set in, and his foot and leg swelled to an enormous size. He developed a raging fever. All his children came, one after the other, begging him to try a different treatment. Swan was there, too, tears in his eyes. No one could make him give up his water treatment. Finally, late one night two weeks later, he reached for Washington's arm.

"Yes, Papa?" his son whispered.

"You were a good partner. The best a man could have," he said. In spite of the intense pain, he felt strangely calm.

"I can say that about you, too," Washington replied, pressing one hand against his father's hot forehead. "Lie down now. You must get well. No one but you . . ."

John raised himself on his elbow. He must make himself very clear."No, no! You can do it, son. Tell them I said that. A Roebling must build that bridge. It will be safe and beautiful!"

He sank back on the pillows and lost consciousness.

The next day, John Augustus Roebling, the most famous engineer in the world—the master bridge builder—was dead.

CHAPTER THIRTEEN

The Challenge

The fatal accident, which drew headlines in newspapers all over the country, caused widespread shock and confusion. Those who had worked with John Roebling were grief stricken. Those who knew him only by reputation took it for granted that his death left the proposed bridge plans in a cloud of uncertainty. Those who opposed the project declared that tragic as the death of the designer was, it might be a blessing to investors and taxpayers, since no one would lose on what, to them, was a foolish idea in the first place. Certainly there was no one able to take over the work.

Washington Roebling was at first too torn by grief to worry over what any of these people said. He tortured himself with regrets. "Papa was such a lonely man. Why wasn't I more understanding? I could at least have written him during the war. Just too stubborn, too unforgiving!" he said to Emily a few days after the funeral services in Trenton.

His wife tried to quiet such talk. "Stop this nonsense, dear. We all have regrets at a time like this. I am sure that your father had many of his own."

Washington found little comfort in all these remarks. "I cannot stop thinking about it. I cannot!"

"Think of the good times, of these past few years. Anyone could see that you and your father were very close to each

other," Emily persisted, a new tone of strength in her voice. "You have a big job ahead of you. You must think of the future."

"I may be President of the Roebling Wire Company now, but that means little. They do not need me down there. Ferdie has been running the business for several years. We can still count on good old Swan to direct the work at the mill. No, they do not need me. And when Charles graduates from Rensselaer . . ."

Emily lifted an impatient hand. "Oh, bother about the Trenton business. I am thinking of the bridge!"

Washington was thinking of the bridge, too, although he was reluctant to admit it. It was all very well for his father to say he could carry on the work, but he was not sure even his brave Emily really believed that he could. Like a small boy, he needed reassurance. "The point is, will the bridge company officers trust a thirty-two-year-old man to do the job?"

"You have had eleven years of bridge building. You are a graduate engineer. You have worked on these plans—and everyone knows it. Of course they will ask you to take over."

Well, perhaps they would, but did they know how hard it would be? Building the foundations, for instance. His father had told the officers that they would have to expect difficulties. He would need to go much farther down into the river bed than Eads did in building his bridge towers for the Mississippi Bridge. There were many unknowns. The underwater work was full of hazards. Washington had learned a great deal about pneumatic caissons in Europe. Most of the trouble came from three dangers—blowouts, fire and the bends, or caisson disease, as it was known. This last danger was shrouded in mystery, even yet. The French had not found a way to prevent it. Men worked deep inside the tight caissons, in the heavily compressed air; then, once they were on the surface, the change in pressure brought on all kinds of trouble—nausea, headaches, leg cramps, paralysis and, all too often, death. What would the public and the newspapers say when workers

here fell victim to caisson disease? Precautions could be taken, of course, but no one could avoid its occurrence entirely. In every caisson project so far, it had taken its toll. There had been blowouts from suddenly released compressed air, too, and from fire. What would the public say to that?

During the long month of waiting for the bridge company to announce its decision on the future of the New York and Brooklyn Bridge, Washington continued to worry, and Emily continued to reassure him. Whenever he expressed a doubt as to his appointment she asked, "Do you know of anyone else they could trust?"

Despite all the difficulties and hazards involved, more than anything in the world Washington Roebling wanted to do the job—not merely because his father had expected and insisted that he should, and that Swan wrote daily, assuring him of the appointment, but because it would be the most important and challenging task he knew of in the world of engineering. He had gained valuable experience during the war, experience which gave him confidence that he could work on a great bridge, even without his father. But this bridge would have challenged the experience and training even of his father.

On the morning of August 4th, 1869, after Emily and the baby had left for a visit to the Warren home at Cold Spring, across from West Point, a messenger arrived at the four-story red brick house, announcing that Henry C. Murphy, President of the bridge company, wished to see Colonel Roebling.

He left the house immediately, hatless, coatless, breathless, his hands clammy with nervous sweat. When he entered the law office of Lott, Murphy and Vanderbilt a short time later, Mr. Murphy greeted him with an easy smile and in a slow, dignified voice invited him into his private office. "Sit down, Colonel Roebling, you look flushed."

Washington had run all the way. Nervously, he smoothed his hair and said, "Hot day. Always have high color. Get that from my mother."

Mr. Murphy toyed with his inkwell a moment, then said,

"By the way, I intended to go by your house last night, after the meeting."

The meeting? The young engineer braced himself for bad news.

"I received a shipment of books and they lured me home." Mr. Murphy's eyes twinkled from under his shaggy brows as he spoke. "Have you read Byrd's *Notes on Virginia*?"

This unexpected question startled Washington. He shook his head.

"No? Very good on the early Colonial period. Difficult book to find, Colonel. I will bring it down if you are interested."

Washington felt like rushing out of the room. Had this man dragged him all the way to his office merely to talk about books? What did the board decide? What about the bridge?

Mr. Murphy sat straight and tall in his long-backed desk chair, as calm as the breeze outside. He droned on for several minutes. Suddenly, he stopped and cleared his throat. "Oh, excuse me. I forget that engineers are seldom interested in anything but their own subject. Not like lawyers. We get a broad education. Well, no matter."

Was ever a well-meaning man so irritating? Why didn't he get it over with. Was the news good or bad?

"I understand that you and your father recently opened a wire rope office in New York, in order to sell your products from the Trenton plant."

Washington nodded.

"Well, as President of the Wire Company now, you have a lot on your shoulders. I was just wondering . . ."

"The work at Trenton goes on without me, sir. I could arrange to give all my time here at the bridge," he said hastily.

Mr. Murphy looked amused. "That is the point. Do you need a good man to run the New York store? I happen to know of a young fellow, fine salesman and mechanic. I thought perhaps you could use him now that you will be so busy on the bridge. The morning papers ran a nice story, didn't they?"

Washington hoped that his feelings at this point did not show on his usually bland face. Evidently, everyone except himself had known of his appointment. He hadn't even seen the newspaper! Mr. Murphy was staring at him. Quickly composing himself, the engineer said, "I will be glad to talk to your young man about the store here, sir."

