according to the author’s system. It is intended to assist the engineer in making out bills of iron.

Chapter IV. is descriptive of the bridges treated, and the connections of the various portions.

Chapter V. treats of the floor system proper (i.e. the ties, rails, and guard rails) and of a re-railing and a ditching apparatus. By means of the last two devices perfect safety is insured to bridges against constantly recurring accidents, such as the running off the line of an engine or a car. If a car or a locomotive were off the line when it reached one of the present Japanese bridges, the structure would be doomed.

Chapter VI. consists of “General Specifications” which treat in a concise manner of all the various steps to be taken, and limitations to be made, in designing, erecting, and maintaining any bridge.

Chapter VII. is on live and dead loads and wind pressures. In connection with Table I., it gives the total weight of iron and the dead load for any single track truss bridge measuring from sixty to three hundred feet span, and indicates how the corresponding quantities are to be found for double track bridges.

Chapter VIII. gives an analysis of stresses in trusses, and methods for finding the same. The causes of stresses in trusses are—

1° uniform live load;
2° dead load;
3° engine excess;
4° wind pressure indirectly;
5° wind pressure directly;
6° curvature of track.

Chapter IX. treats of stresses in lateral systems and sway bracing. The effect of inequality of loading in double track bridges receives due attention. This is a point hitherto uninvestigated as far as we are aware.

Chapter X. is on rivetting, and shows how rivets should be proportioned for bending and bearing rather than for shear.

Chapter XI. treats of the proportioning of main members of trusses, lateral systems, and sway bracing.

Chapter XII. is on proportioning track stringers, plate girders, and floor beams.

Chapter XIII. is on the proportioning of pins.

Chapter XIV. is on the proportioning of other details.

Chapter XV. is on double track bridges.

Chapter XVI. is on economy in the construction of a bridge. It shows how to choose the best number of spans for any bridge, and the best number of panels and depth of truss for any span. It treats of how to design a bridge so that it may be quickly and cheaply erected.

Chapter XVII. shows how to make out bills of materials and estimates of cost. It gives a table of the probable cost of all single track bridges for Japanese roads for spans ranging from 60 to 300 feet.

Chapter XVIII. illustrates as an example how to design all the parts of a single track bridge of 168 feet span; and concludes with bills of iron and timber.

Chapter XIX. gives all necessary directions for making working drawings.