PART I.

GENERAL AND DESCRIPTIVE.

The essential elements of a good bridge consist in so applying the materials of construction to a given design as to have all parts of the work equally strong under the maximum loads that can ever come upon it, and that a proper relation, called the "factor of safety," should exist between the maximum loading and the strength of the structure. The term, factor of safety, as usually applied, means the number of times that the maximum load should be increased in order to break down a given structure, a ratio that varies very greatly in most American highway bridges, particularly in the "cheap ones." This conception of the term, however, is apt to be misleading, since it refers to ultimate strength, and not to the limit of effective strength, which last involves the idea of elasticity. The elasticity of any material is simply its recovering power from the distortion produced by the action of a force, as illustrated in the case of a rubber ball under the pressure of the hand. All materials are more or less elastic, and experiments have shown that if this elasticity is not impaired, they are not injured for use. The strain at which the recovering