western. Thus the railroad traffic will be inside the tube, and consequently invisible from without. The two streams of travel will be separated by the tube—one being on each side—and the pedestrians will be alike separated from the railroad, and will be above and out of the way of the common road travel. The length of the tube will be fifteen hundred and ten (1,510) feet, resting upon four piers, five hundred feet apart, between centres, making three spans. The tube will be fixed to one of the centre piers, and will rest on rollers upon the other piers, so as to accommodate itself to the contraction and expansion incident to so long a mass of connected metal exposed to the changes of temperature.

The foundations of the piers will be formed in coffer dams, by excavating the bed of the river to about twenty feet below low water mark, and if rock bottom can be found within twenty feet of that depth, then, the excavation will be taken out to the rock. If the rock is not found, then, large iron cylinder piles will be sunk by the pneumatic process to the rock, and will be filled with hydraulic concrete. On the top of the piling, a strong timber grillage will be formed, and upon this the masonry will rest.

The piers will be thirty-six feet broad, and seventy-six feet long at the base, placed lengthways, parallel with the stream. The up-stream end of the two centre piers will be sharp and very sloping, to form ice breakers, which will be of large blocks of cast iron or of the most massive blocks of granite that can be obtained and handled. These ice breakers are designed to break the drift and cut and mash up the large fields of ice which have so often been destructive to all kinds of river crafts moored at our wharf. So that after the erection of the bridge all vessels will, in the winter time, be able to find below the bridge a harbor secure from the ice. The ground outline of the shore piers will be elliptic, and those of the centre piers will be somewhat of an egg shape, with the small end up stream, the sides somewhat concave, to economise material and to sharpen the ice breakers.

The Masonry.—All the masonry, both of the piers and of the approaches, will be of the most massive character, and either of Missouri Granite, or selected Grafton Stone, cut in bed and joint, with rock face, and laid in hydraulic cement mortar; the