First Test.—Bar, $1\frac{1}{2}$ inches square, with welded loop at each end, length 5 feet between centres of loops. Four equal spaces of one foot each were laid out on the central part of the bar. No perceptible extension was noted with a strain of 10,000 lbs. per square inch, and but little with 20,000 lbs. With a total strain of 130,000 lbs., equal to 57,777 lbs. per square inch, the length had increased six inches, and the bar yielded by the opening of one of the welds; the four spaces, after the removal of the bar, measured respectively $12\frac{15}{16}$, $12\frac{11}{10}$, $12\frac{3}{4}$ and $13\frac{1}{8}$ inches; the last including a part of the broken weld.

Second Test.—Bar 2 inches square, 9 feet long, with loop on one end and nut on the other, extended by strain of 130,000 lbs. 1 inch, by 160,000 lbs. 3 inches, by 176,000 lbs. $4\frac{1}{2}$ inches, by 200,000 lbs. 8 inches, and by 221,000 lbs. 12 inches, when it broke about 18 inches from the nut, showing a fine fibre-like fracture, the strain being 55,250 lbs. to each original inch of section; but the reduced section at the break was only 2.85 sq. inches, making the strain somewhat over 77,000 lbs. to the square inch. Five equal spaces of one foot each, laid off on the bar before straining, measured after the break $13\frac{1}{8}$, $13\frac{7}{8}$, $13\frac{9}{16}$, $13\frac{7}{16}$ and $13\frac{1}{2}$ inches.

Third Test.—Bar $1\frac{3}{4}$ inches square, 38 feet long, and 3.0625 sq. inches, under the following strain extended as given below:—

Total strain,	26,000 lbs.	8,500 lbs. to square inch.		Extension,	$\frac{1}{8}$ inch.
"	52,000 "	17,000 "	"	"	$\frac{17}{64}$ "
"	78,000 "	25,500 "	"	"	$\frac{25}{64}$ "

No perceptible set after strain of 28,000 lbs. on the square inch.

A number of tests were made at the same time of iron of the same quality manufacturing for the Dubuque bridge, with similar results. This iron is of the kind known as Kloman's mixture, manufactured at the Union Iron Mills, Pittsburg, the ties and truss-rods being made of double-rolled, refined iron. The bar broken in the second test was afterwards cut up, and three small pieces were turned out of it, each having a reduced central diameter. These were taken to the Fort Pitt Foundery, and tested in the lever machine belonging to the U. S. Government; two of these tore out of the clutches before breaking, when the strains per square inch were respectively 62,760 lbs. and 63,134 lbs.