founded on a running sand, but in the excavations which have been made for the Metropolitan District Railway only good sound gravel has been met with.

The construction of the brickwork-covered way is shown in Fig. 1, page 45, and we may remark here that the difference between it and a tunnel is chiefly that, in making the latter, the excavation is driven from the ends, whereas in constructing the brickwork-covered way the ground is opened up to the surface and then filled in again upon the top of the arches. In the case of the Metropolitan District Railway there is no tunnel properly so called at any part. In the ordinary brickwork-covered way the arches are composed of five rings of brickwork, and have a span of 25 ft., the clear height under the crown of the arch being 15 ft. 9 in. above rail level. The curve of the crown of the arch is struck with a radius of 15 ft. 9 in., and the haunches with radii of 9 ft. 6 in., as shown in Fig. 1, whilst the side walls have a curved batter on the face, struck with a radius of 25 ft. from a centre situated 5 ft. 6 in. above rail level. The side walls are three bricks thick at the springing of the arch, and the back is carried down perpendicularly to the foundations. At intervals of 50 ft. there are formed in the side walls arched recesses or manholes, 4 ft. wide, 1 ft. 6 in. deep in the centre, and 7 ft. high, the back of each recess being formed of a horizontal arch composed of three rings of brickwork, and having a versed sine of 9 in. The haunches of the arched covering are filled in with concrete, as shown in Fig. 1, the upper surface being sloped off towards each side, as shown, and coated with asphalt 4 in. thick laid on in two layers. At the back of the side walls drain-pipes are led down to near the footings, and are then carried through the walls, as shown in the figure; and, in fact, their arrangement, as well as that of the central 18 in. barrel drain, is the same as in the case of the girder-covered way.

The side walls of the brickwork-covered way were put in in the same manner as those for the girder-covered way already described, their curved inner faces being built to properly supported wooden templates, having each course marked on them, and each furnished with a plumb-line for setting it upright. These templates extended higher than the side wall proper, and the upper part of each of them was recessed to receive lagging-boards, upon which that part of the arched covering near the springing could be built. To allow of the remainder of the arch being built, the core left between the side walls was rounded off at the top, and was spanned by centering formed of light plate-iron ribs carrying the usual lagging-boards. The ends of the ribs were supported by timbers extending from the footings of the side walls, and furnished with the usual striking wedges; and each rib was jointed at the centre, and supported at that point by means of foot-boards and wedges resting upon the top of the central core. This plan enabled the greater part of the core to be left in its place until the completion of the covering, as in the case of the girder-covered way, so that it could be removed afterwards by end excavation.

We have said that the short length of brickwork-covered way near Buckingham-row is succeeded by about 160 yards of open cutting, the railway being for this distance carried between retaining walls. Vertical and horizontal sections, showing the construction of the retaining walls employed, are given in Figs. 5 and 6, page 45, and from these it will be seen that the walls are constructed in bays, each bay being formed of an arched panel abutting against counterforts, as in the case of the side walls of the girder-covered way. At the back of the walls the counterforts are two and a half bricks thick, whilst in front of the panels the thickness is increased to four bricks. The depth of the counterforts, measured from the face to the back, varies according to the depth of the excavation, and the rule which has been followed is, to make the depth of the counterforts at the rail level = \frac{3}{4} the height of the retaining wall + 18 in. The height here taken is the height, above the level of the rails, of that portion of the wall which is built in bays, and the top of which is generally about 18 in. below the ground level. Above the retaining wall there is a parapet wall, as will be seen from Fig. 5, page 45. The backs of the counterforts are carried up perpendicularly, and their front faces have an uniform batter of 1 in 8, so that the rule above given determines their depth from back to front at the top as well as at rail level.

The counterforts are 11 ft. apart from centre to centre, and the arched panels between them are one brick thick for a depth of 10 ft. from the top of the retaining wall, and one and a half bricks thick below that depth. The versed sine of the horizontally arched panels is 1 ft., and at their springing they are set back 1 ft. 6 in. from the faces of the counterforts. The spaces behind the panels are filled in with lime concrete level with the backs of the counterforts, the same arrangements being made for drainage as in the case of the side walls of the girder-covered way. The distance between the faces of the counterforts of the opposite walls, at rail level, is 25 ft., the distance between the walls at the top, of course, varying according to the depth of the excavation. The footings of the walls rest upon cement concrete carried down about 5 ft. below the rail level, as in the case of the side walls of the covered way. The parapet walls are 6 ft. high above the ground level, and are panelled, the panels being one brick, and other parts of the wall, except at the string course and capping, one and a half bricks thick. The retaining walls, like the side walls of the covered way, were constructed in trenches of sufficient