

A Cliff of Glass.

Among the scientific papers that will appear in the appendix of one of the forthcoming reports of the Geological Survey is one by Professor Joseph P. Iddings upon the obsidian cliff of Yellowstone Park. This cliff is an elevation half a mile long by from 150 to 200 feet high, the material of which, Professor Iddings says, "is as good a glass as any artificially manufactured." Its colors and structure not only make it highly interesting to the visitor, but furnish to the scientific investigator phenomena of importance. The cliff presents a partial section of a surface flow of obsidian that poured down an ancient slope from the plateau lying east. It is impossible to determine what the original thickness of this flow may have been. The dense glass that now forms its lower portion is from 75 to 100 feet thick, while the porous and pumiceous upper portion has suffered from ages of erosion and glacial action. A remarkable feature of the cliff is the development of prismatic columns, which form its southern extremity. These are of shining black obsidian, rising from the talus slope, and are from 50 to 60 feet in height, with diameters varying from two to four feet. The color of the material of this cliff is for the most part jet black, but much of it is mottled and streaked with bright brownish red and various shades of brown, from dark to light yellowish, purplish, and olive green. The brilliant luster of the rock and the strong contrasts of color with the black are very striking. In places, the glass in the process of cooling has been broken into small angular pieces, which have been again cemented by the later flow, producing many-colored and beautiful breccia. In some places, the material shows a fine satin luster, while in others a deep golden sheen is noticeable, which under the lens resolves itself into thin beams of red and yellow light. Through the black and red glass are scattered dull bluish gray patches and bands, and round gray and pink masses, the effect of which is still further to vary the appearance and beauty of the rock, and make it the most conspicuous and characteristic variety of volcanic lava known.

The Proposed French Tower.

The Eiffel tower, 1,000 feet high, which is to be erected in Paris for the exposition of 1889, is likely to afford plenty of excitement to Parisians before it is completed. The first step is about to be taken in ascertaining what curve is to be given to the sides. A chain or cord suspended between two points forms a catenary curve corresponding with the weight. Now it is supposed that something of the kind also occurs when the

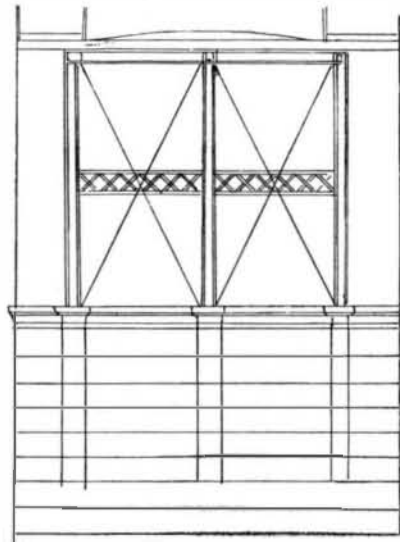
DOUBLE PARABOLIC BRIDGE, SUBMITTED IN COMPETITION, FOR CROSSING THE HARLEM RIVER AT 181st STREET, CITY OF NEW YORK.

BY GEO. ED. HARDING, CIVIL ENGINEER AND ARCHITECT, N. Y.

The main span is to have one clear span of 450 ft., with two end spans of 225 ft. each, composed of low Bessemer steel rectangular braced tube parabola arch, with Bessemer steel linked catenary, braced with the necessary struts and bracing.

The two end spans, where the thrusts and pull of the principal members unite and equalize each other, are anchored down at their respective connections, and so arranged that the necessary lateral movements for expansion and contraction are allowed for.

The iron framed supports which receive the thrust



Section.

of the arch and support the catenary are in longitudinal section that of an isosceles triangle, and have lateral play allowed by resting on bed plates having steel rollers.

The ultimate strength of the steel used is as called for, viz., 60,000 pounds tensile and 190,000 compression. Elastic limit, 36,000 pounds, with 10 per cent extension.

All rock to be leveled off in horizontal steps when used as foundation.

All piers to be faced with granite, 20 to 30 in. thick, averaging 6 and 8 ft. long, with suitable headers binding to the interior stone of limestone, uniform with facing courses.