"Thanks. Now what is your first move on our job?"

Happily, eagerly, Washington replied. As soon as the company awarded the contract for building the caisson, they would start clearing the space for it at the foot of Fulton Street.

The long suspense was over. Washington rushed home to write a letter to Emily, then went down to the bridge office. Even this first task, the preparation of the basin for the caisson, was full of unknowns. His father's trial boring near the abandoned ferry slip showed that they would have to go down ninety feet to reach solid rock, the ideal support for eighty thoustand tons of masonry which would make up the tower. But his father had told him that at a depth of just forty feet he had found a hard, compact material which would do just as well as rock. In this they were lucky.

Washington was also fortunate in having the services of two experienced, highly skilled assistants who had worked with him at Cincinnati: E. F. Farrington, the master mechanic and C. C. Martin, assistant engineer. He could not know how much he would have to ask of these two faithful friends in the years ahead, but there was no doubt that their presence buoyed his spirits.

From the day the men began to dismantle the old Fulton Ferry Slip, they were in for surprises. Ancient piles, fender sheathing and cribwork filled with stone had to be removed, and because of the heavy coating of sediment which had gathered on the foundations over the years, this preliminary operation required an entire month. When they began to pull out the old piles they discovered that all of them were eaten by worms almost to broomstick size just above the mud line, but were still perfectly sound below.

"This means that we must set our timber foundations for the caisson well below the river bed," Washington explained to Martin. It also meant that rocklike clay had to be blasted and dug out and imbedded boulders removed by hand before the work on the foundation could begin. Although this disrupted the work schedule, it was well worth the effort to insure the new piles against worm damage and provide a uniform foundation for the caisson.

Finally, in the spring of 1870, the dredging was completed, the three-sided basin, open toward the water and held together by a wall of timber sheet piling eighteen feet below the water level, was ready to receive the giant caisson.

From his experience in Pittsburgh and Cincinnati, Washington knew the importance of being tolerant with public curiosity, as long as it did not interfere with operations or lead to danger. He was surprised, however, to see that after the first couple of weeks, people seemed to grow bored with watching. It was no fun to stand around only to see mud and rocks being hauled out of the water. But on the first of May, a large crowd gathered at the site. And the bridge company was ready for them. With a practiced eye for public relations, Mr. Murphy had announced a ceremony. This was the day when the caisson would be towed from Greenpoint, Brooklyn, for its launching. Murphy even had a platform built and decorated with flags and bunting. A brass band, dressed in gold-trimmed uniforms, was there tooting lustily as six barges towed the upside-down open box to the river's edge.

Washington, too, felt the excitement of the occasion, although he was somewhat amused by the formalities. He was seated on the platform in front of the band, dressed in his new black suit with its wide lapels, a high wing collar and black tie, lined up with members of the board, E. F. Farrington and C. C. Martin. When Captain Maginn, the commander of the tugs, took his seat, too, Mr. Murphy opened the ceremony with a grand sweep of his long arm. He waited for the band to toot

the last notes of their number, then he pointed toward the caisson.

"Folks," he shouted in a booming voice, "what you see here is a box with three sides, the bottom is on the top, the open part down under. Can anyone guess how large this box, this caisson, is?"

A small boy who sat among a row of children, dangling his bare feet over the edge of the platform, called out, "It is one hundred and sixty-eight by one hundred and twenty feet!"

Mr. Murphy beamed. "You are exactly right. A smart boy!"

A larger boy, who sat next to the one who had spoken, piped up. "Smart, nothing! He read that in the newspapers."

This little exchange brought a roar of laughter from the people near the platform.

Mr. Murphy continued his talk without interruption. The sides of the caisson, he pointed out, were V shaped, tapering down to the open edge, with iron casting to protect them as the caisson cut its way into the ground under the weight of the masonry. The box was divided into six air tight compartments, all connected by heavy iron doors. Mr. Murphy explained that tubes would carry air into the cellar, forced in by means of a pump, to keep water from coming under the sides and interfering with the work. "This water, trying to get in, compresses the air inside the caisson," he pointed out. "Naturally, the deeper the caisson sinks, the more the air will be compressed."

"And," Washington said in a low voice to Farrington, "the greater the danger of blowouts and the bends."

Mr. Murphy made it all sound simple and easy. He pointed to a trap door on the top of the caisson. "This leads into a shaft. When the lid is down, air comes into the shaft through a jet below. A man stands in the shaft and waits until the air is the same pressure as it is in the caisson. Then the lower door drops open and down he goes by ladder to begin work."

He pointed to a larger center shaft where there was a column of water. The men would dump the rubbish inside the

column from the cellar, and the dredging machine would reach down, bring it up through the shaft and dump it outside.

When Mr. Murphy finished speaking, he turned to Washington and asked him to introduce his assistants. The band played one more tune, and the celebration came to an end.

Much remained to be done before anyone could begin work in the caisson. The wooden framework used in launching had to be removed. The men had to clear away more boulders so that the V-edged caisson could settle evenly. Then several layers of masonry were piled on it to help resist the action of the tides. The caisson was finally ready and filled with compressed air.

Washington, Farrington and Martin approached the trap door. Washington lifted the lid and they stepped inside the small compartment. The sun had focused on the box all day, so that it was almost unbearably hot in there. Just as the trap door was sealed and the air began to sift through the jet, he felt a severe pain in his ears. Gradually this disappeared, but it was followed by a loud swishing sound, like rushing waters. None of the men spoke, but when they dropped their hands from their ears, Washington stepped down the ladder into the cellar.

It was very hot here, too. When he lit his candle and looked down, he found he was standing ankle deep in mud. The flame grew amazingly large—almost like that of a torch. Hurriedly, he lowered his arm. They must be very strict with the workmen. One instant of carelessness—and the flame would burn into the wooden roof, starting a roaring fire.

The others descended the ladder.

"Everything is unreal," Farrington remarked in a high voice.

It sounded so strange that Washington laughed, but he sobered quickly. His own voice was queer, too. The dim light in the corner of the compartment—the shadows, the wildly-fluttering candle—gave the whole place an eerie look, a bit

frightening even to him. The Frenchmen had told him that the workers soon grew used to it, though.

As soon as they returned to the surface, Washington held a conference with newspaper reporters who were waiting for an interview. He told them of his reactions, that one seemed to lose his sense of smell in the caisson. This meant an added danger, he admitted. For this reason, they could not use natural gas for lighting. (Electric lamps had not been invented in 1870.) And while candles gave good light, they would be very costly as well as dangerous. But they would still use them for work in dark corners. For greater illumination, they would install calcium lights.

