each side shall extend not less than 6 inches beyond the edge of the nearest batten plate.

Riveted tension members having pin connections shall have a cross sectional area through each pin hole 25 per cent. in excess of the net sectional area of the members. The sectional area of the metal between the pin hole and the end of the member shall not be less than 75 per cent. of the sectional area through the pin hole.

Batten Plates and Lattice Bars.—The open sides of compression members shall be stayed by batten plates at the ends and by diagonal lattice bars at intermediate points. Batten plates shall be used at intermediate points when, for any reason, the latticing is interrupted.

Batten plates shall have a thickness of not less than <sup>1</sup>/<sub>4</sub>-inch nor one forty-fifth the distance between the lines of rivets connecting them to the flanges. They shall have a width parallel to the axis of the member not less than the maximum width of the member.

Lattice bars shall have thickness not less than 5/16inch nor less than one forty-fifth their unsupported length. They shall be inclined to the axis of the member at an angle not less than  $60^{\circ}$  for single latticing nor less than  $45^{\circ}$  for double latticing. Double latticing shall be riveted at the intersection points.

The width of lattice bars shall not be less than 2 inches nor less than on-sixth the width of the member of which they form a part.

Abutting ends in compression members shall be planed true to the angle of the joint and shall be sufficiently spliced on four sides to hold the connecting parts accurately in place. All joints in tension members shall be fully spliced.

Where splice plates are separated from the parts which they connect by intervening plates or fillers, the number of rivets on each side of the joint shall be increased by  $33\frac{1}{3}$  per cent. of the number theoretically required for each intervening plate.

The thickness of eyebars shall not be less than 5%inch nor less than one-seventh the width of the bar. Heads of eyebars shall be formed by upsetting and forging, and never by welding. The heads shall be so proportioned as to develop the full strength of the bar.

Eyebars shall be perfectly straight at the time they are bored, and all bars which work together as one member shall be piled, clamped together, and bored in one operation.

The eyebars composing a member shall be so arranged that their surfaces are not in contact. The inclination of individual eyebars to the axis of the member which they compose shall not be greater than I inch in 16 feet.

No rod shall be used which has a cross sectional area less than 3/4 square inch.

All roads having screw ends shall be upset, previous to threading so that the net sectional area at the root of the threads shall be greater by at least 17 per cent. than the net sectional area of the rod.

Compression members shall be so designed that any part of segment of a member will be proportionately as strong as the member taken as a whole.

No web shall have a thickness less than one-thirtieth the distance between the lines of rivets connecting it to the flanges, and no cover plate shall have a thickness less than one-fortieth the distance between rivet lines. Flanges of built members which have no cover plates shall have a thickness not less than one-twelfth the width of the outstanding leg.

Lateral System.—All lateral and portal bracing shall be made of shapes capable of resisting both compression and tension, and shall have riveted connections to the chords.

Laterals shall be as nearly in the plane of the axes of the chords as practicable. When eccentricity is unavoidable, however, provision shall be made for the maximum bending stresses which would be produced in the connections with the member fully loaded.

Portals for through bridges shall be as deep as the specified head room and depth of truss will permit. They shall consist of top and bottom struts and stiff intermediate bracing. All portals shall be provided with curved knee or corner braces.

Intermediate top struts in through bridges shall have a depth not less than that of the top chord, and, if the engineer so requires, they shall be provided with curved knee or corner braces.

End struts shall be provided at the ends of all bottom chords.

All deck bridges shall be provided at each panel point with sway bracing made of shapes capable of resisting both tension and compression. The sway bracing shall extend the full depth of the trusses, and at the end of the trusses ample provision shall be made for transferring all wind loads to the piers or abutments.

A substantial hand railing not less than  $3\frac{1}{2}$  feet high and of appropriate design shall be constructed on the outside of footwalks, or, when footwalks are omitted, at the outside of the roadway.

**Expansion and Contraction.**—Provision shall be made for all bridge structures to change in length owing to temperature changes at least <sup>1</sup>/<sub>8</sub>-inch for each 10 feet of span, and joints shall be provided at such points in the floor and pavement as may be indicated on the drawings furnished or approved by the engineer.

For all beam and girder bridges expansion bearings shall be designed for motion to take place by sliding. For all truss bridges the expansion bearings shall preferably be provided with rollers or rockers, though for spans less than 80 feet in length the engineer may, in his discretion, permit the use of sliding bearings. All rollers or rockers shall have a diameter of at least 3 inches. In all cases the bearings shall be so designed that motion can take place in a longitudinal direction only, and shall be so placed at the time the bridge is erected that the shoe or bolster will occupy a central position on the bearing at the atmospheric temperatures specified by the engineer in writing.

Shoes or bolsters shall be so designed as to distribute the load over the entire bearing, and shall be securely stayed against lateral or upward motion by anchor bolts. Fixed bearings shall be rigidly anchored to the masonry.

Bedplates shall be designed to distribute the load over an area sufficiently great to keep the pressure upon the masonry within the hereinbefore specified limits. All bed and bearing plates on masonry shall be set on sheet lead not less than  $\frac{1}{4}$ -inch thick and the same size as the plate.