Gabriel's Gully, B. On this, 1 represents the schist rock; 4*a*, the lower part of the auriferous breccia conglomerate; and 4*e*, the higher sandstone part, also auriferous.

The deposits at Weatherstone's and at Waitahuna are practically the same as at Blue Spur, and consequently do not require to be illustrated by sections.

The section Fig. 6 shows the manner of the occurrence of the breccia conglomerates in the Scandinavian Claim, at the head of the west branch of Waitahuna Gully. In the actual line of section the breccia conglomerates have been removed by hydraulic sluicing: 1 represents schist; 4, the breccia conglomerates.

Fig. 7 shows the different small patches of breccia conglomerate and older quartz drifts along a line north-west to south-east, from Monro's Gully to the Tokomairiro Plain: A, Monro's Gully; B, Blue Spur; C, Gabriel's Gully; D, Weatherstone's; E, Forsyth; G, Coghill's Hill; H, Waitahuna; K, Waitahuna Gully; L, Scandinavian Claim, head of Waitahuna Gully; M, Manuka Hill; N, Glenore; O, Adams's Flat; P, downs west of Tokomairiro Plain; X, old rock; 1, schist; 4, breccia conglomerate; 5, older quartz drift.

Without taking into consideration whether or not it be that breccia conglomerates of this age are present in the Nevis Valley, it is apparent that the older breccia conglomerates have at one time extended over a large part of eastern and central Otago. Material, both local and derived from a distance, is to be found in the various patches along the line from Blue Spur to the low grounds of the Tokomairiro Plain, and this is doubtless the case also in the Horse Range. These breccia conglomerates have to be considered as the product of denudation carried by rivers and lesser streams into hollows and inequalities of the land-surface at the time of their deposit. The Blue Spur deposit, and its continuation to the south-east, is, without question, due to the action of a considerable river draining first a schistose area and latterly bringing down a greater amount of sandstone detritus. This is shown by the character of the material in the upper and lower parts of the deposit at Blue Spur itself. At Waitahuna Gully the material is to a considerable extent derived from rocks that are locally developed. Within the Kaitangata Coalfield the coarser schistose and sandstone conglomerates alternate with beds of finer-grained quartz grit and quartz sand, the latter indicating the action of the sea in more completely reducing a portion of the breccia conglomerates, so as to leave only the harder material, consisting of quartz, &c. Professor Hutton clearly indicates his belief that the depression containing the breccia conglomerates at Blue Spur "was excavated by a glacier, and afterwards filled with conglomerates by the agency of a river";* but it has been shown that, at least, one side of this basin had no existence till long after the deposition of the conglomerates. Mr. Rickard, on the other hand, while contending that the material is "the rocky freight of a glacier," yet explains the existence of the basin in which this now rests as being partly due to faulting on the north-east side, and crushing of the slates on the western side of the area covered by the conglomerates.† Mr. Rickard, however, adds the following: "The line of fault is not parallel to the course of the lead; the two meet between Monro's and Gabriel's Gully, and so explain the enlargement at that point of the receptacle of the ore-deposit. This explains the natural selection of this particular place as the *locus* of the deposit. To proceed further, the glacier in its slow downward progress to the sea is temporarily arrested by the softer rock, which it here encounters much in the same way as a runner is retarded in crossing a ploughed field. This arrest allowed the accumulation of a terminal moraine, which, protecting the rock on which it lay, assisted the tendency of the ice to erode the softer schist; where the terminal moraine at one time lay we now find the rocky bar [at the Gabriel's Gully end of the deposit]. A hollow was scooped out. This was in early Eocene days. A little later, that subsidence took place which preceded the deposition of the Oamaru series. This caused the retirement of the glacier, or, more accurately, the melting-away of its lower portion. The rocky basin which had been scooped out by the ice now became a fresh-water lake, with its upper end still guarded by the glacier. The ice which broke away from the foot of the glacier bore with it large boulders of jasperoid which had been brought down from Tapanui. This and other material was borne across the lake, to fall eventually upon its bottom as the ice-floes melted. In the meantime, up above, the glacier continued to plough through the soft quartzose schists, and send down a golden tribute, derived from the lode-formations which it cut through. The fine flakes of gold were accompanied with micaceous mud and angular bits of quartz, all to be deposited in the capacious hollow of the lake. Thus the rocky basin became gradually filled up with confused layers of big jasperoid boulders, quartz gravel, and bluish mud, the gold sifting its way to the lower portions. The subsidence continuing, and with it the slow retirement of the glacier, and the lake being nearly full of detritus, it became a morass. Vegetation took root, and flourished for a brief period. A time of flood, due to excessive thaw, brought down a volume of water, bearing the sand and gravel, which covered the vegetation. Being thus protected from the air, the reeds of the morass became the lignite of to-day. A river linking a series of small lakes, of which the Blue Spur was one, now flowed along the course of the present alluvial lead. Additional material was deposited in some places, while material was removed in others. In the middle of the Eocene period, the elevation of the land culminated and changed the drainage system of the district. In Miocene times, the Clutha and its tributaries began to flow across the line of the Blue Spur lead. That erosion then commenced which, in the cutting-out of Monro's, Gabriel's, and Weatherstone's Gullies, left the gravel-deposit as part of a dividing-ridge";‡ and thus Mr. Rickard as strongly contends for the excavation-by-ice theory as does Professor Hutton.

Nowhere can the evidence of ice-action be seen at the Blue Spur, Weatherstone's, or at Waitahuna, and there is no need for such an hypothesis. The so-called basin has not been "scooped out," and the material filling it, though angular, being locally derived in the lower part, is not of morainic origin. The writer has travelled a good deal amongst the New Zealand Alps, and

* "Geology of Otago," p. 93. † Goldfields Reports, 1893, p. 111. ‡ *Ibid.*