gas passes. The disposition of these boxes is shown in Figs. 2, 3, 4, 7, 8, 9, and in details, Figs. 13, 14, 15. It will be seen that the boxes rest upon the joists, and follow the curves of the ribs, but that they are not secured in any way to them. The size of each box is 4 ft. by 3 ft. 6 in. The plates throughout are $\frac{3}{16}$ in. thick, and are secured at the corners externally by angle irons $2\frac{1}{4}$ in. by $2\frac{1}{4}$ in. by $\frac{1}{4}$ in. At intervals of 12 ft. T-iron stiffeners 4 in. by 2 in. by $\frac{1}{4}$ in. are placed, and serve as covers for the joints of the plates of the boxes. The intermediate covers are 4 in. wide $\frac{1}{2}$ in. thick, placed within and without the boxes.

At each end of the bridge these tubes pass into the abutments, as shown in Figs. 2 and 3, and Figs. 13 and 14, and rest on a plate $\frac{3}{8}$ in. thick, and 4 ft. by 4 ft. 6 in., and fastened to the boxes by angle irons $2\frac{1}{2}$ in. by $2\frac{1}{2}$ in. by $\frac{3}{8}$ in. In the interior of the abutment the tubes rest upon the concrete, as shown, and an opening is cut in the box to form a through connexion with the 4 ft. cast-iron mains which pass from the valve chamber, as shown in plan, Fig. 2. These mains, which terminate in special castings at the point of junction with the wrought-iron tubes, are fastened to the latter by bolts $1\frac{1}{8}$ in. diameter, pitched, 9 in. apart. The details of these connexions are seen in Figs. 13, 14, and 15, which show the arrangements on the east and west abutments. The rivets throughout the boxes are $\frac{1}{2}$ in. diameter, and $1\frac{1}{2}$ in. pitch, and special care was taken in securing tight joints, all being made good with tape and red lead. After completion the tubes were tested to a pressure equal to 36 in. of water. The structure has given perfect satisfaction since its erection.

THE RIVER PIER.

PLATES VIII. AND IX.

THE river pier of the new works of the Chartered Gas Company is, taken altogether, a unique structure. It is 718 ft. in length, inclusive of the abutment pier on the shore, inside the river wall, and is divided into four spans of 64 ft. each, four spans of 65 ft. each, and four spans of 58 ft. each, these dimensions being measured along the centre line of the pier. The general design and all the details connected with this work are shown in Plates VIII. and IX. The rails upon the pier platform are 27 ft. 10 in. above Trinity high water, at the pier head, which is level.

From the pier head round the curve and thence on to the abutment behind the river wall, the rails have a total fall of 4 ft. 10 in., equivalent to a gradient of 1 in 100. This of course greatly facilitates the transfer of the loaded coal wagons from the pier head to the viaduct, whence they are distributed through the retort houses. The width of the pier is 44 ft. from hand-rail to hand-rail, at the pier head, reduced to 25 ft. at the shore end, and gradually increased from the latter width to the former round the curved portion, as shown in plan Fig. 1, Plate IX.

The foundation consists of cast-iron cylinders, 6 ft. diameter, sunk to a level of 18 ft. below low water into the bed of the river. These cylinders are shown in detail Figs. 5-7, Plate IX.; they were cast in lengths of 9 ft., of $1\frac{1}{4}$ in. metal, and in one piece of the full diameter. The lengths are connected together through flanges 3 in. wide, and $1\frac{1}{2}$ in. thick, by $1\frac{1}{4}$ in. bolts placed at intervals of 9 in. The bottom length of each cylinder is cast with a cutting edge (see Fig. 7) slightly turned outwards, in order that the sinking might be facilitated. The top length is furnished with a cast-iron cap, of the form seen in Fig. 5, $\frac{5}{8}$ in. thick, and fastened to the cylinder by tapped bolts placed 9 in. apart, and passed through the upper and lower edges of the cap and neck mouldings. The bearing plates on top of the cylinders which support the girders of the pier are 1 in. higher than are the caps just spoken of, in order that the latter may be kept quite clear of any superincumbent load, which they are not adapted to sustain. After the cylinders were sunk into position, and the interior thoroughly excavated, the interior was filled with concrete in Portland cement, and at the top of this filling was placed brickwork set in cement to the depth of 1 ft., to receive the 9 in. stone carrying the girders (see section Fig. 5). Before sinking the cylinders the bed of the river was dredged out to the level of low water, and the operation was afterwards effected by loading them with kentledge to the extent of 80 tons to each cylinder.

Between each bed stone and the under side of the girder, carrying the platform, a sheet of lead $\frac{1}{4}$ in. thick was introduced. The girders are shown in a general view, Fig. 2, and in the details, Figs. 4-10. There are altogether 29 girders, two in the width of the pier in the narrower portion of its length, and three in the width over the pier head. The girders are 64 ft. long, and have, for 40 ft. on each side of the centres, flanges built up of two plates $\frac{5}{8}$ in. thick, 18 in. broad, and of two angle irons 4 in. by 4 in. by $\frac{5}{8}$ in., the remaining length of the flange being of a single plate. The central longitudinal girders of the pier are exactly the same as those on the outside, except that one of the central plates of the flanges is $\frac{3}{4}$ in. instead of $\frac{5}{8}$ in. thick. The vertical webs are of $\frac{5}{16}$ in. plate, for a length of 32 ft. 6 in. in the centre, increased to $\frac{3}{8}$ in. at the end; at the joints they