

namely, carelessness in centring the eyes from the master-gauge, and the variations of temperature at which they are bored. The best shops use double-end boring-machines mounted on wrought-iron beds, and if care is taken that the bars have been long enough lying in the same temperature as that of the machine, the second class of errors are removed to a remote possibility; the avoidance of the first being simply a matter of shop system, in checking measurements and using intelligent supervision.

Flat eye-bars (the form now almost universally used by the best designers) are manufactured in America, either by welding the eyes previously forged into shape to the ends of the bars, by die-forging under a steam-hammer, or upsetting by means of steam or hydraulic power. The former process is purely a welding process, and should be performed with great care in a hollow coke fire, the form of weld known as the split weld being used. The second process is a weld to the extent that a slab is forged down on the ends of the bar under the powerful blows of a steam-hammer, the shaping being performed at the same instant, the anvil and the hammer having matched die-faces, while the latter process consists in forcing the ends of the bar itself into properly-shaped moulds or dies under an intermittent or a steady, continuous pressure of a ram, the ends being previously heated to a white heat. All these processes are in use, and have given satisfaction; but the two latter have decidedly the preference among engineers, owing to