**THE EAST RIVER SUSPENSION-BRIDGE.  
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**NEVER was a more important engineering work undertaken, nor one which, notwithstanding its immense cost, is more likely to be prolific of rich results by the increased value given to real estate in, all parts, and particularly the outskirts, of Brooklyn, than the construction of the bridge across the East River. Geographically the greater portion of the city of Brooklyn is nearer the business centre of New York than any part of the latter city above Fourteenth Street, and were it not for the isolation—caused by the necessity of twice daily going through *le mauvais quart d'heure* consumed in crossing the East River in the crowded ferry-boats, there is no doubt but that the growth of "The City of Churches" would have been even more rapid and extraordinary than that which has actually taken place.**

**The act to incorporate the New York Bridge Co., for the purpose of building and maintaining a bridge across the East river between New York and Brooklyn, was passed by the Legislature of New York on the 1st of April, 1867, and shortly after this date the work on the structure began. The capital stock of the company was placed at five millions of dollars, to be divided up into shares of one hundred dollars each. By a clause in the charter the corporations of the cities of New York and Brooklyn are empowered to take possession of the bridge and its appurtenances at any time on payment to the bridge corporation of its cost and thirty-three and one-third per cent additional but if advantage be taken of this proviso, the bridge is to be made free to travelers and vehicles. It was further enacted, that no pier should be constructed in the river beyond the pier lines laid down in the Act of authorization, and that the bridge should be built, at an elevation of not less than one hundred and thirty feet above the river at high tide, thus leaving the navigation of the East river unobstructed. It begins at or near the junction of Main and Fulton Streets, in the city of Brooklyn, and will cross the river as directly as possible to some point at or below Chatham Square, not south of the junction of Nassau and Chatham Streets, in the city of New York. In addition to the private subscriptions toward the capital stock, New York city is to pay five hundred thousand dollars in each of the years 1874 and 1875, and the city of Brooklyn the sum of one million dollars during the same time.**

**The work of construction was carried on under the supervision of the late John A. Roebling, the well-known engineer and architect of the Cincinnati Suspension-Bridge, up to the time of his decease. This onerous position was then transferred to his son, Mr. W. A. Roebling, and at this writing is still held by him. The plans and specifications adopted at the inception of the enterprise anticipated many of the leading features which have since contributed to the success of the great bridge at St. Louis. To cross a river 1,600 feet in width with a single span had, up to this time, been thought beyond the limits of engineering skill. But the difficulties in this case were much enhanced by the fact that the towers to support, the immense structure necessary for this purpose had to be constructed under circumstances that rendered the usual modes of sinking piers impracticable. It was, therefore, determined to employ the method of working by compressed air. Caissons were made having the horizontal dimensions of the two piers, that on the New York side being 102 feet by 172. Each caisson was, in effect, a wooden box turned bottom upward, the interior space being nine feet high. The roof of the New York caisson (bottom of the box) was twenty-two feet thick of solid timber bolted together, supported by frames running from side to side. These frames, together with the edges of the box, and the upward pressure of the condensed air within the caisson, were to sustain the vast superincumbent weight. The area of the structure was about 17,500 square feet.**

**The caissons having been built on ways, were launched after the manner of a ship, and towed to the points where the piers were to be located. Courses of granite blocks were then laid upon the top of the caisson, by which it was sunk to the bed of the river. Air was then forced into the chambers from the shore until the water in the interior space was entirely displaced, the engines working night and day to maintain the pressure. The workmen obtained access to the chamber by means of two shafts extending above the surface of the water. At the bottom of each shaft were two air-locks, simply ante-chambers constructed of iron, into which the men entered from the shafts, and, closing an air-tight door behind them, admitted the compressed air from the caisson by means of a cock. When the pressure in the last ante-chamber was equal to that in the caisson, a communicating door was opened, and the men passed into the chamber below. In going out this process was reversed, the compressed air in the lock being allowed to blow off through a cock into the open shaft. Great care has to be taken in regulating the compression of the air, as work in the caisson is attended with considerable danger. Two men have already died, and a score or more have been prostrated, owing to its injurious effects.**

