

When the trench was cut a spring, or running water, was met with between cross-sections Nos. 2 and 3, which was allowed to run down the trench, and was used for mixing the puddle. On the 25th November, 1867, some time after the completion of the embankment, the reservoir was filled up and nearly running over the by-wash, and on the 26th the Inspector observed water running over the surface of the ground on the outside slope of embankment, between cross-sections Nos. 2 and 3.

By reference to the cross-sections of the embankment it will be observed that its outer toe is well tied into the rising ground; in fact, in one or two places to rocky spurs.

Drawing No. 4 is a general plan showing the reservoir and its surroundings.

During the month of July, 1886, Professor Black, of the Otago University, reported to the City Council on the alleged leak from the reservoir; as also did Mr. Robert Hay, M.Inst.C.E., of Dunedin, in September of the same year. I attach a copy of each of those gentlemen's reports, together with Mr. Hay's tables showing the result of daily measurements of the supposed leak, and rainfall from the 28th July to the 26th September, 1886, inclusive. Professor Black's tables 1, 2, and 3 are printed along with his report.

On drawing No. 4 are shown the dry stone-wall, cut in face, shaft, drive, and pipe referred to in Mr. Hay's report; and by inspection of his tables it will be seen that the total flow during the twenty-four hours fluctuates, irrespectively of the depth of water in the reservoir, and that the flow is governed chiefly by the state of the weather, rain, &c. I have shown on this drawing a surface-drain from the upper basin along the foot of the slope on the west side of the reservoir and discharging itself into the reservoir creek below the bridge. This drain also intercepts the water from a small gully near the watchman's house, and, no doubt, in time of wet weather, carries a considerable amount of water which must, more or less, percolate into the old spoil-bank and made ground shown on plan and find its way to the outflow of leak. A very considerable amount of material has been deposited in and around the toe of the outer slope of the embankment from excavation taken from the upper basin about 1875, thus materially increasing the area of the outer slope, into which a portion of the rainfall penetrates, and must find its way to the low ground at the outflow.

When on the ground I noticed a depression in the pitching of the inner slope of embankment, and I have endeavoured to show it by means of the longitudinal section D, A, E and the cross-section A, B, C, both of which are represented on this plan. I asked the caretaker, Mr. Gillies, who has resided at the reservoir for the last twenty years, and he states that it is many years ago since he first observed it, and is not aware that it has increased. The cross-section A, B, C is nearly over the bed of the creek, which can be verified from drawing No. 2, and it becomes a question if this depression did not take place through subsidence of the embankment shortly after its construction.

The 4in. tile-drain shown on drawing, and known as the "concealed pipe," discharges water when the reservoir is within 2ft. 2in. of being full, and is about the spot referred to by the Inspector in his statement of finding water running over the surface of the outer slope of embankment between cross-sections 2 and 3, on the 26th November, 1867, which clearly shows that this has been a weak point in the embankment ever since its construction.

In the third paragraph of Mr. Hay's report he states: "On the first occasion (28th July) when I measured the flow of the supposed leak there was a depth of 18ft. 1in. in the reservoir, and the total discharge from the three flows 139·7 gallons per hour; and the last measurement taken by Dr. Black before the water was turned into the reservoir (after having been emptied, with the exception of a small pool) was 222·1 gallons per hour." On the drawing I have shown the position of this pool, as described by Mr. Gillies, the caretaker, who states that it is about 170ft. long, averaging 40ft. wide towards the lower end. When the reservoir was emptied during Dr. Black's investigations a trench was cut from the pool to the scour-pipe, and when water ceased to run into the scour-pipe the depth in the lower portion of the pool was 10ft., with the length and width as above stated. This pool being the lowest ground is doubtless the bed of the old creek; in fact, its position points to this when comparing drawing No. 4 with No. 2. The water in the bottom of the pool stands 32·8ft. above the outflow of supposed leak, and 10ft. below the mouth of scour-pipe.

The first gauging of the alleged leak by the City Surveyor was taken on the morning of the 8th April, 1875, the discharge for the twenty-four hours being 8,020 gallons, with a depth of water in the reservoir of 25ft. 8in. I append a table (A) on which this gauging is shown, as also gaugings from the 15th March, 1882, to the 26th July, 1889, four of which I have taken myself, on the 22nd, 23rd, 24th, and 25th instant, averaging 4,210 gallons for twenty-four hours, with an average depth in the reservoir of 31ft. 7in., no rain having fallen from the 18th instant, when there was ·04 of an inch, the weather since being fine days and frosty nights. (See Table B.)

As before stated, that the flow fluctuates in accordance with the state of the weather, I append a table (C) from the Meteorological Observer, Mr. H. Skey, showing the amount of rainfall during the months of March and April, 1875, from which it will be observed that ·14 of an inch fell during the previous twenty-four hours from the morning of the 8th April; nevertheless, the months of March and April were comparatively dry.

With reference to the safety of the reservoir, by inspection of the tables showing gaugings of flow and rainfall, it will be observed that so far back as April, 1875 there was a large quantity of water issuing from the outflow of supposed leak, and that up to date, extending over a period of fourteen years, the quantity has been a variable one, governed more or less by the state of the weather, and has not been at all a steadily-increasing one.

The site chosen for the reservoir is a remarkably good one, the embankment being near the foot of a valley at the commencement of a narrow, rocky gorge, and the outer slope of bank in several places abutting against rocky spurs. From all I can learn the seat of the embankment is good ground, and it has been carried out with the utmost care. It is unsatisfactory, however, to