HULL SOUTH BRIDGE.

PLATES LXIII. AND LXIV.

PLATES LXIII. and LXIV. show a swing bridge erected over the River Hull, near its junction with the River Humber, by which the parish of Holy Trinity, in the borough of Kingston-upon-Hull, has been placed in direct communication with "the citadel" and the extra-parochial place called "the garrison side." In the engravings, Figs. 1 and 2 are an elevation and plan of the bridge, Fig. 3 is a cross section through turntable, Figs. 4 and 5 are transverse sections, Fig. 6 is an elevation of the hand-railing, Fig. 7 is a plan of the live ring of the turntable, Fig. 8 is a general plan of the bridge, Figs. 9 and 10 show the locking gear, Fig. 11 is a plan of the lower roller-frame, Fig. 12 is a section of one cylinder, and Figs. 13, 14, and 15 show the turning gear.

This bridge consists of two parts, namely a movable part on the eastern or citadel side, which, when open, gives a clear waterway of 100 ft.; and a fixed part on the western side, with a clear span of 40 ft.

In the bridge we are describing, the swinging portion is made of two arms of unequal lengths, the one being of about 122 ft. long, and the other 47 ft. long, properly loaded, so as to balance the long arm.

The eastern support of the bridge is a brick pier resting upon piles driven to a depth of about 60 ft. below high water of spring tides. The piles are made of whole timbers 12 in. square, with their heads bedded into a layer of concrete, 3 ft. thick, and bound together with sills of the same cement, and covered with 6 in. planking, the entire area occupied by this piling being closed in by sheet piling of half timbers. The pier is built up solid with brickwork set in Portland cement, its river face having a batter of 1:3 in. to the foot.

The coping of the river wall, and the stone upon which the turntable is bedded, consists of granite ashlar 2 ft. thick and from 6 ft. to 6 ft. long.

At a distance from the centre of the turntable equal to the radius of the short arm of the bridge, a circular dwarf wall, resting upon a bed of concrete, and crowned with a granite coping at the level of the roadway of the bridge, sets off the space over which this end travels when the bridge is swung round; and the space intervening between the pier and the dwarf wall is covered with Brough stone paving, bedded upon a layer of concrete 12 in. thick.

At its western extremity, when closed, the swing bridge rests upon two cast-iron caissons filled with cement concrete. These caissons, which are sunk to a depth of about 60 ft. below high water of spring tides, are 8 ft. in diameter throughout the greater portion of the length sunk into the ground. The upper portions are reduced to a diameter of 6 ft., and terminate at the top with neatly moulded caps.

The fixed portion of the bridge rests upon these caissons at its eastern extremity, and at the west end it rests upon a brick abutment 7 ft. thick, carried by piles and crowned with a granite coping like the east pier. This abutment is built in a line with the west river wall, of which it forms part.

The main girders of the swing bridge are hog-backed, single-web girders 11 ft. 9 in. deep over all the plane of the centre of the turntable, tapering down to 4 ft. 6 in. at the end of the long arm, and to about 8 ft. 9 in. at the end of the short arm. These girders have been constructed on the assumption that they are subjected to the greatest strain when open, and in consequence both the webs and the flanges are gradually increased from the ends to the point where they take their bearing upon the upper tram of the turntable. At this point the webs are ¾ in. thick, decreasing to ½ in. at the end of the short arm, and to ¼ in. at the end of the long arm. The top and bottom flanges are alike throughout, and are 2 ft. 3 in. wide, made of six ¾ in. plates over the turntable, reduced to two at the end of the short arm, and to one at the end of the long arm. Besides these there is a continuous cover-plate ½ in. thick throughout the length of the girders, this being the layer of plates next the angle irons, but, of course, not to be reckoned as forming part of the effective sectional area of the flanges. The angle irons are 5 in. x 5 in. x ¾ in., and the joints of the web plates are covered by T irons 6 in. x 3 in. x ¼ in., excepting over the turntable at the end of the short arm, which carries a heavy dead weight of keel-lodge, and at several points in the long arm, where the web is stiffened by means of ¾ in. and ½ in. gusset plates riveted to the web and to the flanges by means of 33 in. angle irons.

The distance from centre to centre of the main girders is 22 ft. 3 in.; and the cross girders, which occur about every 4 ft., project about 7 ft. beyond these. There is