

to be a departure from the hypothesis, as they seem to occupy a mid-flank position on an anticlinal fold. Several factors, however, tend to obscure the evidence and render its interpretation more difficult than usual. Consequently we cannot ignore the success that has attended the application of the hypothesis in the past in this subdivision, and there is no doubt that in directing prospecting for auriferous lodes in new country the geological structure should be the first guide.

BLACKWATER MINE.

Through the courtesy of Mr. T. Hogg, manager of the Blackwater Mine, it was possible to examine an intersection between the main reef and a basic dyke. This was seen in Naylor's Stope, No. 11 level north. The dyke was also examined at other places where it is close to the reef in Nos. 12 and 13 north.

The dyke interrupts the reef in No. 11, and at no place in the mine does the reverse apply. Small inclusions of country rock are not uncommon within the reef, but no case of a fragment of dyke material being thus included in the reef has been recorded. These facts point strongly to a later age for the dyke. A number of minor faults intersect both dyke and reef, but both features seem to be equally affected. Hydrothermal alteration of the dyke rock where it is close to the reef has been suggested as evidence for the reef being the younger. It seems, however, more reasonable to attribute this, and also the presence of tiny veinlets of quartz, differing markedly in character and appearance from that of the main reef, to the action of later active solutions rising in or near the vein fissure, which would doubtless long continue to be an easy path for them. The dyke rock is of a type particularly susceptible to alteration of this kind.

The so-called "Prohibition Fault" obliquely cuts off the main reef at the north end in all levels. No. 13 level had at the time of this visit been driven north just through the fault, from the drag effect shown by the end of shear planes in the country rock, by dyke rock fragments in the pug, and by the material of a small leader in the roof, it can be seen that the country on the north side of the fault, which was steeply dipping where seen, has moved west as regards the horizontal component. The effects seen can only be accounted for either by a normal fault with relative upthrow to the north, or by a fault with some element of westerly thrust on the north side of the fault. In either case a search for the continuation of the reef beyond the fault would seem to be best effected by driving through it and crosscutting westwards. This should be done at the lowest level, to lessen the distance required to be crosscut, owing to the steepening of the reef in depth.

GREYMOUTH COALFIELD.

By H. E. FYFE, M. GAGE, and W. E. HALL.

Introduction.

The chief object of the present survey is to determine the amount of economically recoverable coal within the coalfield. A prerequisite to the establishment of secondary industries requiring large tonnages of coal is a thorough knowledge of the economically recoverable coal. Experience and knowledge gained from mining operations over the period since Bulletin No. 13* was published all suggest that the resources of the coalfield are extremely limited, and if this is the case the survey will be justified in proving this conclusively, so that efforts may immediately be made to conserve our resources, to prove the field systematically by boring, and to develop the field as a unit. A detailed geological survey is a means to this end. It cannot in itself provide all the essential data, but it can utilize all the information available, and direct boring operations.

The late Mr. P. G. Morgan was aware of the limited resources of the bituminous coals, for he wrote† :—

"Too much emphasis cannot be placed on the question of utilizing the coal resources of New Zealand to the best advantage. Already much waste has occurred in almost every coalfield of the Dominion. The supplies of high-class coal are somewhat limited, and therefore their conservation is a matter of the greatest national importance.

" . . . The amount of coal in the Grey Coalfield is estimated at 636,000,000 tons, less 6,000,000 tons already mined. Of this great tonnage, however, a very large proportion can hardly be considered as workable at a profit under any economic conditions ever likely to prevail. If present conditions continue to prevail in all respects, the writer has little hesitation in saying that not one-tenth of the coal in the ground will ever be extracted."

From what information has so far been gathered by the present survey it seems that 63,000,000 tons rather than any larger estimate represents more nearly the actual tonnage likely to be economically recovered from the field. The coal-mining industry on the Grey field would appear to be at, or rapidly approaching, a critical stage in its history. This is due not only to an impending exhaustion of the readily mineable coal, measureable within a couple of decades at most, but also to the scarcity of coal-seams workable under existing economic conditions.

There are few blocks, if any, within the whole coalfield that are so favourable for production as that in which Liverpool No. 2 Mine is now operating. Of the two seams there developed, the upper, or Kimbell, seam to date has been proved to carry workable coal over a distance of 70 chains meridionally and an average of 50 chains transversely. Southwards the seams may extend with a diminished width beyond the No. 3 Extended section of the State mine, but the fault that cut off the southern extension of the No. 4 section will probably intersect the Morgan and Kimbell seams from 15 chains to 20 chains

* MORGAN, P. G.: The Geology of the Greymouth Subdivision, North Westland. *Bulletin No. 13* (New Series), 1911.

† *Ibid.* p. 28.