under the left abutment chalk was reached at a depth of eight metres, whilst on the sites of the piers and the right abutment sand was met with. In putting in the foundation for the piers, large bottomless wooden caissons were sunk nearly to the chalk, and were then partially filled in with bêton, on which the masonry was built by the aid of coffer-dams. The ends of the centres of the large arches were supported upon dried sand contained in suitable boxes, and they were struck by allowing this sand to escape—a method of striking centres which has on many occasions been successfully employed by French engineers. The centres were only lowered 5 millimetres, or about \( \frac{1}{2} \) in., at one time. The lower story of the bridge was quite completed before the upper one was commenced. The form of centering used for the three centre arches, through which the navigation had to be carried on, is shown in the right-hand half of the arch in Fig. 4, Plate LII., whilst in the left-hand half is shown the arrangement of centering used for the side arches. The bridge was designed by M. Bassompierre, engineer of the Ponts et Chaussées, and chief engineer to the Chemin de Fer du Ceinture. M. de Villiers was the resident engineer, and M. Andraud the contractor for the work, while the conductor of works was M. Lion. The total cost of the bridge was 3,200,000 francs, or about 133,000£.

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**BRIDGE OVER THE SEINE AT ORIVAL.**

**Plate LIII.**

The diameter of each cylinder is 11 ft. 9\( \frac{1}{2} \) in. from the base up to 6 ft. 6\( \frac{1}{2} \) in. above the water line, and 10 ft. 6 in. above that level. A conical piece, 1 ft. 5\( \frac{1}{2} \) in. high, connects the two diameters. Each cylinder is made up of rings, each ring being composed of four segments, stiffened from top to bottom by interior ribs, and placed on one another, the end flanges, 1\( \frac{1}{2} \) in. thick, serving to fasten the rings to each other by means of bolts. There are to each joint forty bolts, 1\( \frac{1}{2} \) in. diameter. The rings are 3 ft. 3\( \frac{1}{2} \) in. high, excepting that immediately under the conical junction piece. The height of this ring was determined after the sinking of the lower part of each cylinder, so as to compensate for irregularities in the sinking, and maintain the conical base of all the piers at the same relative level—viz., 6 ft. 6\( \frac{1}{2} \) in. above the usual water line.

The lowest or cutting ring, as it is called, is 11 ft. 11 in. in diameter, and has but one flange, that at the upper end; the lower extremity is cut to a knife edge \( \frac{1}{2} \) in. thick to facilitate the sinking of the cylinder. The topmost ring of the cylinder has likewise only one flange, that at the lower part. A flange projecting 1\( \frac{1}{2} \) in. is cast on the outside of the ring, and carries the capital surrounding the cylinder. The position of this flange is determined after the sinking of the lower part of the cylinder. The thickness of the rings varies according as they belong to the up-stream or down-