markable instance, how much strength, and what a high degree of elasticity can be obtained, by an improved quality of iron and steel. In this connection, I may also point to the great durability of steel springs, used for the support of carriages and Railroad cars. Their great exposure to severe vibrations and constant concussions, is well known ; as also, their great durability. In all such cases of extreme service, it has to be well observed that the safe limit of elasticity is not exceeded, else the material will soon be destroyed. Bridges of half a mile span, for common or Railway travel, may be built, using iron wire for the cables, with entire safety. But by substituting the best quality of steel wire, we may nearly *double* the span, and afford the same degree of security.

STRENGTH OF BRIDGE.

Both ends of the bridge rest upon the cliffs, and are anchored to the rock. As far as supported by the cables, I estimate its weight at less than 1000 tons, which includes the weight of cables between towers, and the pressure of the river stays below. For convenience sake, I will assume this weight at 1000 tons of 2000 pounds each. By multiplying with the factor 1.81—see Appendix B, we find the tension of the cables, which results from this weight 1810 tons. Their ultimate strength was stated at 12,000 tons, therefore their permanent tension is to their ultimate capacity, as 1810 is to 12,000, or as 1 : 6.63.

The sixty-four over-floor stays have an ultimate strength of thirty tons each, or 1920 tons in all. Their average supporting capacity is to their strength, as one