PROGRESS OF THE EAST RIVER BRIDGE.

Marked progress has been made toward the completion of the East River Bridge since our last illustration of this great engineering work. All of the floor beams have been placed, the foot bridge is removed, the approaches have been brought almost to completion, and the elevated super structure has been commenced and is now progressing, having reached a distance of ninety to one hundred feet each way from each tower, and the overfloor stays are correspondingly advanced.

The bridge, as is well known, is designed to carry three kinds of load: the outside roadways being for wagon traffic, the middle one for a promenade, with the railway tracks on either side of it, and between it and the roadways.

The approach on the Brooklyn side differs from the New York approach in having iron street bridges at all of the streets. The New York approach has but one iron street bridge, and this is located at Franklin Square. All the other streets are spanned by massive arches of masonry. The bridge at Franklin Square presents several engineering difficulties of more or less importance, which may be enumerated as follows: First, the bridge is longest on the upstream side; second, it is skewed at both ends; third, it is on an incline; and fourth, it must be adapted to three quite different kinds of load. The form and inclination of the bridge necessitates a great variety of fastenings, of different angles and shapes, and call for somewhat complicated calculations, and a large number of drawings.

The total weight of metal in this bridge in round numbers is one thousand tons. Of this 1,658,279 pounds are wrought iron, 82,092 pounds steel, 27,440 pounds steel pins, 146,891 pounds cast iron. The width of the bridge over all, 88 feet. Length on the longest side 206 feet. Length of longest truss 198′ 5″; length of shortest truss 163′ 10″. The outside roadways will be 16′ 7″ wide between fenders. The two railroad ways will be 12 feet each. The promenade will be 17′ 7″ wide. The parapet is of unique design, and harmonizes with the character of the masonry parapet on the rest of the approach.

The Brooklyn approach intersects at an angle of about 45°, York, Main, and Prospect streets, over which it is carried by wrought-iron bridges composed of riveted plate girders The bridges rest upon stone abutment walls, and have a grade of 2·8 per cent.

The York street bridge consists of six, single web, riveted plate girders, 9 feet deep and 85 and 86 feet long, having lattice cross-girders riveted to them, these latter supporting longitudinal rolled floor-beams. Buckled plates cover the outer floor-beams and are riveted to them. The bridge seats are 42 feet above the street level.

The Main street bridge is similar to the York street bridge, and is about the same length. The mean height of the bridge seats above the level of the street is 22 feet.

The approach where it crosses Prospect street is curved, the mean radius being 260 feet. The Prospect street bridge has six continuous girders, 2 feet 6 inches high, in three spans, one continuous girder in two spans, and six single girders. The continuous girders are parallel to each other, but the other or outer girders are placed so as to conform as nearly as possible to the curve of the approach. The cross girders of this bridge support, as in the other bridges, the longitudinal rolled floor beams. This bridge is supported by two stone abutment walls and two rows of columns, located at the curb lines of the street. All the girders of this bridge, both main and cross, are of the single web, riveted plate type.

The total weight of metal in the street bridges of the Brooklyn approach is as follows: York street bridge, 561,338 pounds; Main street bridge, 551,342 pounds; Prospect street bridge, 185,430 pounds.

The following is a table of the principal dimensions of the bridge:

Construction commenced January 2, 1870.
Size of New York caisson, 172 x 102 feet.
Size of Brooklyn caisson, 168 x 102 feet.
Timber and iron in caisson, 5,253 cubic yards.
Concrete in well holes, chambers, etc., 5,669 cubic feet.
Weight of New York caisson, about 7,000 tons.
Weight of concrete filling, 8,000 tons.
New York tower contains 46,945 cubic yards masonry.
Brooklyn tower contains 38,214 cubic yards masonry.
Length of river span, 1,595 feet 6 inches.
Length of each land span, 930 feet, 1,860 feet.
Length of Brooklyn approach 971 feet.
Length of New York approach, 1,562 feet 6 inches.
Total length of bridge, 5,989 feet.
Width of bridge, 85 feet.
Number of cables, 4.
Diameter of each cable, 15¾ inches.
First wire was run out May 29, 1877.
Cable making really commenced, June 11, 1877.
Length of each single wire in cables, 3,578 feet 6 inches.
Ultimate strength of each cable, 12,200 tons.
Weight of wire, 12 feet per pound.

Each cable contains 5,296 parallel (not twisted) galvanized steel, oil coated wires, closely wrapped to a solid cylinder, 15¾ inches in diameter.

Depth of tower foundation below high water, Brooklyn, 45 feet.

Depth of tower foundation below high water, New York, 78 feet.

Size of towers at high water line, 140 x 59 feet.
Size of towers at roof course, 136 x 53 feet.
Total height of towers above high water, 278 feet.

