THE KINGSBRIDGE AVENUE EXTENSION SEWER.

THE city of Brooklyn is now building a sewer, having an area equal to that of a circle 12 feet in diameter, from the junction of Kalkebecker and Johnson Avenues, through Johnson Avenue and South 5th Street, to the East River. The necessity for the work is great, from the fact that the present sewer for this section of the city, which drains an area of about 2,300 acres, some of which is very low and flooded by every rain, is discharged upon the low land at the head of Newtown Creek, making a nuisance greatly detrimental to public health and dangerous to valuable property in the vicinity. Frequent complaints from people living near this outfall, and by the Department of Health, rendered the construction of a new outlet absolutely necessary.

Although there is nothing new either in the sewer itself or the duty it is designed to perform, the method of building one section of about three-quarters of a mile in length is certainly unique and interesting. Owing to the depth of the grade lines of the sewer below the street surface, in the greater portion of section one (near the river), and the danger to heavy buildings on both sides of South 5th Street, it was thought before to prosecute the work by means of tunneling rather than by open trench. Our frontispiece is composed of views showing the manner of presenting the work, both in the tunnel and in the open cuts.

The section of the sewer for almost its entire length is circular, 15 feet in diameter inside, and where it has been essential to alter this form, the sectional area has been made the same. The sewer is built of brick laid in cement, and the minimum thickness is 12 inches. At some points a foundation was made of concrete and longitudinal timbers, and the brick layers reduced in thickness to 8 inches, between which and the timber a bed of concrete. Where necessary, retaining walls, 3 feet thick at the bottom, 2 feet thick at the top, and extending a short distance above the center line of the sewer, were built. For the greater part of the tunnel section, the work passed through sand, and the sewer is a simple ring of brick. At each crossing sewer a manhole, 9 feet in diameter, where it joins the arch, 3 feet in diameter at the surface, and in height varying with the depth of the sewer below the street. The entire length of the sewer is 4 miles, 49 feet long, 6 inches thick, measured from the center of the sewer, the curve of which has a radius of 41 feet; the sides are vertical, and on these rest iron I-beams, 12 inches deep, and varying in length from 10 feet at the center end to 15 feet where the culvert sewer joins the circular one.

The general method of presenting the tunnel portion of the sewer has been to dig shafts at about every 500 or 600 feet, and then drive the headings as seen in Fig. 1. The shafts were on Park 8th Street, near 5th, which is 64 feet in depth at the bottom of the sewer. The sides are held by sheet piling, and extending through the center are guides for the casing, the machinery for operating which is in the building shown as the right. A track is laid down each tunnel to the heading, as shown in Fig. 5. The cars filled with the excavated material are run to the bottom of the shaft, raised to the surface, and run to the dumping ground. Just east of 5th Street it was necessary to build a short section (Fig. 3) by open cut, and after this had been completed, the earth for filling in was obtained through the shaft shown. Fig. 2 shows the dumping cars here used. The faces of the forward wheels are narrower than those of the rear ones, thereby permitting them to pass between the ends of the rails, which are inclined upward at a sharp angle, and rest in the curved parts of inner rails. The rear wheels mount the inclined rails, thus lifting the car and dumping the load.

In the heading, the earth at the crown is removed and an iron plate inserted; this plate is bolted to the one already in, and held by a strut against the pilot. These plates, unless the earth is very treacherous, are only carried about half way down each side. After the plates have been put in far enough, the section next the masonry is secured, and a portion of the brickwork built. This method of tunneling not only gives an exact idea of the nature of the material in advance of the main work, but also serves to firmly hold the sides of the excavation, preventing caving in, and where the route extends through a street lined upon each side with houses, and, as in this case, at an unusual depth below the surface, thus many advantages over the ordinary open cut. In addition, it occupies the street only of the shafts, so that travel is not much interfered with.

It is estimated that the total cost of the sewer—which will be finished in a short time—will be $375,000.