

surface, but passed away into tracks upward, downward, and longitudinally: these, however, were connected by the "tracks" with the outcropping bodies of stone. In many cases the lodes or their "tracks" have been faulted either laterally, vertically, or longitudinally, but have usually been recovered again by means of proper exploration.

Approaching now the great question as to whether the reefs are likely to prove remunerative at greater depths than those reached, it cannot be denied that the evidence obtained shows a general falling-off at lower levels as regards the actual yield per ton, and the pinching and dying-out of blocks of stone large and highly productive near the surface. During my whole inspection of the Reefton field I saw but few cases where permanent-looking shoots were being successfully mined at the lowest levels. This certainly is discouraging, and, looking back at Victoria for example, it can be seen that even there, though quartz-mining is being successfully carried on at over 2,000ft., and exceedingly rich stone is sometimes found at that depth, the average yields from great depths are not equal to those once obtained from the surface outcrops. This may be in part due to the greater ease of selecting choice stone near the surface than at depths where the rich and the poor stone have frequently to be taken together to make up a common average; but the general tendency has been to a diminution—if only a slight one—of the richness of quartz with increasing depth, though the limit to which it can profitably be worked has certainly not yet been reached in Victoria.

In the Reefton district there is visible nothing whatever in the character of the rocks themselves at depth affording any reason to suppose that the limit of productiveness has been reached. The tracks of the lodes appear to continue downwards in all cases, and little or no exploration has been carried on to prospect for new "makes" of stone below those that have become poor or attenuated.

There is no recognised level at which such impoverishment takes place, as it appears that productive stone has been worked at elevations varying from 2,300ft. above sea-level—at the Ajax Mine—to 100ft. below sea-level—in the Keep It Dark—a range of 2,400ft. in vertical height. There is absolutely no discernible cause why the Ajax and other reefs outcropping at high elevations should not continue productive to as low levels as have been reached in the Keep It Dark, the Keep It Dark No. 2, and the Wealth of Nations Mines, nor is there any apparent reason why in the three latter, and all other mines on the field, the payable stone should not exist at still greater depths than those hitherto attained. In my opinion, the great national importance of the matter and the negatively favourable indications should outweigh the positively unfavourable evidences; and I consider it well worth while, at the risk of possible failure, for those interested to incur the expense of well-directed systematic further exploration. As to the directions of such exploration, there may be considerable local diversity of opinion, but I would certainly indicate two as being particularly suitable. One is the deeper sinking of the Keep It Dark Mine, already the deepest on the field, and cross-cutting at lower levels, especially westward; another is the extension of the Low Level Tunnel, which has already been driven a long distance, and if continued as originally projected will cut the Venus, Ajax, and other lines of reef at deeper levels than have yet been reached, besides affording a useful highway to facilitate mining operations and general prospecting work.

In the Welcome Mine at Boatman's the track of the reef should be accurately ascertained and followed both downward and longitudinally, while at Merijigs the continuance of the Golden Lead tunnel would be genuine prospecting work. The success of any one of these operations would stimulate enterprise throughout the whole field, and afford general grounds for encouragement to deep exploration in all the other mines.

*Lyell.*—I include the quartz mines of this locality with the Reefton group on account of the similarity in the lithological character of the containing rocks, though those of Lyell are regarded as being of Devonian age, or older than the Maitai series of Reefton.

Near Lyell township the rocks are metamorphic in character, and associated with gneissic granites; but at the mines, some three miles up Lyell's Creek, the rocks are nearly unaltered clay-slates, somewhat crushed, and very similar in appearance to those of Reefton, though showing more defined bedding and lamination.

At the United Alpine Mine, Lyell's Creek, the strike of the reef is north-westerly, and the underlie north-easterly, the "pitch" of the quartz shoots being north-westerly with the strike. There are two blocks or shoots of stone—the southern and the northern. The southern block has been worked from the surface, but is described as poorer than the northern, the upper edge of which was only met with some hundreds of feet below the surface. About 60ft. of blank ground, traversed by a "track" of broken country, intervenes between the two blocks. The No. 7 or lowest level has been driven to the lode, which shows a thickness of as much as 14ft., some of the upper portions being reported as up to 40ft. thick. The northern block of stone is about 225ft. in length, and yields about 2oz. of gold per ton, and from its north-west edge or termination a track continues into the country rock. This track, if followed, might lead to other blocks. The southern block is 300ft. long, and is expected to be good when reached at this level, as it showed some improvement downwards in the upper workings.

The low-level tunnel of the Lyell Creek Extended Mine has been driven 3,400ft., but has not yet reached the lode. The country is slate, with occasional bands of sandstone, very regular, and "kindly-looking."

Generally, the rocks of this locality present most favourable conditions for the downward and longitudinal continuance of the lodes, and exploration in those directions is fully warranted.

### THIRD GROUP.

#### *Reefs traversing Metamorphic Schists.*

The precise geological position of the Archæan metamorphic schists of New Zealand is so far undetermined, but they are undoubtedly among the oldest stratified rocks of the world, and constitute the principal visible rock-foundation of the country. They consist mainly of quartz and