

had been a cup-shaped hollow, as represented by Prof. F. W. Hutton in his "Geology of Otago," published in 1875, there would be reason to suppose that it was excavated by glacial action; but the straight, smooth face of the slide having a uniform inclination, goes to show that a large movement has at an early period taken place, and that the depression caused by the faulting has been filled by material conveyed there by glacial action, and apparently this glacier came from the direction of Waikaia and the southern end of the Old Man Range. The cement itself appears to be composed of a quartzose schist rock, the schist being crushed and ground into a pulpy condition by the glacier, having quartz pebbles and sub-angular pieces of rock, some of which are of a jasperoid slate, thoroughly disseminated through the mass. When this material got consolidated it became a compact mass of breccia with partially angular pieces of rock through it.

*Geological Formation of the Blue Spur, Tuapeka.*

Mr. T. A. Rickard, an American mining engineer, after his visit to this locality, read a paper before the American Institute of Mining Engineers at Plattsburgh, in June, 1892, on "The Gold-fields of Otago and the Geological Formation of the Blue Spur," in which there is a great deal of interesting matter. The following is an extract from the paper referred to:—

"The Blue Spur is, perhaps, the best-known and most interesting alluvial deposit in New Zealand. It is situated near the head of Gabriel's Gully, about two miles east of the Town of Lawrence. The name is derived from the colour of the alluvium, which was first discovered in the gully at the foot of the spur, into which it was afterwards traced. The blue, or, more accurately, greenish blue, tint is probably due to the silicate of the protoxide of iron. The deposit consists of a mass of cement and conglomerate, occupying a cup-shaped hollow in a ridge or spur which divides two nearly parallel gullies. Figures 1, 2, and 3 illustrate it, figure 1 being a cross section. The contour line of the ridge, as here shown, is obtained from an old photograph taken in 1865. The working of the deposit has entirely altered the lines. The longer axis is nearly at right angles to the present level of the Blue Spur ridge, the depression which the deposit fills having been cut out of the Wanaka schists, the characteristic rocks of Otago. Figure 3 gives the longitudinal section. The gully on either side is filled with tailings.

"The plan, figure 2, shows the deposit to have a roughly oval shape, the longer axis having a strike N. 60° W., and a length of about 34 chains. The shorter, or N.E. and S.W. axis is 22 chains in length. For the sake of brevity the two longer sides of the deposit, facing respectively N.E. and S.W., will be mentioned as the "Lawrence" and the further side. On ascending the ridge on the further side, about 400ft. above the present level of Gabriel's Gully, the country presents the appearance roughly indicated in figure 2. The accumulation of tailings will in part explain the increased width of the gullies at a point opposite the deposit; but there is no doubt that this is also due in a large measure to the erosion of the conglomerate which formerly extended across. In both instances the gullies narrow rapidly above their intersection with the larger axis of the deposit, and at a short distance become merely rock ravines. It is also noteworthy that there are marked lateral gullies which correspond to the line of the deposit.

"The gold first discovered in Otago, the discovery of which inaugurated the rush to the New Zealand goldfields, was derived from this mass of wash. Neither Gabriel's nor Munro's Gully proved rich above their intersection with the deposit, while both were particularly rich at and immediately below that intersection.

"The mass of the cemented conglomerate has been variously estimated at from eight to ten million cubic yards; but the present manager, whose opinion is of the most value, puts it at from eleven to twelve millions. The area covered is 45 acres.

"A nearer view of the deposit presents the following features. On the Lawrence side, the rock forming the rim of the cup-shaped hollow presents a very uneven surface, and the folia of the schist are much distorted and fractured. The pebbles of the conglomerate are imbedded in the soft crushed country, there being no distinct boundary or line of demarcation between the deposit and the surrounding country-rock. There are longitudinal furrows in the schist, parallel to the strike of the country and the longer axis of the deposit. These furrows are not regular either in shape or direction. Looking down from the ridge on this side, the enormous masses of wash present, by reason of their unequal erosion, the appearance of a miniature cordillera. Reddish layers of oxidized material form marked lines through the general faint blue tinge of the cement, and indicate the dip of the deposit, which is seen to be at a low angle towards Gabriel's Gully, or south-eastward.

"Descending among the masses of conglomerate, one can observe the structure of the material. Fractures cut through the included fragments of the more fissile schist, but they do not pass through the harder pebbles. These last are of varying size up to boulders 2ft. in diameter. The wash shows a large proportion of schist fragments, held together by a light greenish-blue fine-grained cement. Of the remaining portions of the material, large jasperoid boulders are most prominent.

"Going to the further side of the deposit, it is seen at once that the rim-rock has an altogether different appearance from that noted on the Lawrence side. The bounding wall is perfectly straight and even, with a dip of 25° 30' to the south-west. It shows incrustations of alum. The schist of the country, which dips with the face of the rim-rock, shows no signs of having been crushed or dislocated. When first uncovered, the face of this wall is said to have been (and its present appearance suggests it) wonderfully straight and smooth. Exposure to the weather has induced the slow shaling off of its surface, which is now littered with the thin sherd-like fragments broken off by frost and rain. Originally the rim-rock was covered with a thin layer of clay, which protected it; but this clay first hardened and then cracked, to be subsequently removed by the rain; and the underlying country-rock is being rapidly eroded. Fig. 4 gives a view of its present appearance. *CD* is the face of the rim-rock; *EE* are the fragments which have scaled off its sur-