competition, and had filled the position of expert. He would be perfectly aware that his honesty and honorable dealing would be looked upon as questionable, no matter how honorable or honest his intentions may have been

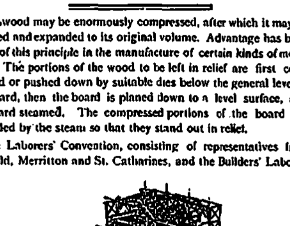
To secure the success of a competition a building committee should make the terms such as would induce themselves to enter the competition if they were architects. It is always possible to have competitors, but it is not always possible to get good men to compete. If there is any object in a competition, it is certainly to obtain the best possible design, and how that is to be obtained through a competition of second and third-rate men, we cannot understand. There is a mode of holding a competition which has resulted very satisfactorily in many cases, and that is to choose several good men to send in competitive designs, paying a stated amount to each, and allowing other designs to be submitted without any remuneration to the competitors. In this style of competition, the decision by a capable expert is just as necessary as in any other form. No man will risk his reputation, except where he believes that he will only be placed second to another because that is his proper position. There is nothing more galling to a man than to know that he has submitted the best design, and yet another has received the prize because of the incapacity and ignorance of the deciding authority.

At the regular meeting of the Architectural Draughtsmen's Association to be held on Tuesday evening the 20th inst., Mr. R. J. Hovenden will offer some remarks on the subject of "Painting." At the succeeding meeting on the 27th inst., the subject of "Sketching in Design" will be considered.

"Constans Fides" writes: I would advise students of architecture to study the following works: "William Chambers' Civil Architecture," 2 vols., by Joseph Gwilt; "Thomas Rickman's Gothic Architecture of England," 1 vol.; "Ferguson's Illustrated Hand Book of Architecture," 3 vols.; "Donaldson's Specifications and Law of Contracts," 2 vols.; R. J. Hatfield's "Transverse Strains," 1 vol.; "Encyclopedia of Architecture," 2 vols.; "Practical Mason," 1 vol.; "Brown's Domestic Architecture," 1 vol.

Basswood may be enormously compressed, after which it may be steamed and expanded to its original volume. Advantage has been taken of this principle in the manufacture of certain kinds of mouldings. The portions of the wood to be left in relief are first compressed or pushed down by suitable dies below the general level of the board, then the board is planed down to a level surface, and afterward steamed. The compressed portions of the board are expanded by the steam so that they stand out in relief.

The Laborers' Convention, consisting of representatives from Thorold, Merritton and St. Catharines, and the Builders' Laborer' Union, has adopted the following scale of wages:—Builders' laborers, 17½ cents per hour, nine hours to constitute a days work, pick and shovel men, 15 cents per hour; corporation laborers, $1.25 for a nine-hour day.



CONSTRUCTION

THE BRIDGE AT POUGHKEEPSIE.

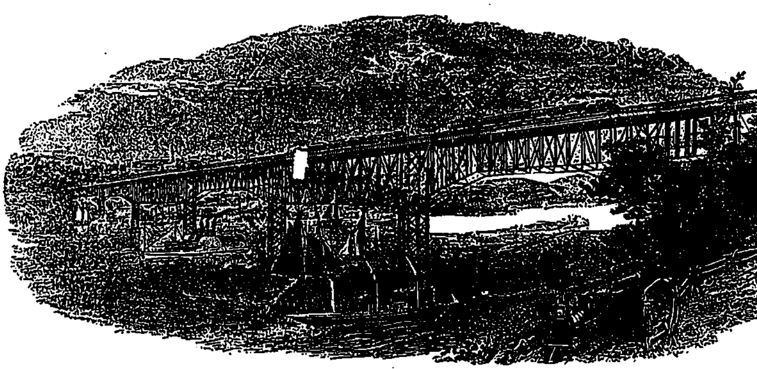
NO river in America is crossed by so many persons and so many tons of freight as the Hudson, and all pass by some means of water carriage if the passage is made below Albany. A glance at the map shows that from the coal and iron fields to the mills and shops of New England, for the greater part, a straight line will cross the Hudson far below Albany, and as a consequence all rail communication between these points requires a long detour. A straight line from Boston to Pittsburg traverses Massachusetts and Connecticut and the coal and iron fields of Pennsylvania, and crosses the Hudson at or close to Poughkeepsie, the same line prolonged passes near to Cincinnati, Louisville and St. Louis. With the exception of a short section west of Poughkeepsie, this line is traversed by existing railroads.

The idea of bridging the Hudson has been entertained for a long time, but the *possibility* of erecting a bridge which would not interfere with navigation is of recent date and the opposition of those who are interested in water carriage has been sufficient to defeat all projects which contemplated bridging the river near the water level.

Advances in the art of engineering have been very great during the past few years, and constructions are now easy which have been beyond the range of possibility; much of this is due to the invention of the cantilever.

The charter of the Poughkeepsie Bridge Company was granted by the State of New York in 1871, but the death of the principal subscriber to the stock, and the panic of 1873 brought the work to a stop after the expenditure of about $1,000,000 in preliminary work and the accumulation of material.

The bridge is accurately shown in the engraving and will be one of the most extensive and magnificent structures of its kind in the



world. It will consist of five spans over the river channel, three of them cantilevers 550 feet each, and two truss spans of 525 feet each. The material is steel, and will be supported on tall steel towers resting upon stone piers 25x87 feet on top.

