

and American engineers. A bar of the best wrought-iron an inch square will not break under a tensile strain of less than sixty thousand pounds. Only a small part of this, however, is to be used in practice. A bar or beam may be loaded with a greater weight applied as a permanent or dead-load than would be safe as a rolling or moving weight. A load may be brought upon any material in an easy and gradual manner, so as not to damage it; while the same load could not be suddenly and violently applied without injury. The margin for safety should be greater with a material liable to contain hidden defects, than with one which is not so; and it should be greater with any member of a bridge which is subjected to several different kinds of strain, than for one which has to resist only a