**To secure proper foundations for the two great towers was the principal engineering problem to be overcome, and now that these have been built and the towers erected on them, the bridge scheme may be said to stand on a firm footing and its construction almost regarded as an accomplished fact. The caisson on the Brooklyn side of the river was sunk into its place during the year 1871. Up to 1872 the borings for foundations on the New York side had been confined to a small area covered by an old pier, owing to the fact that the adjacent ferry slips could not be immediately vacated. These were evacuated by the lessees at so late a date, that experiments could only be made with four bore-holes before the caisson was ready to be sunk.**

**The bore-holes developed the fact that there was an extreme difference of twelve feet in the level of the bed rock, the hole of the least depth touching hard-pan at a depth of eighty feet below high water, and the deepest at ninety-two feet. The strata consisted in the main of a black mud deposit of twelve feet, followed by a layer of coarse sand of six feet in depth, which overlaid a gravel bed of the same thickness. Beneath the gravel was a very heavy deposit of quicksand of a depth varying from fifteen to twenty feet, and abounding with boulders in its lower portion. The quicksand extended usually to within a few feet of the rock, and, in some instances, to the rock itself. But the immediate rock surface was covered with a compact layer of material through which it was impossible to drive a six-inch pipe without shattering it. To drive the pipe only one inch required thirty blows of a five hundred pound hammer, falling from a height of twenty feet. When the sinking of the caisson commenced, it was not determined by the engineers whether to go to rock or to remain above it. Further investigation into the character of the river bed convinced them that no single plan of operation would be adequate to remove all the material that would have to be displaced. The immediate river bed consisted of logs and loose dock stones followed by a sticky black clay. These materials could be most conveniently displaced by dredging. The river sand, and the firm gravel underneath it, could be more easily removed through pipes, either by means of pumps or by the air-pressure direct. The coarser gravel would go to water shafts, while the fine quicksand could be blown out through the pipes, until the preponderance of the boulders and small rounded stones compelled a return to the water shafts. It was at first determined to use the dredge for this latter purpose, but it was found by experience that the dredge had not sufficient capacity to remove stones imbedded in quicksand. After much tedious investigation a satisfactory foundation was reached in May, 1872.**

**The probable cost of the bridge has been estimated at $13,045,065.00. From this amount, however, a large sum must be deducted for land which will lie under, the bridge when completed, and be capable of utilization. It is expected that the leases of these properties will reimburse the Bridge Company $1,644,350.00.**

**The original plans have been considerably modified and altered. Since the first estimates were made, it has been found necessary to increase the width from eighty to eighty-five feet. Two out of the three sidewalks that were contemplated have been given up, and two additional horse-car tracks substituted. This change involved an increase of seven per cent in the cost of the entire bridge, including superstructures, tower foundations and anchorages. The United States Government directed there should be an additional elevation of five feet, an order which necessitated a change in the trusses and some of the masonry.**

**When the cities of New York and Brooklyn take charge of the management of the bridge, the Board of Directors will consist of twenty members. Each city is to have the nomination of eight members, the right of appointment being vested in the Mayor and Comptroller, and the last-named gentlemen are to hold similar positions by virtue of their office.**

**There is a strong inclination on the part of New York to throw off the burden it has assumed in this matter. It has been freely argued that the bridge will work to the detriment of the metropolis by drawing off a large share of its population; but the city is legally bound to fulfil its agreement, and although it may succeed in delaying the opening of the bridge, it will ultimately be compelled to pay its grant. When completed the bridge will be the largest of its kind in the world. Work on it is rapidly progressing; but although the act of incorporation demanded it should be opened for travel during 1870, it will not be finished for three or four years to come. The tower on the Brooklyn side has been carried to a height of one hundred and sixty-two feet, and the tower on the New York shore is also attaining lofty proportions. The Brooklyn tower, at the springing line of the arches, will be two hundred feet high, and the New York tower will require an elevation of one hundred and twenty feet to bring it to the level of the roadways.**

**Our picture of the bridge is taken from the Brooklyn side. The building near it is the office of the Fulton Ferry Co., whose Brooklyn terminus adjoins the office of the New York Bridge Co.**