Washington was glad that he had grown accustomed to dealing with the press in Pittsburgh and Cincinnati. He knew that he must be honest and straightforward for, after all, these men represented the public. As soon as he finished answering their queries about work in the caisson, he offered to explain the safety rules Dr. Andrew Smith of New York had drawn up for the operations. The physician said he would reject any applicant with a history of heart, kidney or lung disease. Posted on the wall of their dressing room the sand hogs would find these warnings:

1. Never enter the caisson on an empty stomach.
2. Eat plenty of meat and take warm coffee before entering and after leaving the job.
3. Put on extra clothing when coming out, to avoid exposure.
4. Lie down in the bunkhouse for an hour after coming to the surface. Sleep at least eight hours every night.
5. Do not drink alcoholic beverages.
6. Never come to work if at all sick. Report all sickness, even if it occurs at home.
7. Never remain on the job more than eight hours.

Because of the dangers and discomforts of the work, the pay was high—two dollars a day. In addition to sand hogs,

or diggers, they had to hire enginemen and firemen to run the excavating engines, gangs to dump the debris into removal cars, blacksmiths, machinists, carpenters and masons, and a gang to remove boulders.

Hiring began at a time when the New York labor market was loaded with skilled and unskilled workmen, mostly new immigrants who lacked the money to travel westward where jobs were more plentiful. Dr. Smith had little difficulty in finding several hundred healthy men needed for the three shifts during this early stage of construction.

Washington was in the caisson through two entire shifts right from the beginning. After a couple of weeks, Dr. Smith hailed him. "I suppose you read the safety rules, Colonel Roebling?"

Washington laughed. "This is a critical time, Doctor. We are running into all sorts of trouble. So many boulders right under the edges of the caisson. Set us far behind schedule. Increases the danger of blowouts. Once we get down to hardpan, it will be easier."

Dr. Smith shook his head and looked very gloomy. "And you are going down again into that caisson? You have had only three hours of rest!"

Washington waved carelessly and turned his back. Down he went, into the caisson.

The second day shift was already at work. He sloshed through the mud from one compartment to another, checking the lights, watching the water-level gage, giving a hand with a wedge or shovel. Suddenly, he heard a loud roar. The metal safety door nearest him flew open. He felt a strong draft on his knees. His muscles froze. Fear gripped his mind.

Immediately the cellar became a scene of utter confusion as a cloud of mist gathered, quickly extinguishing all the lights. Men ran around in pitch darkness, hitting posts and banging into each other, plunging through the doorway, crowding at the foot of the ladder. Many cried out in squeaky voices.

Washington just stood there for a minute, water rising above

his ankles. Then he came to his senses and ran into the next compartment. A worker stood there, clinging to a post. By main force, Washington pulled him through the doorway; then, with all his weight, he shoved on the door and managed to close it. At least the water in the compartment where the caisson was tilted could not get through.

He was the last man to reach the surface. He looked around. Everything was confusion here, too. The top of the caisson was loaded with mud and stones.

Farrington pulled him aside. "Kind of scary even up on top. A column of water shot up with a roar. I felt the caisson settle a bit."

Washington tried to look untroubled, but he said in a low voice, "We will have to pump out Compartment 4. Send a diver down to see whether the shoe hit a boulder. May have caused us to tilt."

Farrington snorted. "No. I can tell you what did it. The ferry nudged us at the corner while it was pulling into the slip."

A light dawned on Washington Roebling. So this was no accident!

Actually, he did not blame the ferry owners for trying to cause trouble. Nevertheless, the watchmen should have kept their eyes on the ferry as it neared the caisson. Once they settled into the hardpan deeply enough, and there were more blocks on top, the ferries would be powerless.

If it wasn't one thing, though, it was another. Washington was an early riser, usually out of bed by five-thirty or six in the morning, but on Sundays he stayed quiet until seven. He was surprised to hear Emily calling him one Sunday. Had she forgotten what day it was? He turned over, hoping to add a few winks of sleep, but she continued to call and finally rushed into the room.

"Get up! Something dreadful must have happened! The night watchman is at the door banging for dear life!"

"Colonel, come at once!" the watchman called, as he en-

tered the hall. "Glory, we just had the biggest blowout ever! It may have wrecked the whole thing, and . . ."

"Anyone hurt?" Washington asked anxiously, as he reached for his trousers and ran to the top of the stairs.

"Well, there were three men standing there with me when it happened. One of them got knocked down by a flying stone. The second jumped into the river. The other fellow buried himself in a coal pile. He was a sight when I pulled him out. They're all right now."

Washington grabbed his coat, pulled it over his shoulder, and still in his carpet slippers he raced down the street.

He suddenly had a strange feeling that it had been raining yellow mud. And right before him in the path were dead fish, slippery stones, even shells. People dressed in blankets, mere night clothes, shirtless or only in their underwear, raced toward the foot of the hill.

The ferry owner shook his fists as Washington approached. "I wish I had somersaulted that old crate of yours when I had the chance. Look at my ferryhouse! All the windows out on this side. An outrage! I will sue you, you . . ."

When the caisson was at last clean, the dam outside the shoe repaired and all the indignant and frightened citizens quieted, digging resumed.

Washington thought that now everything would be all right, but he noticed that the first crew to enter the air lock was strangely quiet. Farrington and Martin looked worried, too. "What's the matter? What are they afraid of? If they had kept that mud dam in repair, this blowout would not have happened this time."

"The men say there is a jinx on this bridge," Martin explained.

Washington hoped that the men would quiet their own fears after a few days of digging, but they remained sullen. On the third night he heard the news.

"The men are going on strike!" Farrington told him.

CHAPTER FOURTEEN

The Crisis

Washington's first thought was that the crew had gone on strike because of the danger from blowouts, but Farrington explained that this was not the case. "It is this way, Colonel. Two of the sand hogs came on the job last night after only four hours of sleep. They would not listen to the night foreman and insisted on going down to the cellar. When they came up they refused to lie down. So one is in the hospital, unconscious with the bends."

It was still not clear to Washington. "What does this have to do with the strike?"

"Just this. The ringleaders on that shift started a whispering campaign. They said that they would all get the bends when the caisson sinks a few feet lower and the air pressure is greater."

Washington thought for a moment. It would do no good to explain that this case of the bends was due to carelessness. The danger would be greater soon. Dr. Smith had said recently that they must break the working time into four-hour stretches. He could see only one way out. "Raise the wages to two-twenty a day," he said.

Farrington's eyebrows went up. "That is an awfully high wage in hard times like this. I can find hundreds of men to take the places of these strikers."

Washington shook his head. "No. I am against a wholesale turnover in labor. Train a new crew? No, we would soon be up against the same problem." After Farrington left, the engineer thought a long time about the work still to be done. The difficulties would be even greater when they dug for the foundations on the New York side. There was no deep layer of hard sediment there. They would have to go all the way to bedrock, double the depth.

That night Emily remarked, "I am sorry to hear about your worker getting the bends, but I must say, you set a poor example."

"What am I to do?" Washington asked, helplessly.

"I was hoping that you would let Mr. Martin take more of the responsibility now. You can't solve every problem by yourself. You come home dead tired, night after night."