Piers for the approaches not to be solid work, but lightened by interior arches, as explained by details if required.

Foundation for northern piers to be of concrete masonry or beton nearly to surface of ground.

vations, are to be of best quality cast iron, carefully painted with one coat of metallic paint before delivery, and to have two additional coats of best Atlantic Mills lead before the final coat of Sienna lead, with tints as desired.

The entire metal work of the bridge to have four coats of best paint, as directed by the chief engineer.

Ornamental railings on the out and inner sides of sidewalk over the three central spans and on the inside of the walk on the approaches (the stone parapet there being on the outside), with posts, to be of best cast iron, selected pattern.

The roadway to be as called for, of corrugated steel plates, concreted with a cover of Trinidad asphalt, with Belgian block granite paving. Sidewalks similarly arranged with bluestone tiles and marble borders.

The designated weight of 200 pounds per square foot distributed load above the full weight of the superstructure, with the live load of 100 pounds and the wind pressure of 400, has been allowed for in the sections.

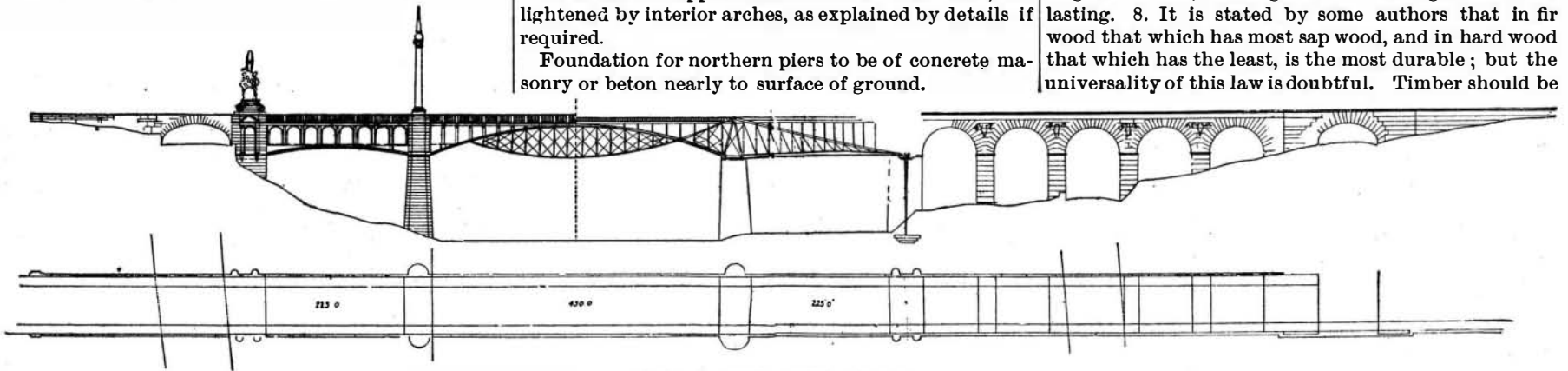
The entire strutting of the superstructure is also to be of Bessemer steel, and also the main floor girders.

Bracing, wind ties, and anchorage links to be of best quality Swedish wrought iron.