Clear height of bridge in center of river span above high water, at 90° Fah., 135 feet.

Height of floor at towers above high water, 119 feet 3 inches.

Grade of roadway, 3¼ feet in 100 feet.
Height of towers above roadway, 159 feet.
Size of anchorages at base, 129 x 119 feet.
Size of anchorages at top, 117 x 104 feet.
Height of anchorages, 89 feet front, 85 feet rear.
Weight of each anchor plate, 23 tons.
Engineer, Col. W. A. Roebling.

The depots at the ends of the bridge are to be elaborate structures of glass and iron. The one on the New York side is to be 260 feet long and 59 feet wide, with a platform on the bridge end 70 feet long.

The cars will pass through the depot, and are shifted from one track to the other on switches between the depot and end of the approach.

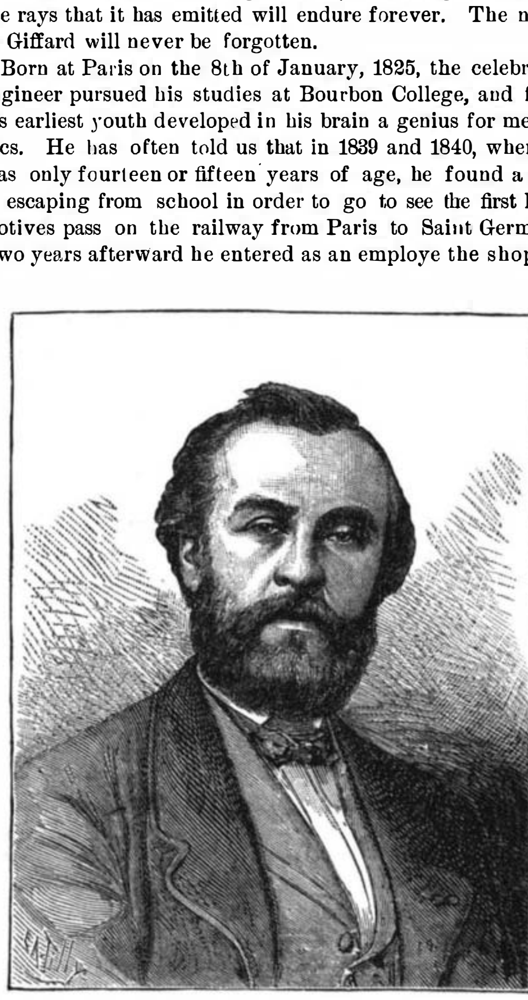
We are informed that Colonel Paine is engaged on a system of wire rope propulsion for the railway crossing the bridge.

For much of our information we are indebted to Messrs. C. C. Martin and F. Collingwood, engineers in charge of the approach work.

HENRI GIFFARD.

Henri Giffard was one of those privileged men whose works honor not only their country but entire science. The light of such an intelligence may be extinguished, but the rays that it has emitted will endure forever. The name of Giffard will never be forgotten.

Born at Paris on the 8th of January, 1825, the celebrated engineer pursued his studies at Bourbon College, and from his earliest youth developed in his brain a genius for mechanics. He has often told us that in 1839 and 1840, when he was only fourteen or fifteen years of age, he found a way of escaping from school in order to go to see the first locomotives pass on the railway from Paris to Saint Germain. Two years afterward he entered as an employe the shops of



HENRI GIFFARD.

this same railway; but his ambition was to drive a locomotive for himself. He succeeded therein, and had the pleasure of taking the first trains of the railroad over the rails with as great speed as he could.

Henri Giffard was only eighteen years old when he began to devote himself to aerial navigation. It was not long ere he made some ascents in a balloon, and it was by joining practice with theory that he was led to realize his great experiment of 1852.

This experiment was one of the most memorable in the scientific history of our epoch. The young engineer, amid a host of material difficulties, had constructed an elongated balloon 44 meters in length by 12 meters in diameter. This aerial vessel, which cubed 2,500 meters, was provided with a screw propeller actuated by a 3-horse power steam-engine. Giffard rose alone into the air, proudly seated on the tender of his engine, and was followed in space by the applause of the spectators. He succeeded in perceptibly turning aside from the line of the wind, and demonstrated that an oblong balloon, the only kind that can be steered with advantage, offers perfect stability, and obeys with great precision the action of the rudder. The road for aerial navigation by oblong balloons was thus marked out. In 1855, the bold mechanician renewed this experiment in another and not less remarkable balloon. But the wind, at the time, was too high to allow of a successful result to the experiment.