"So much depends on our success with this first foundation. I can't ask Martin to make the important decisions. This is the critical time. We never know what problems will arise. I have to accept the responsibility. It would not be fair to ask Martin to take the blame for mistakes."

He tried to allay his wife's fears by turning over all the aboveground decisions to the capable Martin. On the rare occasions when he worked in the office, a crisis was bound to arise in the caisson.

On one such morning Washington said to Martin, "The only pleasant surprises I get down there are new rocks. Come over to the house next Sunday and see my mineral collection, all from the bottom of the East River."

"You are worried about something. Do not try to hide it by chatting about minerals. What's wrong?" asked the canny assistant engineer.

"The deeper we go, the larger the rocks. They have hit one they cannot pry loose. Much as I hate to come to it, I may have to set off a powder blast."

Strangely enough, no one up to that time had tested the effects of blasting in a caisson. Would the concussion break a

man's eardrums? Would he suffocate from the effects of the powder? Could the powder charge be controlled?

Washington was alone in the caisson when he tried his first experiment by firing a pistol, it caused only a faint echo in the chamber. He next set off a small powder blast; the results were again encouraging. When he went down for the big trial, Martin was with him.

"Brace yourself. I hope Mr. Murphy doesn't have to hire two new engineers today."

"That is a grim joke, Colonel. All right, I'm ready!"

Washington lit the fuse and waited as the flame burned its way toward the powder charge. When it went off, he felt a slight jarring, heard a rather loud report, then noticed the queer smell of powder. That was all. Feeling rather foolish, he asked, "Wouldn't you think that two smart fellows like us could have discovered this a little earlier? My son's popgun hurts my ears more than this blast. All the time and effort wasted!"

So blasting, scheduled for night hours, became a regular event. Everyone, including the sand hogs, was happier, for this meant that they would cut many weeks from time needed to complete the excavation.

Although Mr. Murphy's carefully worded announcements to the press received good coverage, the public grumbled. They could not see the progress below the surface; everything seemed so slow. When the taxpayers' clamor grew insistent, state and city committees came to investigate. On these occasions, Washington took time to explain and justify his methods. He wanted everyone to feel that this was a bridge for the people, and that they had a right to ask questions. When the blowouts occurred, the questions had been sharper; then several small fires bedeviled the workers.

A serious fire broke out in December of 1870. It was Friday night, and Washington was at home getting ready for bed when he heard the alarm.

He grabbed his overcoat and rushed down the hill. In the

distance he heard the clang of the fire engines as they sped toward the river. Farrington and Martin met him. "Is it deep inside?" he asked.

"Yes, in the roof timbers. As soon as the men discovered the fire, I discharged two cylinders of carbon dioxide. It didn't do much good," Farrington explained.

The three men descended to the cellar. There was no smoke. The pressure at the bottom had driven the flame upward, through the small burned opening now visible in the roof of the caisson.

Washington examined the hole. It was directly above a shelf where the workmen often placed their candles. "Carelessness again."

Within a few minutes, they had a hose in position, gushing a heavy stream of water into the hole, fighting the blaze blindly. How could they tell the direction of the flames inside the roof?

"We might try a steam jet," Martin suggested.

After an hour of this, Washington made a difficult decision. Somehow, he must get in there himself. Two of the firemen brought axes and chopped a hole through the timbers. They stood by as he crawled into the charred, wet interior of the first roof level. His eyes and throat smarted from the fumes. Far above, he thought he could see a gleam of fire, almost hidden by smoke. When he wormed his way out, he was conscious of a weakness in his legs, but said nothing.

"You're shaking!" Martin exclaimed as he pulled him to the floor.

"Better go up," Farrington cautioned.

Washington insisted that he was all right. He directed the others to leave the caisson, to ask for relief fighters.

It was a peculiar kind of fire fighting—against invisible flames. Suddenly, Washington slumped to the floor.

He had been in the caisson for seven hours—without food, water or rest.

When he regained consciousness, he was lying in his own

bed. He felt weak and there was a strange sensation in his legs, a kind of prickly feeling. Emily and Dr. Smith stood over him, looking at him anxiously. "What happened?" he asked, sitting up with a start. "Oh, the fire! I must have slipped and fallen. Let me up!"

"You stay right where you are, young man," Dr. Smith said. "You had an attack of the bends. You're lucky to be alive, exhausted as you were."

Emily handed him a cup of broth. "They think the fire is out. Here, drink this."

Washington gulped it down, then jumped out of bed. His legs felt as weak as if he had run a five-mile race, but he grabbed his shoes. "I must get back!"

It was now five in the morning. Martin stood on top of the caisson, directing the workmen. "Oh, why did you come back? Can't you trust anyone but yourself?"

"I could not rest. I'm all right. What are you doing?"

"Boring. Making test holes to see whether the fire is out."

Washington sat down on a granite block and waited. Emily and Dr. Smith stood beside him now, the doctor counting his pulse.

"I am afraid that the fire is still burning," Martin explained as he came through the air lock. "What should we do? The whole frame will collapse if this keeps up much longer."

Washington's head reeled from exhaustion and worry. He had to do something drastic. There was only one way he could save it. "Call the fire department again. We will flood the caisson!"

Within half an hour there were four fire engines at the site, pouring giant streams of water into the openings. Washington felt weak. It was nauseating to see all that water going into the caisson. Was it, even now, too late? What if the fire had destroyed all the timber at each level? Or even a major part of it?

Two days later Washington gave the signal to turn on the air. A large crowd gathered to watch as the water was expelled

from the caisson. Many of them remained for the entire six hours. Washington felt like a father waiting for his son to come out of the operating room. He would soon know whether the caisson remained airtight.

Martin let himself down the shaft. "Tight as a drum!" he announced when he completed the investigation.

"Hard to believe," Farrington said.

"All right, men," Washington said with a mingled sense of relief and anxiety. "We must make more trial borings, send men into the roof and find out just how far the damage goes."

The human moles reported that while the fire had worked through three levels, those above appeared to be unharmed.

As usual the public demanded explanations and assurance.

How great was the damage?

Will the roof cave in on the workers?

Whose fault was it?

Patiently Washington answered the questions. He refused to tell the name of the man whose carelessness had caused the fire, but a new man was hired the next day as a replacement for him.

"If anything," Washington told reporters, "the caisson is stronger than before. We have replaced or repaired the damaged beams and have inserted cement to reinforce the frame. There are eleven layers of sound timber above the burned area—enough to insure safety."

It was three months before he was ready for the first step in construction of the foundation for the tower—filling the entire caisson with hydraulic cement.

"I spent so much time down there I feel like I am plugging up my second home," he remarked to Farrington.

"Humph. I would not waste sentiment on that. You will soon have another and larger home across the river."

