

the balance being $4\frac{1}{2}$ inches pitch. At first sight, from theoretical considerations purely, it would seem that a good proportioning of riveted work would require a variation in size of rivets, but such designing would cause endless trouble during manufacture. Uniformity of parts in design is essential to economical production, as well as for the avoidance of shop errors, and for this reason, in flange-riveting, the same size rivets should be used throughout, and change of pitch avoided as much as possible. Some manufacturers depend more or less upon the efficiency of rivets being increased by reason of the friction of the rivet-heads against the plates, due to their shrinkage after being driven. There is no doubt but that in new work this friction is very great, and materially aids the rivet, but as it is uncertain how much this is impaired after a long term of service, as well as the variability of the value of the friction, it is deemed by the most prudent designers of iron-work to make no allowance whatever for friction, but proportion rivets only with reference to their bearing surfaces and shearing areas. As to stiffeners for the webs of girders in highway bridges, they are unnecessary if the thickness of the plate is such that the unsupported distance between the legs of the upper and lower flange angle iron is not greater than from 35 to 40 times that thickness. If this proportion is exceeded, stiffeners must be introduced at intervals and over the points of support. Since the floor-girders of a highway bridge are proportioned (or should be) for the extreme standard load, the rarity of such occurrence, if it ever really occurs at all, is such