Attempts of this nature were very expensive and brought no return. Giffard then gave up balloons for the moment in order to construct a new style of fast-speed steam vessels, and to finally invent the *injector* which made his fortune. Giffard became a millionaire over and over again, but never ceased to be the modest and simple worker such as he was known in the beginning of his career. Balloons remained the objects of his constant thought and of his most assiduous labors. At the time of the Paris Exhibition of 1867 he constructed the first steam captive balloon, and, the year following, he brought out another one at London which cubed 12,000 meters, and which necessitated an enormous outlay, for the material cost more than 700,000 francs, an amount that the projector lost entirely without uttering a single complaint. The eminent engineer never regretted the expense of this experiment, as costly as it was, because, as he said, some profit would always be derived from it.

Giffard was thus led gradually to originate the great captive balloon of 1878, a real monument to aerostation, and which may be called one of the marvels of modern mechanics. Every one still retains a recollection of that globe of 25,000 cubic meters, which lifted into space forty excursionists at once, and opened up a panorama of Paris to more than thirty thousand persons during the time of the Exhibition. All was new in this colossal work, and aerostatics was transformed therein in every detail. The impermeable tissues, the preparation of hydrogen in large quantities, the modified and improved details of construction, all this our engineer had conceived, tried, and realized. His power of conception was remarkable—he thought out everything, he foresaw all. He was an emeritus experimenter, an eminent calculator, a man of exceptional ingenuity, and a mechanician out of the ordinary line. The grand aerostatic constructions to which he had so boldly applied himself should have permitted him to realize the dream of his entire life, to take up again his experiment of 1852, and to give finally to the world a solution of the problem of directing balloons. He had conceived an imposing project, that of constructing a balloon of 50,000 cubic meters, provided with a very powerful motor actuated by two boilers—one heated by gas from the balloon and the other by petroleum. The steam formed by combustion was to be received in a liquid state in a condenser of wide surface, so as to compensate for losses of water from the boiler. How many times has not our regretted master given us in detail a description of this monitor of the air. All was calculated, all was ready, even to the million which was to permit him to put his ideas into execution, and which was always held by him in reserve in some one of the large banking houses of Paris. Other projects were yet germinating in his brain—a steam carriage, a high-pressure locomotive, and a high-speed boat—powerful conceptions, studied out with perseverance and stamped with the seal of genius.

But, beyond human will and foresight, are the fatal laws of destiny, and the strongest must submit to them. Sickness came to combat the efforts of the great inventor, enfeebling his eyesight, rendering all work impossible, and throwing him into extreme grief; for there was little of the athlete in the soul of Giffard, and the idea of finding himself reduced to a state of powerlessness rendered him inconsolable. He shut himself up; and he who had so much loved light, independence, and activity lived in solitude, and gradually passed away.

In Henri Giffard, the man was not less remarkable than the engineer. He was slender and nervous, supple, agile, and very dexterous of hand. He was capable of doing anything himself, and we remember one day having surprised him in the act of taking the stuffing out of an arm chair in his parlor in order to remove therefrom a spring that he needed for an experiment, and another time we observed him making a photometer out of two pencils fixed in the cover of an almanac He informed himself in regard to everything he desired to do through experimentation. He wrote out with minute care the results of all his researches, of all his labors, and has left innumerable manuscripts in which will be found a wealth of scientific facts.

His physiognomy was charming, and his clear, limpid eyes, full of loyalty and frankness, shone with uncommon luster. He was a fine conversationalist, was witty, and had a mind stored with incomparable technical erudition. He was reserved, and disliked the vulgarities and frivolities of the world, and so passed at times in the eyes of strangers as being cold and severe of address. Those who thus judged of him did not know him; for he had a warm heart, an inexhaustible generosity, and an exquisite delicacy. He disdained honors, and loved work above everything. An enemy to manifestations of an apparent wealth, he took pleasure in the practice of a simple and industrious life; but, when it became a question of constructing machines, the millionaire made his appearance. He has been seen to expend 30,000 francs to construct a suspended car or a gas apparatus, and several hundred thousand to construct a captive balloon. When it became necessary to aid a friend or do an act of charity, he took the gold from his coffers by the handful. He was a Mecænas to all aeronauts, and the benefactor of all those whom he knew. He gave incomes to his unfortunate friends, and owned near Paris a house to which tenants were admitted only on condition of being poor and of never paying their rent. Giffard hid himself to do good, and the good acts in which his life abounds he performed in secret.

The man whom we weep is of those whom we never forget. Whatever be the distance that separates the master from his disciples, let us promise him to make every effort to walk in his tracks to continue his good work. May his blessed name protect us! If there come hours of lassitude or weakness, let us remember that we shall only have to visit his tomb to draw new strength therefrom.—*Gaston Tissandier, in La Nature.*