For months now, the caisson for the New York foundation had been under construction. When it was towed into place in September, 1871, the occasion was markedly different from the gala celebration which greeted the arrival of the Brooklyn

caisson. The New Yorkers were interested in reading about it, but they were too "dignified to indulge in a childish display over a mere box." The bridge would have waited for many more years, if they could have had their way. "Who wants to go to Brooklyn?" they jeered. To them, it was unimportant—until they discovered that their government was shockingly corrupt. In their confusion they suspected that perhaps there was graft in the building of the bridge.

Washington had to drop his work while new investigations started. Not a cent of the money which had been voted for the project would be paid until they were satisfied. After eight months of investigation, the citizens of New York received their assurance. The record of the bridge company was untainted.

The Chief Engineer had learned that he could not prevent all accidents. But there was one thing he could and did do as a result of the experience with the first caisson. The one on the New York side was lined with sheet iron, and he installed a system of water tubes inside the roof, so if fire did break out any part of the interior could be flooded on a moment's notice.

The New York caisson was larger and much heavier than the first, and therefore more expensive to build. In explaining this to the press, Washington said, "There are twenty-two feet of timber above the air chamber, seven more levels than the Brooklyn caisson had. We must be prepared to go down perhaps eighty feet, double the distance we went in the other. So we need a heavier roof."

He told the people about the new measures he was taking to protect the health of his workers. He was very proud of the elevator which would replace the old, arduous climb so hard on the men after hours of heavy work. Naturally, he expected this announcement to have a good reception and was amazed when several newspapers headlined the story: EXTRAVAGANCE AT THE EAST RIVER! The general public was still in the era of "strong back is strong virtue." The idea that

an employer should use taxpayers' money to make life easier for his workers shocked and irritated them.

Washington gave up trying to explain every move but proceeded to make his earlier experience count in time and safety. He installed a signal system between the cellar and the surface. (The telephone had not been invented.) His system was a tube with index pointers at the top and bottom. In front of one pointer, above and below, was a plan of the caisson, showing the location of the pipes and shafts. Behind this was another pointer which could be moved to signal such messages as "Stop," "Bucket caught," "Start," "Increase air pressure." The pointers could be moved by rotating the tube to any position so that the man at the other end knew what was wrong by looking at the spot indicated.

The diggers fed the sand into pipes which siphoned it off by means of compressed air. Sometimes as many as sixty men dug at one time in order to keep the sand flowing to the surface. It was exhausting work.

Washington had no time to sit around during these operations. Stones often jammed a pipe. Frequently the cutting force of the sand wore holes in the metal. Or a stone, shooting out of the pipe with the force of a bullet, hit a man who carelessly exposed an arm to the force of the stream. Workers found surprising trophies as they dug—cannon balls, crockery, bones.

For eight months the work inside the caisson went smoothly; then came a regular epidemic of the bends. Washington was at a loss to know what to do. Three men died within the space of one month. Dozens of others suffered brief attacks.

"I have examined all of these men carefully. Their lungs and hearts were sound," Dr. Smith explained.

The mystery of the deaths was finally solved with the reports from hospital authorities. Two of the men were very heavy drinkers. A third suffered from kidney disease.

When the newspaper men asked for explanations, Washington faced them squarely. "We have taken every precaution

medical men can offer. We have had to increase air pressure as the caisson sinks. You must remember that we are far deeper in the river than we were on the Brooklyn side—almost twice as deep. This adds to the danger. The work is always attended with a certain amount of risk. All of our men knew this when they applied. Most of them have learned to observe the rules. Those who face these risks daily deserve more than ordinary credit."

He worked harder and longer than almost anyone else, for he always carried the burden of responsibility to his men, to the company, to the public. He ran great risks in warfare, gambling constantly with his health and life, yet he came out of the Civil War without a scratch. He was still young and strong and felt compelled to gamble with his health now, in order to carry out the work. His father would have felt the same way. "A few more weeks, just a few more," he kept telling himself. When the second caisson was filled with cement, the danger from the bends would be over.

These all-important last few weeks were too much for Washington Roebling, however. One afternoon he collapsed in the cellar where he had been working for twelve hours.

He was still conscious when the men carried him to the surface, but in too great pain to speak. He heard Farrington say, "The bends. It got him, just as we feared. His luck failed."

CHAPTER FIFTEEN

The Wonder of the World

Washington Roebling was only thirty-five years old that summer of 1872 when he collapsed in the caisson. He had been sturdy and energetic all his life, and now he lay in his bed, eyes closed, in greater and greater pain, paralyzed from the waist down and unable to talk. But his mind was perfectly clear. Over and over he asked himself why had he not listened to Emily's warning? How soon would he be able to return to work? Who would carry on in his absence? Why hadn't he written his instructions so that Farrington and Martin could direct the work, at least for the next few weeks? He thought about new orders for materials, about tools that must be replaced. But most of all he thought about the day his father was injured and the shocking realization that somehow the work must go on without him. Ill though he was, Washington did not consider the possibility that he, too, might not live to do the work. No, he must get well. "A Roebling must build this bridge . . ."

During the next few days, it became clear even to him that the doctors despaired of his life. They did not seem to know that he could hear everything they said: "He may live a few more days. His pulse is very weak. We can offer little hope . . ."

Then his brothers arrived. Ferdie, a genial, bespectacled, mustached young man leaned over and took his hand. "Can you hear me, Washington?"

Washington made a real effort to speak. All he succeeded in doing was to open his eyes a little.

A murmur came from Emily and the doctor. Five-year-old John called, "He hears, Mama, he does!"

"Sh, ssh," Emily whispered.

This was the first time Washington had heard his son's voice since he was taken ill. He tried to smile. Then Ferdie spoke again.

"Now, you are not to worry. Swan and I have everything in hand at the mill. Farrington and Martin told me to say they are carrying on here. All we ask is that you live."

So even his own brother was alarmed. When Charles came down from Troy it was the same story, although by this time the feeling had returned to his legs. Washington longed to speak, but he could not. His young brother's voice sounded exactly like their father's. It was uncanny. Surely, they must all know that he would get well. The bridge . . .

A few days later when Swan arrived, he was able to keep his eyes open and to whisper a few words of greeting to his dear old friend. Although Swan was much heavier, he still looked young and vigorous. It was a great comfort to see him smiling, to listen to his talk about the mill. It was an even greater joy to see the smile on Emily's face.

Then all the visitors were gone. Everything settled into a dull routine. Even John went to stay with his Grandmother Warren. Where was Martin? Where was Farrington? Finally, Washington asked that one of his assistants, at least, be allowed to come.

His wife shook her head. "The doctors will not allow it. Be patient, dear."

Patient? What was going on at the East River? What did the newspapers say? What about the bridge company officers? His mind was in a continuous whirl. And the pain was everywhere: his legs, his back, his arms, his neck, his head ached. Even Emily's soft, reassuring voice caused his ears to hurt.

