THE ST. CHARLES RAILROAD BRIDGE, MO.

We herewith publish an engraving of the St. Charles bridge, over the Missouri river, built by a company formed for the purpose and leased to the North Missouri Railroad Company at a rental of $100,000 a year. The bridge cost $1,800,000, or nearly double the original estimate, the difficulties in constructing the foundations being greater than were anticipated.

It is the longest iron bridge in the United States, consisting of three through spans on the Fink plan, four Fink suspension spans, and the iron viaduct approaches, making a total length of iron bridge of 6,535 feet. The seven river spans vary in length from 305 feet to 321 feet. There were eight river foundations—most of them presenting new and extraordinary difficulties in construction—varying from 54 to 76 feet in depth, the caissons for which had to be carried down through alternate strata of quicksand, large boulders, and tangled masses of drift logs. Add to these subaqueous difficulties the facts that at the bridge site the Missouri river rises and falls 40 feet; that its flood speed is nine and one half miles per hour; and drift islands drawing 20 feet of water, and which are more than 300 feet in diameter, are not unfrequently carried past in the heavier freshets, and an adequate idea may be formed of the character of the work.

During the progress of the work, owing to an unusual freshet, the general direction of the current was suddenly changed. Four thousand feet above the site of the bridge a diversion of the current carried away 1,400 feet of the south bank, and, curving outward and returning in the form of an S, brought its abrading force directly upon the south abutment. In this emergency, when the entire demolition of the abutment was threatened, the engineer constructed a groyne, which so diverted the current as to reclaim a large tract from the river bed and confine the channel. The south abutment is now surrounded by dry land. This groyne projects 700 feet from the south shore, and extends above the shore some 400 feet. Out from the south shore a spile wall was driven, from which coarse rip-rap was thrown in, and an embankment made upon it, producing an eddy immediately below. In this eddy, material could be deposited without danger of wash, and so the work was carried forward in an irregular line, guided by the slack water which preceded the bank in its progress down stream. This was continued until a space 700 by 400 feet, more or less, was inclosed by the wall meeting the shore below the bridge line. After being properly packed and protected from wash, this immense cofferdam, for such it now was, was pumped out, leaving the former uncertain bed of the river comparatively dry land, upon which the pier could be erected without interference from the principal enemy, the river current.

It was afterward built to such a hight and so strengthened that its outer walls now form the south bank of the river at that point, thus effectually and permanently forcing the current to keep toward the north shore and to be confined within fixed limits. Although the cross section of the river is necessarily narrowed, it does not affect the velocity of the current.

