Engineering, Civil & Mechanical.

PROGRESS OF THE GREAT SUSPENSION BRIDGE BETWEEN NEW YORK AND BROOKLYN.

The present appearance of the work on the East River Bridge is shown in the accompanying engravings so clearly that any description, except of details, is quite unnecessary.

The point of view chosen by our artist is (for the larger engraving) on the high ground northeastward of the Brooklyn tower, so as to show not only the progress of the work, but the graceful structure of the tower, which from its great height appears to be very slender, notwithstanding its massive thickness and breadth of base.

Beneath the bridge is seen the harbor, looking southward, with Governor's Island and Castle William in the middle distance. Beyond is the lower bay, and beyond that the ocean. Only the southern point of New York is seen on the right. Across the mouth of the Hudson, which looks like a pointed bay, lie the Jersey shores and Staten Island. Across the bay, on the left, is the Long Island shore, with Bay Ridge and Brooklyn.

The smaller cut shows the underside of the bridge, without the timber flooring, as seen from the deck of a ferryboat passing beneath. The work of suspending the floor beams progresses with practical uniformity at both towers and on both sides of each tower, the design being to keep the strains on the masonry as equally balanced as possible. At this writing about twenty-five beams are placed on each side of the two towers, or something near a hundred in all. Suspender ropes are in place for more than twice as many additional beams, there being four suspenders to each beam.

From below the suspenders look like spider lines; they are, however, stout ropes of steel wire, from 1⅝ to 1¾ inches in diameter, and able to sustain a weight of 50 tons or more each, or five times the heaviest load likely ever to fall upon them. The bands by which the suspenders are attached to the cables above are of wrought iron, five-eights inch thick by 5 inches wide. They were put on when the cables were being wound, and fit closely to the cables. On the outer side the ends of the bands terminate in two lugs, seven-eighths inch thick. An iron screw bolt, 1¾ inches in diameter, passes through the lugs to hold the suspender socket and to tighten the band around the cable. The bands were put on by the winders, who heated the backs of the bands in little forges until they could be opened far enough to let them go over the cable. The two ends of the band were then drawn together, a thin plate of iron being slipped between the cable and the hot band so as to protect the galvanizing of the wire of the wrapping until the band was cool. To these bands the suspender ropes are attached by means of wrought iron closed sockets. On the lower end of each suspender is a cast iron socket for the reception of the stirrup rods which hold the floor beam. The stirrup rods have long screw threads, by means of which the beam can be raised or lowered to regulate the floor grade, it being impossible to cut and fasten the suspenders to the exact length required.

The floor beams are made in halves at the steel works; are landed at the foot of the towers; are hoisted to the level of the bridge floor and run out upon a tramway to the point of suspension; and after being attached to the suspenders are securely riveted together, making a continuous beam the entire breadth of the bridge, or 85 feet. These beams are unlike any ever before used on a suspension bridge. They are 32 inches deep, 9⅜ inches wide, and weigh four tons. Each beam has two top and two bottom chords tied and braced together in the form of a triangular lattice girder. The chords are of steel channel bars. The main beams are suspended 7 feet 6 inches from centers, and between each pair of principal beams a lighter I beam is placed, resting on the truss chords, so that the floor planking will be supported and fastened every 3 feet 9 inches from centers. Wooden bridging will be inserted between the beams to resist the strain of the over-floor stays. The longitudinal trusses are six in number, dividing the bridge floor into five sections. The two outside sections, 18 feet 6 inches in width, are for vehicles. A tramway will also be laid down in each, in case it may be desirable to run street cars across the bridge. Inside the carriage-ways will be two railways for cars to be propelled by an endless iron rope, operated by a stationary engine. Between the rail ways, and elevated 12 feet above them, will be a footwalk, 15 feet wide. This promenade will be the first part of the structure completed, since it will be needed for the workman upon other parts of the superstructure. On both sides of the river the masonry of the approaches to the bridge is substantially finished.

An idea of the magnitude of the work already accomplished may be had from the following figures, which are furnished by Mr. E. E. Farrington, master mechanic of the bridge:

Length of the main span	1,595½	feet.
" " land spans, 930 ft. ea., total	1,860	"
" " New York approach	1,562½	"
" " Brooklyn approach	971	"
Height of main span above water	135½	"
Depth of N. Y. foundation below high water	78½	"
Depth of Brooklyn foundation below high water	44½	"
Size of N. Y. caisson (for foundation)	172x102	"
" " Brooklyn "	168x102	"
Cubic yards of masonry N. Y. tower	46,945	
" " " " Brooklyn tower	38,214	
Size of towers at high water mark	140x59	feet.
" " " " top	136x53	"
Total height of tower above high water	271½	"
Height of roadway at towers	119	"
" " arches above roadway	117	"
" " towers " "	159	"
Width of openings through towers	33¾	"
Size of anchorages at base	129x119	"
" " " " top	117x104	"
Height in front	85	"
" " rear	80	"
Width of flooring	85	"
Grade of roadway	3¼ ft. in 100	"
Number of cables	4	
Diameter of cables	15¾	in.
Length of each cable	3,578½	feet.
Wrapping wire on each cable	243 miles 943	"
Number of wires in each cable	5,434	
Total length of wire in each cable	3,515	miles.
Number of suspenders—		
Each cable, main span, 208; in all.. 832		
" " each land span, 86; in all. 688		
Total	1,520	
Number of post bands—each land span, each cable, 35; in all	280	
Number of double floor beams supported by cables	450	
Strength of each suspender	140,000	lbs.
Sustaining power of each cable	12,000	tons.
Greatest weight on a single suspender	20,000	lbs.
" " " " " cable	3,000	tons.

—*Scientific American.*

THE FIRE RISK OF STEAM HEATING.—The Fire Marshal of Pittsburgh has pronounced the opera-house in that city dangerous, on account of its liability to take fire from steam pipes, and quotes from several authorities to support his position, among them the opinion of the vice-president of the Continental Fire Insurance Company, of New York. He says: "Steam pipes have been known to set fire to wood at a distance of 300 feet from the boiler. Pipes should not pass through a side wall or roof or enter chimneys in unused rooms, where joints may become loosened. It has become a serious question whether stoves—because of their admitted danger and consequent care in their management—are not safer than steam pipes." He cites fifteen fires known to have occurred from a contact of wood and steam pipes, such as the Fire Marshal describes at the opera house.

"It is useless," says the Marshal, "to spin theories upon this question, because the dangerous character of steam pipes in contact with wood has been fully proven in this city, and at the expense of the insurance companies. It will trouble no reader to recollect the burning of Stoner & McClure's planing mill, in the Twelfth Ward, in the latter days of 1879. The fire was not susceptible of explanation on any other theory than from the steam pipes. This the firm refused to believe, and rebuilt in the same manner. The result was a second fire, which satisfied them, and they tore out the apparatus. On the 23rd day of May, 1870, there was a day-light fire at the American Iron Works of Jones & Laughlins. There was no dispute about what caused that burning, as it was observed, and the records of the payment for damages are upon the books of the local underwriters. It was a steam pipe. Wm. G. Johnston, president of the Citizens' Insurance Company, could not believe that hot air would set a board on fire until after suffering a loss from that cause and collecting $300 from his own company to repair it."—*Metal Worker.*