After a month had passed, he noticed that the doctors were

a little more cheerful. They no longer talked gloomily about his condition, at least in the room. Still, they would not allow anyone but Emily to talk to him. And there was so much he needed to tell the men about their work. He whispered to Emily, "You could at east take a message."

This was how it began. Emily made daily trips to the bridge office, taking brief instructions, dictated at slow, painful intervals. Sometimes she had trouble understanding the words Washington used. Then one day, to his surprise, he saw that she was sitting by the window surrounded by his old college textbooks. He motioned to her to come over. "What are you doing?" he whispered. Had she gone out of her mind?

"Well," she said with a bright smile, "I was very good at mathematics in school. I thought I might at least learn what those big words mean. Then I can run your errands more intelligently."

Washington sighed and shook his head. Was there ever a woman like his Emily?

Gradually, she grew more skilled at taking down his directions. She spent many hours each day studying, and when she returned from the bridge office she could pass on Martin's comments and questions clearly, even asking a few on her own. Repeatedly, when he finished an explanation, exhausted, he asked himself why he had not spent more time in the office instead of grubbing in the caisson.

By September, even Washington knew that his chance of resuming active work was unlikely. He had lost weight, his abundant hair was streaked with gray. When he looked in the hand mirror at his unshaven face, he saw that it had a gaunt look. His cheeks were hollow. It was odd, but he was beginning to look like his father—the same intense eyes, the unsmiling mouth.

One day the doctor finished examining him, then shook his head and said, "Colonel Roebling, you are considerably improved. It is miraculous." Then he cleared his throat and looked toward Emily who sat studying by the window. "Mrs.

Roebling, I think your husband needs a free mind. He should resign."

Washington knew this was coming. He had been expecting it, but to hear the proposal put so bluntly was a shock. When the doctor left, he whispered to Emily, "I am not ready to resign. I cannot give up, unless . . . unless Martin and Murphy think they can build the bridge without my help."

Emily remained quiet for several minutes. Finally, she arose and said in a firm, clear voice, "I will go down right now and ask them."

The next hour seemed like a week to Washington Roebling. When his wife returned, he raised his head from the pillow, eager to read the message on her face, but although his eyesight had improved, he had to wait until she came quite close. She looked troubled.

She spoke in a strained voice: "They said that no one could build this bridge without you, but . . ."

Washington grasped her hand and held it tight.

"If you could, *if* you could put all you know about it on paper, they are willing to try while you take a good long rest."

All that winter Washington worked on his instructions for the work ahead. He filled many hundreds of pages with notes, going into every detail. When he tired, Emily wrote for him. But the work was very difficult. His whispers grew weaker as the months passed. His eyes blurred again. His hearing failed. But at last, in one final enormous effort he finished his task.

The Roeblings sailed that spring to spend several months in Wiesbaden, Germany, a famous watering place. When they returned, Washington was much better. He could sit up in a chair for several hours at a time. He even surprised himself by speaking aloud for the first time since his accident. Unfortunately, he insisted on reading all news reports on the bridge. These increased the strain on his uncertain health. While the work proceeded without serious difficulty on the anchorages and towers, the public still felt that progress was too slow. Murphy and Martin did their best to quiet doubts. Washing-

ton's nerves would still not allow visitors, so he could not answer unfair charges himself, and it worried him. If he could just talk to the reporters . . . assure them that delays were unavoidable. Costs had gone up; he was in close touch with the work and knew that there was no unnecessary expense.

There were satisfactions, too. Washington could now sit in his big armchair by the wide bay window and through his field glasses keep a close watch over the work. Every move of the workmen had a meaning for him. When the giant towers finally reached their full height of two hundred and seventy-one feet above the water, he had a "grandstand seat" from which he could view the most spectacular phase of the building.

One of his greatest satisfactions was that his son John returned home after four years at Cold Spring with his grandmother. He was a quiet boy, with a good mind, always happy to sit with him by the window. Like all ten-year-olds, he asked questions. But to his father, this was no bother. Washington was happy to have him there, to see his eager face and listen to his childish talk, to answer his doubts and questions. He often thought of how proud his father would be of little John, for he, too, was good at arithmetic!

One day the boy held the glasses to his eyes, fumbling with the adjustment screw. "When will we walk on the big bridge, Papa?" he asked.

Washington scarcely knew what to say. "Not for several years, anyway."

It was now 1877. John Roebling had planned to finish it by this time. Yes, it would be years, more than several. He sighed and looked out of the window. As he watched the men at work his thoughts ran over the thousands of tasks that were ahead. Everything he had learned about bridge building would go into the completion of this great bridge. And he knew that as the work progressed, he would still see frequent need for at least minor changes in the master plan. Would his brain, his health, be equal to the need?

The Brooklyn Bridge would have four cables instead of two.

In addition there would be temporary cables to be used during construction in order to carry the wheels as they crossed back and forth, stringing the wires. The first temporary cable was raised into place in late summer after the granite towers were finished. Washington sat at the window looking down at the scow with its giant reel, as the tug pulled it to the New York side. The crossing took just eight minutes by his watch.

"You can see it unreeling as it goes," John exclaimed excitedly. "Down, down, down into the river!"

Washington, too, was excited. Next came the ticklish part —raising the cable to the towers.

"There must be thousands of people along the banks," Emily said, amused. "How does the news get around?"

"Well, Murphy has an eye for good publicity, I guess."

"Martin is running him a close second these days. Here, John, hand the glass to your father. I want him to see Martin over there with the signal flag," Emily said hastily.

It was comical to see how his assistant tried to please the public, to represent him on public occasions. Washington felt a glow of satisfaction as he looked across the river. Good, faithful Martin. And there was Farrington, enjoying every bit of the excitement. He turned to John, "Son, why aren't you out there with the men?"

John looked rather sheepish. "Aw, it is more fun to be with the *Chief* Engineer!" Then he suddenly ran out of the room. A few minutes later, Emily pointed to his small figure atop the warehouse a short distance away.

"Apparently, all he wanted was to be invited to leave," Washington said. Why was it that a father never knew what was in his son's mind?

The river was clear of boats now. The signal flags wagged, a cannon shot sounded, then Washington saw the gleaming steel rope, dripping with water as it swooped up from the river amid the cheers of the spectators. Up it went and in a few minutes hung clear, above the masts of the boats—first permanent link between New York and Brooklyn.

Next came the first traveling cable which would carry the workmen in a kind of boatswain's chair from tower to tower while they constructed the footbridge. "I suppose Murphy will make a great occasion of Farrington's first ride across?" Washington asked.

"He will; he has it all ready to announce. Farrington wanted to take it at night, when there would be no crowd, but Mr. Murphy would not hear of it."

That afternoon when Farrington prepared to start his historic ride—the first man to cross the river above water—thousands of people lined the banks. They crowded the housetops, filled the ferryboats and sat in every window which offered a view. Hundreds of newsmen were there, too. Young John Roebling had a very good seat on top of the bridge office, and Emily sat on the arm of her husband's chair.

