comes the area to which the breaking strain is referred. The character of the grooving, whether long or short, affects, in a marked degree, the result of a test. If the groove is a short one, the iron will break at a much higher strain per square inch than if it had been long, and this result is due to the fact that a free stretching of the fibres is prevented by the reinforcement derived from the metal contiguous to the ruptured section of the short-grooved specimen. This difference, due solely to the preparation of the specimen, will amount in some cases to as much as fifty per cent. The explanation of this apparent anomaly in the strength of iron may be made still clearer by an inspection of the cut, where Fig. 1 represents a long-grooved specimen, and Fig. 2 a short-grooved one. The shoulders at either end are formed for the grappling-irons of the testing-machine.

There are two terms continually met with among iron-workers—namely, red-short and cold-short iron, which it may be advisable to explain. The peculiarity of the former is, that while very strong and tough when cold, it is difficult to work in the forge except under very high heats, otherwise it will crumble and waste, and for this cause has received the enmity of smiths. On the other hand, cold-short iron is brittle when cold, and absolutely unsafe to use where life depends upon its