(Paper No. 2288.)

“Covered Way as Constructed on the Glasgow City and District Railway.”

By WALTER STUART WILSON, M. Inst. C.E.

THE Glasgow City and District Railway is a short line $2\frac{1}{2}$ miles long, running east and west, principally underground, which has recently been made to connect the railways which terminated at

College and Stobcross Stations, some distance from the centre of the city.

The length in tunnel is 2,600 yards, of which 1,050 yards were built by the process of “cut and cover,” which it is now proposed briefly to describe.

In Kent Road, near the western end of the line, the railway follows the course of the street for a distance of 700 yards in a straight line. The depth from the surface of the street to the rock, which is nearly at formation-level, varies from 22 to 32 feet. All the material above the rock having been proved to consist of wet sand and mud, it was decided to drive a row of 6-inch sheet-piles at the back of the walls, at each side of the covered way.

This was done without difficulty at the rate of from 9 to 10 feet a day for each piling machine.

When a portion of the piling was finished, the Contractor began to sink a trench for the side wall, timbering in the usual way. On

the excavation reaching the level of the sewers a considerable quantity of water had to be dealt with.

In pumping this water it was found impossible to prevent the sand from running through the piling, so this mode of working was abandoned. At this time the sewer for the permanent drainage of the railway was being constructed, and it was resolved to delay the work of building the side walls of the covered way until the sewer was completed, so as to avoid all further pumping.

In the meantime, with the object of afterwards facilitating operations, as well as to ensure the safety of the adjoining buildings, many of which were large and valuable, it was decided to

form a continuous safety arch of concrete between the two rows of piling. This was done by removing the surface to the proper level and form of the arch. Concrete was then filled in, and the causeway restored so as to allow the vehicular traffic to be resumed (Fig. 1).

The safety arch, 700 yards in length, was carried out in the eight months from April to November 1884.

In May 1884 the drain leading to the River Clyde being now available, tunnelling was begun under the concrete arch. Pits were sunk at the cross streets, from 150 to 300 feet apart, and the materials removed by portable steam-cranes. The "gullet" (Fig. 2) was always kept well ahead of the side walls, in order that the sand and mud might be thoroughly drained before the

sheet-piles were exposed. The work was carried on satisfactorily and rapidly, the wings being removed and the side walls and arch built at the rate of about 200 feet per month, and the 700 yards at this place were completed in April 1885. Fig. 3 shows the completed covered way.

At two other points on the railway the same method was followed, but the bottom being composed of mud, it was found necessary to put in a concrete invert (Fig. 4).

The Paper is accompanied by four diagrams, from which the Figs. in the text have been prepared.