Again the cannon boomed and up went Farrington in his little wooden swing, sailing out into the air to the top of the Brooklyn tower. Washington could see the men lift him across, then send him on down the main cable span. The chug of the engines as they powered the flying passenger came through the open window.

"Look, look! He is waving his handkerchief!" Emily cried.

"Now he is standing," Washington observed. The swing hung awkwardly because of the steep descent on the other side. No doubt the crowd thought this was sheer bravery—instead of necessity to keep from falling.

"Well, do listen to all those whistles!" Emily put her arm around his shoulder. "It is fun, isn't it?"

Washington agreed. What wouldn't he have given to be in that flying chair!

The public had to wait all winter for the next excitement at the East River, until they completed the four-foot-wide footbridge, suspended high above the level for the future roadway. Because of its location, in an area noted for strong winds, Washington had planned it with unusual care. He directed Martin to string an inverted cable between the towers to re-

duce the sway of the fragile catwalk. There was also great danger from winds which came from below, so planking had to be porous—with cracks more than half the width of the boards themselves. When the handgrasps were in place, it made a good, safe crossing for the workmen.

Washington was both surprised and amused when Emily told him, "Mr. Murphy says that every man and his dog wants permission to cross on that footbridge."

He sat at the window to view the first attempt, confident that few citizens, unused to steadying themselves at such a dizzy height, would venture more than a couple of feet into space. A workman was assigned as guard. The first visitors started out bravely, and a surprising number completed the crossing. Washington had a good laugh when he saw a stoutish woman venture out a few feet, grab her ballooning skirts, drop to her knees, then crawl back to the tower. The demand for crossing tickets was so great that Farrington finally "called off all this foolishness," to Washington's relief. They had done enough to satisfy the first wave of curiosity.

The stringing of the permanent cable wires was about to begin. All of the other Roebling bridges had cables made of seven strands. This would require nineteen strands, with an inner core of seven. Squeezing the strands into a cable had to be done in two operations. It was dangerous work, for the men in their swinging chairs might lose their balance. But none did. They soon grew accustomed to the great height.

The fifteenth strand was just completed—with four more to go before they could complete the first cable. Washington was not at the window when the accident occurred, but he read a full account in the newspapers.

"It was a terrible sight," according to one account. "One of the strands broke loose from its tackle. It swept from the anchorage at the Brooklyn side, up in the air like a giant whip. It leaped nine hundred feet through space, grazing the houses and streets. For an instant, the strand touched the bridge yard

near the New York tower, then with terrible speed, it whipped up and plunged into the river! It narrowly missed two ferryboats loaded with passengers. Two bridge men were swept from the tower, three others seriously hurt. We understand that the strand is a total loss."

As always when accidents occurred, a wave of criticism followed. Considering the dangers involved, the cost in lives during the building of the Brooklyn Bridge was surprisingly small. During its thirteen years of construction, twenty men died or were killed as the result of accidents. Even today, with all the mechanical safety devices which can be provided, lives are lost. The Walt Whitman Suspension Bridge across the Delaware River, opened in the spring of 1957, brought death to eight men.

The builder of the Brooklyn Bridge never lost sight of the dangers. He spared no expense to protect lives and health, and he continued to explain the cause for each accident as it occurred. Usually, the public accepted his explanations. On this occasion, the drama of the tragedy aroused the critics to unusually prolonged shouts of indignation. They even questioned the design of the bridge: "Why are you using steel for the framework? It is unheard of. You are adding unnecessary expense. How do we know that steel is as strong as iron?" The old cry of "fraud" arose.

Patiently, carefully and fully, Washington outlined his reasoning for the bridge company.

One of the New Yorkers on the board told a reporter: "Our city is not jealous of Brooklyn. But why should we pay for a bridge in order to send trade to a neighbor? This is asking a good deal. Now they ask us to add the extra expense of steel. Something is rotten about this!"

Even the New York *Times* joined in the clamor. Others called Washington stupid and extravagant. One midwestern newspaper started a rumor that the bridge would need a third tower, in center stream, to protect it from high winds.

Washington expected the criticism to die down, but he was

wrong. Enemies of the project began to attack him openly, as mentally incompetent. When one of the board members demanded that he appear in person at a meeting to answer the charges, he was heartbroken. He wrote a letter, saying, "I am not well enough to attend meetings, and cannot listen to conversation if it is continued very long. Everyone knows I am sick, and they must be as tired as I am of hearing my health discussed. I believe there is not a day that I do not do some sort of work. My assistants do the jobs assigned to them. The bridge interests do not suffer from my absence. I shall be most highly honored to be present at meetings of the board as soon as I am well enough to be of any use."

Emily read the letter. "This should quiet them. Do not think about it. You have made splendid progress this summer with the bridge."

Washington was not so easily assured. He said nothing to her but he came to the conclusion that he must resign. If the excitement continued another week, he must give up his position.

Seth Low, Mayor of New York, unwittingly changed this decision by proposing that the board fire Washington Roebling as Chief Engineer. For the first time, Martin received permission to visit.

"They tell me I can only stay a few minutes," he explained, "so I will tell you immediately that several men have proposed that I be appointed to your job. As long as you breathe, Colonel, I shall not accept it. I have been in your employ for many years. I worked for your father. I intend to go on working for the Roeblings—as long as you want me. Every man on the job would walk out if they dismissed you. Ask Farrington. He knows."

Washington tried to smile but he could not. Did he deserve such loyalty? He looked into Martin's troubled face and said, "I think you know how grateful I am. Tell the men that I will not resign. I will fight."

For the moment he scarcely knew just what tactics he would

use. Then an idea came to him. The American Society of Civil Engineers was meeting in New York. He would lay his problem before them—the top professional organization in the field. "Emily, get pencil and paper. I will dictate a complete story. You are to read it to the evening meeting."

His wife paled. "Why me? Shouldn't Mr. Martin do that? A woman at that meeting! It would be too ridiculous!"

Washington understood but insisted, "Everyone else is getting dramatic about this. Martin is just one more good engineer to those professionals. Give the newspapers something to talk about. When words gets around that a woman will make a speech, everyone will sit up and take notice!"

He asked no sympathy, but he merely stated plain facts. He swallowed his pride and detailed his accomplishments, making it plain that his chief concern was for the best interests of the bridge.

Dressed in her smartest outfit Emily started off, clutching the paper in her gloved hand.

The newpaper men had known that Emily Roebling was the Colonel's "go-between" and had reported that she was studying engineering—a subject which people of that day thought impossible for a woman to learn. The coverage they gave her simply presented yet eloquent appeal to the country's top engineers satisfied everyone. It was tremendous! She received an ovation when she finished, and hurried home to tell Washington that the men voted complete confidence in him and his ability to carry on his work.

During the next five years, while the work continued, Washington and Emily Roebling were free from attacks. The last doubters were quieted.