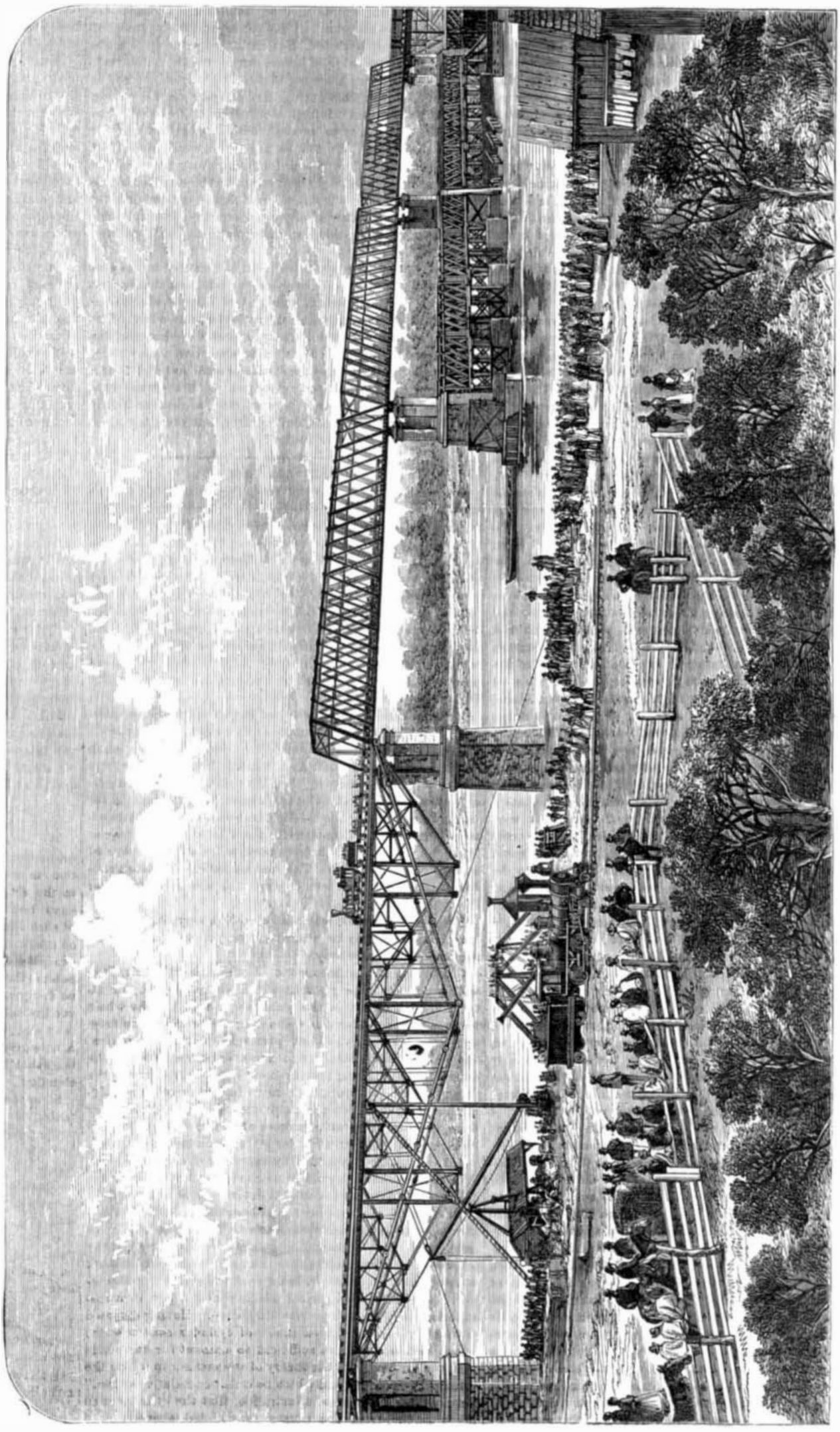
The bed of boulders found immediately below the shifting bottom, although more permanent in position, by their bulky and unyielding nature, made the passage of the foundations through them very difficult. To drive a pile through them required an average of 3,000 blows of a 3,000 lbs. hammer, and, in some cases, over 5,000 blows were required to sink the pile to the bed rock. Sycamore piles alone were found capable of standing the continued batter of the pile hammer. The pile basis was used only when the pile was entirely protected from scour.

The superstructure is of the Fink and trellis or double form, the latter modified by the omission of the usual counter ties. The counter strains are taken by compression ties, extending a few panels on each side of the center, and consisting of two parallel plates stiffened by short diagonal braces of wrought iron riveted to the side plates and at the centers. The wrought iron strut columns are secured to the chord by wrought iron suspension joints, so that they are equally available for tensile strains at points where such strains occur, thus dispensing with the center tie rod usually found in this form of truss. The substitution of the peculiar ties at the center, for counter ties, constitutes the essential difference between this truss and the one used at Kansas City.

The details show many important features of novelty. A leading idea of the engineer has been to construct the bridge of as few pieces as possible. For instance, the upper chord is composed of a single cast iron tube. The structure is fastened throughout by pin joints. The cross ties are placed directly upon rolled iron girders placed between the chords proper, thus throwing all the bending strains upon parts not subject to either tension or compression, dispensing with the ordinary stringers, and avoiding the bulky depth of flooring beams usually seen. The Fink deck spans are proportioned to carry 2,250 lbs. per foot, the chord is 2 feet in diameter, and the main post is 21 inches. The truss itself is a double triangular girder, with inclined end posts and no connection between the systems The counter brace action is secured by stiffening the middle ties and giving the braces a tensile connection. The floor beams are composed of 12 inch channel iron, sandwiched with and forming part of the lower chord, the cross ties being laid directly on these, without the interposition of a stringer. These girders are proportioned in the same manner as in the Fink trusses, but to a working load of 2,400 lbs. per foot. The weight of each Fink span is 680,000 lbs., of each trellis span 788,000 lbs

Probably the most dangerous work of all was the erection of these spans. As no false work could possibly stand at this point in the river, temporary piers were constructed, resting on piles and surrounded by cribs 18 feet wide and 50 feet long, filled with stone. There were three of these piers in each span, and on these were placed, bodily, by means of powerful twin derrick boats, Howe truss spans, 80 feet each. On these spans was placed the false work proper, the top of which was 121 feet from the water.

The bridge was designed and constructed by Mr. C. Shaler Smith. Captain James B. Eads, the engineer of the St Louis bridge and of the Mississippi delta improvement, one of the directors of the bridge company.



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A VERY good impression of any article of metal having a flat ornamented surface may be taken by wetting some note paper with the tongue and smoking it over a gas flame. The article is then pressed upon the smoked part, when, if the operation be carefully conducted, a clear impression will appear. This can be made permanent by drawing the paper through milk and afterwards drying it.