DESCRIPTION OF DESIGNS.

DESIGN "A."

The general style of girder shown in this design is well adapted to spans under 18 or 20 feet. It is composed of two eye-beams, 15 inches deep in the present case, weighing 200 pounds to the yard. These beams are thoroughly braced in two panels, so as to secure perfect lateral stability.

The lateral struts are 6-inch eye-beams, and the ties are rods 1½ inch in diameter.

This simple structure is specially adapted to locations in which the head room is very limited.

The plate represents a girder placed on the line of the Seaboard and Roanoke Railroad, at Suffolk, Va.

DESIGN "B."

This design shows the adaptation of our plate-girder system to a span of about 40 feet. In the vicinity of the ends the chords are each composed of a pair of angles, which are reinforced for somewhat more than the central half of the span by a heavy plate. As there is only one cover-plate, it may be depended upon to perform its functions with the greatest efficiency.

The stiffness of the intermediate portion of the web is secured by pairs of angles (one angle on each side of web) riveted at sufficiently frequent intervals. As the ties are placed on the top chords, the ends of the girders are subjected to very severe shocks and consequent fatigue. This is amply provided against by extra heavy vertical end-stiffeners riveted over fillers reaching from upper to lower chord-angles.

Transverse stiffness is secured by latticed struts of equal depth of the girders, which take hold of the angle-stiffener throughout the entire depth of the main girder. These transverse struts also serve as the compression members of the lateral system, the latter being completed by the ties as shown. The most thorough lateral and transverse stiffness is thus secured, and the girders enabled to sustain the most efficient manner that severe use under rapidly-passing heavy loads to which all short spans are unavoidably subject.

This particular structure was built for the Seaboard and Roanoke Railroad, and forms a part of the "Meherrin Bridge."

These plate-girders may be advantageously used under ordinary circumstances for spans running from 20 to 50 feet, although they have been constructed for spans of about 70 feet.

DESIGN "C."

The general character of our deck lattice-girders is well illustrated by this plate, which represents the 60-foot span of the Kinzua Viaduct. The upper and lower chords are alike, and are composed of two angles and a deep web-plate extending throughout the length of the span, reinforced over about the central half by a cover-plate. A sufficient depth of web-plate in the chords was taken to properly resist the bending action of the moving load in combination with the direct compression, as well as to secure sufficient bearing surface for the rivets uniting the web members to the chords.

All the web-braces are arranged in pairs, so as to take hold of both sides of the chord-plate, thus securing double shear in the rivets, and completely avoiding all twisting of the chords. Both the rivet shear and the bearing capacity of rivets against the plate and angles are carefully considered in all our riveted work; and when, as in the present instance, the ties rest directly on the chord, the latter is designed to resist the combined stresses arising under such circumstances.

By our system of construction we are enabled to make the centre lines of stress of members meeting at one place intersect as nearly as possible in one point, thus essentially avoiding those secondary stresses which frequently constitute such an objectionable feature in riveted work.

The vertical end-posts are made very heavy, as they are exposed to very severe duty. The transverse and lateral systems of bracing are of heavy angle-iron and in short panels, and so attached to the chords as to develop the full resistance of cross-section in the most direct and effective manner.

At and near the centre of the span, where the web members take both kinds of stress, both bars and angles are provided, the former to take the tension and the latter to resist the compression.

All intersections of web members are riveted, in order to shorten the struts and give general stiffness.

DESIGN "D."

Our type of ordinary through bridge for railway traffic is well exemplified by these trusses of 120-feet span, built for the Norfolk and Western Railroad, and forming a part of the bridge at Reed Island crossing. In each span there are six panels of 20 feet, and the trusses are 21 feet deep. The chief characteristics are the single system of triangu-