The bridge opened formally on May 24, 1883. Ten thousand invitations went out to national and state officials. President Chester A. Arthur arrived from Washington by special train. The Honorable Grover Cleveland, Governor of New York, came for the ceremony. Colonel Emmons Clark, commander of the "Dandy Seventh" Regiment, mounted his

spirited horse to lead his men in the parade down Broadway. The United States Marine Band, columns of marching citizens and grandstands filled with cheering onlookers joined in glorious celebration. All the stores in Brooklyn and many in New York closed their doors. The fleet of the United States Navy took up position below the bridge, and the guns at the Navy Yard in Brooklyn fired in salute. The water was a mass of sailing craft and steamboats, with horns tooting, sirens screeching. A million people looked on as the procession reached the New York tower. In a carriage, leading the parade, sat Emily Warren Roebling, talking to the President of the United States.

Washington Roebling sat in his window and watched through his field glasses as his wife rode into view. Slowly he shifted his sights to the Brooklyn end of the bridge. There were his assistant engineers, the sand hogs, the cable spinners, the carpenters, the mechanics, his brothers, his son and, far to the rear, Charles Swan dressed in top hat and swallow-tailed coat.

The patient, loyal men who had assisted Washington Roebling through the long, difficult years paid their tributes, many of which were printed in newspapers and periodicals at the time.

Mr. Farrington said: "The sun and the stars will shine upon it. The zephyrs will toy with its stays and the storms will howl through its latticed sides, but through all, and indifferent to all, it will stand motionless and firm, an enduring monument to engineering skill, to daring, patient, laborious effort."

It was Abram Hewitt, the man to whom John Roebling submitted his first proposal, who underlined the personal factors: "The bridge is more than an embodiment of scientific knowledge. It is equally a monument to the moral qualities of the human soul. Its builders have had to face death and dread disease—death to its designer, disease to the engineer who has erected it. But the record will not be complete without reference to the unnamed men whose unflinching courage

appalled the stoutest heart. The bridge is a lasting monument also to the self-sacrificing devotion of a woman—Emily Warren Roebling."

The final speaker on the program at the opening was William C. Kingsley, President of the board since the death of the beloved Mr. Murphy, and the man who is called the "Father of the Bridge." He paid tribute to Washington Roebling, making a last defense of the builder. "While this structure stands, all who use it will be his debtors," he concluded.

During the entire ceremony the eyes of the man in the bay window were undoubtedly the most critical eyes that focused on the Brooklyn Bridge that day. He tried to look at it as if for the first time, as if he were an engineer from a foreign land. He found it beautiful.

To most people, accustomed to the gew-gaws and meaningless decoration of that architectural period, the towers were too plain, too massive to be pleasing. The best judgment on any architectural endeavor comes with the passing of the years. It lies in its usefulness, its durability, its ability to blend with its location. The Brooklyn Bridge meets these tests. The magic tracery of its cables and stays—the grace of its sweeping curves—will thrill the onlooker from any vantage point. For the best effect, to see the real beauty of the Brooklyn Bridge, the viewer should look at it from a distance, out in the harbor. There he sees that the giant towers complement the spires which now dominate these two boroughs of New York City. The new skyscrapers do not dwarf the old bridge—they merely accent its beauty and usefulness.

And so it stands, "The Eighth Wonder of the World," the most talked about, the most written about, yes, even the most joked about, but certainly the most beloved engineering structure in existence.

EPILOGUE

For the first time in many years Washington Roebling was now free of strain and heavy responsibility. The family moved to Troy, New York, where they stayed four years, until John graduated from Rensselaer Polytech. Then they moved to Trenton. By that time Washington was able to take short walks and have a few visitors. During those years he concentrated on his mineral collection, which became the largest in private hands and is now endowed and on view at the Smithsonian Institution in Washington, D.C. He also read widely in the fields of literature, history and public affairs, but found time to keep in close touch with the family business which he served as a consultant. He lived quietly in his beautiful Tudor home on the outskirts of Trenton until a series of disasters came to the Roeblings. Emily died in 1903; Swan, a short time later. In 1917 he lost his brother Ferdie. A number of months later, Charles died, and then his nephew Ferdinand, who was President of the company.

Washington came out of retirement once more to head John A. Roebling's Sons, which had grown from a small business valued at one hundred and fifty thousand dollars at the death of its founder to more than forty million—the largest of its kind in the world, a place it holds even today. He was now eighty-four, white haired, stooped, but as mentally alert as ever, and during the three years he served the business actively it made a spectacular growth. The people of Trenton enjoyed seeing their leading citizen start off to work each morning, by streetcar (he did not trust automobiles), with his beloved Airedale dog Billy at his heels. Since his son John had gone

into business for himself as a research engineer, he had to wait for his nephews to gain enough experience to take over the bulk of the decisions. Once again he retired, remaining as an active consultant, offering advice from his home when asked, until a few days before his death at the age of eighty-nine.

The people of Trenton loved to tell stories about Washington Roebling, to quote his salty remarks, to compliment him on his beautiful flower garden, his mineral collection, his infrequent stories about his life. But when someone asked, as they so often do of elderly folk, "What was the greatest thrill you ever experienced, Colonel Roebling?" there was never a moment's hesitation.

"My greatest thrill came when they dedicated my father's monument here in Trenton. The speaker on that occasion voiced my thoughts in much finer words than I could have found. I shall always remember: 'Brooklyn Bridge is beautiful. All the latent poetry of the mathematician—all the beauty of the artist—architect, all the harmony of the musician, all the wonders of philosophy, all the faith and reverence which John Roebling had in his heart are in this bridge. It is a soul's bid for immortality.' "

A LIST OF THE ROEBLING BRIDGES

	Opened
ALLEGHENY RIVER AQUEDUCT Taken down in 1861 when the canal was abandoned	1845
MONONGAHELA RIVER BRIDGE Taken down in 1882 to meet new traffic needs	1847
DELAWARE RIVER AQUEDUCT Converted into a highway in 1898; still in use	1849
LACKAWAXEN RIVER AQUEDUCT Taken down in 1898 when the canal was abandoned	1849
RONDOUT RIVER (HIGH FALLS) AQUEDUCT Taken down in 1898 when the canal was abandoned	1850
NEVERSINK RIVER AQUEDUCT (PORT JERVIS) Taken down in 1898 when the canal was abandoned	1850
NIAGARA RIVER RAILROAD BRIDGE Taken down in 1897 to meet the need for a larger bridge	1855
ALLEGHENY RIVER BRIDGE Taken down in 1891 to meet the need for a larger bridge	1860
WHEELING, WEST VIRGINIA, OHIO RIVER BRIDGE Still in use; oldest suspension bridge in North and South America	1862
CINCINNATI-COVINGTON, OHIO RIVER BRIDGE Still in use	1867
BBOOKLYN BRIDGE Still in use	1883

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