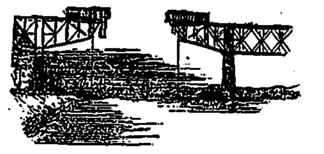
The bridge is to have two tracks and be of sufficient strength to support two trains each drawn by 85-ton locomotives, and a moving load of 3,000 pounds per lineal foot on each track. The bottom of the truss and the cantilever spans will be 130 and 160 feet respectively, above high water, and the track will be 212 feet above high water.

Last year the Manhattan Bridge Company was organized and acquired all the rights of the previous company. This new company made a contract with the Union Bridge Co. for the entire work of the foundation and superstructure, and on this contract operations were re-commenced in September, 1885. In the new plans now made, the charter requirements of 500 ft. clear channel openings and a clear height of 130 ft. below bottom chord were of course still adhered to, and the two foundations partly completed were to be utilized, and the new foundations sunk in similar open cribs. But the piers and superstructure were entirely changed. For the solid masonry piers of the old plan metallic towers resting on stone piers, 40 ft. high, were substituted, and the superstructure was changed to two connecting and three cantilever spans with the rails 212 ft. above high water. The dimensions of these spans were also controlled somewhat by the change in conditions on the west bank where the West Shore R. R. now has its tracks.

At the bridge site the river has a depth of water ranging from 50 to 60 ft. The general character of the bottom is made up of a fine, soft mud and clay and sand mixed to a depth of at least 100 ft. below high water, when a firm, hard sand and gravel stratum was met with, overlying the bed rock, which latter was about 140 ft. below high water mark.

The crib was 69 ft. wide by 190 ft. long at the bottom; and for the first 20 ft. in height there was a cutting edge made of solid timbers shod with a 12x12 inch oak stick. All the timber used in the crib was 12x12 in. hemlock, saving the oak shoe before referred to. The triangular end portions formed close pockets to be used in sinking the crib through the mud, etc., and holding it down against flotation. Above the cutting edge the walls of the pockets were made of two thicknesses of timber, or 2 ft. wide. The longitudinal walls were firmly tied together by six cross walls (not including the end walls) each 2 ft. thick also, and starting just above the oak shoe. There were 14 clear openings each 12x12 ft. used for dredging pockets through which all the material was removed by the clam-shell dredge as the crib was sunk by the weight in the central and side pockets. The 12x12 in. timbers were so laid that the longitudinal and cross courses alternated in direction, and the spaces between in each case were closed with fillers of the same timbers. All halving or jointing of sticks was thus avoided and the entire mass was thoroughly tied in each direction, with solid walls from bottom to top. Each course was fastened to the one below by round 1 in. drift-bolts, 20 in. long, with 425 bolts to each full course.

The actual sinking of the cribs to hard bottom was accomplished by dredging, under the usual conditions of such work, the cribs

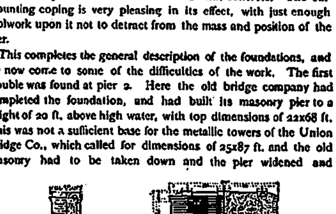


hanging for a time and then descending with a drop of some feet at a jump, settling more or less out of level in either direction. Mr. O'Rourke, we understand, introduced some very practical modifications in the dredging practice which resulted in the better maintenance of the level of the crib in sinking. When hard bottom was at last reached the dredging pockets were filled with concrete deposited under water by boxes holding one cubic yard each and opened at the bottom by a latch and trip line. The concrete was made alongside the crib on a float especially fitted. This float carried a raised mixing platform with the concrete mixer set beneath; cranes on this float handled the boxes and deposited the concrete at a maximum rate of 300 cu. yards per day, which is an almost unequalled rate of progress. It should be remarked that before this concreting the weighting pockets had been solidly floored over with twelve inch timbers and the concrete was levelled off within them by the aid of divers.

A floating caisson surmounts the crib and carries the masonry on its six foo deck. The bottom of the caisson is six feet deep, made of twelve inch timbers laid in three two foot steps or courses. The sides are double layers of two inch plank, calked on the outside, with the angle pitched, covered with canvass and battened. Holding-down bolts and cross-girders permitted the sides to be removed as soon as the masonry was above the water sufficiently. The caisson was towed out over the crib and the masonry started, and when it would only float at high water (for the tide reaches this point in the river) it was exactly located and sunk to a final bearing by additional weights.

The piers are very handsome in design, and are built with a face of dark limestone laid in magnificent courses of 3 feet and upwards in depth and the interior filled with concrete. The surmounting coping is very pleasing in its effect, with just enough toolwork upon it not to detract from the mass and position of the pier.

This completes the general description of the foundations, and we now come to some of the difficulties of the work. The first trouble was found at pier 2. Here the old bridge company had completed the foundation, and had built its masonry pier to a height of 20 ft. above high water, with top dimensions of 22x68 ft. This was not a sufficient base for the metallic towers of the Union Bridge Co., which called for dimensions of 25x87 ft. and the old masonry had to be taken down and the pier widened and



lengthened somehow. But the old company had had trouble here too, and it came about in this way: In the old crib the upper eight courses had been calked, and a coffer-dam commenced upon it, and carried down with the crib until its bottom was 38 ft. under water. When this dam was pumped out, the upward pull proved too great for the holding power of the combined bolts and concrete, and the whole mass lifted several feet at the north end,