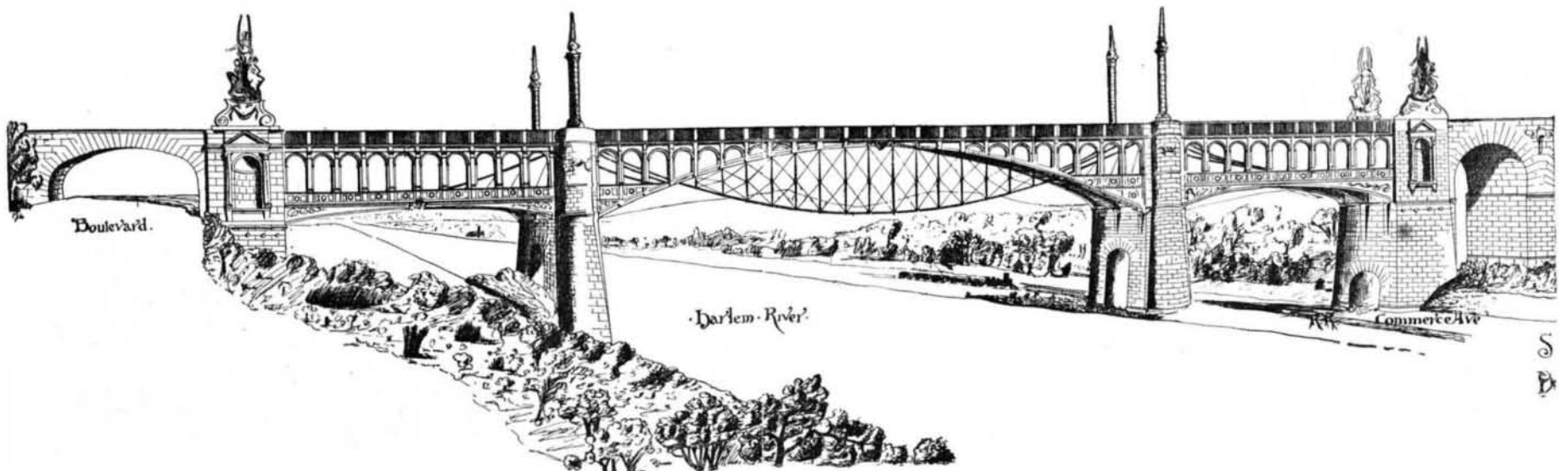
The four ornamental groups of figures at the beginning of the approaches to be of bronze, are alike, and consequently have been estimated at \$10,000 each.

Characteristics of Good Timber.

There are certain appearances which are characteristic of strong and durable timber, to what class soever it belongs. 1. In the same species of timber, that specimen will, in general, be the strongest and the most durable which has grown the slowest, as shown by the narrowness of the annual rings. 2. The cellular tissue, as seen in the medullary rays (when visible), should be hard and compact. 3. The vascular or fibrous tissue should adhere firmly together, and should show no wooliness at a freshly cut surface, nor should it clog the teeth of the saw with loose fibers. 4. If the wood is colored, darkness of color is in general a sign of strength and durability. 5. The freshly cut surface of the wood should be firm and shining, and should have somewhat of a translucent appearance. A dull, chalky appearance is a sign of bad timber. 6. In wood of a given species, the heaviest specimens are in general the stronger and the more lasting. 7. Among resinous woods, those which have least resin in their pores, and among non-resinous woods, those which have least sap or gum in them, are in general the strongest and most lasting. 8. It is stated by some authors that in fir wood that which has most sap wood, and in hard wood that which has the least, is the most durable; but the universality of this law is doubtful. Timber should be



ELEVATION AND PLAN.



DOUBLE PARABOLIC BRIDGE FOR HARLEM RIVER, N. Y.—BY GEO. E. HARDING, C.E.

suspension is vertical. The engineers have therefore arranged to cause a balloon to ascend to the height of the proposed tower. From the boat, ropes will be hung to the ground and fixed there. From their curvature, the contour of the tower will be derived. It is a novel experiment, but, as there is some difficulty in arranging the slope of an ordinary lighthouse, we cannot expect that a colossal tower, made of iron plates, is to be designed without much deliberation.

The coping, cornices, and parapets on the approaches to be moulded as per details, but the general face stone is designed to be rock faced, with draughted joints.

All cement above ground to be best Portland tested cement; for concrete foundations, best American Rosendale or Taylor's, with clean 2 in. broken trap.

The ornamental arches covering the parts of the main span and the two side spans, as shown in the ele-

free from such blemishes as clefts or cracks radiating from the center, "cup shakes" or cracks which partially separate one annual layer from another; "upsets," where the fibers have been crippled by compression; "ringgalls," or wounds in a layer of the wood, which have been covered and concealed by the growth of subsequent layers over them, and hollows or spongy places, in the center or elsewhere, indicating the commencement of decay.—Professor Rankine.