

simple and may apparently also result in a strong and substantial bridge, but, nevertheless, should not be recommended, because it deprives the engineer of the opportunity to calculate exactly the tensions in the different parts of his bridge, the ignorance of which may, if not fatal to the bridge, prove at least a loss of safety or of capital.

### III. THE MATERIAL AND THE MANNER OF WORKING IT INTO THE CABLE.

1. *The Cable Wire.*—In all bridge cables, constructed previous to those of the East River bridge, charcoal iron wire of either No. 10 or No. 9 gauge was used. The cables of the Niagara railway bridge, for instance, contain 3640 wires No. 10 gauge with an ultimate strength of 2658 tons, forming cables of 10 inches diameter. Those of the Cincinnati bridge—until now the largest suspension bridge ever built—are 12 inches in diameter and consist of 5200 No. 9 wires with an aggregate strength of 4212 tons. In comparing