full live load almost instantly than on those which receive it more gradually. Consequently, the material in short spans, and such members as hangers, hip verticals, etc., will become fatigued more quickly and to a greater extent than in long spans, and in those members receiving their maximum stresses from a full loading of the span. As the chords all receive their maximum loads from a fully-loaded span, the percentage to be added for impact should be the same for all panels. As the web members, with the exception of those at the ends, receive their maximum stresses from a partial loading of the bridge, those nearest the centre are subjected to their maximum stresses more suddenly than those nearer the ends. The percentage, therefore, to be added to web members for impact will increase from a minimum at the end to a maximum at the centre.

The effect of a train at high speed on a perfect track is supposed to closely resemble that of a suddenly-applied load. Now, it is well known that the effect of a suddenly applied load is double that of a gradually applied one, and that the effect of a moving train on a bridge is intermediate between the effect produced by the same load applied suddenly and the same load applied gradually. Such being the case, we find a number of the formulae used to determine the impact stress in a member are dependent upon the length of span loaded when that member receives its maximum stress. The method of allowing different unit stresses for various members would not seem to be so commendable, since the effect of impact is to increase the stress and not to lower the elastic limit or working stress of the material in use. By considering impact as an increase in the stress its effect is carried into the connections as well as being computed in the main body of the member. This seems a more reasonable assumption than to make allowance for it by a diminished unit stress in the body of the member, and to use the same data for designing a connection in which there is no impact as in one in which there is impact. By increasing the stress, and keeping the unit a constant, the connection will be increased in strength in the same proportion as the member. The unit stress which the material will stand is definitely determined by experiment, whereas the stresses resulting from the dynamic train load are merely the closest approximations which we are able to make with our limited knowledge.

It has been experimentally determined that failure may be brought about by a much smaller load than the breaking load if repeated often enough, that the greater the variation in load the fewer repetitions will be required, and that for the same variation, the effect is greater when the stresses are of opposite kinds than when of the same kind. Allowable unit stresses may be determined