by the 9-inch girders running lengthways underneath, riveted to the beams, and connected with the timber-stringers, the rails, and the bridgings by stirrups, 2' 6" apart.

The upper joints, connecting the arches and upper chords, are channels of 7 inches depth of a light section, one on each side of a post bolted to it and riveted to the flanges of the arches and chords. Plate 2 fully explains the details. So far as the upper chords in the side spans are plated, the joints are of 7-inch beam section in place of channels, their lower flanges riveted to the plates.

DIAGONALS IN PANELS.

The object of the panel-rod is to impart stiffness, and to spread any concentrated pressure over a large extent of truss. An inspection of Plate 2 clearly shows their action. In the centre of the main span, the pressure upon any point is spread by these rods over 4 panels, or 80 feet of length of truss. For every row of posts there is a plane of diagonals; consequently there are 4 lines, each rod 14 in. diameter, with screw-ends proportionally enlarged.

Fig. 6, Plate 6, explains how two diagonals are joined in one, and how they are bolted to the stem of the post, between the upper chords.

Fig. 8 exhibits a union of the horizontal ties and of the diagonals next to the posts, which support the track-beams.

Fig. 9 explains how two of the lower diagonals are formed into one, passing around the lower end of a post. By thus uniting two into one, the connections are made simple. It will be noticed that these rods all radiate toward central screw-rings, for the purpose of screwing them up to a proper tension, and thus to impart stiffness to the framing.

Any load upon any one point will make an impression upon 2 to 3 floor-beams, and 16 rods, of 14 in. diameter each, will be brought into service, and will distribute the weight over a large extent of truss. The kinking action of heavy locomotives will thereby be much decreased and the strains upon the bolts and rivets diminished.

RAILWAY TRACK.

This track should be made as perfect as possible: all concretes and impacts caused by an imperfect track, must be avoided on such costly structures. But this precaution is seldom observed, and for this reason I improve this occasion to bring to a more general notice a simple railroad joint of my own device, which perfectly fulfills all the necessary conditions of a good splice. The first condition of a good joint is a continuous bearing. Without this, no joint is entitled to be called a good joint. More destruction of railroad machinery is caused by these open joints, which number 500 to 600 in every mile, than by any other defects. Every wheel which rolls over these gaps and depressions, receives a blow corresponding to the width of the opening, to the depth of depression which the ends of the rails suffer, to the weight upon the wheel, and to its velocity. All these elements of destruction go to swell the aggregate moments of forces which are allowed to do their work effectually and unerringly. But I need not dwell upon this picture of railway imperfection—it is well enough understood. Now for an effective remedy.

Fig. 11, Plate 6, is an elevation, and Fig. 12 a section of the proposed splice. A simple cast-iron block 18 to 20 inches long, of the same height as the rail, and a corresponding width, fitting the side of the rail accurately or nearly so, is fastened to the two rail ends by four screw-bolts, which are double nutted and riveted. On the opposite side a wrought-iron fish-plate is put on, and the two altogether embrace the rails more effectually than is done by ordinary fish-jointing. The top face of the cast-iron block is sloped at both ends, and the central and level part is chiseled, to make it hard and to wear. The operation will now be readily understood. The outer edge of the rim of each wheel passing over it will be supported by the top of the block, and a continuous bearing is established. I would advise the cutting away of about 4 inches of the side of each rail-top for the depth of half an inch, which can be done cheaply in the rail-mill by a